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GENERA OF THE ERYSIPHACEAE

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摘 要

根据对我国白粉菌的研究，以及对其他国家的有关属的模式及非模式标本的研究，在 Erysiphaceae 科中共承认无性型4个属和有性型或全型19个属。它们分别是：*Oidiopsis* SCALIA, *Oidium* LINK, *Ovulariopsis* PAT. & HARIOT, *Streptopodium* ZHENG & CHEN; *Arthrocladiella* VASSILK., *Blumeria* GOLOV. ex SPEER, *Brasiliomyces* VIÉGAS, *Bulbouncinula* ZHENG & CHEN, *Cystotheca* BERK. & CURT., *Erysiphe* DC.:FR., *Furcouncinula* Z. X. CHEN & GAO, *Leveillula* ARN., *Medusosphaera* GOLOV. & GAMAL., *Microsphaera* LÉV., *Phyllactinia* LÉV., *Pleochaeta* SACC. & SPEG., *Podosphaera* KUNZE, *Queirozia* VIÉGAS & CARDOSO, *Sawadaia* MIYABE, *Sphaerotheca* LÉV., *Typhulochaeta* ITO & HARA, *Uncinula* LÉV. 和 *Uncinuliella* ZHENG & CHEN。可疑属为：*Xenomyxa* SYD.。排除的属包括：*Astomella* THIRUM., *Chilemyces* SPEG., *Leucoconiella* BAT. et al., *Leucoconis* THEISS. & SYD., *Parodiellinopsis* HANSF., *Rhizotexis* THEISS. & SYD., *Schistodes* THEISS. 和 *Toroa* SYD.

科的形态及属的历史有简短的介绍。对承认的属提供有异名名单及线条图，并有分属的纲要检索表及特征检索表。

SUMMARY

Based on studies of the powdery mildews in China, together with studies carried out on the type and nontype specimens of the related genera from other countries, 4 anamorphic, and 19 teleomorphic or holomorphic genera of the Erysiphaceae are considered acceptable. These include: *Oidiopsis* SCALIA, *Oidium* LINK, *Ovulariopsis* PAT. & HARIOT, *Streptopodium* ZHENG & CHEN; *Arthrocladiella* VASSILK., *Blumeria* GOLOV. ex SPEER, *Brasiliomyces* VIEGAS, *Bulbouncinula* ZHENG & CHEN, *Cystotheca* BERK. & CURT., *Erysiphe* DC. :FR., *Furcouncinula* Z. X. CHEN & GAO, *Leveillula* ARN., *Medusosphaera* GOLOV. & GAMAL. , *Microsphaera* LEV., *Phyllactinia* LEV., *Pleochaeta* SACC. & SPEG., *Podosphaera* KUNZE, *Queirozia* VIÉGAS & CARDOSO, *Sawadaia* MIYABE, *Sphaerotheca* LÉV., *Typhulochaeta* ITO & HARA, *Uncinula* LÉV., and *Uncinuliella* ZHENG & CHEN. *Xenomyxa* SYD. is treated as very doubtful; whereas the following genera are excluded from the Erysiphaceae: *Astomella* THIRUM., *Chilemyces* SPEG., *Leucoconiella* BAT. et al., *Leucoconis* THEISS. & SYD., *Parodiellinopsis* HANSF., *Rhizotexis* THEISS. & SYD., *Schistodes* THEISS. and *Torca* SYD.

Morphology of the family and historical notes of the genera are briefly introduced. Synonyms and line drawings are provided for the recognized genera. A synoptic key as well as a diagnostic key is also given.

INTRODUCTION

In the classification of the genera of the powdery mildews, most frequently importance was attached only to a few characteristics of the teleomorphs, observations generally being confined to the number of asci per ascocarp and the morphology of the appendages, etc., whereas little attention has been paid to other aspects of the teleomorphs, and especially to those of the anamorphs. This is why powdery mildews, so rich in kind and diverse in form and behaviour as they are, have seldom been sorted out properly, with the result that many genera are not recognized as they should have been.

Only 6-7 genera have been universally accepted as teleomorphic members of the family Erysiphaceae. For example, in THE FUNGI IVA, YARWOOD (1973) merely listed 7 genera: *Erysiphe*, *Podosphaera*, *Sphaerotheca*, *Microsphaera*, *Uncinula*, *Phyllactinia* and *Leveillula*. Nearly all of them were reported as early as the 19th Century. Although many new genera of the powdery mildews were described in the 20th Century, none was included in the family by him except *Leveillula*.

A few exceptions of authors recognizing more genera in the Erysiphaceae can still be found. In the 7th edition of THE DICTIONARY OF THE FUNGI (HAWKSWORTH et al., 1983), as many as 28 genera were listed as members of the powdery mildews. BRAUN (1981) discerned 19 genera. Despite the fact that some of the genera in BRAUN's classification have to be reconsidered, his system is doubtless the most important one up to the present.

All the genera that have been listed or reported as powdery mildews will be further discussed in this paper.

MORPHOLOGY

THE ANAMORPHS:

Morphology of the anamorphic state of the powdery mildews has been most thoroughly studied by BOESEWINKEL (1980).

The MYCELIA of the powdery mildews are frequently found on the leaves of their host plants, but can also be formed on young shoots, tender tips, twigs, flowering parts and fruits. Mycelia of most genera are ectophytic, while *Leveillula*, *Phyllactinia*, *Pleochaeta*, *Queirozia*, and one species of *Cystotheca* (*Cystotheca tjibodensis* (GÄUM.) KATUM.) have been reported to be subendophytic, that is, partly ectophytic and partly endophytic. Mycelia on the leaf blade may be epiphyllous, hypophyllous or amphigenous. Some species form roundish or irregularly outlined, thick or thin patches; others become effuse and do not form patches at all. The margin of patches may be distinct or indistinct. When severely attacked, the whole leaf surface may be covered with collapsed patches. Mycelia may be persistent throughout the season or evanescent.

The HYPHAE are straight, curved, flexuous or geniculate. Generally they branch profusely, while in a few species they do not branch at all. The width of the hyphae is quite different in different species. The hyphae are multiseptate, composed of cells which are usually thin-walled and uninucleate. Nuclei of the hyphae are relatively large and the nucleoli are distinct.

Mycelia of most species remain white throughout their growth, but many species of *Sphaerotheca* and some species of other genera may turn brown later. Hyaline to brown coloured, falcate SETAE (or termed 'special aerial hyphae' by some authors) can be formed by *Blumeria* and *Cystotheca* and hyaline, dichotomously branched ones can be formed by *Queirozia* on the mycelia. (Fig. 1, a-d)

By the help of APPRESSORIA, the mycelia can anchor themselves to the leaf surface of the host. According to BOESEWINKEL (1980), appressoria are formed by about 20-50% of the hyphal cells. Appressoria may be multilobed, moderately lobed to unlobed, and may be alternate, opposite or in sequence on the hyphae.

HAUSTORIA are organs which absorb nutrients from the

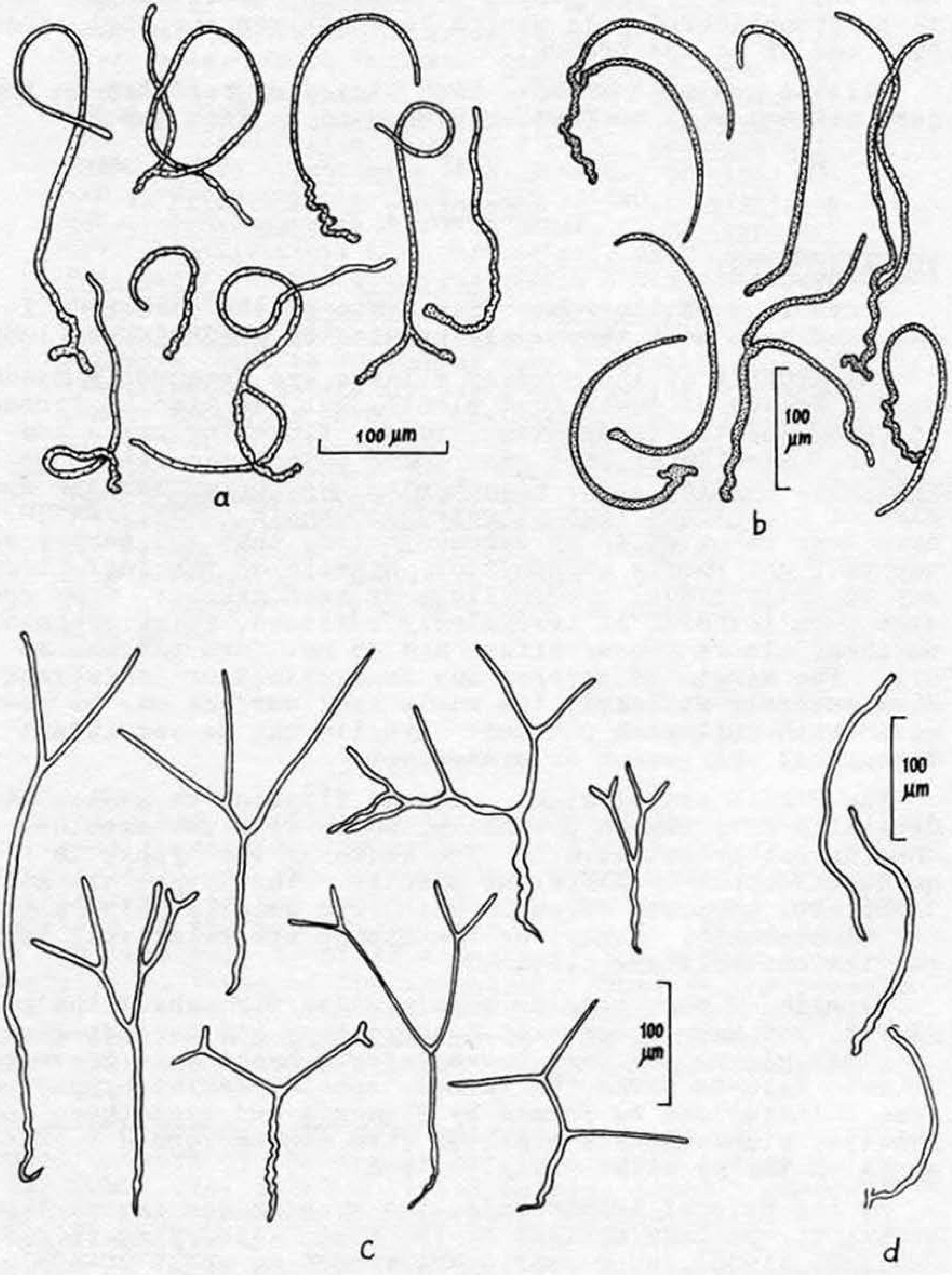

Fig. 1. Mycelial setae of some powdery mildews: a. *Cystotheca tjibodensis*, b. *Cystotheca lanestris*, c. *Queirozia turbinata*, d. *Blumeria graminis*.

hosts. In the epiphytic species, invading filaments are sent from the appressoria and penetrate through the host to form haustoria inside the epidermal cells. In subendophytic species, haustoria are formed inside the mesophyll cells of the host from the endomycelia. Most haustoria are spherical to pyriform in shape, a few can be slightly lobed and only those of Blumeria graminis (DC.) SPEER are deeply lobed and hence very characteristic. (Fig. 2, a-d)

During the growing season, the powdery mildews form conidiophores and conidia in large quantities.

CONIDIOPHORES of almost all genera of the ectophytic and subendophytic types are developed from the ectophytic mycelia and are seldom branched. The only exception is the Oidiopsis state of Leveillula, which develops its conidiophores from the endophytic mycelia, springing out through the stomata of the host and frequently branching. Most

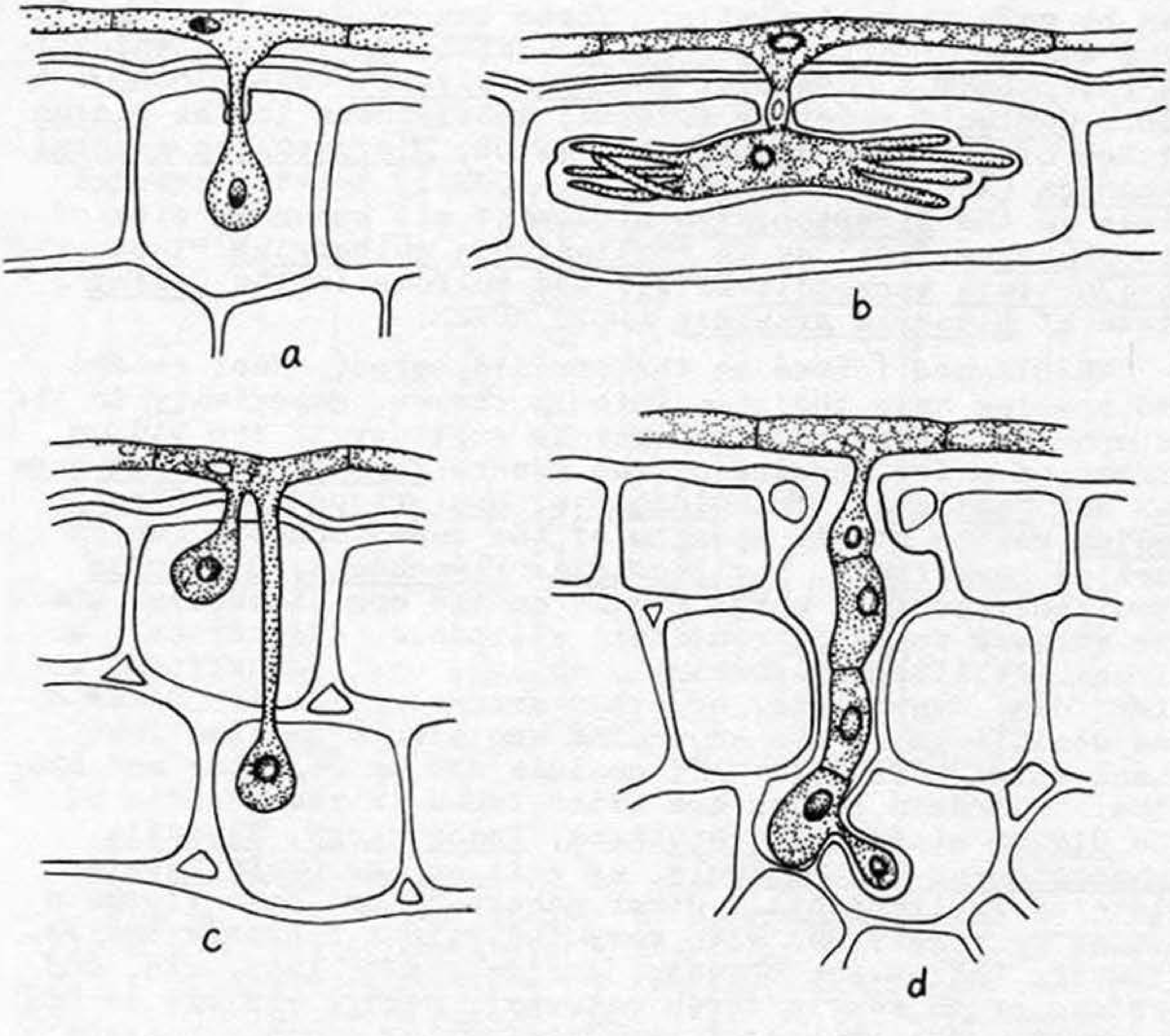

Fig. 2. **Haustoria of some powdery mildews: a. Erysiphe polygoni, b. Blumeria graminis, c. Uncinula adunca, d. 'Phyllactinia corylea'. (SMITH, 1900)**

conidiophores consist of 1-3 cells, rarely as many as 8 cells (BOESEWINKEL, 1980). The uppermost cell of the conidiophore is the sporogenous cell. Conidiophores are usually equal in diameter throughout, hyaline, and thin-walled with the exception of the Ovulariopsis state of Phyllactinia rigida (SALM.) BLUM. which is very thick-walled. Length of the conidiophores is greatly affected by environmental conditions, etc. Foot cells of the conidiophores are straight in most species, but some may be enlarging upward, or attenuating upward, or constricted abruptly. For example, according to BOESEWINKEL (1980), species with enlarging foot cells include the Oidium states of Erysiphe verbasci (JACZ.) BLUM., and Sphaerotheca aphanis (WALLR.) BRAUN (=Sphaerotheca alchemillae (GREV.) JUNELL); species with attenuating foot cells include the Oidium states of Erysiphe cruciferarum (OPIZ) JUNELL, Erysiphe pisi DC., Microsphaera viburni (DUBY) BLUM., and the Streptopodium state of Pleochaeta polychaeta (BERK. & CURT.) KIMBR. & KORF; while the Oidium state of Uncinula pyrenaica VIENN.-BOURG. may become strongly constricted at the base of the foot cells. Morphology of the foot cells of some species can be very characteristic. These can be curved in the Oidium states of Erysiphe sordida JUNELL, Uncinula clandestina (BIV.-BERN.) SCHROET., Uncinula miyabei (SALM.) SACC. & SYD., Uncinula ehretiae KEISSL.; subflexuous in the Oidium states of Erysiphe carpophila NEVOD, Microsphaera euonymi-japonica (ARC.) HERTER ex VIENN.-BOURG.; twisted several times in the Streptopodium states of all known species of Pleochaeta as well as in Phyllactinia dalbergiae PIROZ. and Phyllactinia yarwoodii PATW.; and bulbous in the Oidium state of Blumeria graminis (DC.) SPEER.

CONIDIA are formed on the conidiophores. Most genera and species have their conidia in chains, especially in the ectophytic types, but they may be solitary in the Oidium states of a few species of the genera Erysiphe, Microsphaera, and Uncinula. The Oidiopsis, Ovulariopsis or Streptopodium states of all species of the subendophytic genera such as Leveillula, Phyllactinia, Pleochaeta, Queirozia have their conidia borne singly on the conidiophores. There are various forms of conidia: ellipsoid, cylindrical, doliform, doliform-cylindrical, oblong, oval, claviform, obclaviform, lanceolate, or other irregular forms. Sizes of the conidia which are in chains are always smaller than those borne solitary. All conidia are unicellular and hyaline. Fibrosin bodies are often found in the conidia of the Oidium states of Cystotheca, Podosphaera, Sawadaia, Sphaerotheca, and Uncinula, as well as the Ovulariopsis state of Phyllactinia. Other genera do not have fibrosin bodies or rarely so, with very indistinct fibrosin bodies. Fibrosin bodies are clavate, conical, patellate, etc. and are easier to see in fresh material, hardly visible in old material. Germ tubes of the germinating conidia possess very characteristic morphology. NEGER (1902), HIRATA (1942, 1955, 1956), ZARACOVITIS (1964, 1965) and BOESEWINKEL (1977, 1980) have reported the morphology of the germinating conidia. They believed that by the use of diagnostic criteria regarding the length of the germ tubes, position on the conidia where they germinate, shape of the germ tubes, as well as the shape of the appressoria on the germ tubes, together with the other characteristics of the anamorphs, one would be able to divide powdery mildews into genera and species. (Fig. 3, a-n)

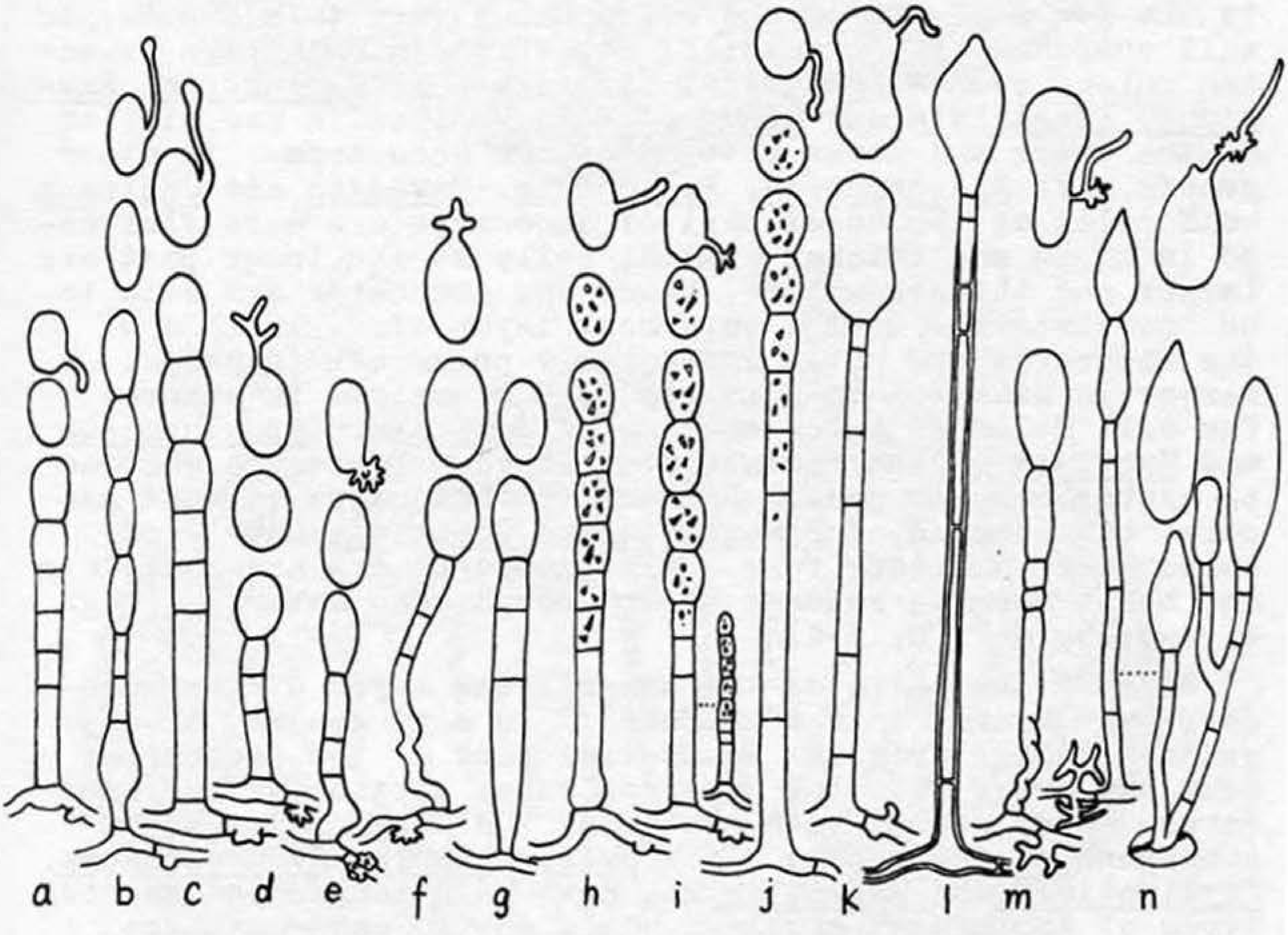

Fig. 3. Characteristics of the anamorphs of the Erysiphaceae: a-j. Oidium, k-l. Ovulariopsis, m. Streptopodium, n. Oidiopsis. (teleomorphs: a. Arthrocladiella mougeotii, b. Blumeria graminis, c. Erysiphe galeopsidis, d. Erysiphe aquilegiae var. ranunculi, e. Microsphaera euonymi-japonici, f. Uncinula necator, g. Uncinula pyrenaica, h. Podosphaera leucotricha, i. Sawadaia bicornis, j. Sphaerotheca fugax, k. Phyllactinia roboris, l. Phyllactinia rigida, m. Pleochaeta polychaeta, n. Leveillula taurica.) (BOESEWINKEL, 1980)

THE TELEOMORPHS:

Sexual reproduction of the powdery mildews proceeds in late growing season. Finally asci and ascospores are developed in the ascocarps.

ASCOCARPS are formed on the surface of the hosts, most on the mycelial mat while the others are imbedded in it and interwoven with the mycelia. The ascocarp wall is generally composed of outer and inner walls each with several layers of cells. The outer and inner walls are undetachable in most genera, while those of Cystotheca can be completely detached. There is only one layer of cells when the powdery mildews first form their ascocarps. More layers are formed as the ascocarps become more and more mature, while the cell wall of the outer wall cells also becomes thicker and darker. Therefore, immature ascocarps usually show a yellow to yellowish-brown colour, while the mature ones are dark brown to blackish brown coloured. The only exception is the genus Brasiliomyces which has a very thin ascocarpic wall composed of one layer of cells retaining a pale brownish colour even at maturity. In genera like Blumeria, Erysiphe, Leveillula and Sphaerotheca, wall cells are similar at the upper and lower portion of the ascocarps. In other genera like Microsphaera, Pleochaeta, Sawadaia and Uncinula, wall cells at the upper part of ascocarps are more flattened in shape and thicker walled, cells at the lower part are larger and thinner walled, hence the ascocarps are said to be 'dorsiventral'. The outermost layer of wall cells of the ascocarps are often irregularly polygonal in shape, larger in diameter in some species or smaller in others. The wall cells of a few species of Sawadaia, Typhulochaeta and Uncinula may be radiately arranged. Depressed globose to globose is the usual shape of the ascocarps in most genera, but species of Pleochaeta and Queirozia have ascocarps of a turbinate form. All ascocarps are non-ostiolate and burst open to release their spores when mature. (Figs. 4, a-b; 5, a-f; 6, a-d)

Some of the cells of the superficial layer of the ascocarp can develop into APPENDAGES. In many genera, the appendages arise from the equatorial part of the ascocarps. Some may arise from the upper or basal portion of the ascocarps. Most genera have one type, the longer type of appendages. A few genera, like Bulbouncinula, Medusosphaera, Phyllactinia and Uncinuliella, have both longer and shorter types of appendages simultaneously on the same ascocarp. As a rule, the shorter type of appendages of the four above-mentioned genera are borne apically on the ascocarp and become gelatinized on contact with water after they are fully mature. The longer type of appendages in a few genera like Pleochaeta and Typhulochaeta may likewise deliquesce at least at their apices. This gelatinization is believed to play a very significant role in how the ascocarps adhere after being wind-blown from their original sites of production. Typical appendages, i.e. the longer type of appendages, with the exception of those in Blumeria and

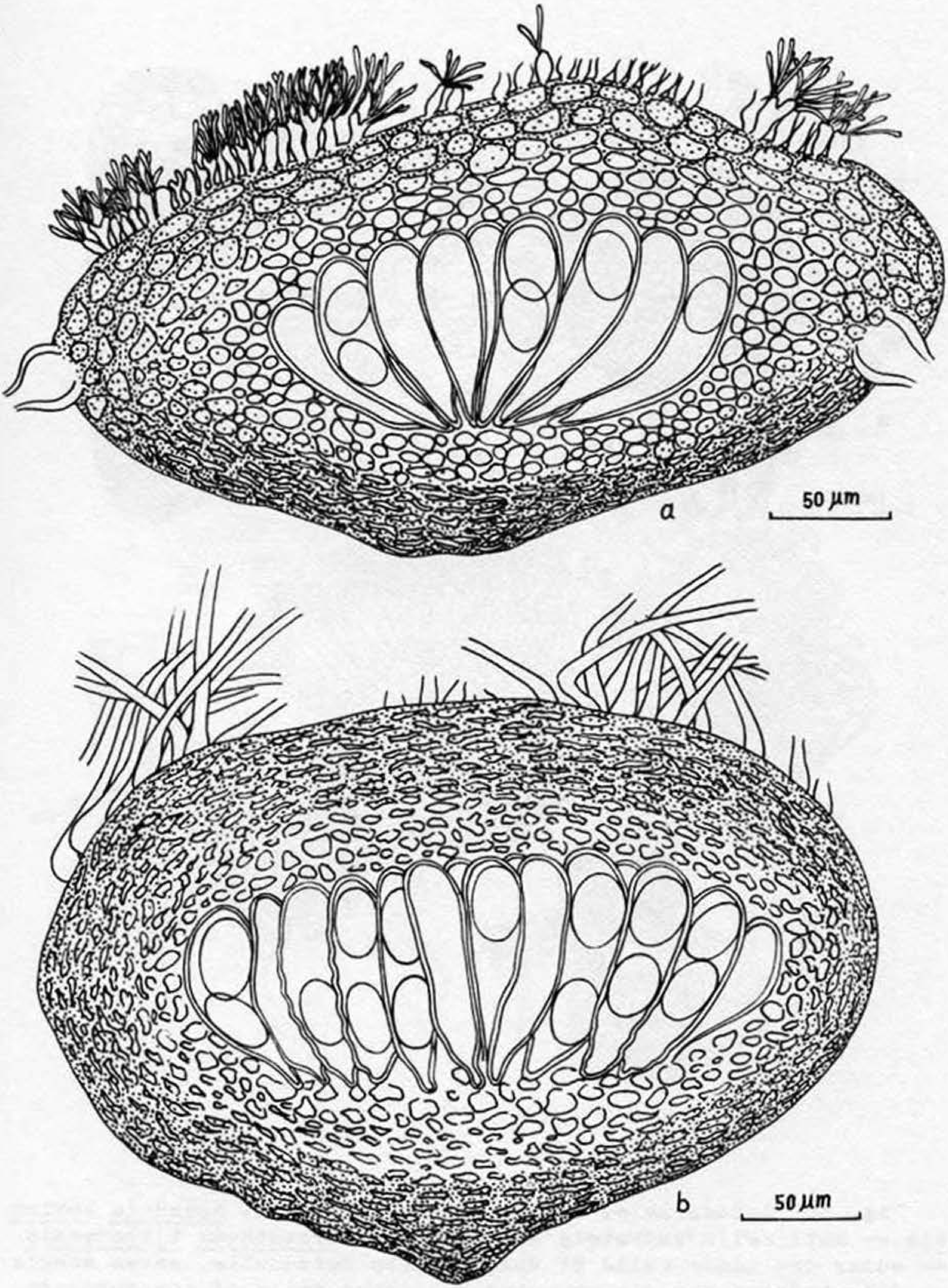

Fig. 4. Ascocarps of the Erysiphaceae I: a. *Phyllactinia actinidiae-latifoliae* — ascocarp depressed globose, with asci arranged in a fascicle; b. *Queirozia turbinata* — ascocarp turbinate, with asci arranged in a hymenium.

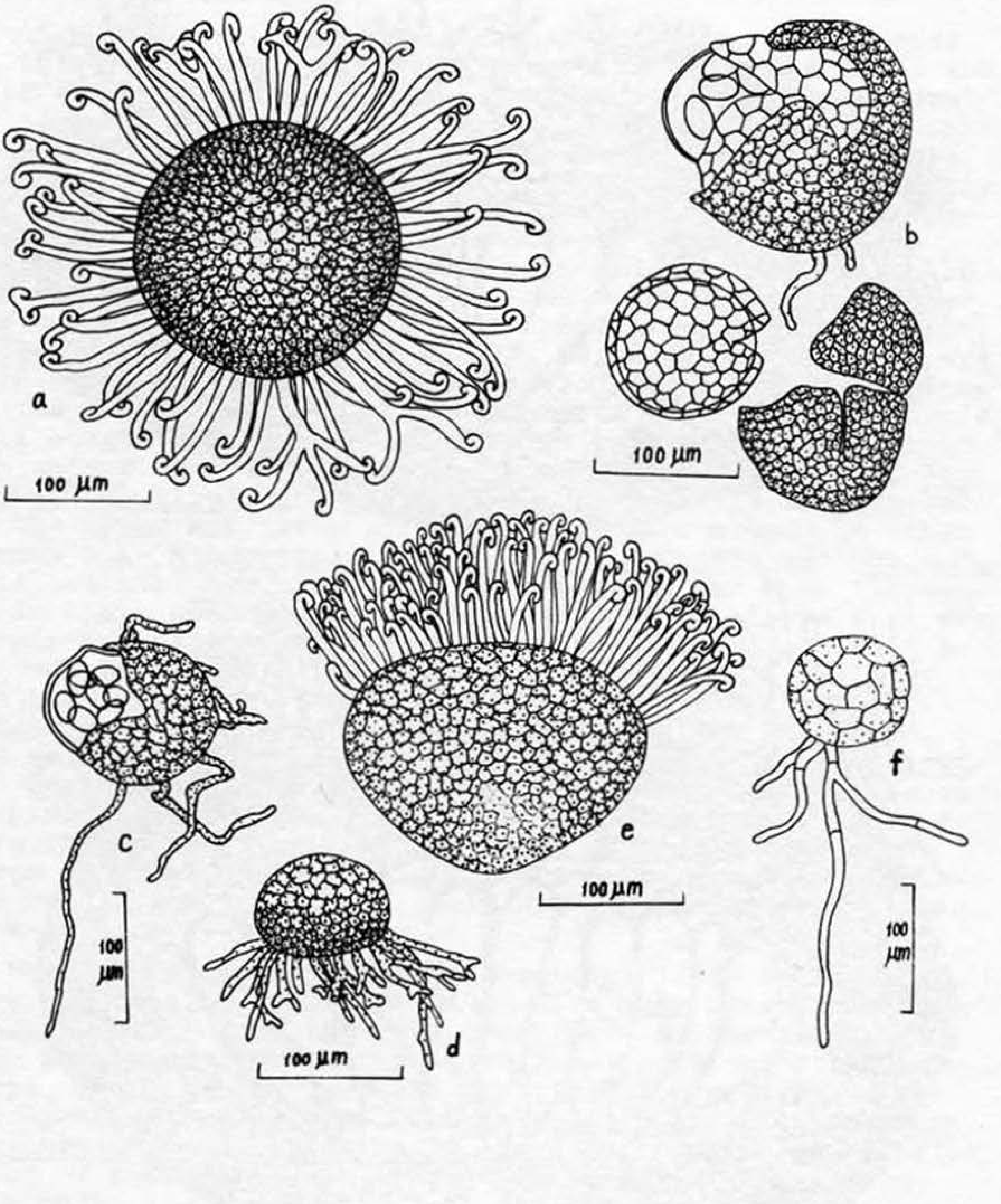

Fig. 5. Ascocarps of the Erysiphaceae II: a. Sawadaia bomiensis — wall cells radiately arranged; b. Cystotheca tjibodensis — outer and inner walls of the ascocarp detachable, ascus single; c. Sphaerotheca aphanis — outer and inner walls of the ascocarp undetachable, ascus single; d. Erysiphe heraclei — with appendages arising from the basal part of the ascocarp; e. Pleochaeta salicicola — with appendages arising from the upper portion of the ascocarp; f. Sphaerotheca melampyri — with very large wall cells.

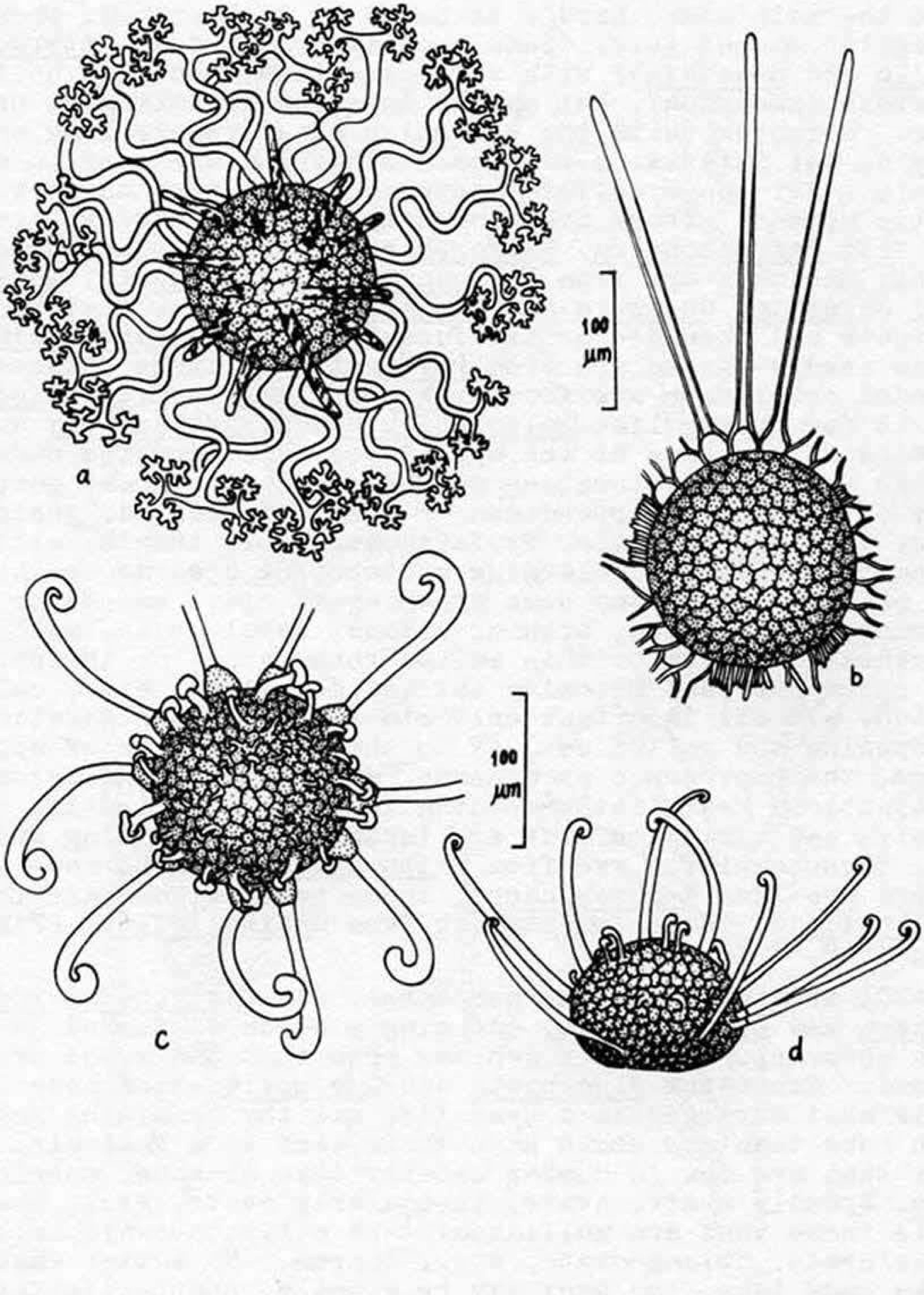

Fig. 6. Ascocarps of the Erysiphaceae III: a. Medusosphaera rosae, b. Phyllactinia corylopsidis, c. Bulbouncinula bulbosa, d. Uncinuliella simulans var. rosae-rubi. All genera have two types of appendages on the same ascocarp.

Brasiliomyces, which are more or less rudimentary, and those in *Cystotheca*, *Erysiphe*, *Leveillula* and *Sphaerotheca*, which are mycelioid, are well developed and non-mycelioid. Mycelioid appendages may be simple or irregularly branched, most oftenly nonuniform in width throughout their length, intertwined with each other, and are hard to enumerate. Non-mycelioid appendages, except in the apical portion, have the main stems hardly branched or if branched, then in a regular manner (e.g. dichotomously branched in *Arthrocladiella* and *Sawadaia*); with rare exception, most are uniform in width throughout, but may be tapering or enlarging upward. Moreover, with the exception of extremely long ones, they do not intertwine with each other and are easy to enumerate. All non-mycelioid appendages have very characteristic apices: those dichotomously branched several times are from *Medusosphaera*, *Microsphaera*, *Podosphaera*; those simply uncinate are from *Bulbouncinula*, *Pleochaeta*, *Queirozia*, *Sawadaia*, *Uncinula* and *Uncinuliella*; those that become uncinate and then di- or tri-furcate are from *Furcouncinula*; those needle-shaped are from *Phyllactinia*; those obtusely rounded or clavate are from *Arthrocladiella* and *Typhulochaeta*. A few genera like *Bulbouncinula* and *Phyllactinia* are bulbous at the base of the appendages. Besides the number of the appendages, location on the ascocarps, gross morphology of the entire appendages — straight, curved, geniculate, twisted, undulate, or flexuous, etc., length, width, changes in width — enlarging or tapering upwards, enlarging or tapering on the same appendages, etc., smooth or verrucose, septation, with or without basal cells, wall thickness — thick or thin walled throughout, or thinner at the upper part and becoming thicker downwards, etc., coloration, are all important criteria for the classification of species and varieties. As to the shorter type of appendages, their presence or absence, and their morphological distinctions bear little meaning in the classification of species and varieties, but are important in dividing genera, e.g. those capitate are from *Bulbouncinula*, those rod-shaped are from *Medusosphaera*, those penicillioid are from *Phyllactinia*, those falcate are from *Uncinuliella*. (Figs. 7, a-i; 8, a-j)

ASCI are formed in the ascocarps. In *Cystotheca*, *Podosphaera* and *Sphaerotheca*, one single ascus is formed in each ascocarp. In other genera, more than one ascus are formed. Excepting *Pleochaeta* and *Queirozia* which have their asci arranged in a hymenium, all the remaining genera with more than one ascus have their asci in a fascicle. Asci that are few in number usually take globose, subglobose, broadly ovate, ovate, irregularly ovate, etc., shapes, while those that are multiascal take elliptic-ovate, elliptic-clavate, oblong-ovate, etc., shapes. No matter what shape they take, the asci may be sessile, short-stipitate to evidently stipitate. Asci within an ascocarp are usually similar in size, but in rare cases like *Erysiphe begoniae* ZHENG & CHEN, there are two types — the macro- and micro-types of asci in an ascocarp. Asci usually are thin walled, rarely thick-walled. In most cases, the ascus

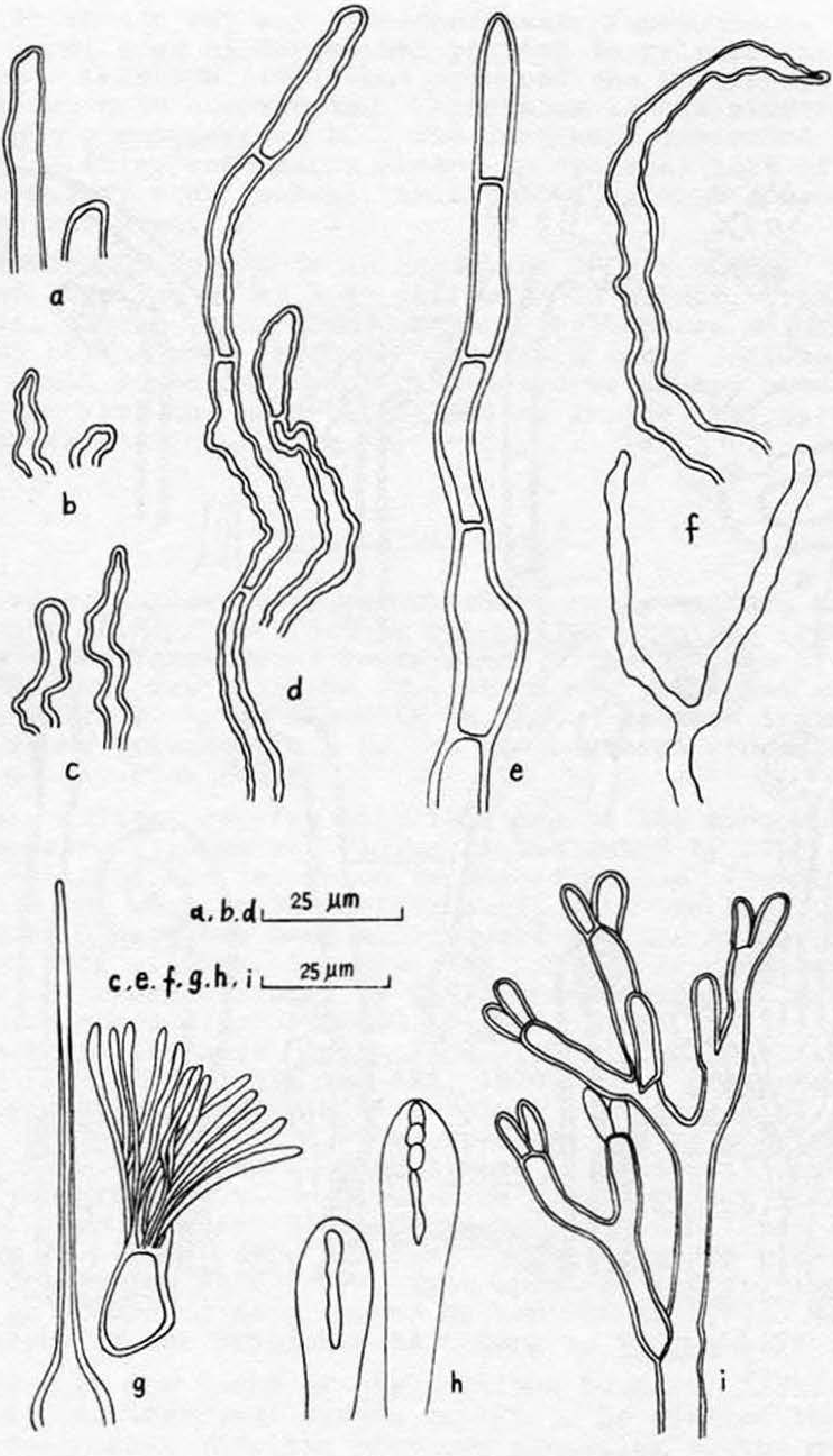

Fig. 7. Appendages of the Erysiphaceae I: a. Blumeria graminis, b. Brasiliomyces malachrae, c. Cystotheca wrightii, d. Erysiphe sambuci, e. Sphaerotheca astragali var. phaseoli, f. Leveillula leguminosarum, g. Phyllactinia actinidiae-latifoliae, h. Typhulochaeta alangii, i. Arthrocladiella mougeotii.

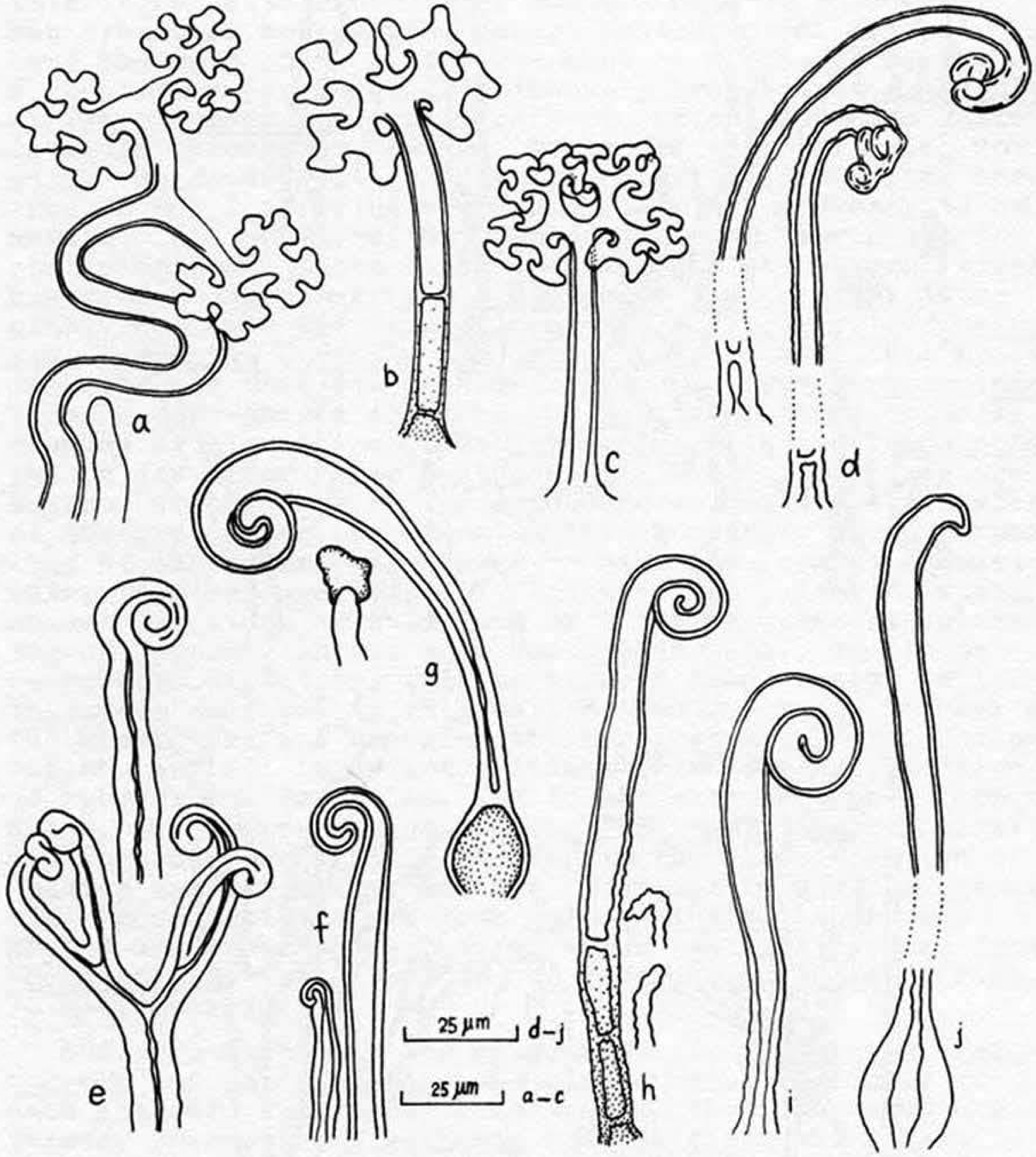

Fig. 8. Appendages of the Erysiphaceae II: a. Medusosphaera rosae, b. Podosphaera erineophila, c. Microsphaera sinensis, d. Furcouncinula wuyiensis, e. Sawadaia aesculi, f. Pleochaeta shiraiana, g. Bulbouncinula bulbosa, h. Uncinuliella australiana, i. Uncinula delavayi, j. Queirozia turbinata.

wall is smooth but may be occasionally verruculose. Mature asci burst open at the apical portion to release their spores. ERIKSSON (1981) has referred the Erysiphaceae to the bitunicate ascomycetes. According to his studies on *Erysiphe cichoracearum* DC., the asci were described as "Ectotunica thin; endotunica absent in upermost part of ascus (i.e. a very wide oculus), thin below, without zonation and ring structures."

ASCOSPORES formed in an ascus are 2-8 in number, one-celled, hyaline or at most yellowish in colour, oval, elliptic, oblong, etc. Most commonly ascospores mature in autumn of the same year when they form their conidia, but in a small number of species, ascospores do not mature in the same year and only become mature in the next spring after overwintering. (Fig. 9, a-f)

HISTORICAL NOTES

Powdery mildews were described by early authors as *Mucor Erysiphe* (LINNAEUS, 1753) or *Sclerotium Erysiphe* (PERSOON, 1796). The first genus conforming to the demands of modern nomenclature was *Erysiphe* DC., which was published as *Erysiphe* HEDW. f. by de CANDOLLE in 1805. Species included in this genus belonged to 6 genera at the least according to our present knowledge.

The earliest generic name relating to the anamorphs of the powdery mildews was *Oidium*, established by LINK in 1809. LINK assigned his new genus to 'Mucedinaceae' (Moniliaceae) and did not mention the relationship with the Erysiphaceae. The name *Oidium* has been widely used for the anamorphs of the powdery mildews, but was also applied to different kinds of imperfect fungi by different authors. Since *Oidium* was emended by SACCARDO in 1880, BISBY (1953) proposed to conserve the name *Oidium* SACC. (1880), while a few authors (SUMSTINE, 1913; von ARX, 1970, etc.) preferred to use *Acrosporium* NEES (1817) in place of *Oidium* LINK. In 1978, *Oidium* LINK (1824, type species: *Oidium monilioides* (NEES:FR.) LINK) was adopted by the XII International Botanical Congress as a conserved name versus *Oidium* LINK:FR. (1809, type species: *Trichoderma aureum* (PERS.:FR.) PERS.), *Oidium* FR. (1832, type species: '*Mucor leprosus* LINN.'), and *Acrosporium* NEES (1817, type species: *Acrosporium monilioides* NEES:FR.) as proposed by WERESUB in 1973. Most anamorphs of the Erysiphaceae belong to *Oidium* LINK.

Based on the works of the previous authors, LÉVEILLÉ proposed an important system in 1851. He divided the family Erysiphaceae into two sections according to the number of asci per perithecium, and then the sections were subdivided into 5 genera according to the morphology of the appendages. Two genera, *Podosphaera* KUNZE and *Sphaerotheca* LÉV. belonged to the section with a single ascus, while three genera, *Phyllactinia* LÉV., *Uncinula* LÉV. and *Calocladia* LÉV. belonged to the section with more than one ascus.

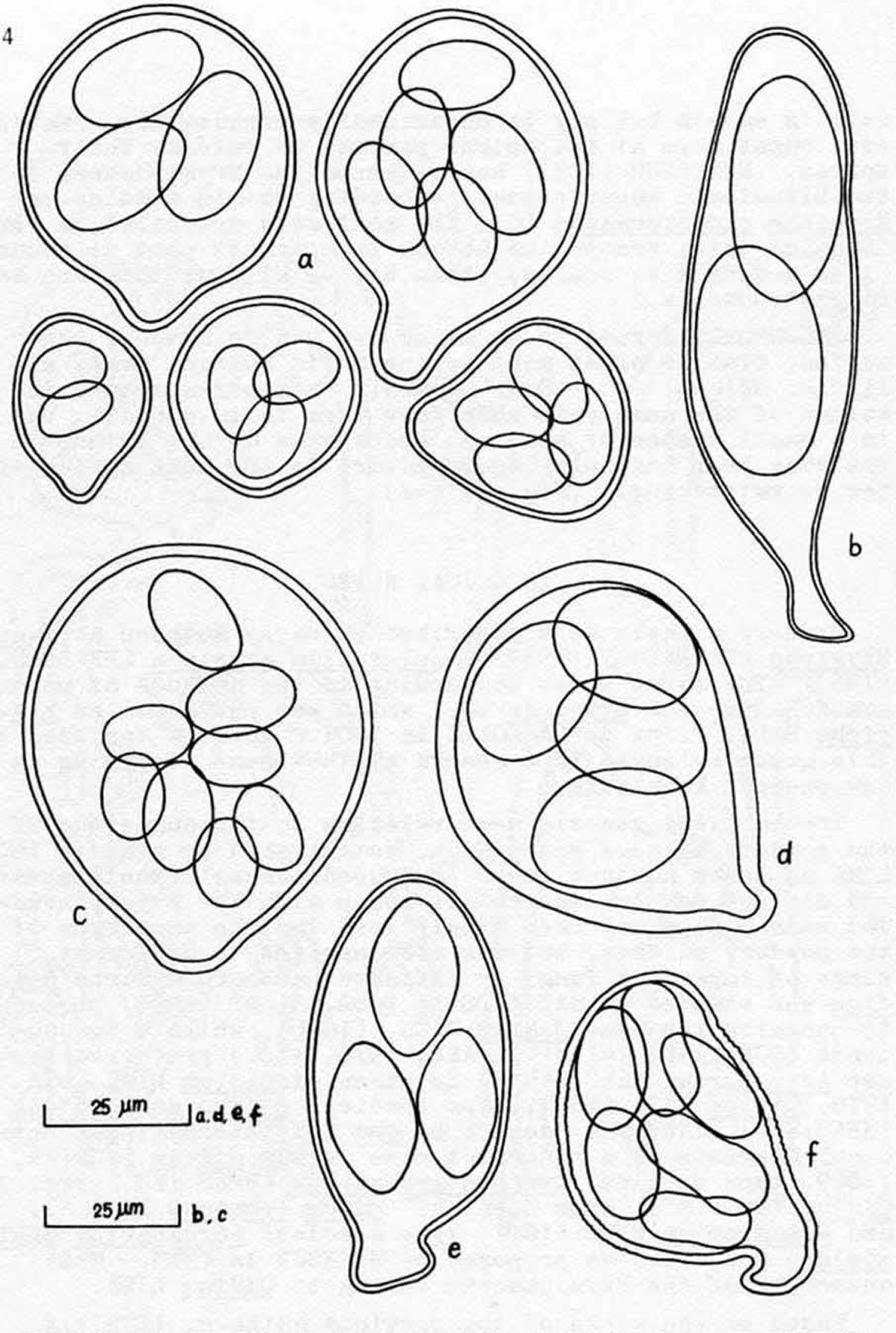

Fig. 9. Asci and ascospores of the Erysiphaceae: a. Erysiphe begoniae — both macro- and micro-types of asci and ascospores from a single ascocarp; b. Phyllactinia mandshuricae — asci thin-walled, ascospores 2 in number and very large; c. Sphaerotheca astragali — a single ascus from an ascocarp; d. Erysiphe sambuci var. crassitunicata — asci thick-walled; e. Erysiphe rorippae — asci thin-walled, ascospores somewhat pointed at both tips; f. Erysiphe epimedii — ascus wall verruculose.

The last genus (*Calocladia*) was immediately subdivided into *Microsphaera* LÉV. and *Erysiphe* HEDW. f. by himself in the same book. Except that *Erysiphe* was established in 1805 by de CANDOLLE as mentioned above, and *Podosphaera* in 1823 by KUNZE, all were LÉVEILLÉ's new genera.

In 1859, BERKELEY & CURTIS erected a new genus called *Cystotheca*. Owing to the dark mycelial setae of the type species *Cystotheca wrightii* BERK. & CURT., which rendered the mycelial patches dark coloured, BERKELEY & CURTIS classified their genus as a member of the 'Perisporiaceae'. Actually the characteristics of both anamorph and teleomorph of this genus are entirely different from the sooty molds, but in accord with the other known genera of the Erysiphaceae. Like *Sphaerotheca*, this genus has mycelioid appendages and one ascus in an ascocarp, and was thus considered to be synonymous with *Sphaerotheca* by a few authors (SAWADA, 1915; TAI, 1979). It differs from that genus by the presence of dark mycelial setae and two detachable layers of the ascocarpic wall, and many authors have preferred to retain it as an independent genus (HOMMA, 1937; BLUMER, 1967; ZHAO, 1979; BOESEWINKEL, 1980; BRAUN, 1981).

Erysiphella PECK was erected in 1875. The type species, *Erysiphella aggregata* PECK, was described as non-appendaged but was later reported to be appendaged (FARLOW, 1878; fide SALMON, 1900). It is doubtless congeneric with *Erysiphe*.

Pleochaeta SACC. & SPEG. was published in 1881 (SACCARDO, 1881) but not widely accepted until it was restudied and republished by KIMBROUGH & KORF in 1963. Appendages of *Pleochaeta* are morphologically similar to those of *Uncinula*, but the anamorph is of the *Streptopodium* type and not of the *Oidium* type. It differs from *Uncinula* also in that the ascocarps are turbinate and not depressed-globose from their side view; the asci are arranged in a hymenial layer and not in a fascicle.

Erysiphopsis HALST. was established in 1899. Its type species, *Erysiphopsis parnassiae* HALST. was reduced to synonymy of *Erysiphe polygoni* DC. by SALMON (1900), thus making the genus synonymous with the genus *Erysiphe*. This genus has not been accepted by any author except SATHE (1969).

The second anamorphic genus of the powdery mildews, i.e. *Ovulariopsis* PAT. & HARIOT, was published in 1900. It differs from *Oidium* in possessing both endophytic and ectophytic and not merely ectophytic mycelia, principally solitary and not catenulate conidia. Most *Phyllactinia* species have *Ovulariopsis* type of anamorphs.

Trichocladia NEGER was established in 1901. Most of its early species were transferred from the genus *Erysiphe*. A part or the whole of the appendages are dichotomously branched one to several times at the apex, and the anamorph is of *Oidium* type, thus tallying with *Microsphaera*. The main difference between these two genera is that under natural conditions, the appendages of *Trichocladia* often turn to one direction in fascicle. SALMON (1900), BLUMER (1933, 1967), HOMMA (1937), JUNELL (1967), TAI (1979), and BRAUN (1981) treated *Trichocladia* as a synonym of *Microsphaera*, while JACZEWSKI (1927), GOLOVIN (1950, 1960), VASJAGINA et al. (1961), SANDU-VILLE (1967), ZHAO (1979), and YU & LAI (1981) retained it as an independent genus.

Still another anamorphic genus, *Oidiopsis* SCALIA was published in 1902. Like *Ovulariopsis* the mycelia of *Oidiopsis* are subendophytic and the conidia are solitary; but the conidiophores are developed from the endophytic mycelia, emerging through the stomata of the host. Moreover, the conidiophores are apt to branch and hence dissimilar to *Ovulariopsis*. Anamorphs of *Leveillula* are exclusively *Oidiopsis*.

Sawadaia MIYABE is a small genus segregated from *Uncinula* (SAWADA, 1914). Both genera have appendages circinate at their tips, but a small to large portion of the appendages of *Sawadaia* may become di- to tri-chotomously divided several times beginning from the middle part upward. Furthermore, both genera have *Oidium*-type anamorphs, but in *Sawadaia* the macro- and micro-types of conidiophores and conidia may occur simultaneously or successively on the same host. This makes *Sawadaia* a unique genus in the family. Even so, the genus was not recognized by most European authors. In my opinion, not only should *Sawadaia* be segregated from *Uncinula* in its teleomorphic state but also from *Oidium* in its anamorphic state.

One year after *Sawadaia* was described, another new genus of powdery mildews was again reported from Japan. This was *Typhulochaeta* ITO & HARA (ITO, 1915), which was characterized by possessing simple and club-shaped appendages.

The genus *Uncinulopsis* SAW. erected in 1916 by SAWADA is a synonym of *Pleochaeta*.

In the system of THEISSEN & SYDOW (1917b), aside from the six traditionally recognized genera of *Erysiphe*, *Microsphaera*, *Phyllactinia*, *Podosphaera*, *Sphaerotheca*, and *Uncinula*, three more genera — *Chilemyces* SPEG. (1910), *Leucoconis* THEISS. & SYD. (1917) and *Schistodes* THEISS. (1917) were included in the Erysiphaceae. The same system was also adopted by WEHMEYER (1975). Among these three genera, *Chilemyces* has been shown to be synonymous with *Dimerina* THEISS. (1912), a member of the Dothideales (fide PETRAK & SYDOW, 1934); *Schistodes* has been shown to be synonymous with *Perisporiopsis* P. HENN. (1904), also member of the Dothideales (fide MÜLLER & von ARX, 1962). Though *Leucoconis* was accepted as one of the powdery mildew genera in all editions of AINSWORTH & BISBY's DICTIONARY OF THE FUNGI, no taxonomist working on the powdery mildews accepted it. Also the genus *Rhizotexis* THEISS. & SYD. (1917), which was included in the family Englerulaceae by its authors when it was first published (THEISSEN & SYDOW, 1917a), has been assigned to the Erysiphaceae as a doubtful genus in all editions of the DICTIONARY. In my opinion, since *Leucoconis* has multicelled ascospores and *Rhizotexis* has brown and 2-

celled ascospores, both must be excluded from the Erysiphaceae.

Leveillula ARN. was established in 1921, segregated as a new genus from *Erysiphe*. Appendages of *Leveillula* are also mycelioid, but the mycelia are partly ectophytic and partly endophytic, its anamorph is of *Oidiopsis* type. It is very different from *Erysiphe*.

Lanomyces GÄUMANN (1922) was reported to be a new genus of 'Perisporiales' when it was first described. After studying the type species (*Lanomyces tjibodensis* GÄUM.) of the genus, KATUMOTO (1973) thought that it did not belong to sooty molds but to Erysiphaceae instead. He transferred *Lanomyces tjibodensis* to *Cystotheca*, thus making it a new combination — *Cystotheca tjibodensis* (GÄUM.) KATUM. GÄUMANN (1922) described the asci of this fungus as multi-spored, while KATUMOTO (1973) reported it as 8-spored. The number of spores per ascus, according to our study on the type specimen of *Cystotheca tjibodensis* tallies with that of KATUMOTO. Aside from the partly ectophytic and partly endophytic mycelia, *Cystotheca tjibodensis* agrees well in other respects with all known species of *Cystotheca*.

Toroa SYD. was not included in the powdery mildews by its own author when he published it (TORO, 1926). It was treated as a member of the Erysiphales in the 6th edition of the DICTIONARY and Dothideales in the 7th edition as a result of the study by von ARX & MÜLLER (1975).

Uncinulella HARA is an illegitimate name since it was not described in Latin when published in 1936. Morphologically, it shows no difference from *Uncinula*.

Xenomyxa SYD. was considered to be a very isolated genus and was not referred to any family when it was first published by SYDOW in 1939 from Ecuador. It was, however, referred to the Erysiphales in the 6th edition of the DICTIONARY, but was referred to Dothideales in the 7th edition According to my study of the type specimen of the type species, *Xenomyxa disseminata* SYD., the fungus is in accord with the powdery mildews in growing superficially, ascocarps non-ostiolate, with mycelioid appendages, asci arranged in a fascicle, ascospores hyaline and with no septation. But there are also several aspects which may distinguish it from the common members of Erysiphaceae: (1) it parasitizes a fern host; (2) ascocarps deliquesce after maturation; (3) asci of different degrees of maturation are always present in the same ascocarp, indicating a different type of ascus development; (4) asci are surrounded by a mucilaginous layer. It is doubtful whether it is a true powdery mildew; it is better to wait till its anamorph is found before recognizing it.

Orthochaeta SAW. is another illegitimate name which did not have a Latin diagnosis when it was published in 1943. The type species of the genus, *Orthochaeta acalyphae* SAW., is known to be synonymous with *Uncinula acalyphae* TAI (1946). The latter was transferred to *Erysiphe* by ZHENG & CHEN

(1981) and became a new combination *Erysiphe acalyphae* (TAI) ZHENG & CHEN. The genus *Orthochaeta* was likewise treated as a synonym of *Erysiphe* by these authors.

One year later, VIEGAS (1944) reported a new genus, *Brasiliomyces* VIEGAS, with a typical *Oidium* state from Brazil. The absence of appendages on the ascocarp was taken as a most important characteristic of the genus, but these were found to be present in all known species by ZHENG (1984). The genus is unique in the extremely thin ascocarpic wall composed of only one layer of cells.

In the same year, another genus of powdery mildews, *Queirozia* VIEGAS & CARDOSO (1944) was reported. It is closely related to *Pleochaeta* in having subendophytic mycelia, turbinate ascocarps, and asci arranged in a hymenial layer. BRAUN (1981) reduced it to synonymy with *Pleochaeta*. I have studied the type specimen of the type species, *Queirozia turbinata* VIÉGAS & CARDOSO. In this fungus there are many colourless, non-septate, and dichotomously branched mycelial setae that are never found in *Pleochaeta*. More important is the morphology of the appendages: although they are hooked as in *Pleochaeta*, yet the apex of these is distinctly pointed and the basal part bulbous in shape, thus contrasting with *Pleochaeta* very sharply.

Parodiellinopsis HANSF. (1946) was assigned to Erysiphales with a question mark in the 6th edition of the DICTIONARY but was treated as a synonym of *Chevalieropsis* ARN. (1923), a member of the Dothideales, by von ARX & MÜLLER (1975).

In 1947, THIRUMALACHAR reported *Astomella* THIRUM. from India. Despite the fact that the ascospores are 2-celled and coloured, THIRUMALACHAR still referred it to the family Erysiphaceae. It is very unnatural to accomodate this fungus in the powdery mildews since all known species of the powdery mildews have single-celled and hyaline ascospores.

Arthrocladia GOLOV. (1956) is a nomen nudum as well as a homonym of the algal genus *Arthrocladia* DUBY (1830). It was republished as *Arthrocladiella* VASSILK. in 1960.

Two years later, the same author published another new genus *Linkomyces* GOLOV. (1958), which was again a nomen nudum. This genus was segregated from *Erysiphe* to accomodate those forms with *Pseudoidium* type of conidia (conidia solitary on the conidiophores).

Ischnochaeta SAW. (1959) was another genus based on the same grounds as *Linkomyces*. SAWADA did not publish a Latin diagnosis until 1959, though he established his new genus in 1951. Both *Linkomyces* and *Ischnochaeta* are treated as synonyms of *Erysiphe* by most authors.

Like *Orthochaeta acalyphae* SAW. (1943), the type species of *Salmonomyces* CHIDD. published in 1959 was another synonym of *Uncinula acalyphae* TAI (1946) (=*Erysiphe acalyphae* (TAI) ZHENG & CHEN). Hence, *Salmonomyces* was either reduced to synonym of *Uncinula* (PIROZYNSKI, 1965; BRAUN, 1981) or *Erysiphe* (ZHENG & CHEN, 1981).

In 1960, BATISTA et al. reported a new genus, *Leucoconiella* BAT. et al. from Paraguay. The ascocarps were described as pseudo-ostiolate and with paraphyses, while the ascospores are multiseptate, and hence the genus must be excluded from the Erysiphaceae.

Arthrocladiella VASSILK. (1960) was a segregate from *Microsphaera*. The appendages of *Arthrocladiella* are multiseptate and dichotomously branched one to several times on the main stem. The shape of the conidia is also different from those of *Microsphaera*.

Medusosphaera GOLOV. & GAMAL. (1962) is one of the few genera possessing two types of appendages on the same ascocarp. The longer type appendages are strongly undulate at the main portion and dichotomously branched one to several times at the apex; the shorter type appendages are rod-shaped.

The only and type species of *Salmonia* BLUM. & MÜLLER (1964), *Salmonia malachrae* (SEAV.) BLUM. & MÜLLER, is known to be synomous with *Brasiliomyces malvastri* VIÉGAS (1944), type species of the genus *Brasiliomyces*. Thus, *Salmonia* is also a synonym of *Brasiliomyces*.

Kokkalera PONN. (1970) is another tropical genus that can form ascocarps. It forms 'non-appendaged' ascocarps each with a single ascus in its teleomorphic state and forms *Oidium* type conidia with fibrosin bodies in its anamorphic state. This fungus has been reported only once. We have studied the type specimen of the type species, *Kokkalera crotonis* PONN., borrowed from Herb. IMI. Unfortunately, no ascocarp was found. PONNAPPA (1970) did realize that *Kokkalera* was closely related to *Sphaerotheca*, but he emphasized the importance of the absence of appendages on the ascocarp and published it as a new genus. As stated above, both *Xenomyxa* and *Brasiliomyces* were also said to be non-appendaged but true, though rudimentary, appendages were found after studying their type specimens. In fact, from the photo of *Kokkalera crotonis* published by PONNAPPA (1970), appendages growing out from the basal part of the ascocarp can be seen clearly. It seems to me that *Kokkalera* does not warrant an independent genus at all. Dr. Uwe BRAUN of GDR also holds the same view that *Kokkalera* is merely a synonym of *Sphaerotheca* (personal communication).

Blumeria GOLOV. ex SPEER was first described in Russian by GOLOVIN (1958) and then in Latin by SPEER (1974). The genus includes only one species, i.e. *Blumeria graminis* (DC.) SPEER (basionym *Erysiphe graminis* DC.). SPEER emphasized the existence of a sub-cortical intermediate zone between the atrosclerocortex and the hymenium of the ascocarp as a most salient feature for *Blumeria*. Aside from the difference in the anatomical characteristics of the ascocarps, many more differences in the anamorphic state of *Blumeria* and *Erysiphe* can also be found. Although both genera have an *Oidium* type anamorph, *Blumeria* has a bulbous base of the conidiophores, falcate-shaped mycelial setae, and haustoria which are digitate and hence very different from *Erysiphe*. More important still, the host specificity of *Blumeria* is also unlike that of all genera of the family including *Erysiphe*, with the former parasitizing exclusively monocotyledons and not dicotyledons. Again, in my opinion, as in the case of *Sawadaia*, not only the teleomorphs but also the anamorphs of *Blumeria* and *Erysiphe* should be separated into different genera.

Streptopodium ZHENG & CHEN (1978) was created to accommodate those powdery mildews with basally twisted conidiophores in the anamorphic state as distinct from the typical *Ovulariopsis*. All species of *Pleochaeta* with known anamorphic state, two species of *Phyllactinia* and the only species of *Queirozia* have been reported to have *Streptopodium* state of anamorphs.

In 1979, ZHENG & CHEN segregated two new genera from the genus *Uncinula* on the same ground that two kinds, instead of one kind of appendages, were simultaneously present on the same ascocarp. In *Uncinuliella* ZHENG & CHEN the longer type appendages are also uncinate at the apex but not bulbous at the base; while the shorter type appendages are falcate in shape (ZHENG & CHEN, 1979a). In *Bulbouncinula* ZHENG & CHEN, the longer type appendages are uncinate at the apex and bulbous at the base; while the shorter type appendages are capitate in form (ZHENG & CHEN, 1979b).

In 1981, BRAUN used *Erysiphe trina* HARKN. as a basionym for *Californiomyces trina* (HARKN.) BRAUN to erect a new genus *Californiomyces* BRAUN. He claimed that *Californiomyces* differed from *Brasiliomyces* in the presence of appendages and the size and number of ascospores. After studying all known species of the two genera, ZHENG (1984) reduced *Californiomyces* to synonymy with *Brasiliomyces* since both of them have rudimentary appendages and very thin ascocarpic wall composed of one layer of cells.

The latest genus reported in Erysiphaceae was *Furcouncinula* Z. X. CHEN (CHEN et al., 1982) from China. The genus is characterized by the morphology of the appendages which are uncinate and then di- or tri-furcate at their apices.

RECOGNIZED GENERA

THE ANAMORPHS:

Oidiopsis SCALIA, Agricolt. Calabro-Siculo 27:396. 1902.

TYPE SPECIES: *Oidiopsis sicula* SCALIA
TELEOMORPH: *Leveillula* ARN.

Oidium LINK *in* WILLDENOW, Sp. Pl. 6(1):121. 1824. nom. cons.

HOMONYMS: *Oidium* LINK:FR., Mag. Ges. Naturf. Fr. Berl. 3:18. 1809. nom. rej.; *Oidium* FR., Syst. Mycol. 3:427. 1832. nom. rej.

SYNONYM: *Acrosporium* NEES, Das System der Pilze und Schwämme. p.53. 1817. nom. rej.
TYPE SPECIES: *Oidium monilioides* (NEES:FR.) LINK (Basionym: *Acrosporium monilioides* NEES:FR.)
TELEOMORPHS: *Arthrocladiella* VASSILK.; *Blumeria* GOLOV. ex SPEER; *Brasiliomyces* VIÉGAS; *Cystotheca* BERK. & CURT.; *Erysiphe* DC.; *Medusosphaera* GOLOV. & GAMAL.; *Microsphaera* LÉV.; *Podosphaera* KUNZE; *Sawadaia* MIYABE; *Sphaerotheca* LÉV.; *Uncinula* LÉV.; *Uncinuliella* ZHENG & CHEN

Ovulariopsis PAT. & HARIOT, J. Bot. 14:245. 1900.

TYPE SPECIES: *Ovulariopsis erysiphoides* PAT. & HARIOT
TELEOMORPH: *Phyllactinia* LÉV.

Streptopodium ZHENG & CHEN, Acta Microbiol. Sinica 18:183. 1978.

SYNONYM: *Ovulariopsis* PAT. & HARIOT, J. Bot. 14:245. 1900. p.p.
TYPE SPECIES: *Streptopodium bonariensis* (SPEG.) ZHENG & CHEN (Basionym: *Ovulariopsis bonariensis* (SPEG.) SPEG.)
TELEOMORPHS: *Phyllactinia* LÉV.; *Pleochaeta* SACC. & SPEG.; *Queirozia* VIÉGAS & CARDOSO

THE TELEOMORPHS:

Arthrocladiella VASSILK., Bot. Zhurn. 45:1368. 1960.

SYNONYMS: *Microsphaera* LÉV., Ann. Sci. Nat. III. 15:381. 1851. p.p.; *Arthrocladia* GOLOV., Tr. Bot. Inst. Komarova, Akad. Nauk SSSR, II. 10:306. 1956. nom. nud.
TYPE SPECIES: *Arthrocladiella mougeotii* (LÉV.) VASSILK. (Basionym: *Microsphaera mougeotii* LÉV.)
ANAMORPH: *Oidium* LINK

Blumeria GOLOV. ex SPEER, Sydowia 27:2. 1974.

SYNONYMS: *Erysiphe* DC., Flore Fr. 2:272. 1805. p.p.; *Blumeria* GOLOV., Sborn. Rabot. Inst. Prikl. Zool. Fitop. 5:124. 1958. nom. nud.
TYPE SPECIES: *Blumeria graminis* (DC.) SPEER (Basionym: *Erysiphe graminis* DC.)
ANAMORPH: '*Oidium* LINK'*

Brasiliomyces VIÉGAS, Bragantia 4:17. 1944. emend. ZHENG, Mycotaxon 19:284. 1984.

SYNONYMS: *Erysiphe* DC., Flore Fr. 2:272. 1805. p.p.; *Salmonia* BLUM. & MÜLL., Phytopath. Z. 50:382. 1964; *Californiomyces* BRAUN, Nova Hedwigia 34:688. 1981.

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*Different from the typical *Oidium* in being bulbous at the base of the conidiophores.

TYPE SPECIES: *Brasiliomyces malvastri* VIÉGAS (=*Brasiliomyces malachrae* (SEAV.) BOESEW.)
ANAMORPH: *Oidium* LINK

Bulbouncinula ZHENG & CHEN, Acta Microbiol. Sinica 19:376. 1979.

SYNONYM: *Uncinula* LÉV., Ann. Sci. Nat. III. 15:151. 1851. p.p.
TYPE SPECIES: *Bulbouncinula bulbosa* (TAI & WEI) ZHENG & CHEN (Basionym: *Uncinula clintonii* PECK var. *bulbosa* TAI & WEI)
ANAMORPH: unknown

Cystotheca BERK. & CURT., Proc. Am. Acad. Arts Sci. 4:130. 1859.

SYNONYM: *Lanomyces* GÄUM., Ann. Jard. Bot. Buitenz. 32:43. 1922.
TYPE SPECIES: *Cystotheca wrightii* BERK. & CURT.
ANAMORPH: *Oidium* LINK

Erysiphe DC.:FR., Flore Fr. 2:272. 1805.

SYNONYMS: *Erysiphella* PECK, XXVIII Rep. N. Y. State Mus. 2:63. 1874; *Erysiphopsis* HALST., Bull. Torrey Bot. Club 26:594. 1899; *Orthochaeta* SAW., Descript. Catal. Taiwan Fungi VII:22. 1943. nom. nud.; *Salmonomyces* CHIDD., Sydowia 13:55. 1959; *Ischnochaeta* SAW., Descript. Catal. Taiwan Fungi IX:16. 1959. p.p. nom. illegit.; *Linkomyces* GOLOV., Sborn. Rabot. Inst. Prikl. Zool. Fitop. 5:127. 1958. nom. nud.
TYPE SPECIES: *Erysiphe polygoni* DC.
ANAMORPH: *Oidium* LINK

Furcouncinula Z. X. CHEN *in* CHEN et al., Acta Mycol. Sinica 1:19. 1982.

TYPE SPECIES: *Furcouncinula wuyiensis* Z. X. CHEN & GAO
ANAMORPH: unknown

Leveillula ARN., Ann. Epiph. 7:92. 1921.

SYNONYM: *Erysiphe* DC., Flore Fr. 2:272. 1805. p.p.
TYPE SPECIES: *Leveillula taurica* (LÉV.) ARN. (Basionym: *Erysiphe taurica* LÉV.)
ANAMORPH: *Oidiopsis* SCALIA

Medusosphaera GOLOV. & GAMAL., Bot. Mat. 15:91. 1962.

TYPE SPECIES: *Medusosphaera rosae* GOLOV. & GAMAL.
ANAMORPH: *Oidium* LINK

Microsphaera LÉV., Ann. Sci. Nat. III. 15:381. 1851.

SYNONYMS: *Calocladia* LÉV., Ann. Sci. Nat. III. 15:154. 1851; *Trichocladia* NEGER, Rev. Fl. Paris. p.350. 1901.
TYPE SPECIES: *Microsphaera divaricata* (WALLR.) LÉV. (Basionym: *Alphitomorpha divaricata* WALLR.)
ANAMORPH: *Oidium* LINK

Phyllactinia LÉV., Ann. Sci. Nat. III. 15:144. 1851.
TYPE SPECIES: Phyllactinia guttata (WALLR.:FR.) LÉV. (Basionym: Alphitomorpha guttata WALLR.:FR.)
ANAMORPHS: Ovulariopsis PAT. & HARIOT; Streptopodium ZHENG & CHEN

Pleochaeta SACC. & SPEG. in SACC., Michelia 2:373. 1881. emend. KIMBR. & KORF, Mycologia 55:623. 1963.
SYNONYMS: Uncinula LÉV., Ann. Sci. Nat. III. 15:151. 1851. p.p.; Pleochaeta SACC. & SPEG. in SPEG., Anal. Soc. Crent. Argent. 10:64. 1880. nom. nud.; Uncinulopsis SAW., Trans. Formosa Nat. Hist. Soc. 6:33. 1916.
TYPE SPECIES: Pleochaeta lynchii (SPEG.) SPEG. (=Pleochaeta polychaeta (BERK. & CURT.) KIMBR. & KORF)
ANAMORPH: Streptopodium ZHENG & CHEN

Pososphaera KUNZE in KUNZE & SCHMIDT, Myk. Heft. 2:111. 1823.
SYNONYM: Sphaeria FR., Syst. Mycol. II:319. 1823. p.p.
TYPE SPECIES: Podosphaera myrtillina (SCHUB.:FR.) KUNZE (Basionym: Sphaeria myrtillina SCHUB.:FR.)
ANAMORPH: Oidium LINK

Queirozia VIÉGAS & CARDOSO, Bol. Soc. Brazil. Agron. 7:5. 1944.
TYPE SPECIES: Queirozia turbinata VIÉGAS & CARDOSO
ANAMORPH: Streptopodium ZHENG & CHEN

Sawadaia MIYABE in SAW., Agric. Exp. Stat. Formosa, Spec. Bull. 9:49. 1914.
SYNONYM: Uncinula LÉV., Ann. Sci. Nat. III. 15:151. 1851. p.p.
TYPE SPECIES: Sawadaia bicornis (WALLR.:FR.) HOMMA (Basionym: Alphitomorpha bicornis WALLR.:FR.)
ANAMORPH: 'Oidium LINK'*

Sphaerotheca LÉV., Ann. Sci. Nat. III. 15:138. 1851.
SYNONYM: Kokkalera PONN., Sydowia 23:4. 1970.
TYPE SPECIES: Sphaerotheca pannosa (WALLR.:FR.) LÉV. (Basionym: Alphitomorpha pannosa WALLR.:FR.)
ANAMORPH: Oidium LINK

Typhulochaeta ITO & HARA in ITO, Bot. Mag. Tokyo 29:20. 1915.
SYNONYM: Erysiphe DC., Flore Fr. 2:272. 1805. p.p.
TYPE SPECIES: Typhulochaeta japonica ITO & HARA
ANAMORPH: unknown

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*Different from the typical Oidium in possessing both macro- and micro-types of conidiophores and conidia.

Uncinula LÉV., Ann. Sci. Nat. III. 15:151. 1851.
SYNONYM: *Uncinulella* HARA, Plant Parasitic Fungi of Japan. p.133. 1936. nom. illegit.
TYPE SPECIES: *Uncinula bivonae* LÉV. (=*Uncinula clandestina* (BIV.-BERN.) SCHROET.)
ANAMORPH: *Oidium* LINK

Uncinuliella ZHENG & CHEN, Acta Microbiol. Sinica 19:283. 1977.
SYNONYM: *Uncinula* LÉV., Ann. Sci. Nat. III. 15:151. 1851. p.p.
TYPE SPECIES: *Uncinuliella simulans* (SALM.) ZHENG & CHEN (Basionym: *Uncinula simulans* SALM.)
ANAMORPH: *Oidium* LINK

DOUBTFUL GENUS

Xenomyxa SYD., Ann. Mycol. 37:336. 1939.
TYPE SPECIES: *Xenomyxa disseminata* SYD.
ANAMORPH: unknown

EXCLUDED GENERA*

Astomella THIRUM., New Phytologist 46:271. 1947.

Chilemyces SPEG., Fungi Chilensis. p.27. 1910.

Leucoconiella BAT. et al., Broteria N. S. 29:130. 1960.

Leucoconis THEISS. & SYD., Ann. Mycol. 15:456. 1917.

Parodiellinopsis HANSF., Proc. Linn. Soc. London 1944-46: 141. 1946.

Rhizotexis THEISS. & SYD., Ann. Mycol. 15:140. 1917.

Schistodes THEISS., Ann. Mycol. 15:456. 1917.

Toroa SYD. *in* TORO, J. Departm. Agric. Porto Rico 10(2):19. 1926.

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*None of excluded genera listed have anamorphs assignable to the accepted genera. Ascospores of all these genera are 2-many-celled. Ascospores of *Astomella*, *Parodiellinopsis*, *Rhizotexis*, *Schistodes* and *Toroa* are even brownish to brown in colour. *Leucoconiella* and *Toroa* are considered to be particularly unacceptable because of their pseudo-ostiolate and paraphysate ascocarps.

KEYS TO GENERA RECOGNIZED

SYNOPTIC KEY:

Abbreviation

ANAMORPHS

Oidiopsis	Os	*Ovulariopsis*	Ov
Oidium	Om	*Streptopodium*	St

TELEOMORPHS or HOLOMORPHS

Arthrocladiella	A	*Phyllactinia*	Ph
Blumeria	Bl	*Pleochaeta*	Pl
Brasiliomyces	Br	*Podosphaera*	Po
Bulbouncinula	Bu	*Queirozia*	Q
Cystotheca	C	*Sawadaia*	Sa
Erysiphe	E	*Sphaerotheca*	Sp
Furcouncinula	F	*Typhulochaeta*	T
Leveillula	L	*Uncinula*	U
Medusosphaera	Me	*Uncinuliella*	Un
Microsphaera	Mi		

I. Type of mycelia:

1. Subendophytic — Os, Ov, St; L, Ph, Pl, Q, *C. tijbodensis*
2. Ectophytic — Om; A, Bl, Br, Bu, C, E, F, Me, Mi, Po, Sa, Sp, T, U, Un

II. Presence or absence of aerial setae:

1. With subhyaline to brown, falcate aerial setae — Om (in some species); Bl, C
2. With hyaline, dichotomously branched aerial setae — St (in one species only); Q
3. Without aerial setae — Os, Om (in most species), Ov, St (in most species); A, Br, Bu, E, F, L, Me, Mi, Ph, Pl, Po, Sa, Sp, T, U, Un

III. Types of conidiophores and conidia:

1. With macro-type of conidiophores and conidia only — Os, Om (in most species), Ov, St; A, Bl, Br, C, E, L, Me, Mi, Ph, Pl, Po, Q, Sp, U, Un
2. With macro- and micro-types of conidiophores and conidia — Om (in some species); Sa

IV. Morphology of the foot cells of the conidiophores:

1. Bulbous — Om (in one species only); Bl
2. Twisted several times — St; Ph (in some species), Pl, Q
3. Mostly simple — Os, Om (in most species), Ov; A, Br, C, E, L, Me, Mi, Ph (in most species), Po, Sa, Sp, U, Un

V. Branching of the conidiophores:

1. Frequently branched — Os; L
2. Usually unbranched — Ov, Om, St; A, Bl, Br, C, E, Me, Mi, Ph, Pl, Po, Q, Sa, Sp, U, Un

VI. Catenulation of the conidia:

1. Single — Os, Om (in some species), Ov, St; E (in a few species), L, M (in a few species), Ph, Pl, Q, U (in a few species), Un (in one species)
2. In chains — Om (in most species); A, Bl, Br, C, E, (in most species), Me, Mi (in most species), Po, Sa, Sp, U (in most species), Un (in one species)

VII. Structure of the ascocarpic wall:

1. Composed of 1 layer of cells only, hence not differentiated into outer & inner walls — Br
2. Composed of several layers of cells and differentiated into detachable outer & inner walls — C
3. Composed of several layers of cells and differentiated into undetachable outer & inner walls — A, Bl, Bu, E, F, L, Me, Mi, Ph, Pl, Po, Q, Sa, Sp, T, U, Un

VIII. Number of asci in an ascocarp:

1. Single — C, Po, Sp
2. More than one — A, Bl, Br, Bu, E, F, L, Me, Mi, Ph, Pl, Q, Sa, T, U, Un

IX. Arrangement of asci in the ascocarp:

1. In hymenial layer — Pl, Q
2. In fascicle — A, Bl, Br, Bu, C, E, F, L, Me, Mi, Ph, Po, Sa, Sp, T, U, Un

X. Types of appendages present:

1. With 2 types (the longer & shorter types) of appendages on the same ascocarp — Bu, Me, Ph, Un
2. With 1 type (the longer type) of appendages only — A, Bl, Br, C, E, F, L, Mi, Pl, Po, Q, Sa, Sp, T, U

XI. Presence or absence of the mycelioid longer type appendages:

1. Mycelioid — Bl, Br, C, E, L, Sp
2. Nonmycelioid — A, Bu, F, Me, Mi, Ph, Pl, Po, Q, Sa, T, U, Un

XII. Morphology of the main stem of the longer type appendages:

1. Di- or tri-chotomously branched — A, Sa
2. Undulate — Me
3. With a bulbous base — Bu, Ph, Q
4. Club-shaped — T
5. Not as above — Bl, Br, C, E, F, L, Mi, Pl, Po, Sp, U, Un

XIII. Morphology of the apex of the longer type appendages:

1. Needle-shaped — Ph
2. Simply uncinate or helicoid — Bu, Pl, Q, Sa, U, Un
3. Uncinate or helicoid then di- or tri-chotomously branched — F
4. 1-several times dichotomously branched — Me, Mi, Po
5. Obtuse to somewhat pointed — A, Bl, Br, C, E, L, Sp, T

XIV. Morphology of the shorter type appendages:

1. Capitate — Bu
2. Rod-shaped — Me
3. Penicillioid — Ph
4. Falcate — Un

DIAGNOSTIC KEY:

1\. Anamorphic....................................2
1\. Teleomorphic or holomorphic...................5

2\. Mycelia ectophytic; conidia generally in chains, or rarely single, doliform, doliform-cylindric to cylindric, relatively small....................*Oidium*
2\. Mycelia subendophytic; conidia single, clavate, obclavate, or of other shapes, relative large..........3

3\. Conidiophores developed from the endophytic mycelia and emerging through the stomata of the host, frequently branched..................................*Oidiopsis*
3\. Conidiophores developed from the superficial mycelia, usually unbranched..............................4

4\. Foot cells of the conidiophores twisted several times....................................*Streptopodium*
4\. Foot cells of the conidiophores straight and not twisted.................................*Ovulariopsis*

5\. Ascus single in an ascocarp...........................6
5\. Asci more than one in an ascocarp......................8

6\. Tips of the appendages dichotomously branched several times.................................*Podosphaera*
6\. Tips of the appendages not branched...................7

7\. Inner wall of the ascocarp undetachable from the outer wall; aerial setae absent..............*Sphaerotheca*
7\. Inner wall of the ascocarp detachable from the outer wall; aerial setae present...............*Cystotheca*

8\. With 2 types of appendages on the same ascocarp......9
8\. With only 1 type of appendages.......................12

9\. Longer type appendages with a bulbous base..........10
9\. Longer type appendages without a bulbous base.......11

10\. Tips of the longer type appendages needle-shaped; shorter type appendages penicillioid....*Phyllactinia*
10\. Tips of the longer type appendages uncinate; shorter type appendages capitate..............*Bulbouncinula*

11\. Longer type appendages not undulate, tips uncinate; shorter type appendages sickle-shaped...*Uncinuliella*
11\. Longer type appendages strongly undulate, tips dichotomously branched; shorter type appendages rod-shaped. ....*Medusosphaera*

12\. Appendages mycelioid....................13
12\. Appendages not mycelioid....................16

13\. Ascocarps with outer wall only, composed of one layer of cells....................*Brasiliomyces*
13\. Ascocarps with outer and inner walls, each comprising several layers of cells....................14

14\. Mycelia subendophytic; conidia single; conidiophores developed from the endophytic mycelia and emerging through the stomata of the host..........*Leveillula*
14\. Mycelia ectophytic; conidia in chains; conidiophores developed from the superficial mycelia...........15

15\. Ascocarps embedded in a mycelial mat; appendages rudimentary; conidiophores with a bulbous base..*Blumeria*
15\. Ascocarps not embedded in a mycelial mat; appendages usually well developed; conidiophores without a bulbous base....................*Erysiphe*

16\. Appendages regularly dichotomously or subdichotomously branched several times....................17
16\. Appendages usually not branched....................19

17\. Appendages branching at the tips..........*Microsphaera*
17\. Appendages beginning to branch at the middle portion.18

18\. Appendages multiseptate; not uncinate at the apex; with one type of conidia and conidiophores only.......... ....*Arthrocladiella*
18\. Appendages usually not septate, uncinate at the apex; with macro- and micro-types of conidia and conidiophores....................*Sawadaia*

19\. Appendages club-shaped....................*Typhulochaeta*
19\. Appendages not club-shaped, hook-like or uncinate at the apex....................20

20\. Mycelia subendophytic; asci arranged in hymenial layer; ascocarps more or less turbinate.................21
20\. Mycelia ectophytic; asci in fascicle; ascocarps depressed-globose....................22

21\. Appendages with a bulbous base; aerial setae present... ....*Queirozia*
21\. Appendages without a bulbous base; aerial setae absent. ....*Pleochaeta*

22\. Tips of the appendages uncinate and not forked.*Uncinula*
22\. Tips of the appendages at first uncinate then forked... ....*Furcouncinula*

ILLUSTRATED GENERA*

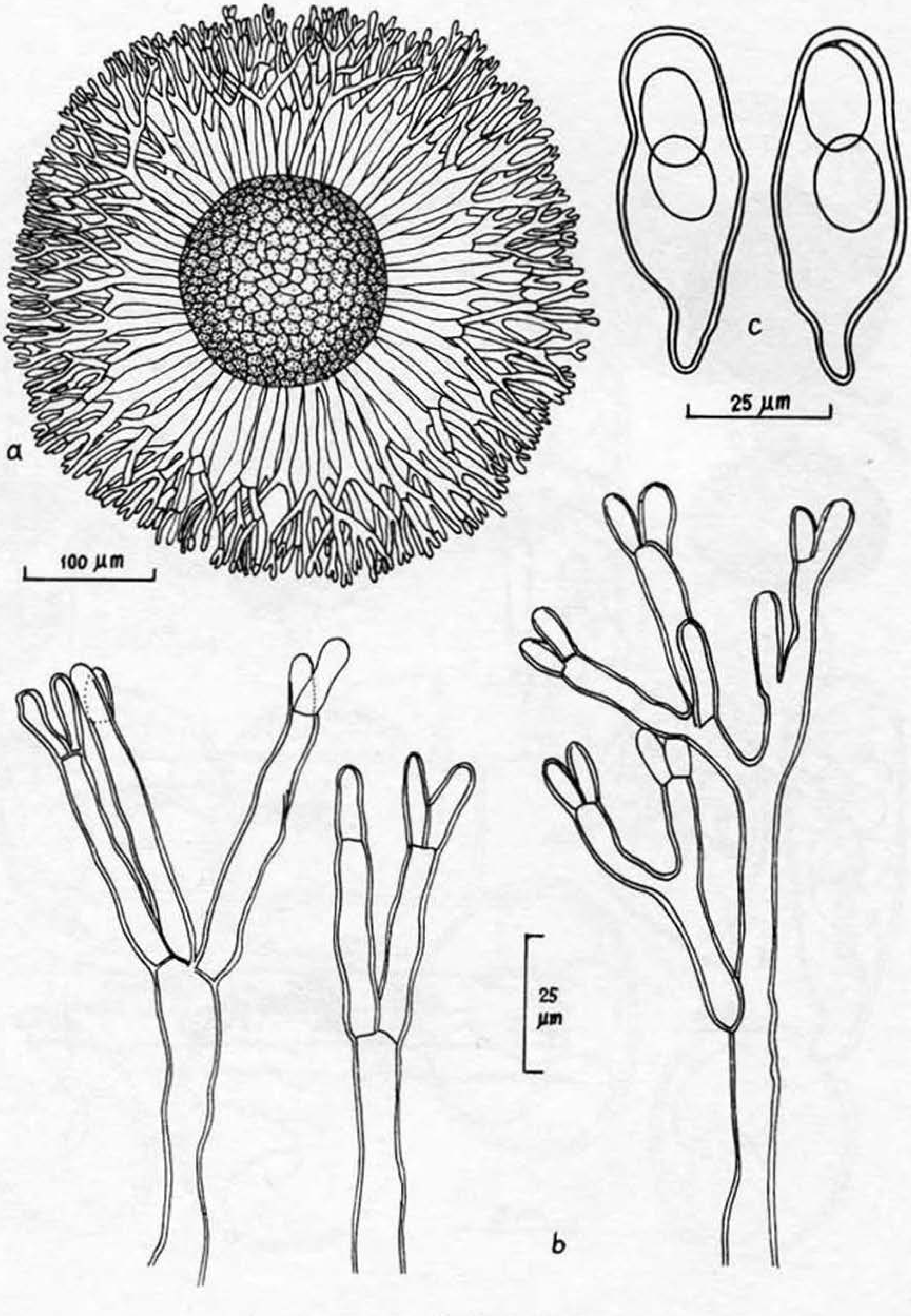

Fig. 10. ARTHROCLADIELLA

Arthrocladiella mougeotii (LÉV.) VASSILK.: a. ascocarp, b. appendages, c. asci & ascospores. (on Lycium potaninii POJARK., XJA-IAC 56)

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* For illustrations of the anamorphic genera, see Fig. 3.

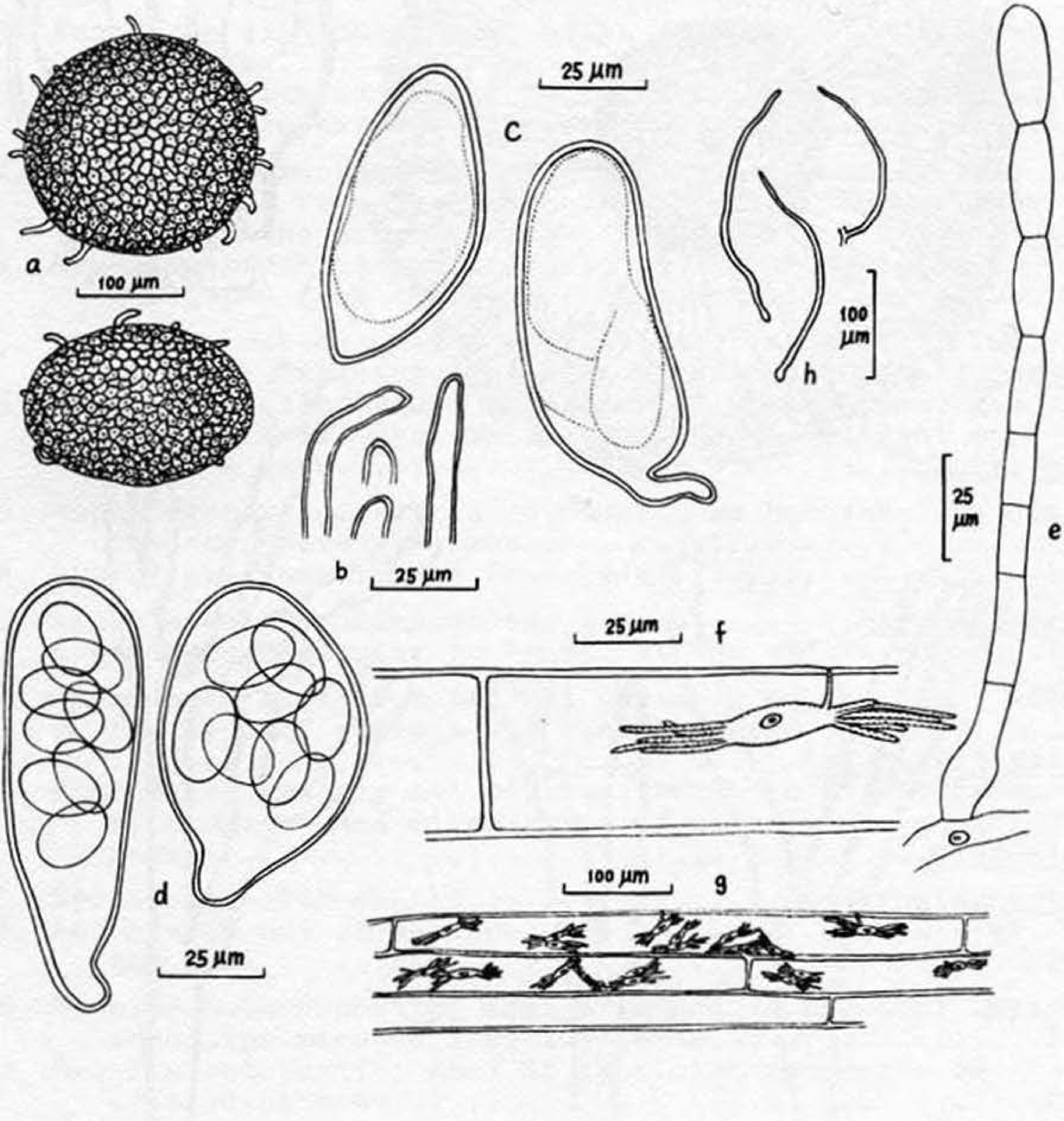

Fig. 11. BLUMERIA

Blumeria graminis (DC.) SPEER: a. ascocarps, b. appendages, c. immature asci, d. mature asci, e. conidiophore & conidia, f & g. haustoria, h. aerial setae. (on Triticum aestivum L., HMAS 40033 - a, b, c, h, XJA-IAC - e, f, g; on Poa ianthina KENG, HMAS 40028 - d)

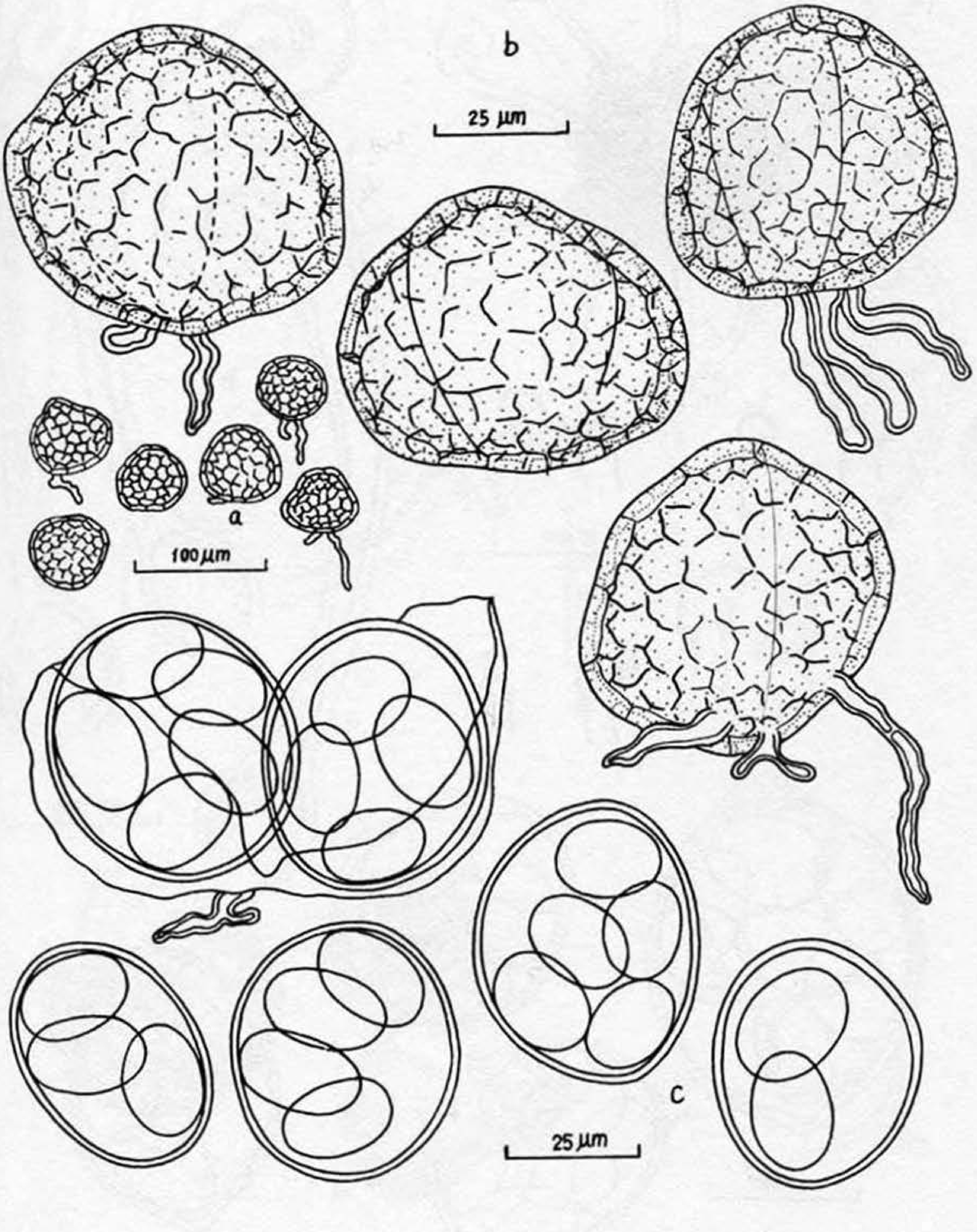

Fig. 12. BRASILIOMYCES

Brasiliomyces malachrae (SEAV.) BOESEW.: a & b. ascocarps, c. asci & ascospores. (on *Malachra capitata* L., NY 6488)

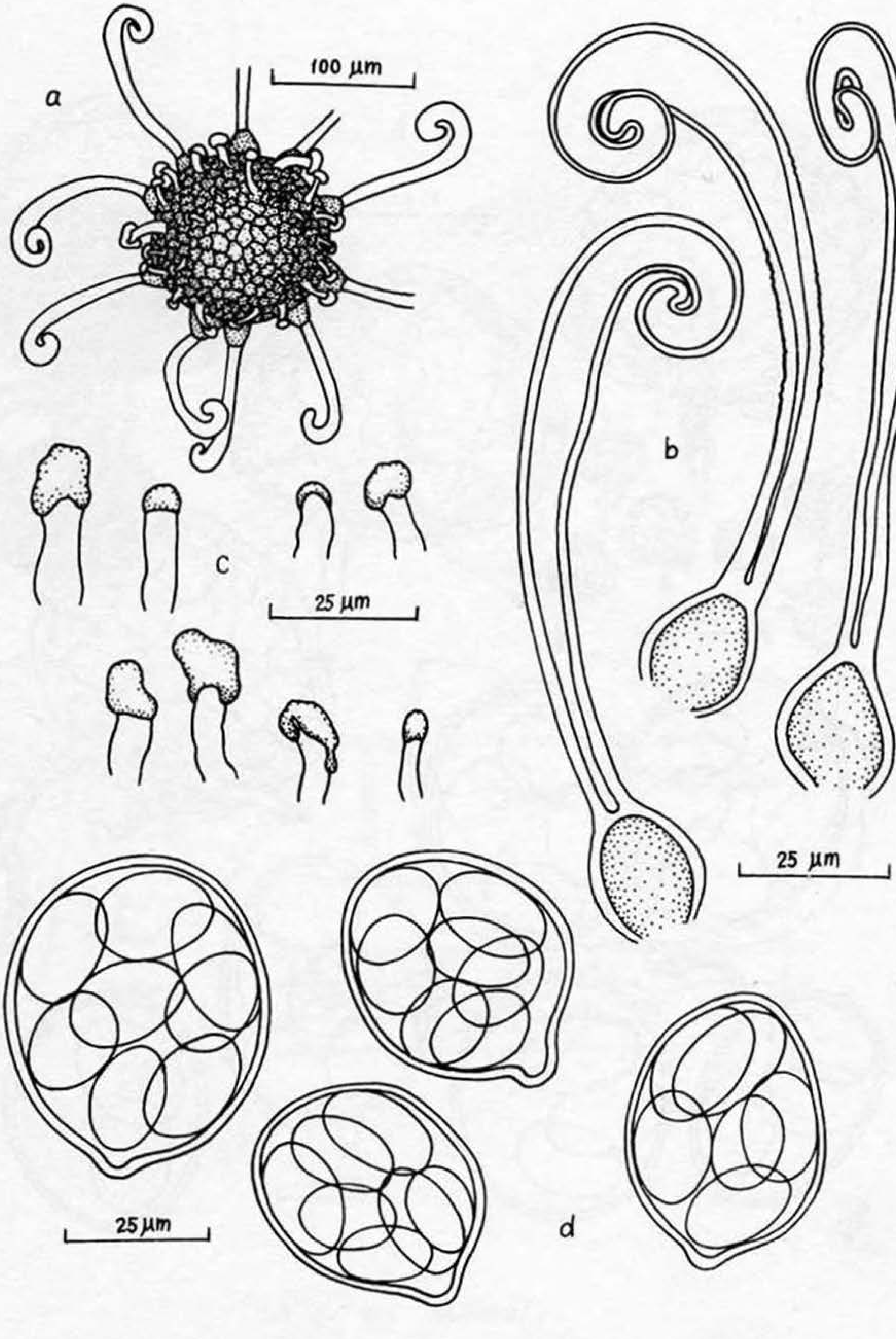

Fig. 13. BULBOUNCINULA

Bulbouncinula bulbosa (TAI & WEI) ZHENG & CHEN: a. ascocarp, b. longer type appendages, c. shorter type appendages, d. asci & ascospores. (on Koelreuteria paniculata LAXM., HMAS 11460)

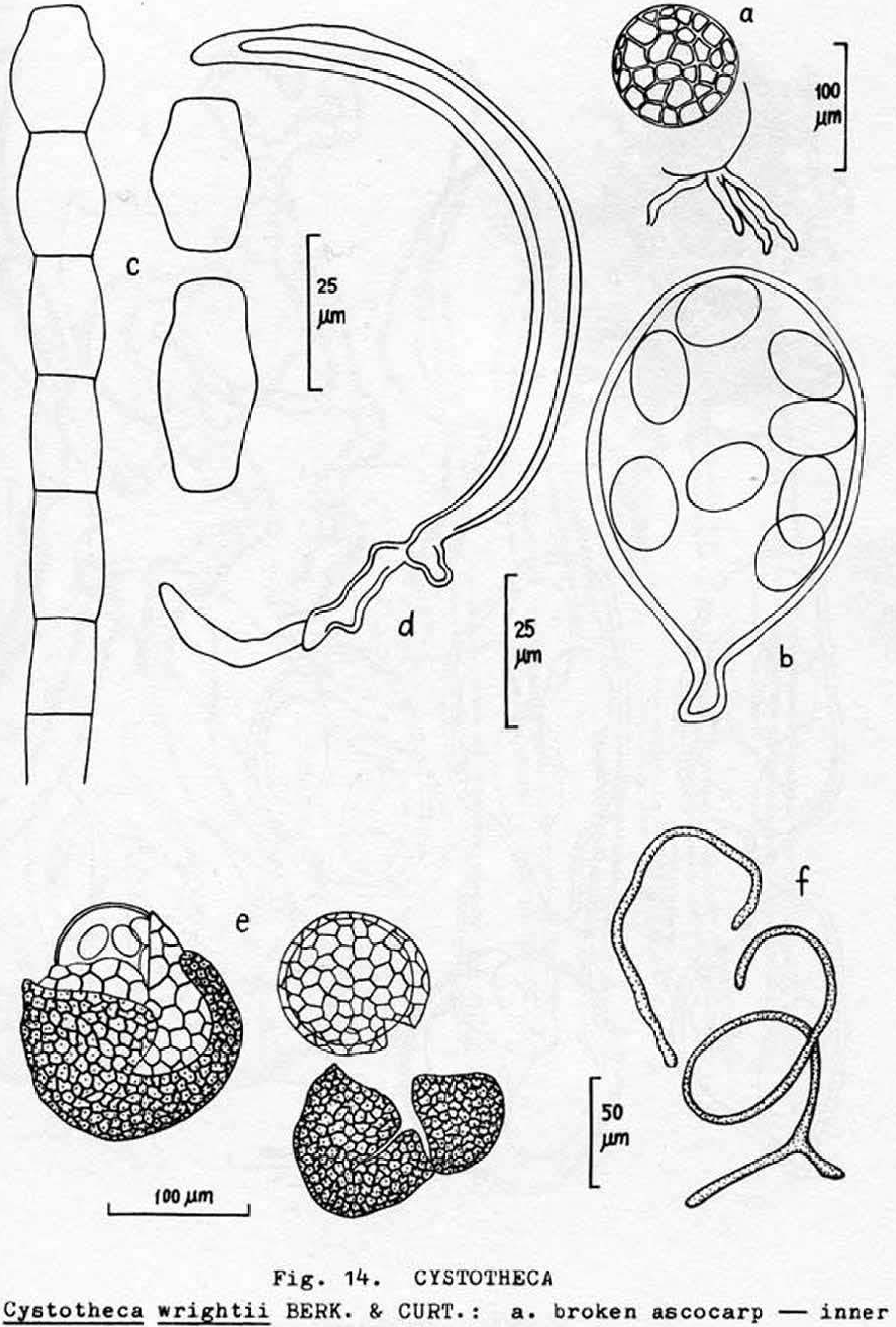

Fig. 14. CYSTOTHECA

Cystotheca wrightii BERK. & CURT.: a. broken ascocarp — inner wall detached from the outer wall, b. ascus & ascospores, c. conidiophore & conidia, d. aerial seta. (on Quercus glauca THUNB., HMAS 02912) Cystotheca tjibodensis (GÄUM.) KATUM.: e. broken ascocarps — inner wall detached from the outer wall, f. aerial setae. (on Castanea argentea BR., BERN)

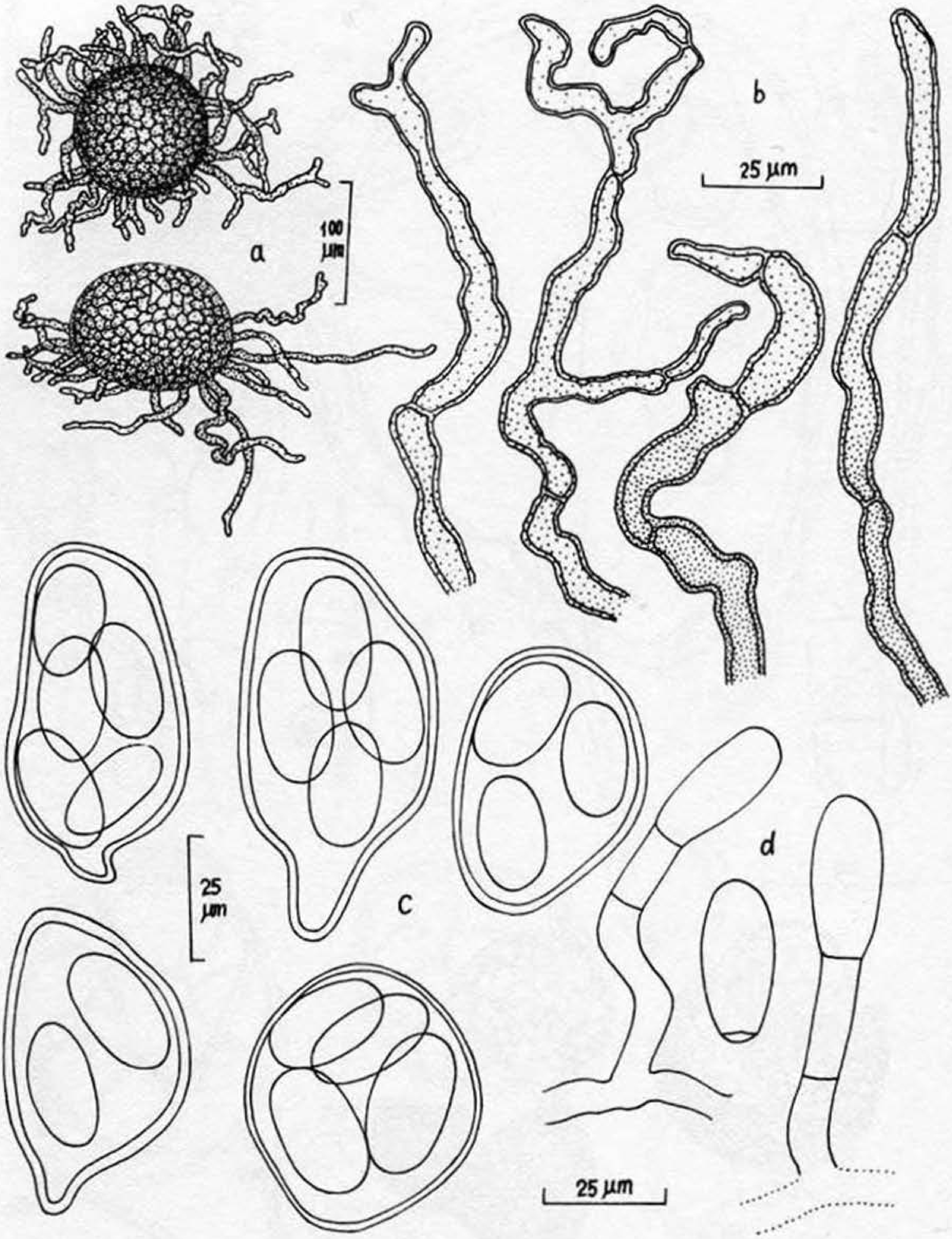

Fig. 15. ERYSIPHE

Erysiphe polygoni DC.: a. ascocarps, b. appendages, c. asci & ascospores, d. conidiophores & conidia. (on Polygonum aviculare L., HMAS 40223)

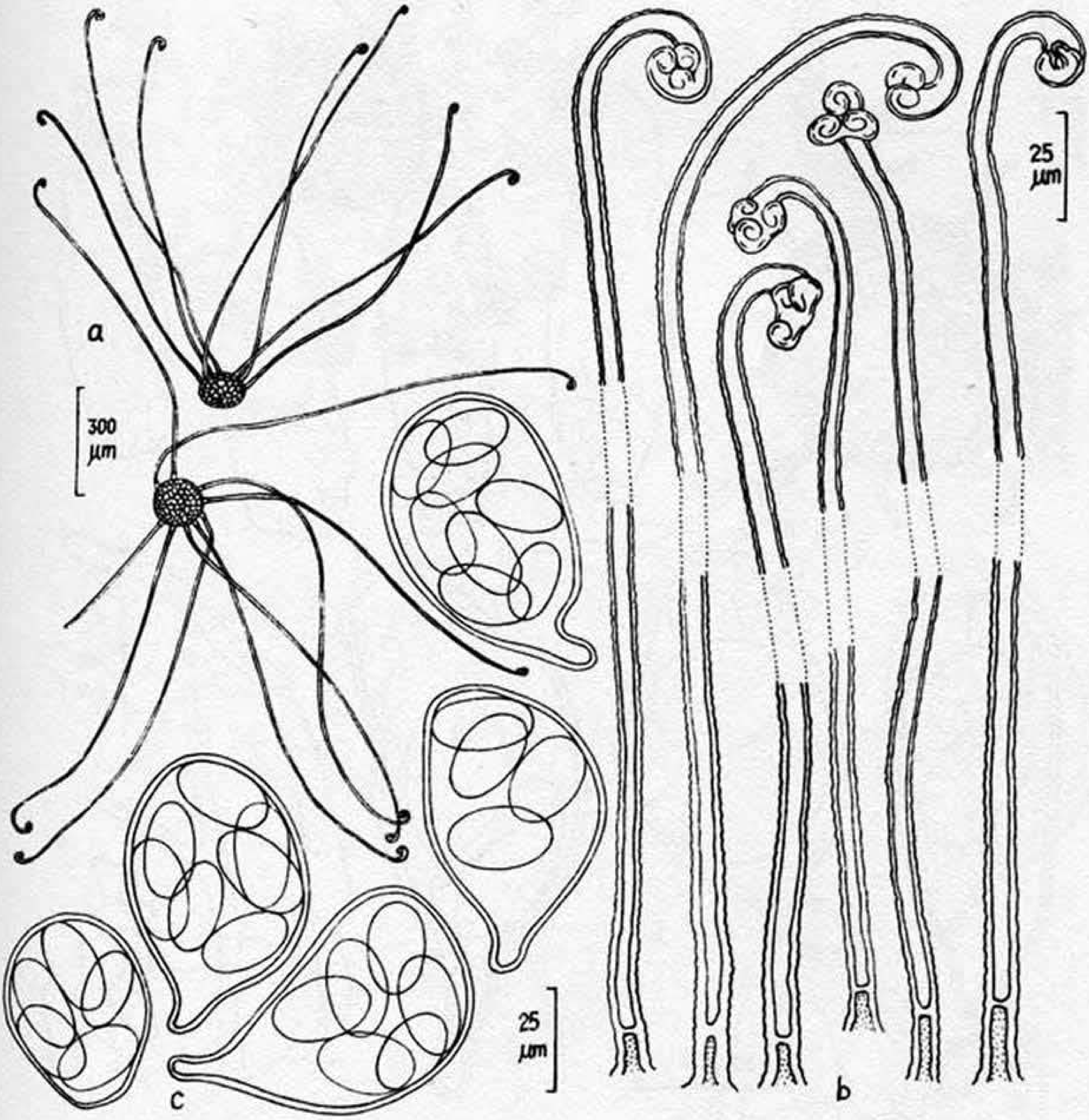

Fig. 16. FURCOUNCINULA

Furcouncinula wuyiensis Z. X. CHEN & GAO: a. ascocarps, b. appendages, c. asci & ascospores. (on Carpinus londoniana H. WINKL., HMAS 41443)

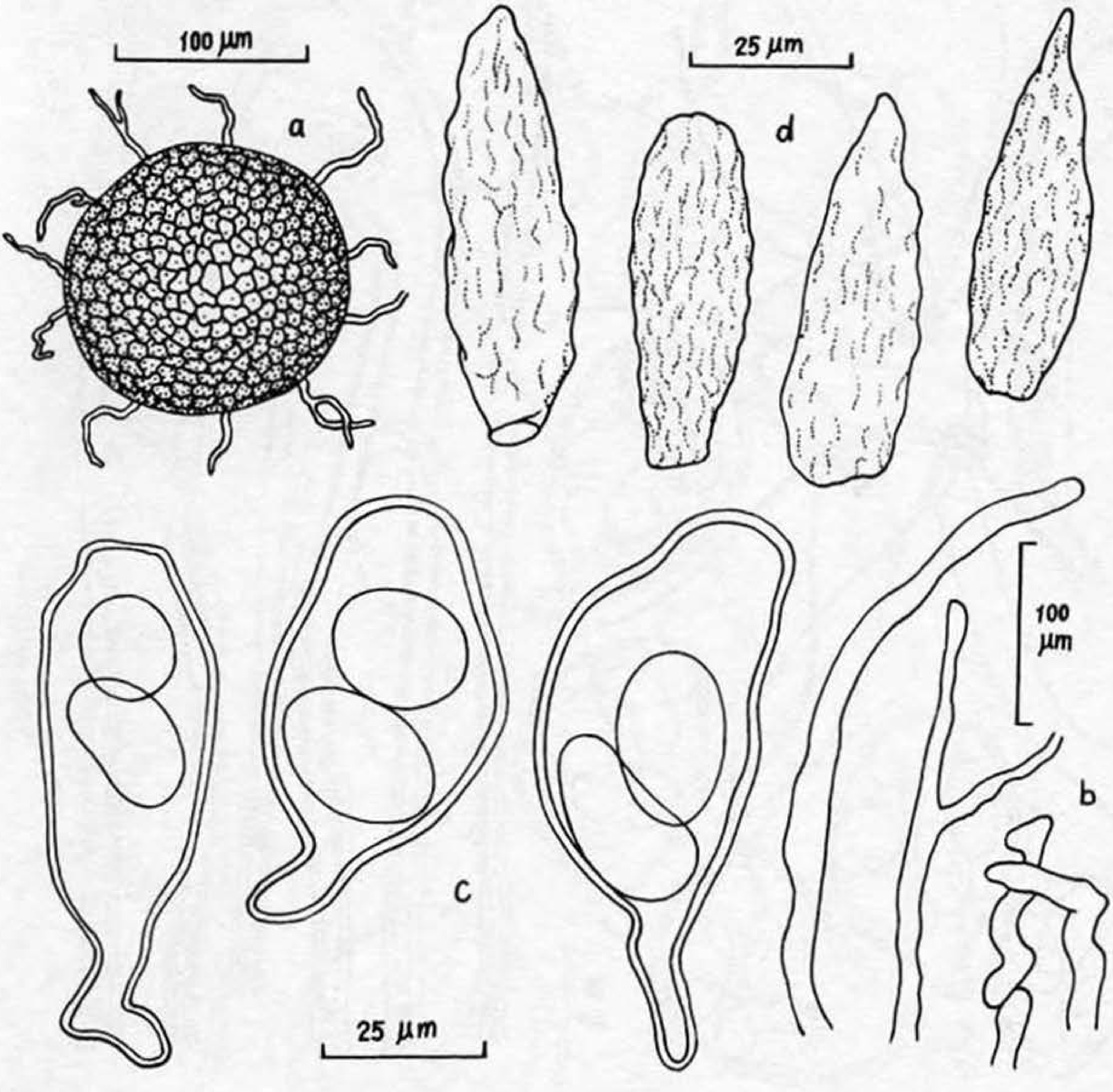

Fig. 17. LEVEILLULA

Leveillula taurica (LÉV.) ARN.: a. ascocarp, b. appendages, c. asci & ascospores, d. conidia. (on Peganum harmala L., HMAS 37623)

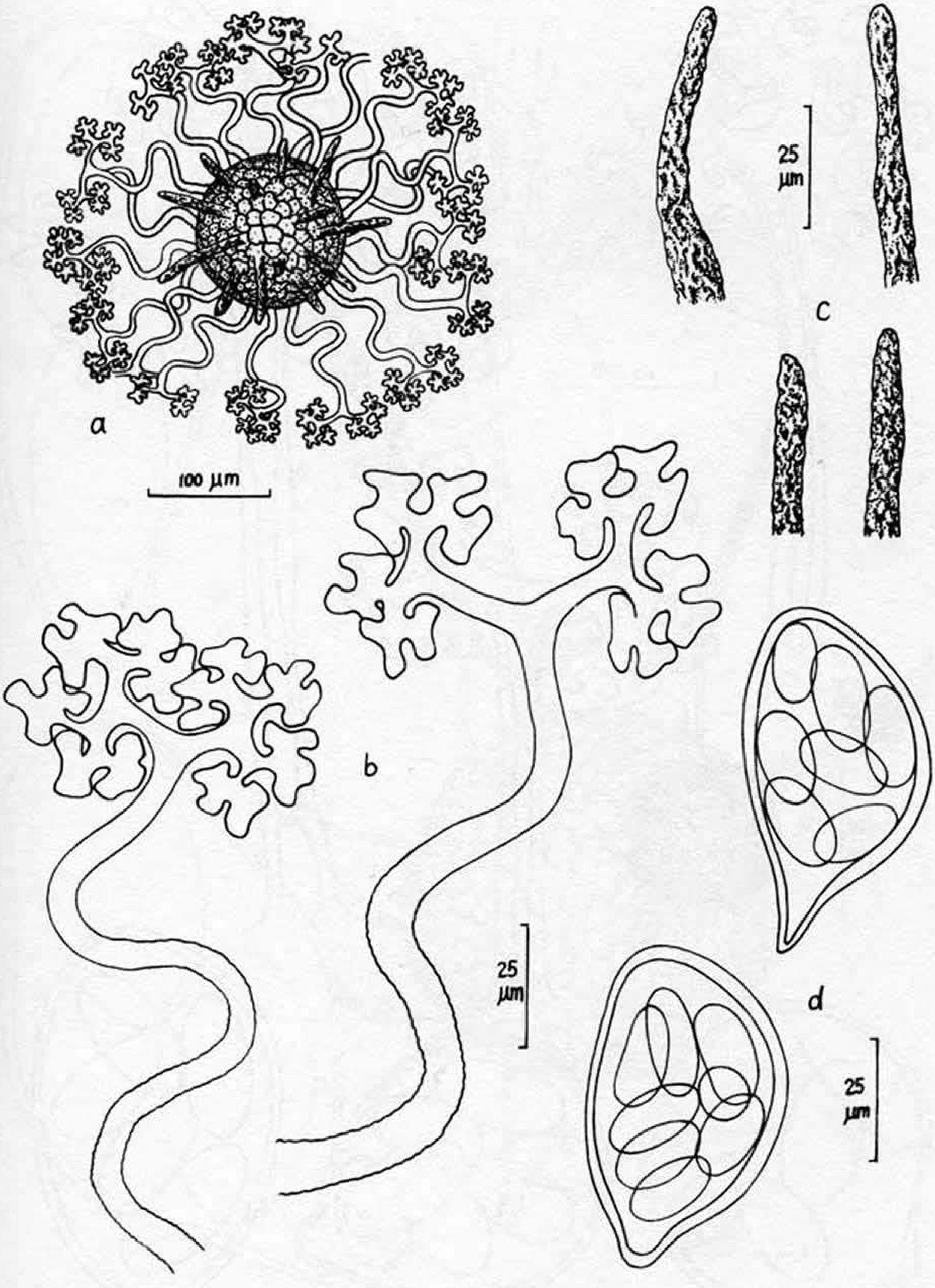

Fig. 18. MEDUSOSPHAERA

Medusosphaera rosae GOLOV. & GAMAL.: a. ascocarp, b. longer type appendages, c. shorter type appendages, d. asci & ascospores. (on *Rosa alberta* REGEL, HMAS 36517)

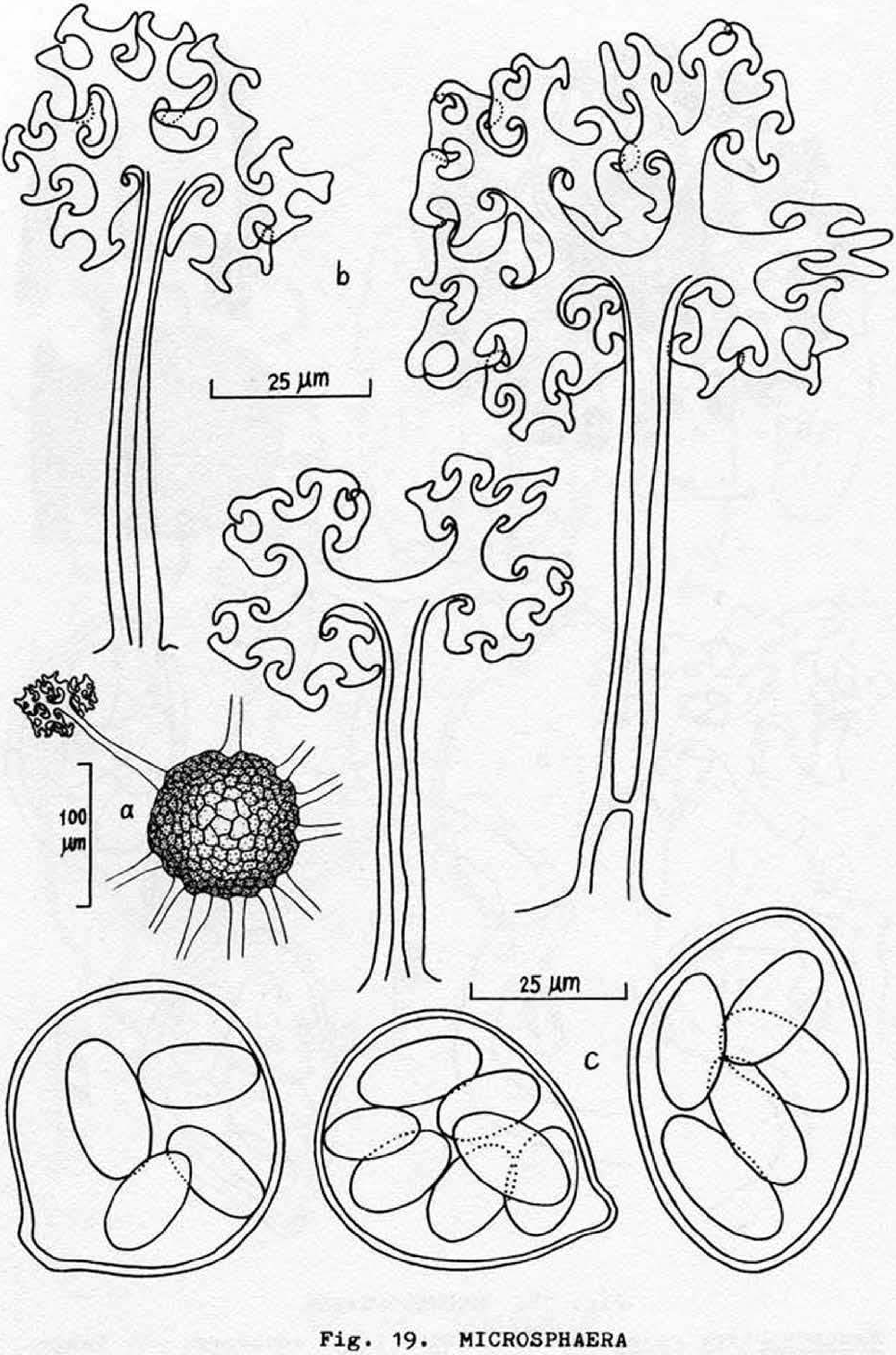

Fig. 19. MICROSPHAERA

Microsphaera friesii LÉV.: a. ascocarp, b. appendages, c. asci & ascospores. (on Rhamnus davurica PALL., HMAS 37644)

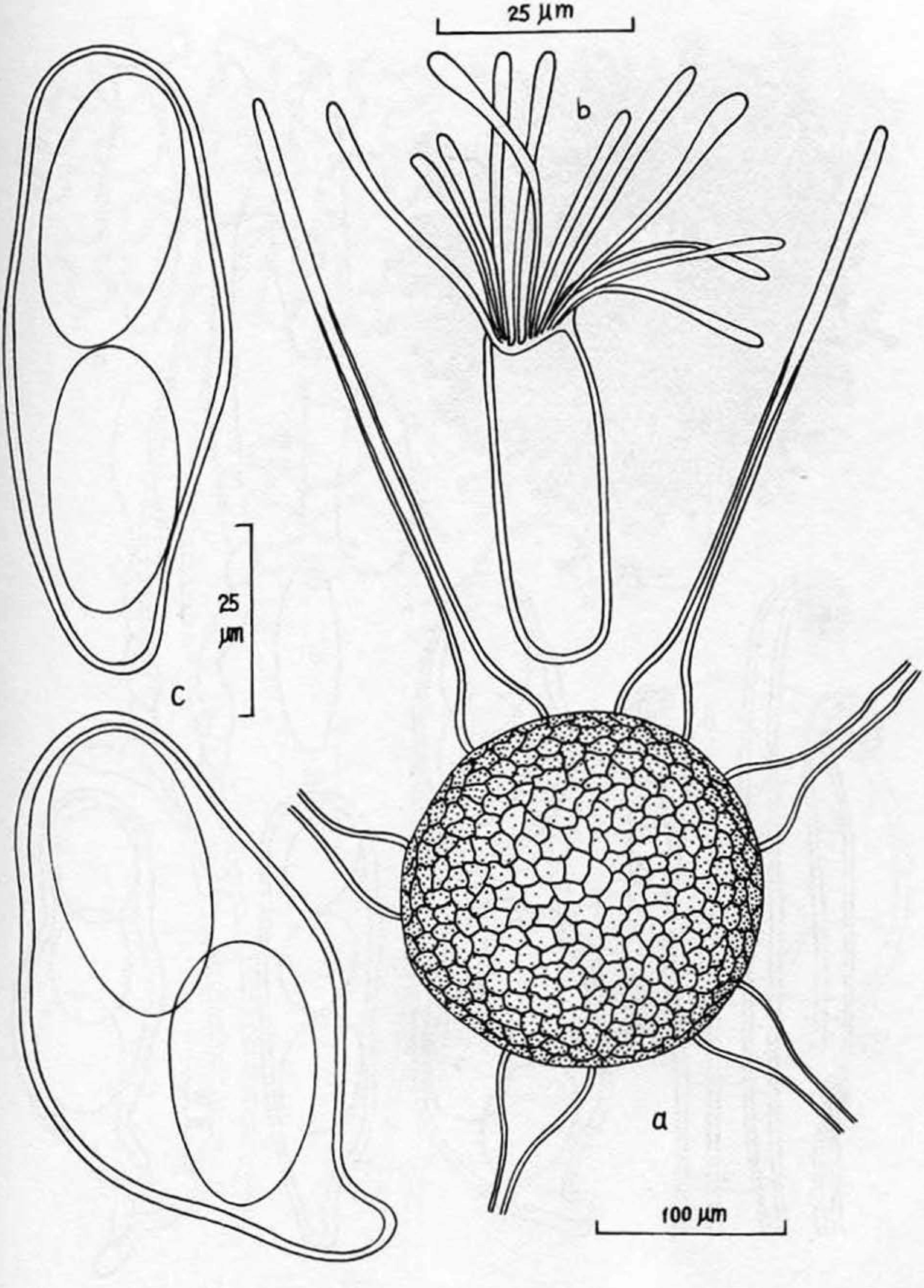

Fig. 20. PHYLLACTINIA

Phyllactinia guttata (WALLR.) LÉV.: a. ascocarp, b. shorter type appendages, c. asci & ascospores. (on Ostryopsis davidiana DECNE., HMAS 37131)

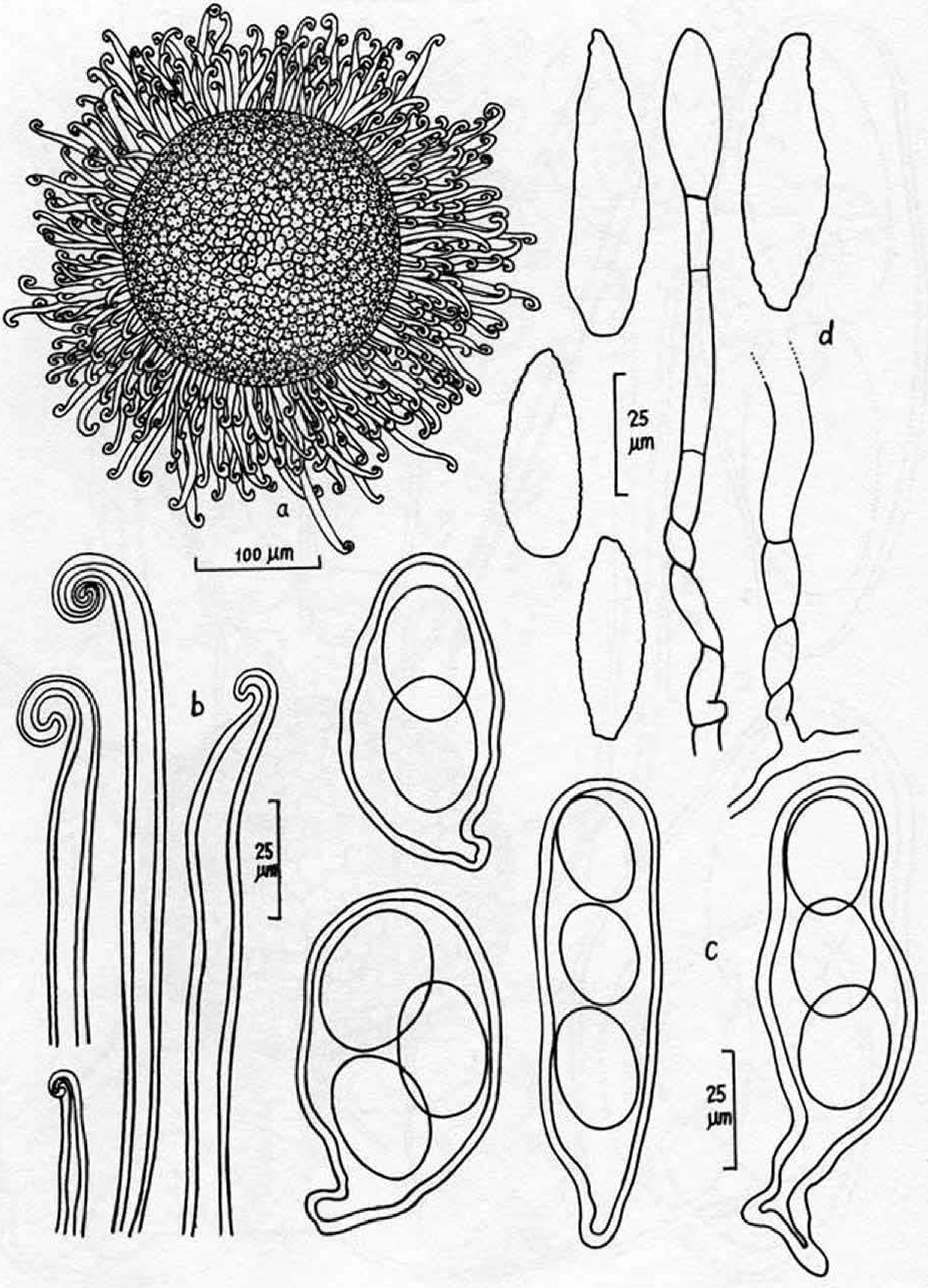

Fig. 21. PLEOCHAETA

Pleochaeta shiraiana (P. HENN.) KIMBR. & KORF: a. ascocarp, b. appendages, c. asci & ascospores, d. conidiophores & conidia. (on Celtis sinensis PERS., HMAS 00122 - a, b, c, HMAS 00123 - d)

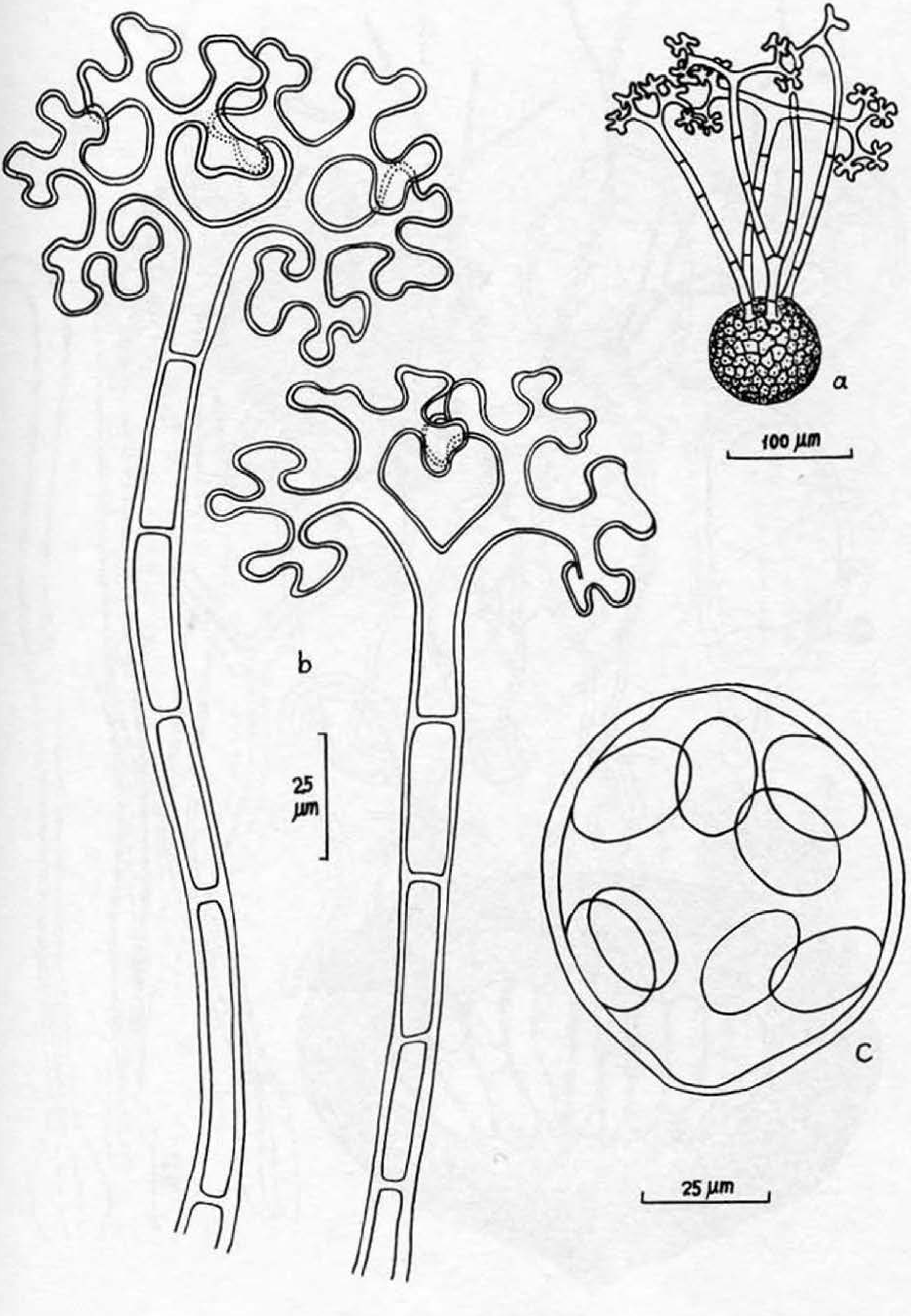

Fig. 22. PODOSPHAERA

Podosphaera tridactyla (WALLR.) de BARY: a. ascocarp, b. appendages, c. ascus & ascospores. (on Prunus persica (L.) BATSCH, HMAS 36536)

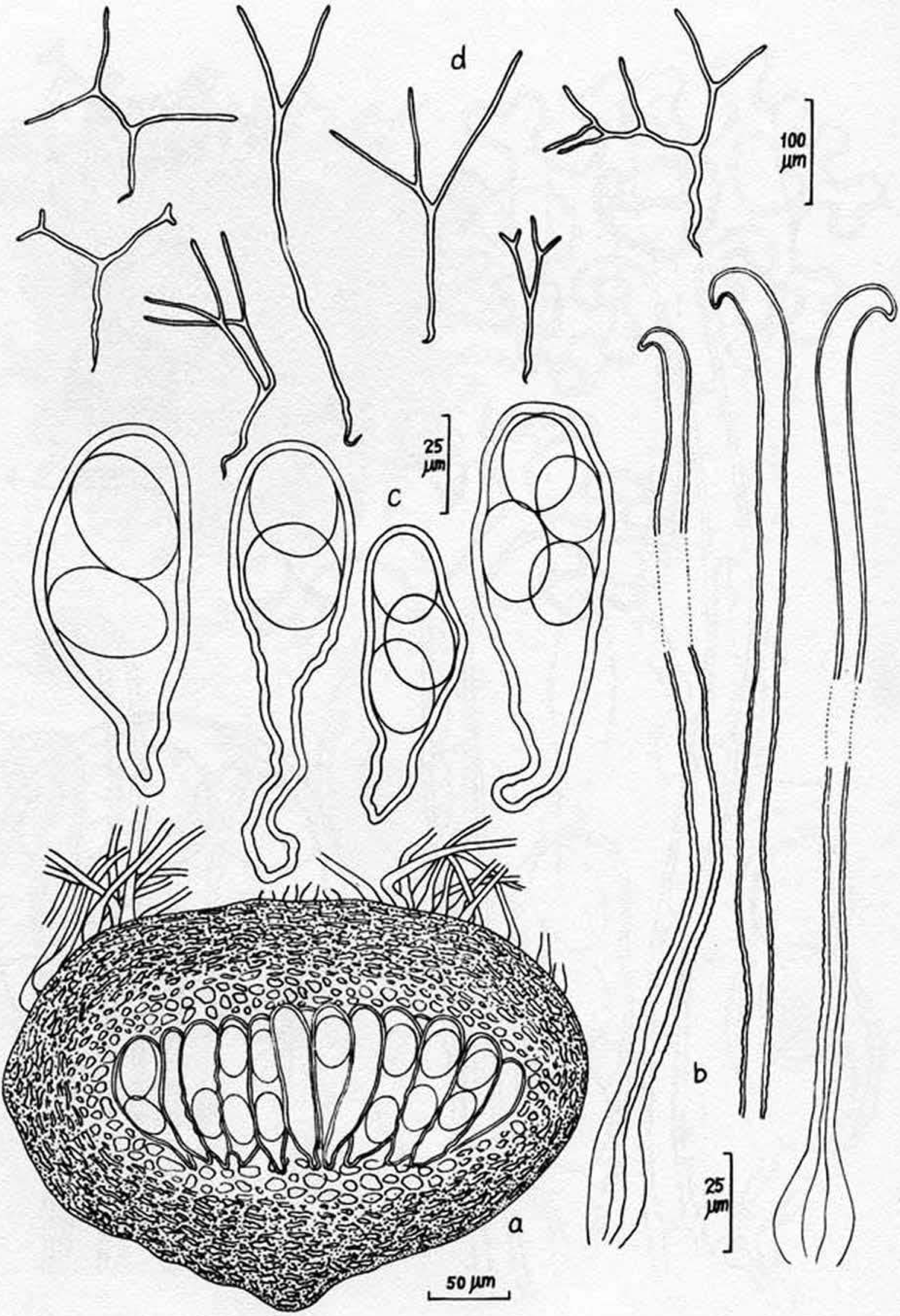

Fig. 23. QUEIROZIA

Queirozia turbinata VIÉGAS & CARDOSO: a. ascocarp, b. appendages, c. asci & ascospores, d. aerial setae. (on Platycamus regnelli BENTH., IACM)

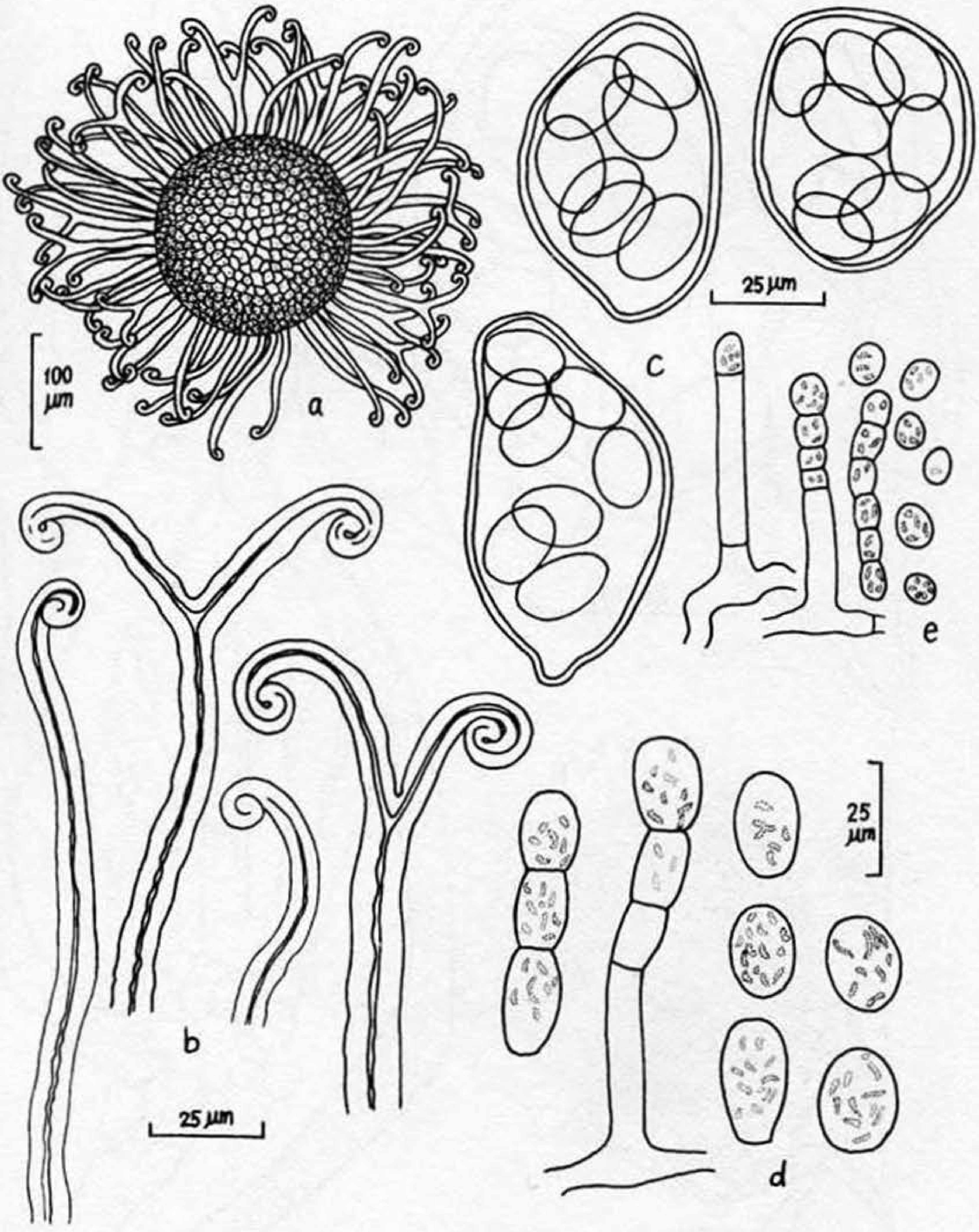

Fig. 24. SAWADAIA

Sawadaia tulasnei (FUCK.) HOMMA: a. ascocarp, b. appendages, c. asci & ascospores, d. macro-type conidiophore & conidia, e. micro-type conidiophores & conidia. (on Acer sp., HMAS 40312 - a, b, c; on Acer truncatum BUNGE, HMAS 13615 - d, e)

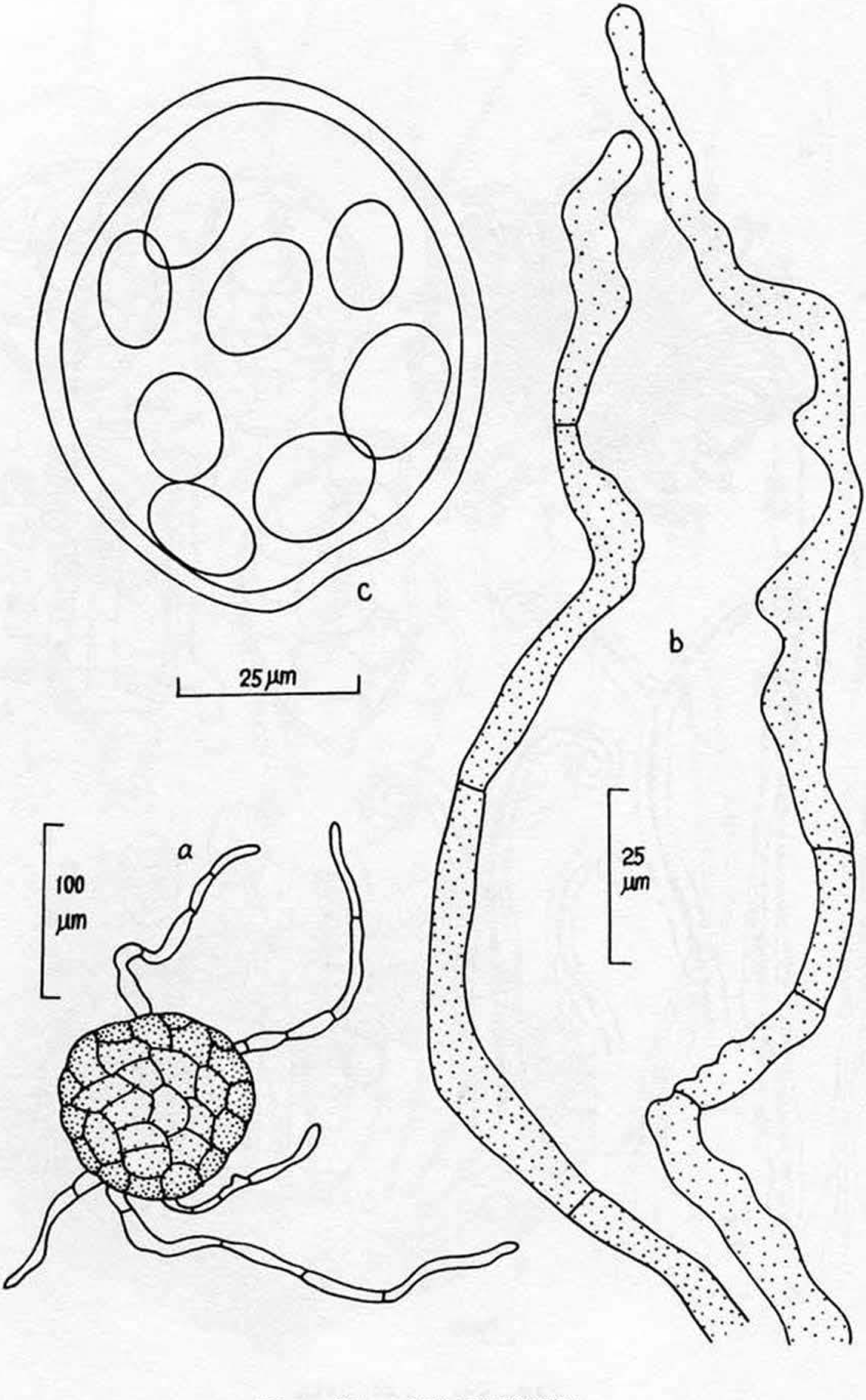

Fig. 25. SPHAEROTHECA

Sphaerotheca balsaminae (WALLR.) KARI: a. ascocarp, b. appendages, c. ascus & ascospores. (on Impatiens balsamina L., HMAS 31546)

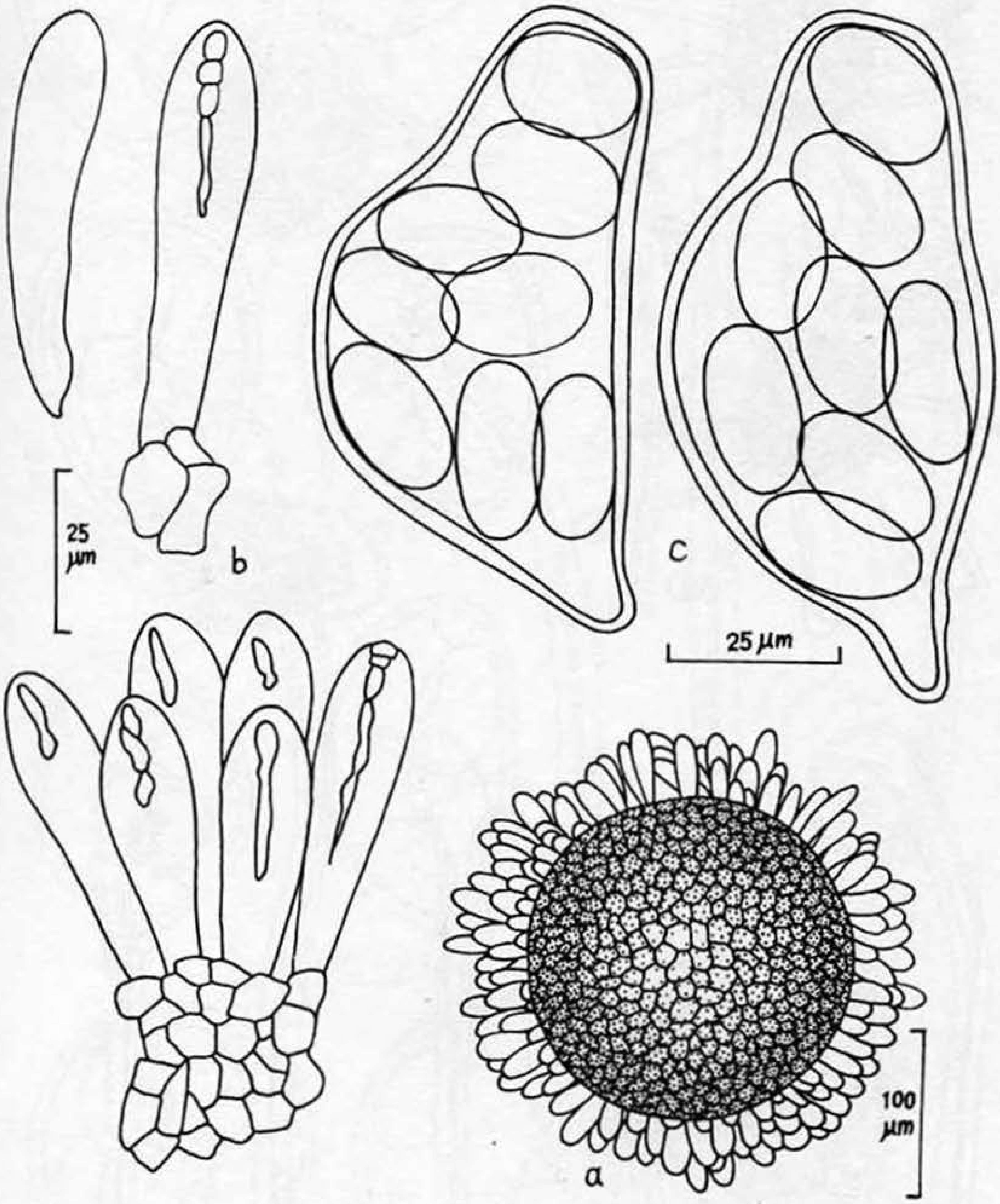

Fig. 26. TYPHULOCHAETA

Typhulochaeta japonica ITO & HARA: a. ascocarp, b. appendages, c. asci & ascospores. (on Quercus sp., HMAS 11242)

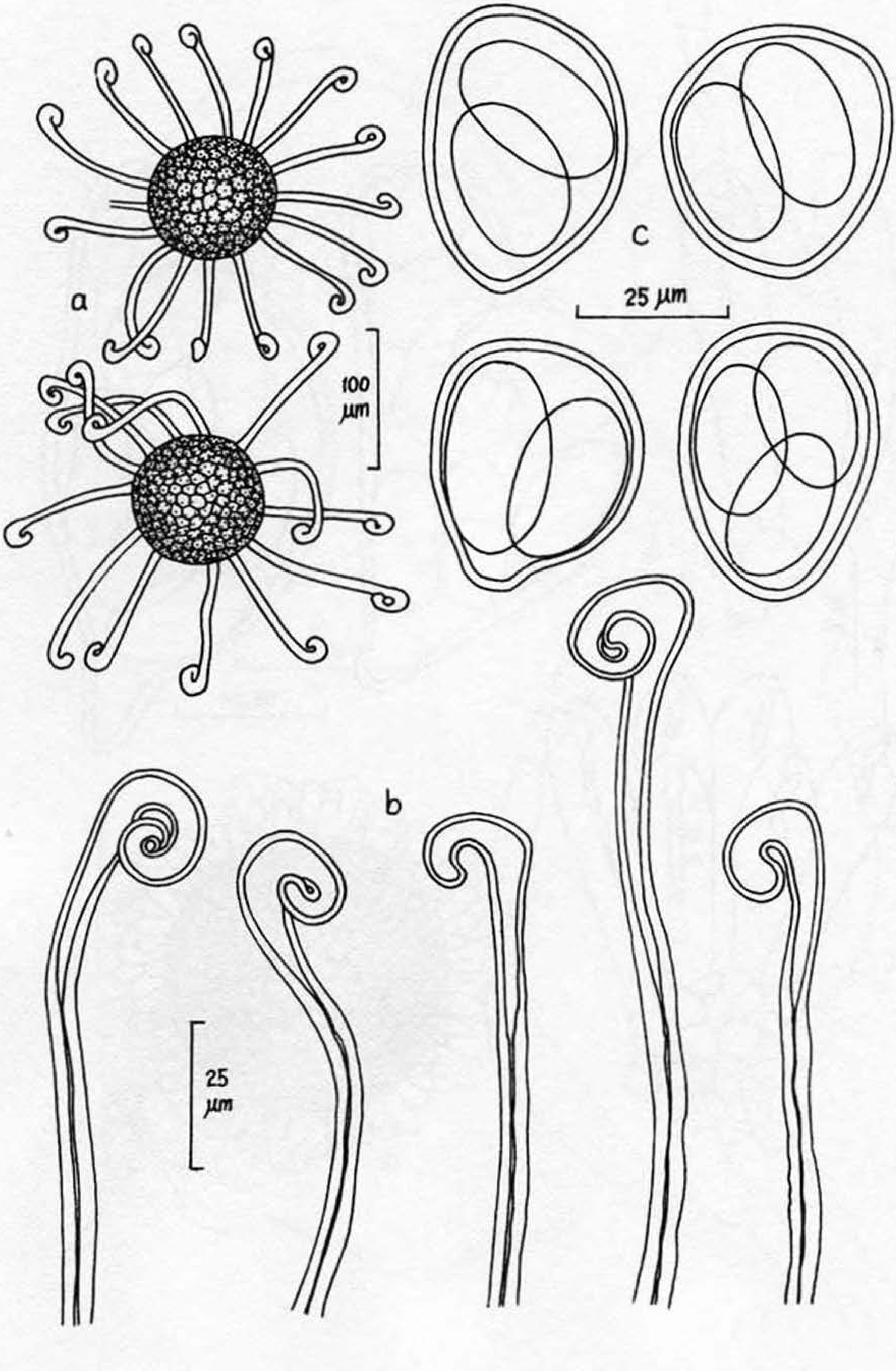

Fig. 27. UNCINULA

Uncinula clandestina (BIV.-BERN.) SCHROET.: a. ascocarps, b. appendages, c. asci & ascospores. (on Ulmus parvifolia JACQ., HMAS 11457)

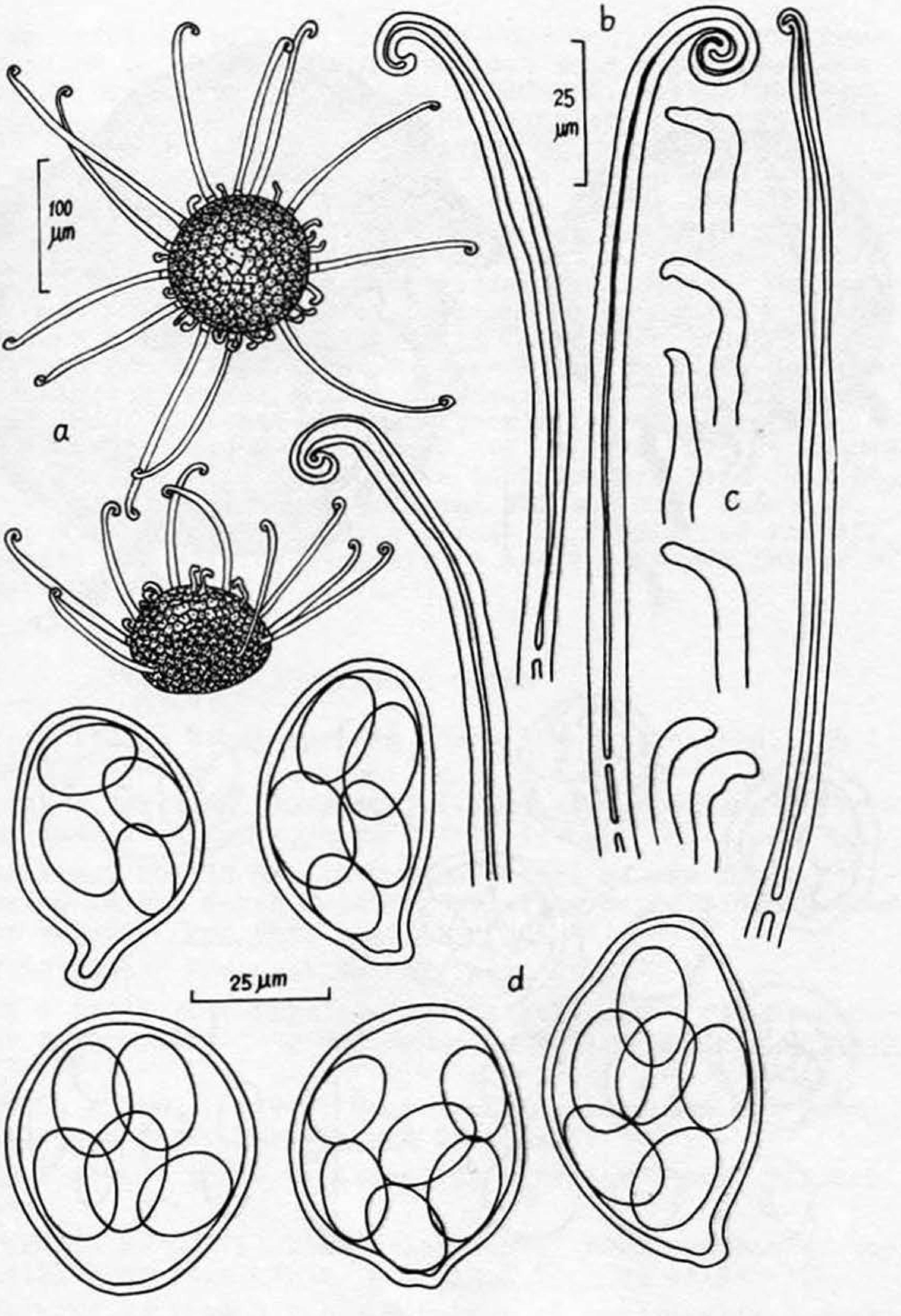

Fig. 28. UNCINULIELLA

Uncinuliella simulans (SALM.) ZHENG & CHEN var. rosae-rubi ZHENG & CHEN: a. ascocarps, b. longer type appendages, c. shorter type appendages, d. asci & ascospores. (on Rosa rubus LÉVL & VANT., HMAS 11418)

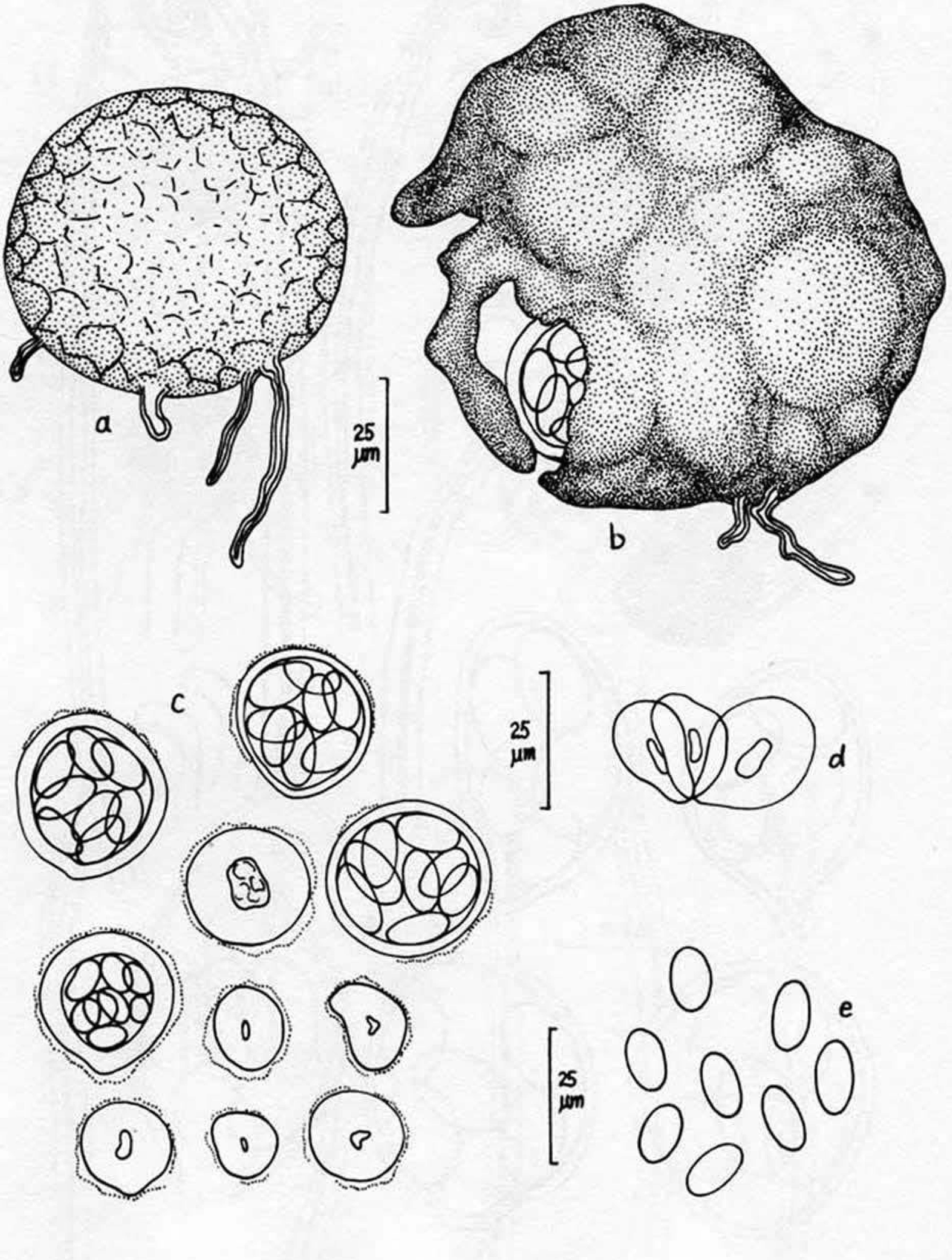

Fig. 29. XENOMYXA (doubtful genus)

Xenomyxa disseminata SYD.: a. immature ascocarp, b. mature ascocarp, c. asci from a single ascocarp, d. 3 immature asci in a fascicle, e. ascospores. (on Alsophila hirta KLF., S 1147)

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I am indebted to the Directors and Curators of the herbaria cited below for sending on loan many type specimens of the Erysiphaceae: Dr. P. E. GEORGESON, Herb. IMI (Brasiliomyces entadae MARAS & RABIE, Kokkalera crotonis PONN.); Dr. O. P. FILHO, IACM (Brasiliomyces malvastri VIÉGAS, Queirozia turbinata VIÉGAS & CARDOSO); Dr. A. STRID, S (Xenomyxa disseminata SYD.); Dr. Marie W. ESHER, BPI (Erysiphe trina HARKN.); Dr. Patricia K. HOLMGREN, NY (Erysiphe malachrae SEAV.). I am also grateful to Dr. B. BARTHOLOMEW, CAS, and Prof. CHEN Zhao-xian, Fujian Agricultural College for donating the specimen of Erysiphe trina HARKN. and the co-type of Furcouncinula wuyiensis Z. X. CHEN & GAO respectively; to Prof. ZHAO Zheng-yu, Ba-Yi Agricultural College of the Xinjiang Uygur Autonomous Region and Prof. YU Yong-nian of this institute for kind permission to reproduce some of their drawings (Figs. 10, 14, 17, 18, 22, 25 and 19, 20, 26 respectively) and to Miss TANG Wen and Miss JIAN Li, also of this institute, for inking all the line drawings. Sincere appreciation is due to Prof. R. P. KORF of Cornell University for helpful suggestions and a critical review of the manuscript.

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SOWERBYELLA IMPERIALIS (PECK) KORF IN ESTONIA

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Sowerbyella imperialis is a rare fungus found in U.S.A. (Peck, 1878), Sweden (Nannfeldt, 1938; Eckblad, 1968), France and Switzerland (Svrček, 1969; Moravec, 1973); in the Estonian SSR it was found for the third time recently. A description of the Estonian collections is presented here.

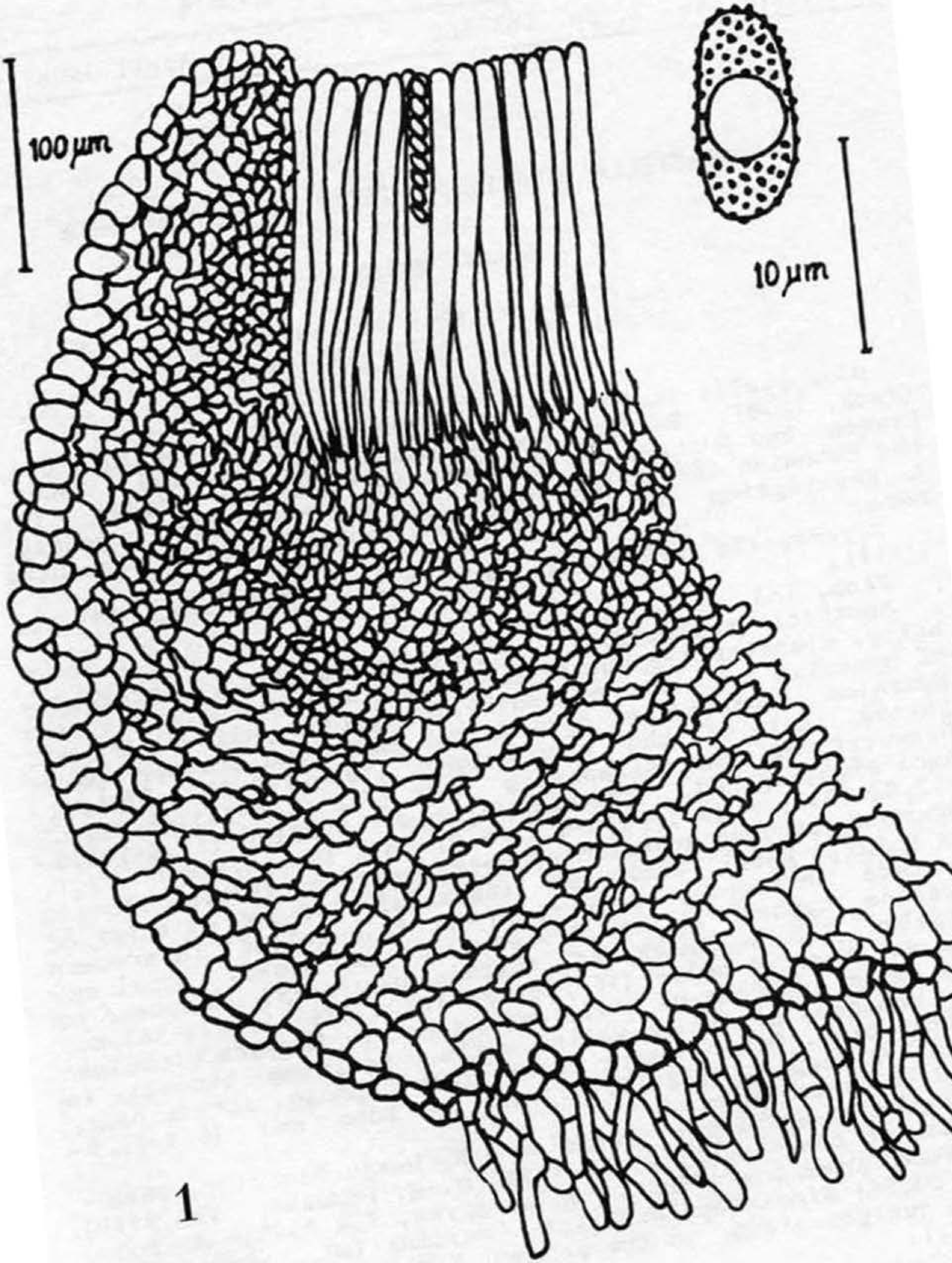
Sowerbyella imperialis (Peck) Korf, Phytologia 21: 206 (1971).

Figs. 1-3.

Apothecia terrestrial, stipitate, cupulate, externally hairy, diameter 4-9 cm, stipe 20-30 x 5-7 mm, external side of hymenium and that of apothecium golden-yellow all over. Hymenium consists of cylindrical asci and clavate paraphyses, all of the same height, (185-)190-200(-210) µm. Diameter of the paraphysis apex (3.2-)3.8-7.3(-8.2) µm. Asci eight-spored. Spores ellipsoid, hyaline (12.0-)12.5--12.8(-13.2) x (5.7-)6.0-6.5(-6.9) µm, length/width = 2.1. Ornamentation of spores microverrucose. Hypothecium 130-150 µm thick. Ental excipulum (medulla) 190-200 µm thick of textura intricata, consisting of thin-walled interwowen hyaline hyphae (4.8-)8.0-9.6(-11.2) µm broad. Ectal excipulum 130 µm thick of textura angularis, composed of larger hyaline cells (16-)24-32(-37) x (24-)40-42(-56) µm. The outer surface of ectal excipulum of textura globulosa is composed of thick-walled cells, staining strongly in Cotton blue. Out of these cells arise hyphoid, obtuse hairs with 1-3 septa, (32-)66-77(-96) µm long and (6.4-)7.5--8.2(-9.6) µm broad.

Material examined: Estonian SSR, Harju District, Vasalemma, on the ground, 25.IX.1957, H.-E. Rebassoo, TAA 6589; Rakvere District, Vinni, on an alvar, 7.X.1970, A. Roos, TAA 60856; Kingissepa District, Muhumaa Isl., Suuremôisa, in a juniper stand, on the ground, 6.X.1983, M. Vaasma, TAA 115731.

Compared to previously known specimens, our no. 115731 is conspicuous by its larger apothecia up to 9 cm in diameter.



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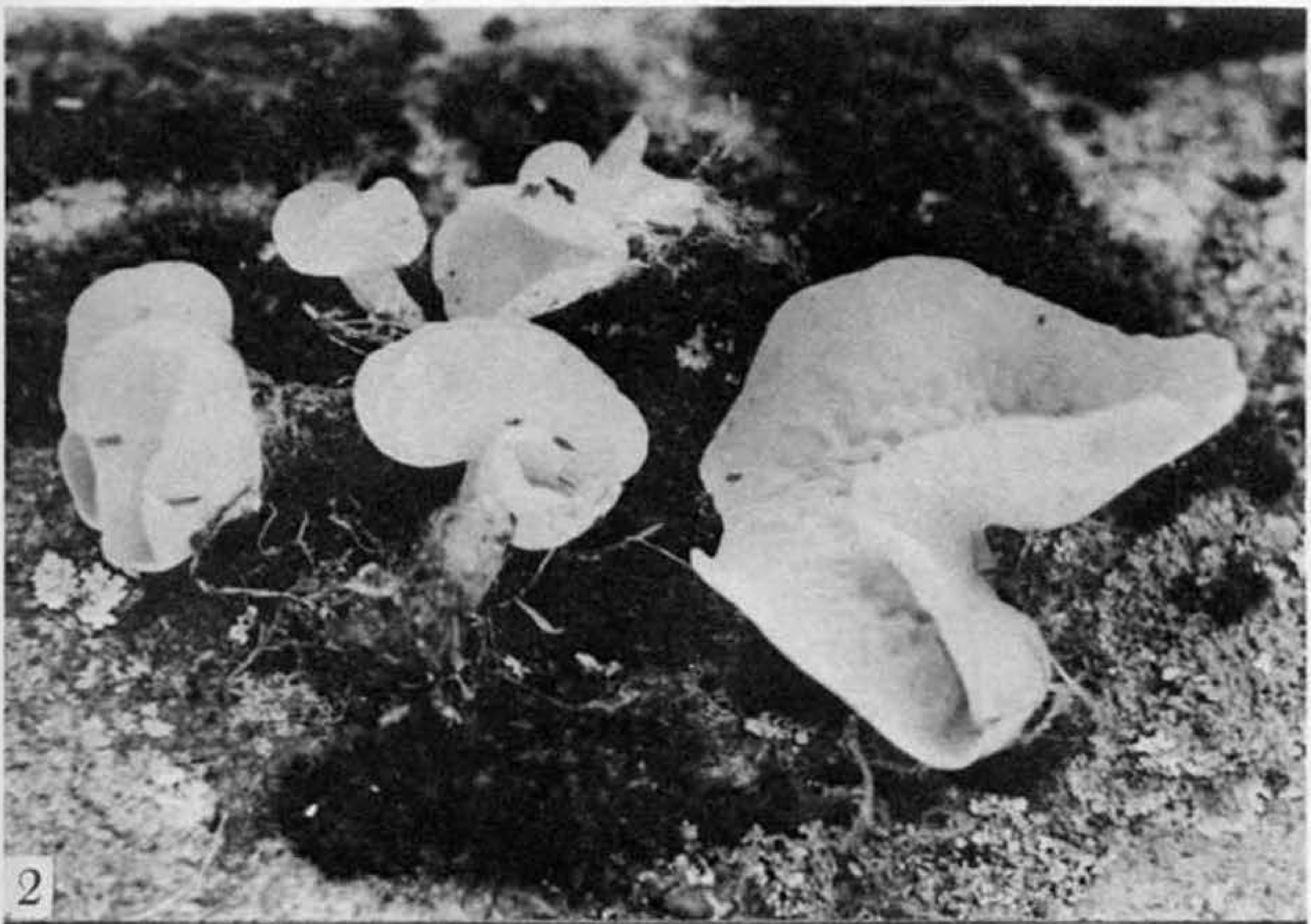
1. Cross-section of an apothecium and one ascos



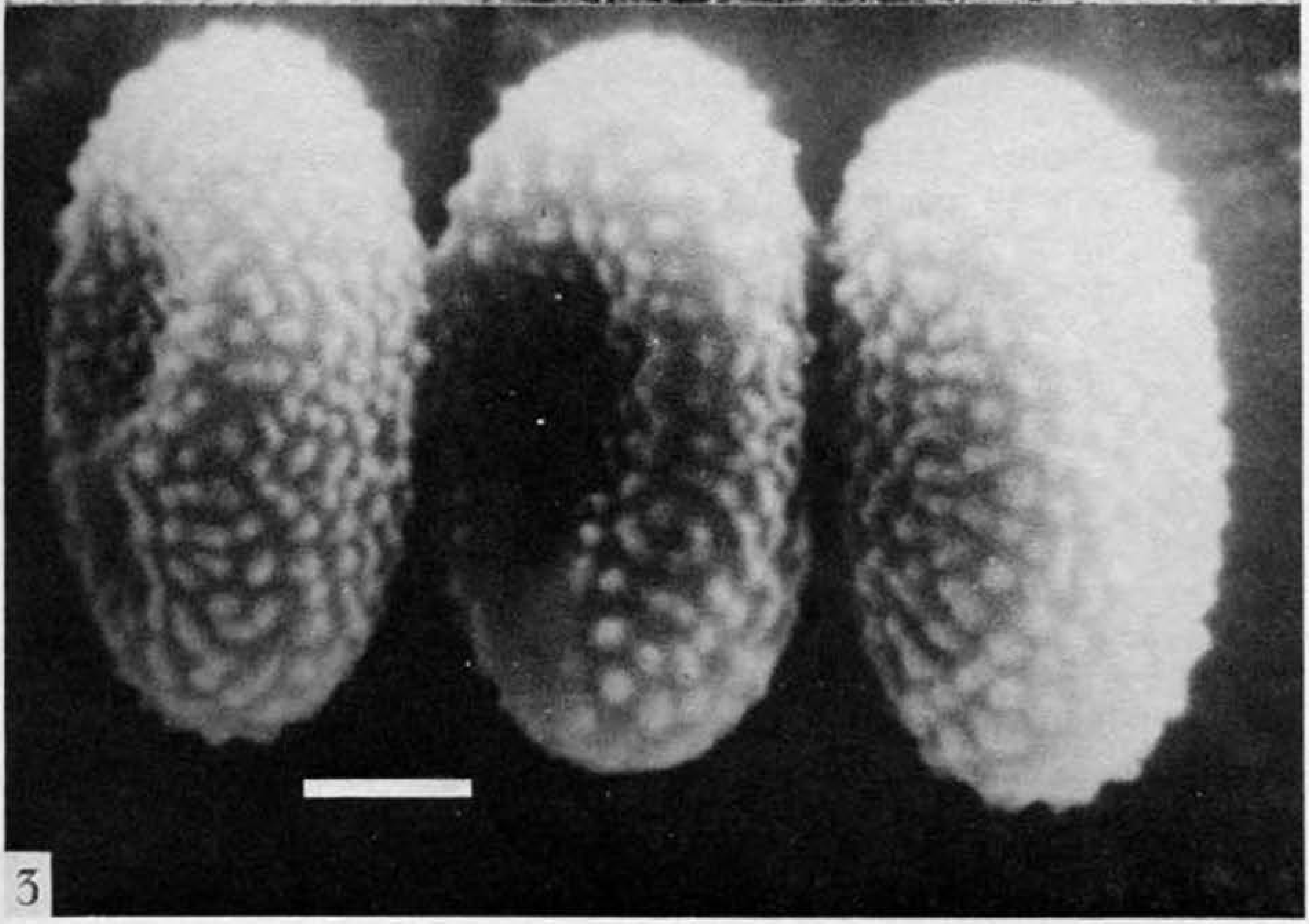


Figure 2. Apothecia of *Sowerbyella imperialis*, x2.
Figure 3. Spores of *Sowerbyella imperialis* (scale-line = = 2 μm).

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STUDIES ON CHINESE ASCOMYCETES.
1. PHAEOSACCARDINULA DICTYOSPORA.

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SUMMARY

Phaeosaccardinula dictyospora (Petr.) comb. nov. (syn. **Chaetothyrium dictyosporum** Petr.) is the only species in the genus known from China. All epithets that have been used in the genus are discussed.

INTRODUCTION

The genus **Phaeosaccardinula** P. Henn. (1905: 67) is characterized by epiphyllous, superficial, uniloculate, perithecioid ascomata, which are usually described as being covered by a thin, non-setose pellicle, centrum of saccate, bitunicate asci producing muriform, hyaline - brownish ascospores. More than 30 epithets have been used under this generic name, but many of the species belong in other genera (**Limacinula**, **Treubiomyces**; Reynolds 1971, 1983). There is, however, no modern study of all species in the genus, so the position of some of them is uncertain.

Two species of **Phaeosaccardinula** have been reported from China, viz. **P. javanica** (Zimm.) Yamam. and **P. longispora** Yamam. Neither of them belongs in the genus. The former species is **Limacinula javanica** (Zimm.) Höhn., the latter one is **Treubiomyces roseosporus** (Höhn.) Reyn. (see below). However, **Chaetothyrium dictyosporum** Petr., described from the Kwangsi Prov., has not hyaline phragmospores as other **Chaetothyrium** spp., but is a true **Phaeosaccardinula.** It differs from all species previously placed in the genus. Two species from Brazil with similar spores (see below) were described much later than **C. dictyosporum** and do not affect the nomenclature of this species, if they would be considered conspecific with it.

Phaeosaccardinula dictyospora (Petr.) O. Erikss. & J. Yue comb. nov.
Basionym: **Chaetothyrium dictyosporum** Petrak in Acta Horti Gotob. 17: 133 (1947).

This species was found by Petrak on herbarium material of **Ficus** sp. from China (Kwangsi Prov., Chiu Fung Yun Hsien, alt. ca. 1500 m. 9.V.1933, leg. A.N. Steward & H.C. Cheo 372, W). The fungus grows on the upper surface of living leaves. We have examined semithin sections of one ascoma (embedded in glycol methacrylate - Historesin, and sectioned on an LKB Ultrotome 4801 A) and squash mounts of the type. The following description gives only the most important details of the morphology of the species. Our observations agree with Petrak's detailed description in most parts, but some important details have been added.

Ascomata superficial, perithecioid, depressed, with a thin superficial, non-setose, tesselate scutellum, which is circular - broadly elliptical in outline, and ca. 750 µm across; central parts of scutellum ca. 20 µm thick, outermost layers of rather short, dark-walled cells, inner layers of more elongated, straight, subpericlinal, radiating, dark-walled cells, which continue into hyaline, thin-walled cells lining the ascomal cavity and cells filling out the space between scutellum, ascomal cavity and epidermis of leaf; marginal, clypeus-like, free parts of scutellum ca. 200 µm broad, proximally ca. 20 µm thick, distally thinner and finally a dense, ca. 5-10 µm thick network of 1-2 layers of hyphae; the central pore ca. 30 µm high, and ca. 25 µm wide in proximal and distal parts, ca. 20 µm wide in the middle part and here surrounded by a ring-like zone of small angular, rather thin-walled cells (Fig. 2A), pore filled with ±gelatinized cells, probably originating in part from cells lining the locule; locule ca. 280 µm wide and 70 µm high, roofed by hyaline cells

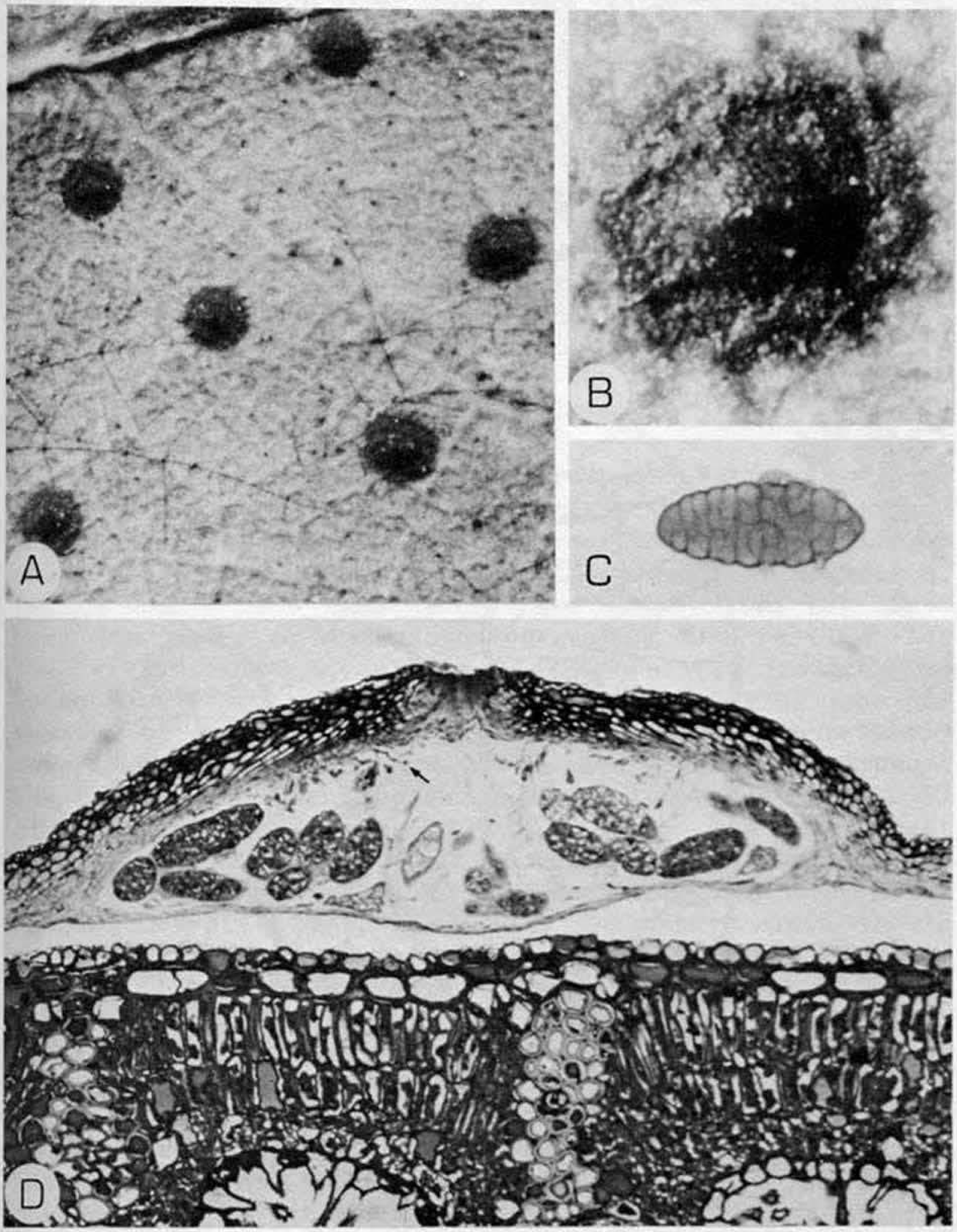

Fig. 1. **Phaeosaccardinula dictyospora.** - (A) Scattered ascomata on leaf. (B) Ascoma; scutellum with clypeus-like margin. (C) Ascospore. (D) Median section through ascoma. Note the hamathecium (arrow) and the ring-like zone of more thin-walled cells around the pore. - (A) X 14. (B) X 60. (C) X 475. (D) X 300.

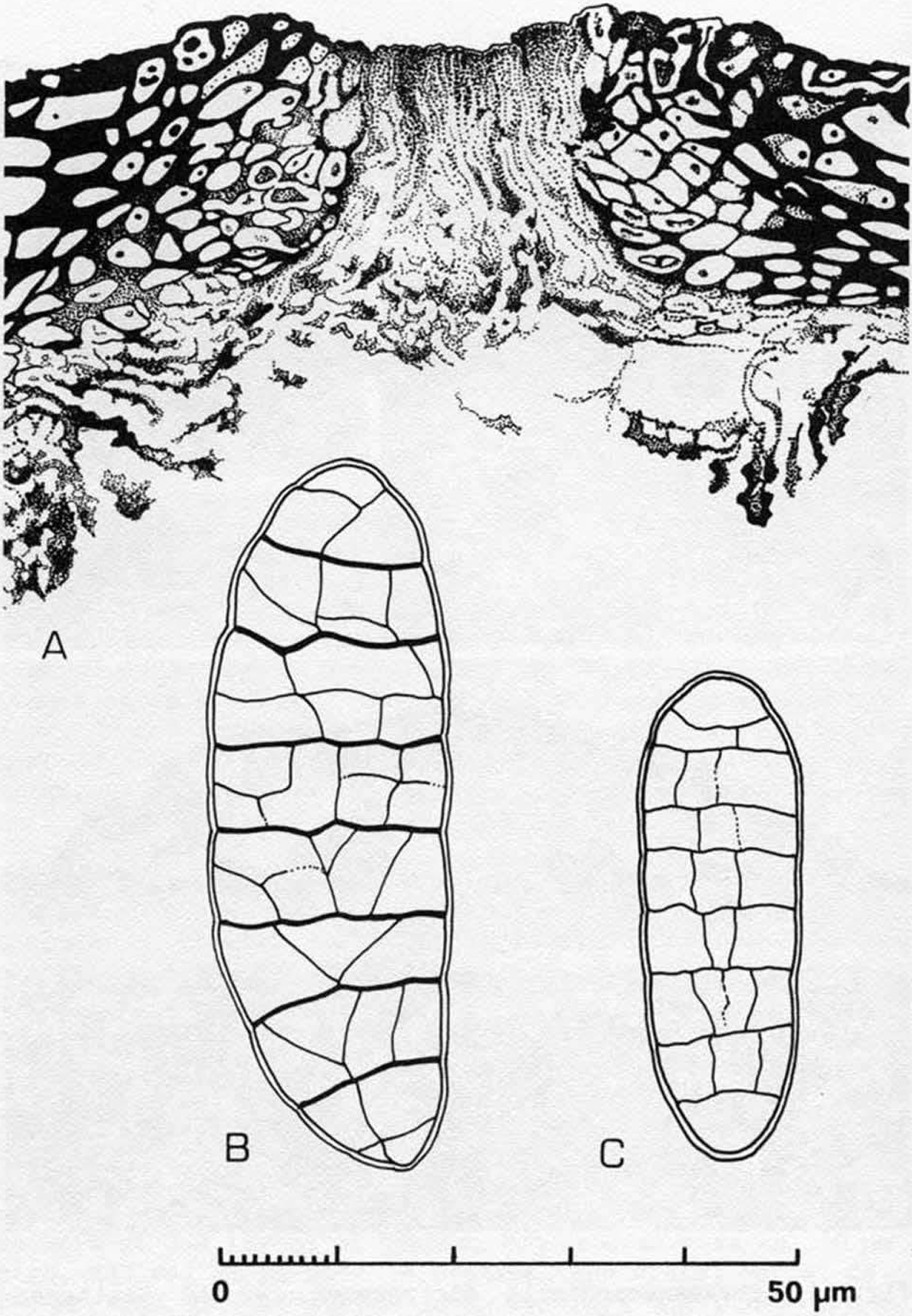

Fig. 2. (A, B) **Phaeosaccardinula dictyospora.** (C). **P. pipericola.** - (A) Ostiole with ±gelatinized hamathecial cells. (B, C) Ascospores.

producing a hamathecium of sparse ?pseudoparaphyses or ? periphysoids (at least near the ostiole) and laterally and basically lined by a thin wall of a few layers of flattened, hyaline cells, all originating from the overlaying, innermost layer of the scutellum; asci bitunicate, cylindric clavate, short-stalked, KOH/IKI+ blue, 4-6-spored; ectotunica thin (easily broken in squash mounts), endotunica thick; ascospores ca. 35-61 x 16-24 µm, ellipsoidal, slightly inequilateral, light brown, divided by usually 7 A-transsepta and some longisepta, and in at least some segments also by B-transsepta, without distinct perispore.

DISCUSSION

Sections of ascomata of **Phaeosaccardinula dictyospora** (Fig. 1D) show that 1) the wall surrounding the locule in each ascoma originates from the lower surface of the covering scutellum, 2) a lysigenous pore is formed in the scutellum, and 3) there is a hamathecium of ?periphysoids (at least near the pore, or ?pseudoparaphyses in the rest of the locule). The ontogeny of the closely related **Treubiomyces pulcherrimus** has been studied by Pohlad (1980) and discussed by Reynolds (1983: 349). They have appropriately described the marginal part of the scutellum as a clypeus. The hamathecium should consist of periphysoids. As in P. dictyospora, the asci are KOH/IKI+ blue. The development is not quite similar to that described in the "hemisphaerialean" Microthyriaceae (e.g., **Myiocopron smilacis** (De Not.) Sacc.; Luttrell 1944). The family Chaetothyriaceae should be kept for a group of genera (**Chaetothyrium**, **Ceramothyrium**, **Phaeosaccardinula**, **Treubiomyces**, etc.) that Reynolds has characterized as "foliicolous capnodiaceous fungi with a clypeated ascocarp".

The following is a list of all epithets that have been used in **Phaeosaccardinula**. Our studies of material and/or literature indicate that none of these epithets refers to our species, **P. dictyospora**. We have tried to indicate the correct specific name for each epithet and the differences between **P. dictyospora** and the other species in the genus. Some of the names in **Phaeosaccardinula** are used only provisionally until original material has been examined, but all these names are younger than **Chaetothyrium dictyosporum** and a restudy of these species will not result in any change of name of our species. The host(s) given in the original description of each species is mentioned in the list.

1. **amapensis** Bat. & Silva
   Host: indet. leaves. (Batista & al. 1967: 159).

The ascospores are cylindrical and much longer than in **P. dictyospora**. They may have up to 33 transsepta and only one longiseptum in some segments.

2. **anomala** (Cooke & Harkn.) Miller & Bonar = **Limacinula anomala** (Cooke & Harkn.) Reyn.
   Host: **Laurus sp.** (Reynolds 1971: 1186).
3. **butleri** (Syd.) Theiss. & Syd. = **Limacinula butleri** Syd.
   Host: **Artocarpus mysorensis.** (Reynolds 1971: 1189).
4. **canthii** (Hansf.) Hansf.
   Hosts: **Canthium** sp., etc. (Hansford 1946: 154-155).

The spores are usually longer and narrower and divided by more transsepta than in **P. dictyospora.**

5. **caucasica** (Woron.) Hansf. = **Limacinula javanica** (Zimm.) Höhn.
   Host: **Taxus baccata.** (Reynolds 1971: 1192)
6. **caucasica** (Woron.) Hansf. var. **artocarpi** Bat., Nascim. & Cif. = **?Limacinula**
   Host: **Artocarpus integrifolia** (Batista & Ciferri 1962: 84).
7. **ceibae** (Petr. & Cif.) Bat. & Cif.
   Host: **Ceiba pentandra.** (Bat. & Cif. 1962:86).

The size and septation of the spores in this species agree very closely to our observations of **P. dictyospora.** We have not seen material of **P. ceibae** and cannot decide whether the two species are conspecific. However, if they are, **Chaetothyrium dictyosporum** is the older name and has priority.

8. **coumae** Bat. & Vital
   Host: **Couma utilis.** (Bat. & Cif. 1962: 10, as **Batistaella coumae** (Bat. & Vital) Cif.).

The spores are usually longer and broader than in **P. dictyospora** and divided by more transsepta.

9. **dematia** Miller & Bonar
   Host: **Baccharis pilularis.** (Miller & Bonar 1941: 411).

The original material consists of **Baccharis pilularis** with twigs and leaves covered by a dense dematiaceous mycelium. This mycelial mass should produce "globose, collabent, ostiolate, somewhat tuberculate" ascomata with muriform ascospores of **P. dematia**, and "dark brown, subulate, simple or branched" pycnidia with "brown, flexuous, acuminate, greatly elongated" conidia (Miller & Bonar l.c. and Pl. 67, Figs. 8 and 9; Note: 8 and 9 should be switched). We could not find any ascomata or pycnidia matching the description in the isotype (California Fungi 661, Moss Beach, San Mateo County, H.E. Parks 2139, 17.IV.1924, S). However in another number of "California Fungi" (796, N. end of Wildcat Canyon, Contra Costa County, L. Bonar, 21.IV.1931, S) we found narrowly conical pycnidia of a **Phaeoxyphiella** sp. with conidia of just the same type as described by Miller & Bonar. One species in this genus is considered the anamorph of **Capnodium walteri** Sacc. (Hughes 1976: 723-725). We found two types of ascomata with mature spores. One was shiny black and somewhat stalked and produces bitunicate asci with muriform ascospores, which were shorter than the length given by Miller & Bonar for **P. dematia**. The other fungus had small, globose, smooth ascomata containing bitunicate asci with 8, ellipsoidal, inequilateral, (2-) 3-septate, brown ascospores, measuring 11-14 x 5-6 µm. We have seen at least one more species in the material, but with immature asci. Capnodiaceous hyphal mats often consist of a mixture of species (Hughes 1976: 700), as was also found in this collection of **P. dematia**. More studies are needed before we can classify **P. dematia**, but it is in any case clear that this species does not belong in **Phaeosaccardinula**.

10. dictyospora (Petr.) O. Erikss. & J. Yue, this paper.

11. diospyricola P.Henn.

Host: **Diospyros** sp. (Reynolds 1971: 1175).

This is the type species of **Phaeosaccardinula**. Reynolds studied a slide of the original material filed in FH. He could not find any ascomata of this species in the specimen packet, only ascomata of **Micropeltis applanata** Mont., which also Hennings (1905: 67) had found in the same collection. We have seen another part of the same collection ("E. Ule. Herbarium Brasiliense. Amazonas-Expedition. No. 6471. **Phaeosaccardinula diospyricola** P. Henn., auf **Diospyros**, Peru, Rio Amazonas, Tarapoto, 9.1902", S). It consists of three leaves. We found two species with flattened ascomata. One has a bluish ascomal wall in the light microscope (black in the dissecting microscope) and hyaline phragmospores. This is **Micropeltis applanata**. The other species has a brown ascomal wall (in both the light and dissecting microscope) and immature, hyaline spores measuring ca. 17-20 x 6 µm and divided by 5 transsepta. This may be immature **P. diospyricola**. The original description of this species gives the spores as 7-13-septate, interrupted muriform and measuring 35-60 x 7-10 µm, i.e. they should be narrower and be divided by more numerous transsepta than in

P. dictyospora. Hennings' description and illustration of the type species **P. diospyricola** are not very detailed, but the current concept of **Phaeosaccardinula** is certainly correct.

12. **epicarpa** Bat., Nascim. & Cif.
Host: **Citrus grandis**. (Bat. & Cif. 1962: 87).

The spore measures of **P. epicarpa** and **P. dictyospora** overlap, but the spores have fewer A-transsepta in **P. epicarpa**.

13. **ficicola** P. Henn.
Host: **Ficus** sp.

We have examined original material ("**Phaeosaccardinula ficicola** P. Henn. Auf Ficus spec. Ost-Usambara, Amani. 1.1903. leg. Zimmermann", S) consisting of three fragments of leaves. On their upper sides are brown patches of a very thin mycelium. Numerous ascomata are to be found on this mycelium, but the same type of ascomata are also seen between the brown patches. They are circular in outline and often with collapsed ostiolar region. The bitunicate asci produce cylindric fusiform, often mucronate, hyaline phragmospores. We have identified this fungus as **Zukalia transiens** Höhn., which was described from the same material from Tanganyika. Von Höhnel (1910: 917) mentions that the subiculum produces conidia of **Triposporium**. Such conidia are common in the collection we have studied. According to von Höhnel (1910: 915-916) the ascomata of **Z. transiens** and **P. ficicola** are very similar. We have not been able to find any ascomata with well-developed dictyospores. Dr. Å. Strid has kindly informed us that there is no original material of **Z. transiens** in S. Such a collection might have contained also **P. diospyricola**. - **P. ficicola** was described from the same host genus as **P. dictyospora**, but they can hardly be conspecific, as the ostiolar region of the former species should be of the same type as in **Limacinula** (von Höhnel incorrectly considered **Phaeosaccardinula** and **Limacinula** congeneric; see Reynolds 1971: 1173).

14. **ficina** (Syd.) Hansf. = **Limacinula samoensis** Höhn.
Host: **Ficus** sp. (Reynolds 1971: 1197).

15. **funtumiae** (Hansf.) Hansf. = **Treubiomyces funtumiae** (Hansf.) Reyn.
Host: **Funtumia** sp., etc. (Reynolds 1983: 352).

16. **gigantospora** Bat. & Matta
Host: **Manilkara zapota** (**M. "sapodilla"**). (Bat. & Cif. 1962: 89).

The spores are longer and broader than in **P. dictyospora**. They should be divided by 12-22 transsepta (i.e. A- and B-transsepta), which is more than in the latter species.

17. guajavae Bat. & Vital = **Limacinula musicola** (Bat.) Reyn.
Host: **Psidium guajava.** (Reynolds 1971: 1194).

18. guajavae Bat. & Vital var. **citrina** Bat. = **Limacinula musicola** (Bat.) Reyn.
Host: **Citrus aurantium.** (Bat. & Cif. 1962: 91).

19. jasmini Hansf.
Host: **Jasminum** sp. (Hansford 1946: 154-155; Reynolds 1983: 356).

The spores are much smaller and have fewer septa than in **P. dictyospora.**

20. javanica (Zimm.) Yamam. = **Limacinula javanica** (Zimm.) Höhn.
Host: **Coffea liberica**, etc. (Reynolds 1971: 1190).

This species has been reported on 73 different hosts from China (Tai 1979: 264). The material may represent more than one **Limacinula** species and should be restudied.

21. longispora Yamam. = **Treubiomyces roseosporus** (Höhn.) Reyn.
Host: **Citrus maxima.** (Reynolds 1983: 354).

This species was described from Taiwan by Yamamoto (1956: 169).

22. malloti (Rehm) Theiss. & Syd. = **Limacinula samoensis** Höhn.
Host: **Mallotus phillipinensis**, etc. (Reynolds 1971: 1197).

23. marsileae Rao = ?
Host: **Marsilea quadrifolia.** (Rao 1962: 349).

This fungus is certainly not a **Phaeosaccardinula** sp. The ascomata should not be covered by any scutellum in **P. marsileae,** and the ascospores should be divided by only 3 transsepta and have one longiseptum in one or two segments. Also the host species indicates that this species belongs in another genus. No other **Phaeosaccardinula** species has been reported on a pteridophyte.

24. martini (Ellis & Sacc.) Höhn. = ?
Host: **Quercus laurifolia.**

The spores should measure 24 x 7 µm and should be divided by 4 transsepta and one longiseptum (von Höhnel 1915: 58).

25. monosporica Bat.& Cif.
Host: **Manilkara zapota** (**M. "sapodilla"**). (Bat. & Cif. 1962: 92).

Each ascus contains only one ascospore. The spores are much longer than in **P. dictyospora.**

26. morindae Mend. = **Limacinula theae** Syd. & Butl.
Host: **Morinda citrifolia.** (Reynolds 1971: 1205).

27. musicola Bat. = **Limacinula musicola** (Bat.) Reyn.

Host: **Musa** sp. (Reynolds 1971: 1194).

28. penzigii (Sacc.) Yamam. = ?

Host: **Citrus** sp.

The mycelium of this species was described as "crustaceo, nigrescente, facile secedente", the ascomata as "peritheciis globulosis, superficialibus, e filis mycelibus oriundis sed glabris, ...", and the ascospores as "... 3-septato-muriformibus, constrictis, 11-12 = 4-5, hyalinis dein fuscidulis". It should be associated with "**Coniothecii, Heterobotrys, Chaetophomae, Capnodii** (spermogonici) species". All these data indicate that **P. penzigii** is not a **Phaeosaccardinula** species, but belongs in the Capnodiaceae.

29. pipericola Bat. & Vital

Host: **Piper nigrum.** (Bat. & Cif. 1962: 94).

The spores (Fig. 2C) are smaller than in **P. dictyospora** and usually seem to be divided by 7-8 A-transsepta as in this species, but by no or very few B-transsepta.

30. piperis Bat. & Peres

Host: **Piper nigrum.** (Bat. & Peres 1964: 159).

No information has been available to us about this species, but it does not affect the nomenclature of **P. dictyospora.**

31. pulcherrima (Höhn.) Petrak = **Treubiomyces pulcherrimus** Höhn.

Host: **Ficus elastica** etc. (Reynolds 1983: 354).

32. seaveriana Toro = **Limacinula samoensis** Höhn.

Host: **Erythrina glauca.** (Reynolds 1983: 356).

33. tenuis (Earle) Seaver & Chardon = **Limacinula samoensis** Höhn.

Host: **Musa** sp., etc. (Reynolds 1971: 1197).

34. theae (Syd. & Butl.) Theiss. = **Limacinula theae** Syd. & Butl.

Host: **Camellia sinensis (C. "thea").** (Reynolds 1971: 1205).

35. vera Bat. & Cif. = **Limacinula musicola** (Bat.) Reyn.

Host: **Psidium guajava.** (Reynolds 1971: 1194).

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摘　要

黑壳炱属（Phaeosaccardinula P. Henn <1905:67>）的特征是子囊果在叶面上表生、单腔、子囊壳状、无刚毛、被一层薄膜覆盖。壳心内有囊状的双囊壁子囊。子囊内产生砖格状的、透明一略帶褐色的子囊孢子。在此属名下曾有过三十多个种名，其中许多属於其他属（Limacinula, Treubiomyces; Reynolds 1971, 1983），但是近代无人对这些种进行过研究。

曾从中国报道过黑壳炱属的两个种，即爪哇黑壳炱（P. javanica）和长孢黑壳炱（P. longispora）。两种均不属於此属。前一个种为Limacinula javanica (Zimm.) Höhn.，后一个种为Treubiomyces roseosporus (Höhn) Reyn. 然而在广西省发现的网孢刺盾炱（Chaetothyrium dictyosporum）是一个真正的黑壳炱。它不同於以前此属内所有的种。两个在巴西发现的种有相似的孢子，但都比C. dictyosporum描述得晚，並不影响此种的名称。我们建议此种为一新组合Phaeosaccardinula dictyospora (Petr.) comb. nov.

本文研究了此种的超薄切片（材料包埋在塑料内）和一般制片，修改了种的描述，附有照片和绘图。文中将此种与属内其他种做了对比，评论了此属内所有曾用过的种名。

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NEW SPECIES IN THE LICHEN GENUS XANTHOPARMELIA (VAIN.) HALE (ASCOMYCOTINA: PARMELIACEAE)

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Abstract.--Five new species of Xanthoparmelia are described: X. albomaculata from South Africa, X. alectoronica from Venezuela, X. austroamericana from Brazil, Argentina and Chile, X. keralensis from India and X. peruviensis from Peru. Alectoronic acid, colensoic acid and subcolensoic acid are reported for the first time in the genus.

Xanthoparmelia albomaculata Hale, sp. nov. Fig. 1

Thallus saxicola, laxe adnatus, lobis sublinearibus, 3-5 mm latis, superne effigurato-maculatus, isidiis sorediisque nullis, subtus planus, niger, sparse rhizinatus; acidum sticticum continens.

Thallus adnate to loosely attached on rock, dull greenish yellow, 8-12 cm broad; lobes sublinear to subirregular, becoming imbricate, 3-5 mm wide; upper surface maculate to strongly effigurate-maculate, isidia and soredia lacking; lower surface plane, black, rhizines very sparse, black. Pycnidia numerous; conidia bifusiform, 1 X 5-6 µm. Apothecia to 3.0 mm in diameter; spores 4-5 X 9-10 µm.

Chemistry: Stictic, constictic and usnic acids.

Type: 6 mi N of Houtbosch, Distr. Pietersburg, Transvaal, South Africa, Almborn 6722, 12.10.1953 (LD, holotype; US, isotype).

This species belongs to the X. hypoleia group but is unique in several respects. It contains stictic acid, the only species here with this chemistry, has rather broad, finally subirregular lobes and is distinctly adnate on rocks. Typical X. hypoleia (Nyl.) Hale has linear, divaricate lobes and is loosely attached. Xanthoparmelia albomaculata is known only from the type collection.

Xanthoparmelia alectoronica Hale, sp. nov. Figs. 2, 3

Thallus saxicola, arcte adnatus, centro areolatus, lobis sublinearibus, 0.3-0.8 mm latis, isidiatus, isidiis cylindricis, subtus planus, niger, modice rhizinatus; acidum alectoronicum continens.

Thallus very tightly adnate to subcrustose on rocks, greenish yellow at the margins but dark grayish green at the center, 2-3 cm broad; lobes sublinear, contiguous, 0.3-0.8 mm wide; upper surface continuous, isidiate, the isidia unbranched, black tipped, 0.03-0.05 X 0.1 mm; lower surface plane, black, moderately rhizinate, the rhizines black. Pycnidia and apothecia lacking.

Chemistry: Alectoronic and usnic acids.

Type: Loma de El León, Sierra Portugesa, Estado Lara, Venezuela, M. López and R. Smith 21216A, 23 July 1979 (MERF, holotype; US, isotype).

Additional specimens examined. Venezuela: Same locality as the type, López and Smith 21176, 21188 (MERF, US).

Xanthoparmelia alectoronica is a member of the X. mougeotina group, which is characterized by the tightly adnate to subcrustose thallus, isidia and a black lower surface. Xanthoparmelia mougeotina itself contains stictic, constictic and norstictic acids, while other species contain hypoprotocetraric acid (X. neocongensis (Hale) Hale from East Africa), subcolensoic acid (X. keralensis described below) or salazinic acid (X. diadeta (Hale) Hale from Africa). This new species is unusual in containing alectoronic acid, the only occurrence of this depsidone in the genus (outside of the anomalous X. centrifuga group). It is known only from the type locality.

Xanthoparmelia austroamericana Hale, sp. nov. Fig. 4

Thallus terricola, laxe adnatus, lobis sublinearibus, 1-2.5 mm latis; superne continuus, isidiis sorediisque nullis, subtus planus, niger, sparse rhizinatus; acidum sticticum continens.

Thallus loosely attached on soil or more rarely on rock, pale greenish yellow, 8-15 cm broad; lobes sublinear to subirregular, separate to imbricate, 1-2.5 mm wide; upper surface continuous, isidia and soredia lacking; lower surface plane, black, rhizines sparse, black. Pycnidia abundant; conidia bifusiform, 1 X 5-6 µm. Apothecia to 5 mm in diameter. Spores 5 X 9 µm.

Chemistry: Stictic, constictic, norstictic and usnic acids.

Type: Morro do Pinheiro Seco, Lajes, Santa Catarina, Brazil, Reitz and Klein 15724, 14.7.1963 (US, holotype).

Additional specimens examined. Brazil: Porto Alegre, Fleig 1760 (US). Argentina: Prov. Corrientes, Depto. San Martín, Krapovickas 29167 (CTES, US). Chile: Prov. Valparaiso, Santesson 2814, 3102 (S, US).

This austral species is externally close to X. tasmanica (Hook. & Tayl.) Hale but differs in chemistry (X. tasmanica has salazinic acid) and in having narrower, more contiguous lobes. Xanthoparmelia hypopsila (Müll. Arg.) Hale also contains stictic acid but is strictly saxicolous with adnate, subirregular lobes. Finally, a stictic acid-containing terricolous species from Australia, New Zealand and Madagascar, X. suberadicata (des Abb.) Hale, has very narrow (0.5-1 mm), subdivaricate lobes.

Xanthoparmelia keralensis Hale, sp. nov. Fig. 5

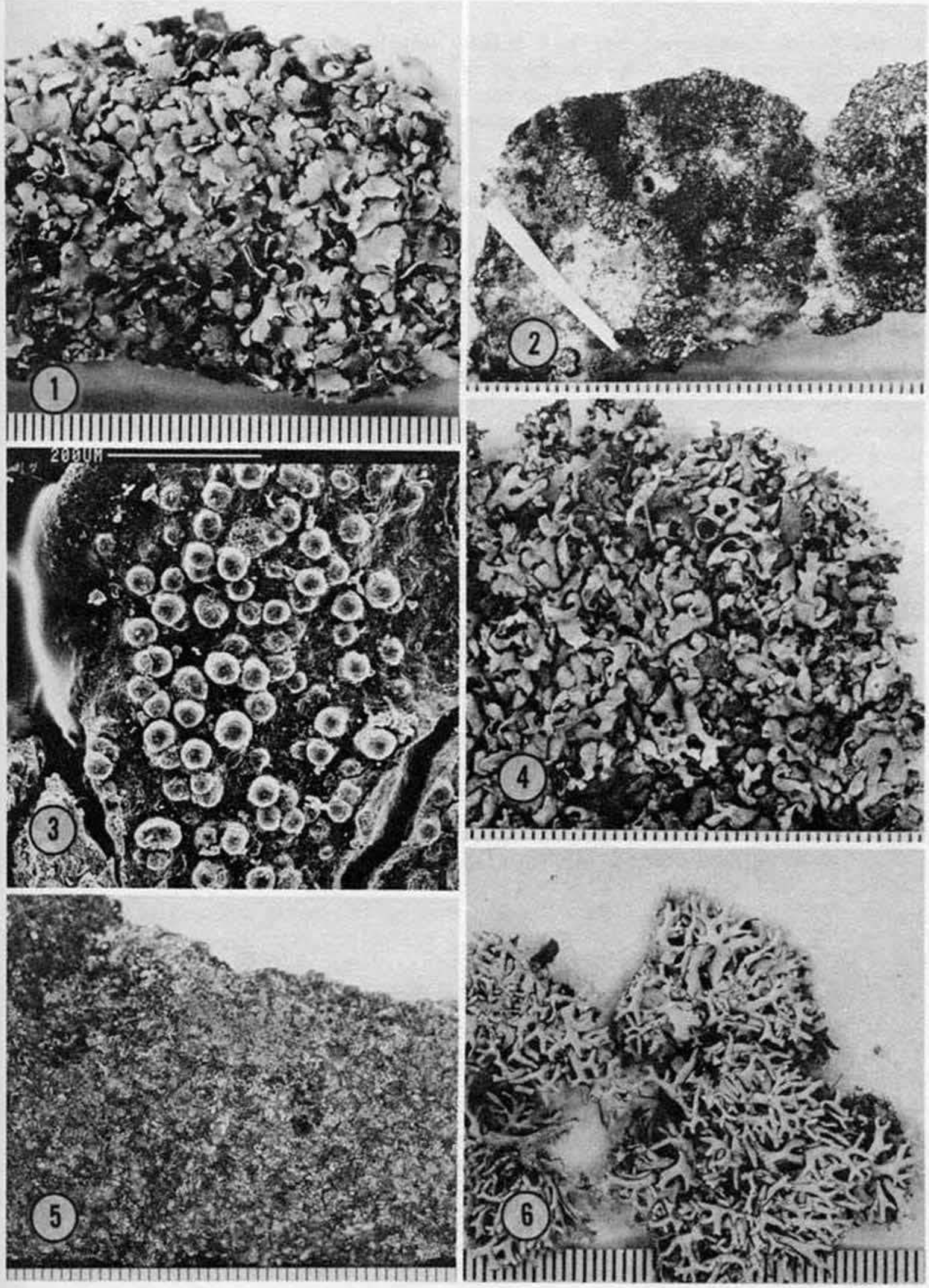
Thallus saxicola, arcte adnatus, lobis sublinearibus, contiguis, 0.2-0.5 mm latis, superne continuus, sparse isidiatus, isidiis cylindricis, subtus planus, niger, sparse rhizinatus; acidum subcolensoicum continens.

Thallus tightly adnate on rocks, yellowish green, about 6 cm broad; lobes sublinear, short, contiguous, 0.2-0.5 mm wide; upper surface shiny, continuous, sparsely isidiate, the isidia 0.06-0.09 X 0.1 mm, black tipped; lower surface plane, black, sparsely rhizinate. Pycnidia and apothecia lacking.

Chemistry: Subcolensoic acid (major), colensoic acid (±trace), norcolensoic acid (±trace) and usnic acid (determined by Dr. J. A. Elix).

Type: 45 km from Munnar on the Munnar-Kodaikanal road, Kerala, India, elev. 1900 m, M. Hale 46480, 24 Jan. 1976 (US, holotype).

The main component of X. keralensis, subcolensoic acid, is unique in the genus. Xanthoparmelia peruviensis, described below, contains colensoic acid



Figures 1-6. New species of Xanthoparmelia: 1, X. albomaculata (isotype in US); 2, X. alectoronica (isotype in US); 3, isidia of X. alectoronica with SEM; 4, X. austroamericana (holotype in US); 5, X. keralensis (holotype in US); 6, X. peruviensis (isotype in US). Scales in mm.

as the major component but is a totally unrelated species. Xanthoparmelia keralensis could at first be mistaken for X. mougeotina, although the lobes are shorter and the isidia very sparse. It has been found only at the type locality, a small outcropping of granite in a pastured area of Rhododendron forest.

Xanthoparmelia peruviensis Hale, sp. nov. Fig. 6

Thallus terricola, laxe adnatus, lobis linearibus, separatis, 0.5-1.3 mm latis, superne leviter reticulato-maculatus, isidiis sorediisque nullis, subtus planus vel canaliculatus, brunneus, dense rhizinatus; acidum colensoicum continens.

Thallus loosely attached to free growing on soil, pale greenish yellow, 3-5 cm broad; lobes linear, dichotomously branched, separate, 0.5-1.3 mm wide, the ultimate lobes sometimes becoming terete; upper surface shiny, faintly reticulate-maculate, isidia and soredia lacking; lower surface plane to usually channeled with a pale yellow rim, the center brown to dark brown, rhizines dense, about 2 mm long, becoming furcate. Pycnidia not seen. Apothecia poorly developed, about 1 mm in diameter; spores absent.

Chemistry: Colensoic acid, lobaric acid and usnic acid (determined by J. A. Elix).

Type collection: Santa Rosa, Cuzco, Peru, elev. 13,500 feet, D. Wofford 532 (BM, holotype; US, isotype).

Additional specimen examined. Peru: Above Taucia, Prov. Urubamba, Depto. Cuzco, King et al. 221 (MIL, US).

Xanthoparmelia peruviensis is unusual in several respects. It contains colensoic acid, previously unknown in the genus (except as a minor component in the newly described X. keralensis above). It has dense, long rhizines and a reticulate-maculate surface. The lower surface may become rather strongly channeled with a pale rim, much as in the X. amphixantha group, which does not occur in the Americas. It is probably endemic to Peru at high elevations.

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PORE FUNGI FROM FRENCH ANTILLES AND GUIANA

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SUMMARY

Twenty four species are recorded from the French Antilles and/or French Guiana from collections gathered in recent years by mycologists of Lyon University (France). Five species are proposed as new, namely, *Flaviporus venustus* sp. nov., *Grammothelopsis incrustata* sp. nov., *Polyporus arcularioides* sp. nov., *Pyrofomes aurantiacus* sp. nov. and *Wrightoporia brunneo-ochracea* sp. nov. The following new combinations are proposed: *Phellinus rickii* (Bres.), *Amylosporus bracei* (Murr.), *Amylosporus iobaphus* (Pat.), *Funalia fulvocinerea* (Murr.), *Microporellus violaceo-cinerascens* (Petch), *Pyrofomes fulvo-umbrinus* (Bres.) and *Trametes maxima* (Mont.) . *Cystostiptoporus* Dhanda & Ryv. is shown to be a nomenclatural synonym of *Microporellus* Murr. *Ceriporia xylostromatoides* (Berk.)Ryv. is a complex of species. Cultural studies were carried out with *Flaviporus venustus* sp. nov., *Grammothele lineata* Berk. & Curt., *Hapalopilus albo-citrinus* (Petch)Ryv., *Microporellus dealbatus* (Berk. & Curt.)Murr., *Pachykytospora alabamae* (Berk. & Curt.) Ryv., *Poria carneola* Bres., *Porogramme albo-cincta* (Cke. & Massee)Lowe and *Trametes membranacea* (Sw.:Fr.)Kreisel. Nuclear behavior and sexual polarity are given for several species.

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[1] With the collaboration of B. Dequatre, technician of the Centre National de Recherche Scientifique, C.N.R.S. (France).

[2] Research undertaken during the tenure of a fellowship from the Consejo Nacional de Investigaciones Científicas y Técnicas de la República Argentina, in the Mycology Laboratory of Lyon University.

A large number of pore fungi have been collected in the French Antilles in the course of recent years by scientists of the Mycology Laboratory of Lyon University, notably A. David and J. Boidin; to these have been added those collected by P. Berthet in French Guiana. Our knowledge of the Polypores from these regions is due mainly to the work of Patouillard (1889, 1899, 1900 and 1902) and Duss (1903), and from several papers by Léveillé (1844 and 1846) and Montagne (1837, 1840, 1841, 1842, 1843, 1849 and 1854). Additional species remain to be encountered, according to their general distribution given in neotropical floras, e.g. Lowe (1958 and 1966), Murrill (1907-08 and 1915), Lloyd (1898-1925), Dennis (1970) and Ryvarden & Johansen (1980). The number and variety of our collections warranted their publication in order to contribute to a better knowledge of tropical polypores.

When possible spore prints were obtained in situ and many cultural, nuclear behavioral and sexuality studies were performed. Unfortunately a number of these cultures became contaminated during a long period of refrigeration and original data could not be reconfirmed. When possible collections were compared with types and collections from South America (Argentine) and Africa (personal collections in the herbaria of Drs. A. David and L. Ryvarden (Oslo University, Norway)).

METHODS

Genera and species are listed alphabetically. Poroid and grammotheloid Corticiaceae are included in the Polyporaceae.

Measurements and drawings were made from freehand sections mounted in a 1% phloxine solution and 5% KOH solution. Cultural studies followed Boidin's mothodology (1958) and cultural characters were coded according to Nobles (1965) with the complements added by Boidin (1966) and Boidin & Lanquetin (1983). Color notations were made according to Munsell (1954). Herbaria abbreviations are from Holmgren & Keuken (1974), in addition LYAD refers to the herbarium of A. David which is at Lyon University. Type materials studied are indicated by a ' ! ' following the herbarium abbreviation where it is deposited. Localities are cited with the following abbreviations: G= Guadeloupe, GI= French Guiana, M= Martinique. Unless otherwise indicated the collector is A. David.

RESULTS AND DISCUSSION

AGARICACEAE

Dictyopanus rhipidium (Berk.)Pat.

LYAD 1417 G, Basse Terre, path in the Sofaia region, 9.VIII.72; LYAD 2135 G, Basse Terre, Corrosol river; LYAD 2268 G, Douville, 12.X.76

GANODERMATACEAE

Ganoderma lucidum (Leys.:Fr.)Karst. complex

LYAD 2230 M, Pointe Rouge forest, 7.X.76 .

Ganoderma australe (Fr.)Pat.

LYAD s.n. GI, Crique Grégoire, P. Berthet X.68, two collections; LYAD 2227 M, Pointe Rouge forest, 7.X.76; LYAD s.n. M, family Martinel IV.77 .

Humphreya coffeatum (Berk.)Stey.

LYAD 2233 M, forest of La Charles district, 9.X.76 .

HYMENOCHAETACEAE

Coltricia cf. *spathulata* (Hook.)Murr.

LYAD 1389 G, Deux Mamelles route, 3.VIII.72; LYAD 2173, ibid., 30.IX.76; LYAD 2155 G, ibid., Petit Bourg towards INRA's laboratory 28.IX.76; LYAD 2237 M, forest of La Charles district, 9.X.76 .

Our collections differ from typical material because of the absence of a distinct black line under the tomentum, but they agree in all other macro and microscopic features.

Cyclomyces tabacinus (Mont.)Pat.

LYAD 1377 G, Natural Park, 31.VII.72; LYAD 1978 G, Tropical Park, Piolet road, J. Boidin 12.VIII.72; LYAD 2122 G, Piolet's Youth Village, 25.X.76; LYAD 2281 G, Douville region, 12.X.76 .

Inonotus rickii (Pat.)Reid

LYAD 2107 M, Fort de France, on *Tamarindus indica*,Jaquenoud 12.I.75.

Phellinus calcitratus (Berk. & Curt.)Ryv.

LYAD 2222 and 2223 M, Pointe Rouge forest, 7.X.76 .

Phellinus extensus (Lév.)Pat.

LYAD 2123 G, Deux Mamelles route, Piolet's Youth Village, 25.IX.76; LYAD 2280 G, Grand David, X.76 .

Phellinus gilvus (Schw.)Pat. var. *gilvus*

LYAD 1366 G, path in the Deux Mamelles route, 30.VII.72; LYAD 1963 G, Deux Mamelles route, Ecrevisses cascade, J. Boidin 29.VII.75; LYAD 2124 G, Piolet's Youth Village, 25.IX.76; LYAD 2177 G, Lézarde forest, Forest Station, 30.IX.76; LYAD s.n. GI, P. Berthet X.68; LYAD 260 M, Fort de France, at the river's margin between la Jossaud and le Marin, 7.I.65; LYAD 1363 M, Grand Riviere region, 28.VII.72; LYAD 2225 M, Pointe Rouge forest, 7.X.76; LYAD 2251 M, Clark's Ravine, 10.X.76 .

Phellinus gilvus (Schw.)Pat. var. *licnoides* (Mont.)Lloyd in Corner.

LYAD 2248 M, Clark's Ravine, 10.X.76 .

Phellinus nilgheriensis (Mont.)Cunn.

LYAD 2259 M, X.76 .

Phellinus portoricensis (Overh.)Fidalgo

LYAD 2247 and 2250 M, Clark's Ravine forest, 10.X.76 .

Phellinus punctatus (Fr.)Pilát

LYAD 1973 G, Petit Canal, J. Boidin 7.VIII.75; LYAD 2136 G, IX.76; LYAD 2202 G, Grosse Montagne, X.76; LYAD 2231 M, Pointe Rouge forest, 7.X.76 .

These collections differ from typical European specimens by forming thinner fruitbodies.

Phellinus rickii (Bres.)David & Rajchenberg comb. nov.
Basionym: *Poria rickii* Bres., Ann. Mycol. 18: 37, 1920 (BPI !).
LYAD 2137 G, Petit Bourg in front of INRA's laboratory, X.76 .

Our collection is identical with the type material at BPI. As stated by Setliff & Ryvarden (1983) the species comes close to *Phellinus ferrugineo-velutinus* (Henn.)Ryv. whose type, however, is sterile (Lowe, 1966; Ryvarden & Johansen, 1980) and then the name becomes of uncertain application. We reject *Poria ferrugineo-velutina* Henn. as a *nomen ambiguum* and propose the well represented *Poria rickii* Bres. as the name for this taxon. *Phellinus glaucescens* (Petch)Ryv. described from Africa and Asia is also identical in all respects. Study of more materials should probably show that it is an unique pantropical species.

Phellinus robustus (Karst.)Bourd. & Galz.
LYAD 2235 M, forest of La Charles district, 9.X.76 .

Phellinus roseo-cinereus (Murr.)Reid
LYAD 1981 G, Petit David, J. Boidin, 13.VIII.75; LYAD s.n. GI, P. Berthet X.68; LYAD s.n. GI, Kourou, S. Lucas.

Phellinus undulatus (Murr.)Ryv.
=*Fomitiporia undulata* Murr. (NY !).
LYAD 2229 M, Pointe Rouge forest, 7.X.76 .

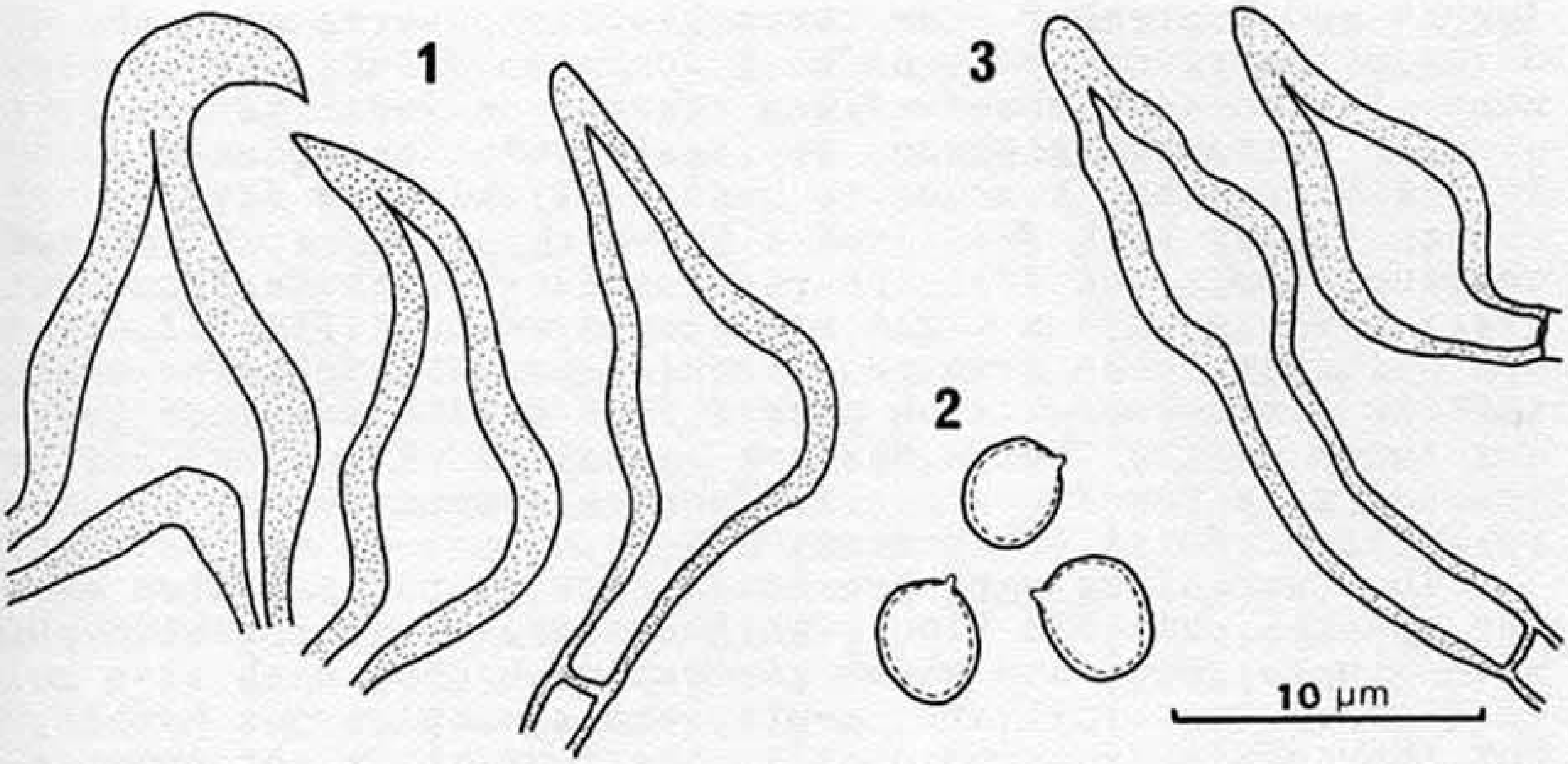
This species is characterized by hooked setae (fig. 1) which are unequally distributed in the hymenium. Spores vary from broadly ellipsoid, thin-walled and hyaline (as seen in the type) to broadly ellipsoid-subglobose, slightly thick-walled and pale yellow (in our collection, fig. 2). Our material is identical with the type collection in all other respects especially the kind of setae, pore sizes and hyphal features.

The pale-yellowish spores seen in our collection led us to *Phellinus gilvoides* (Petch)Ryv., an Asiatic species which has the same kind of spores. Lowe (1966) and Ryvarden & Johansen (1980) overlooked the presence of setae that are found in the cotype at Kew (n° 2884, Peradeniya, leg. Petch VII.1909, the only type material found at the herbarium). These setae are ventricose to subulate, 13-25 x 3,5-7 µm (fig. 3), and are only present in the dissepiments in the pore mouths and do not bend toward the hymenium into the pore. This collection probably represents an underdeveloped fungus.

Phylloporia frutica (Berk. & Curt.)Ryv.
LYAD 1387 G, Basse Terre, Deux Mamelles route, 2.VIII.72 .

POLYPORACEAE

Amylosporus bracei (Murr.)David & Rajchenberg comb. nov.
Basionym: *Poria bracei* Murr., Mycologia 13: 91, 1921 (NY !).
=*Amylosporus wrightii* Rajch. (BAFC !).
LYAD 1328 M, Précheur region, Couleuvre inlet, 21.VII.72; LYAD 2236 M, forest of La Charles district, 9.X.76 .



Figs. 1-2, *Phellinus undulatus*: 1. hooked setae; 2. spores. Fig. 3, *Poria gilvoides* (cotype): setae.

This species was recently described from subtropical forests in Argentine (Rajchenberg, 1983a). It is easily recognizable in the field by its widely effused fruitbody with a lilaceous pink pore surface (which may become yellowish cream upon drying). *Polyporus scleromyces* Berk. & Curt., stated by Lowe (1947, 1958 and 1966) to be a previous name for the species, does not seem to be the same taxon as it can be understood from its original description (cfr. P.A. Saccardo, Syllogue Fungorum 6: 183, 1888); otherwise it is stated to be sterile (Lowe, op. cit., Ryvarden, personal comunication). *Polyporus vibratilis* Berk. & Curt. (K !) is also reported by Lowe to be a probable synonym of the species but spores in the type material are ellipsoid and have no reaction in Melzer, and generative hyphae are simple-clamped.

This species comes quite close to *Phaeolous iobaphus* Pat. (FH !) (Patouillard, 1922) which was described from Singapur and differs mainly by its darker vinaceous pore surface and its pore size 2-2,5 per mm (5-7 per mm in *A. bracei*). The hyphal system with simple-septate generative hyphae, wider multi-clamped (verticillate) generative hyphae (only found after careful examination in *P. iobaphus*) and dextrinoid skeletal hyphae, as well as the finely verruculose amyloid spores are similar in both species. The following new combination is proposed:

Amylosporus iobaphus (Pat.)David & Rajchenberg comb. nov.
Basionym: *Phaeolus iobaphus* Pat., Bull. Soc. Myc. France 38: 85, 1922 (FH !).

Amylosporus campbellii(Berk.)Ryv.

LYAD 1358 M, path between Couleuvre and Grand Riviere, on the earth in a bamboo forest, 28.VII.72; LYAD 2217 M, Pointe Rouge forest, on a rotten wood buried in the ground, 7.X.76

According to Mr. J.P. Fiard, from Martinique, this polypore grows only in the meso and xerophytic forest during

August and September. Our two collections agree with the description given by Ryvarden & Johansen (1980); we supplement it with some observations taken from fresh material:

The pileus is glabrous to finely velutinate, more or less tuberculate, tending to become dirty white 5Y 9/2, chestnut grey 10YR 7/2 7/3 6/2 6/3 with presence of reddish chestnut spots 10R 4/4. The pore surface is white becoming greyish white with a light violaceous shine 7,5YR 8/2 5YR 8/2 with age; when bruised it stains red 5YR 5/8. The context is alutaceous yellow near 2,5Y 9/6 with numerous growing zones with either a hyaline aspect or with a more or less darkish chestnut colour. Tubes are concolorous with pore surface. Pores 4-6 per mm.

The two collections present the principal features of the species: amyloid finely warted spores, generative hyphae with simple septa and wider generative hyphae with also multi-clamped (verticillate) septa, and gloeopleurous hyphae; but they differ in some points: the context is not compressible and the dried fruitbody is neither light nor brittle.

Antrodia malicola (Berk. & Curt.)Donk

LYAD 1976 G, Basse Terre, Corrosol's ford, J. Boidin VII.75; LYAD 1332 M, Montravail forest, 23.VII.72; LYAD 2243 M, Clark's Ravine hygrophile forest, 10.X.72 .

Thirty monosporous cultures obtained from LYAD 1332 and twenty-one cultures from LYAD 2243 became all simple-clamped which certified the homothallism of the species (Sarkar, 1959). Nuclear behavior is normal.

Bjerkandera af. adusta (Fr.)Karst.

LYAD 1325 M, Couleuvre inlet, 20.VII.76; LYAD 2028 M, Lévrier inlet, M. Jaquenoud 21.III.76; LYAD 2218 M, Pointe Rouge forest, 7.X.76 .

Our collections differ from typical ones by being more massive. Carranza & Sáez (1984) also report large specimens from Costa Rica. They are all sterile thus we did not risk a definite determination. Nevertheless a spore print obtained from LYAD 1325 revealed spores with binucleate condition as found in B. adusta .

Ceriporia alachuana (Murr.)Hallenb.

LYAD 1329 M, Trinité, 22.VII.72; LYAD 2112 M, Jossaud, M. Jaquenoud 9.I.72 .

Giemsa coloration of fruitbodies LYAD 1329 and 2112 revealed that generative hyphae have slightly coenocytic articles with 1-5 nuclei and that spores are monokariotic.

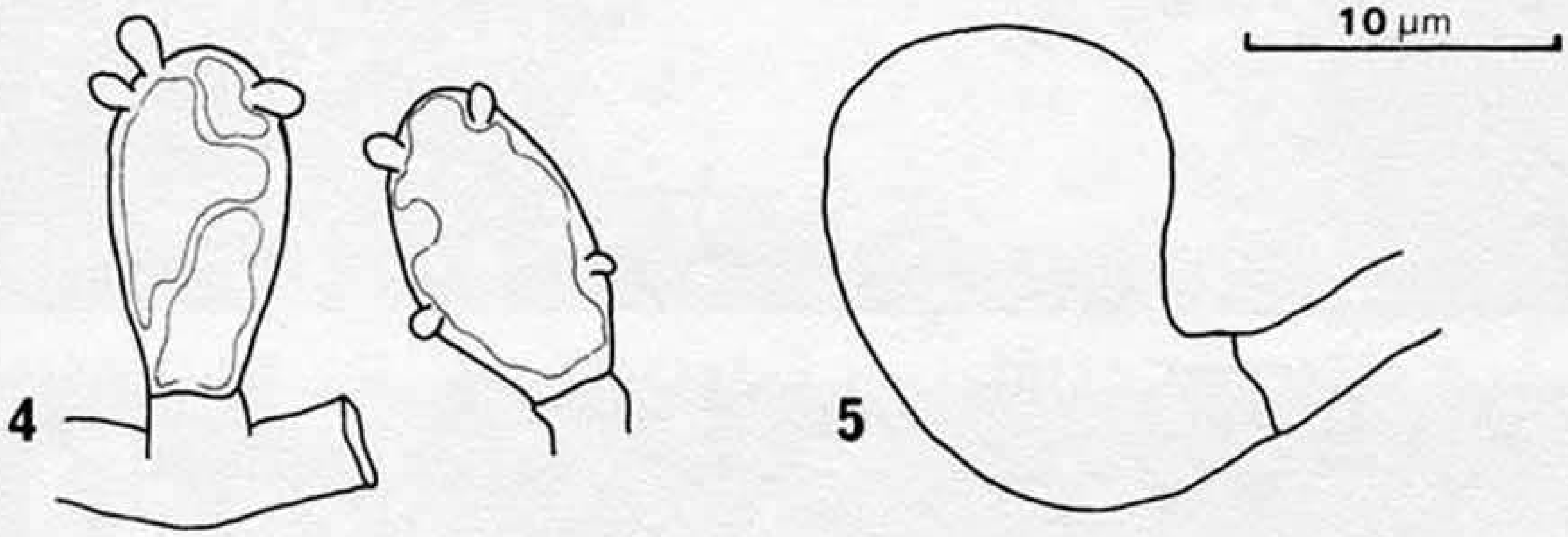
Ceriporia xylostromatoides (Berk.)Ryv.

LYAD 1414 G, path in the Grande Savane region, on fallen log, 6.VIII.72; LYAD 1418 and 1419 G, Sofaia region, 9.VII,72; LYAD 2148 G, Jules' Forest road, 27.IX.76; LYAD 2238 M, forest of La Charles district, 9.IX.76; LYAD s.n. M, Lévrier inlet, M. Jaquenoud.

The collections from the French Antilles are all effused reflexed with narrow and concrescent pilei 0,5-1 cm radius, elongated and forming a strip on the support; becoming thin in the margin. LYAD 1414 is totally formed by dimidiate fruitbodies 2-4 x 1,5-2 x 0,1-0,15 cm, with tubes 0,2-0,3 mm long and context 0,1-1,2 mm wide. When fresh they are pure white, with gossypine consistency and become alutaceous upon drying. The abhymenial surface has 2-3 concentric furrows. Microscopic characters are identical with the descriptions given by Lowe (1966) and Ryvarden & Johansen (1980) but distinct hymenial cystidia have been seen in all the collections: they are thin-walled, claviform cystidia with several papillae, 10-11 x 5-6 µm (similar to the size of basidioles) and stain strongly with cotton blue (fig. 4).

Cultural studies: our results from culture LYAD 1418 were similar to those presented by Nakasone & Gilbertson (1978). We add our oxidase reactions and citological results. The articles of the polysperm (LYAD 1418) and of the fruitbody (LYAD 2148) are binucleate and simple septate.

Oxidases: guaiacol 0,02%:++++, 0   p-cresol:-
guaiacol 0,2% :+++++, 0   tyrosine:-
gallic ac.:++++



Figs. 4-5, *Ceriporia xylostromatoides*: 4. cystidia (French Antillean collections); 5. cystidium (Gabon collections).

REMARKS: Argentine pileate collections of *C. xylostromatoides* also had cystidia (BAFC 28774, Argentina, Misiones, Puerto Libertad, Alto Paraná plantation, M. Rajchenberg 24. XII.74 and BAFC 28526, ibid., Gral. Belgrano, Forest Station leg. Wright, Deschamps and del Busto M-2466 29.X.73, on *Araucaria angustifolia*). Two African collections were studied: LYAD 2396, Gabon, la Mondah forest, G. Gilles 17.XII.77 and LYAD 2403, ibid., 24.XII.77. They differ by being exclusively resupinate with no tendency to become reflexed and by the absence of papillate cystidia. Nevertheless they exhibited thin-walled, claviform, hymenial cystidia, larger than basidioles, 12-17 x 8-10 µm with contents that stain intensely with cotton blue (fig. 5) and could possibly be considered gloeocystidia. Many resupinate Argentine collections did not have any kind of cystidia and are identical to current descriptions of the species.

The studied material suggests that the name *C. xylostromatoides* is being applaid to a complex of species that can be distinguished by the shape of the (resupinate, effuse-reflexed or only pileate) fruitbody, by the presence and kind of cystidia and by the geographic distribution.

Coriolopsis caperata (Berk.)Murr.

LYAD 1409 G, Sofaia region, 7.VIII.72; LYAD 2180, Lézarde forest, 30.IX.76; LYAD 2196 G, Grosse Montagne road, 4.X.76; LYAD s.n. GI, Crique Grégoire, P.Berthet X.68, 4 collections; LYAD 1341 M, Couleuvre inlet, in cacao plantation, 24.VII.72.

The species is tetrapolar and has a normal nuclear behavior (observation made on LYAD 1409).

Coriolopsis occidentalis (Klotz.)Murr.

LYAD 2132 G, Corrosol river, 23.IX.76; LYAD 1352 M, Grande Riviere region, 28.VII.72; LYAD 1360 M, Source Didier road, 27.VII.72 .

For cultural studies see David (1970).

Favolus tessellatus Mont.

LYAD 1725 GI, Crique Grégoire, P. Berthet I.74; LYAD s.n. GI, ibid. X.68 .

This species is distinctive with its small fruitbodies up to 2 x 2 cm, which are always petaloid or reniform with a short lateral stem, its woody consistency and its tessellate pileus due to the thin context (100-300 µm thick). Pores are 1-1,3 per mm. Favolus bipindensis Henn., described from Cameroon, is quite similar and is probably a synonym; intercompatibility tests and cultural studies are needed to solve this problem.

Favolus brasiliensis (Fr.)Fr.

LYAD 2470 GI, leg. Fougerousse .

A different plant from F. tessellatus. The fruitbodies are larger and pilei have an infundibuliform tendency which makes the lateral stem slightly eccentric; the context is thicker (300-550 µm) and the abhymenial surface lacked a tessellate aspect, being striate and with a cartilaginous consistency. Pores are 0,6-1-(2) per mm.

Favolus sp.

LYAD 1378 G, Deux Mamelles route, 1.VIII.72; LYAD 2151 G, Petit Bourg, in front of the INRA's laboratory, 28.IX.76; LYAD 1402 M, Contrebandiers' path, Atlantic side, 5.VIII.72 .

Fruitbody annual, dimidiate to flabelliform, frequently in groups, 3-6 cm long 2,5-3,5 cm radius and 0,6 cm wide (Fig. 7). Pileus slightly tessellate, pale chestnut when fresh, around 10YR 7/4 6/4 8/3 8/4, covered by a fine tomentum which is denser toward the stipe and by darker radial fibrils which are more distinct toward the margin. Stipe lateral and short, 3-4 mm long and 3-4 mm diam. concolorous with the pileus and finely tomentose, sometimes forming a white disc of mycelium on the support. Pore surface white. Pores 0,75 mm wide, radially elongated up to 2 mm long (Fig. 8).

Hyphal system dimitic with simple-clamped generative hyphae. Basidia claviform, 20-25 x 5-6 µm, tetraspored. Spores cilindric, 8-10 x 3-3,5 µm.

Sexuality tetrapolar and nuclear behavior normal (data obtained from LYAD 1378).

Fibuloporia donkii Dom.

LYAD 2185 G, Deux Mamelles route, 3.X.76; LYAD 2203 G, Grosse Montagne, 3.X.76; LYAD 2257 and 2285 G, Douville region, 7.X.76 .

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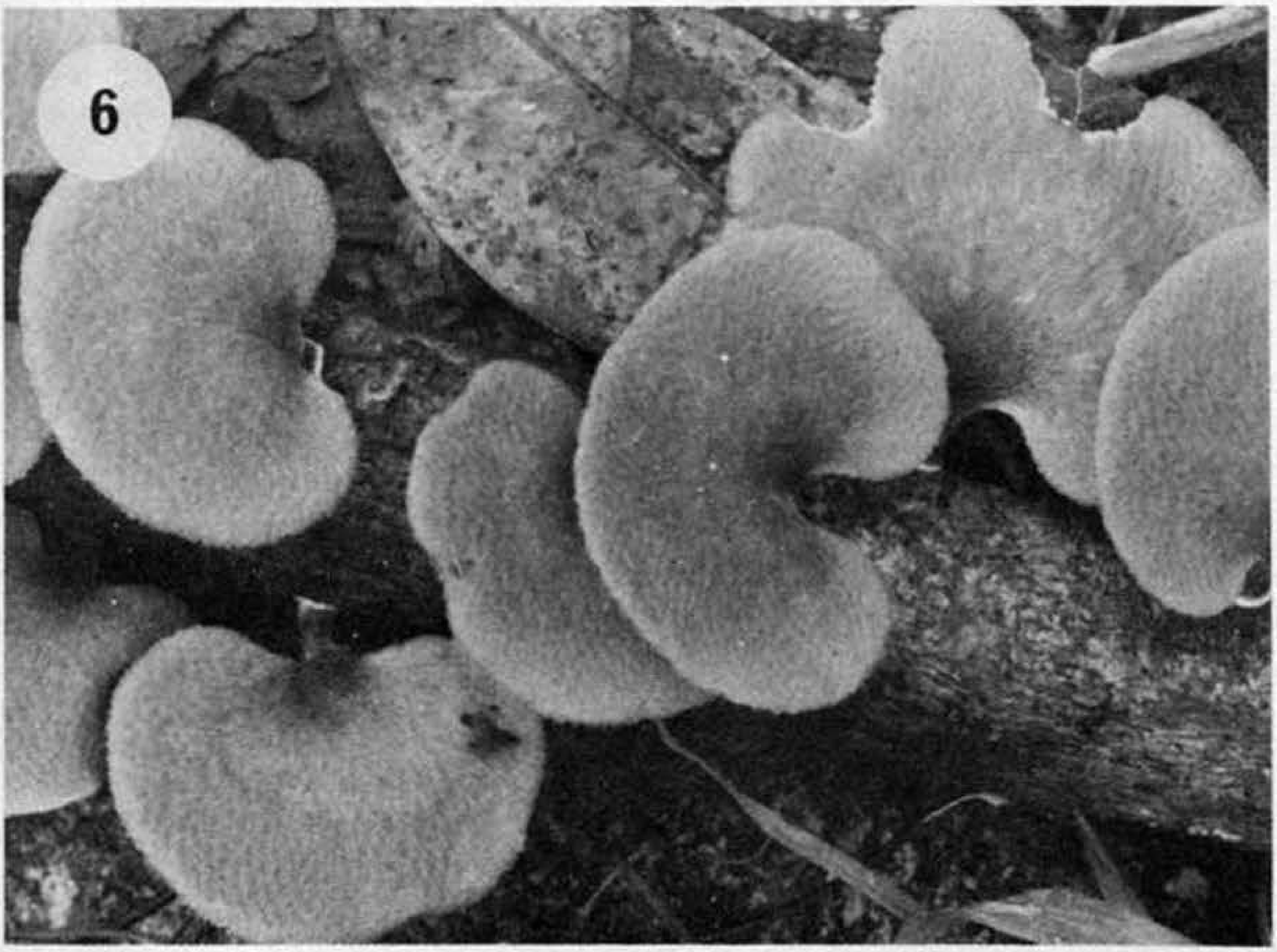

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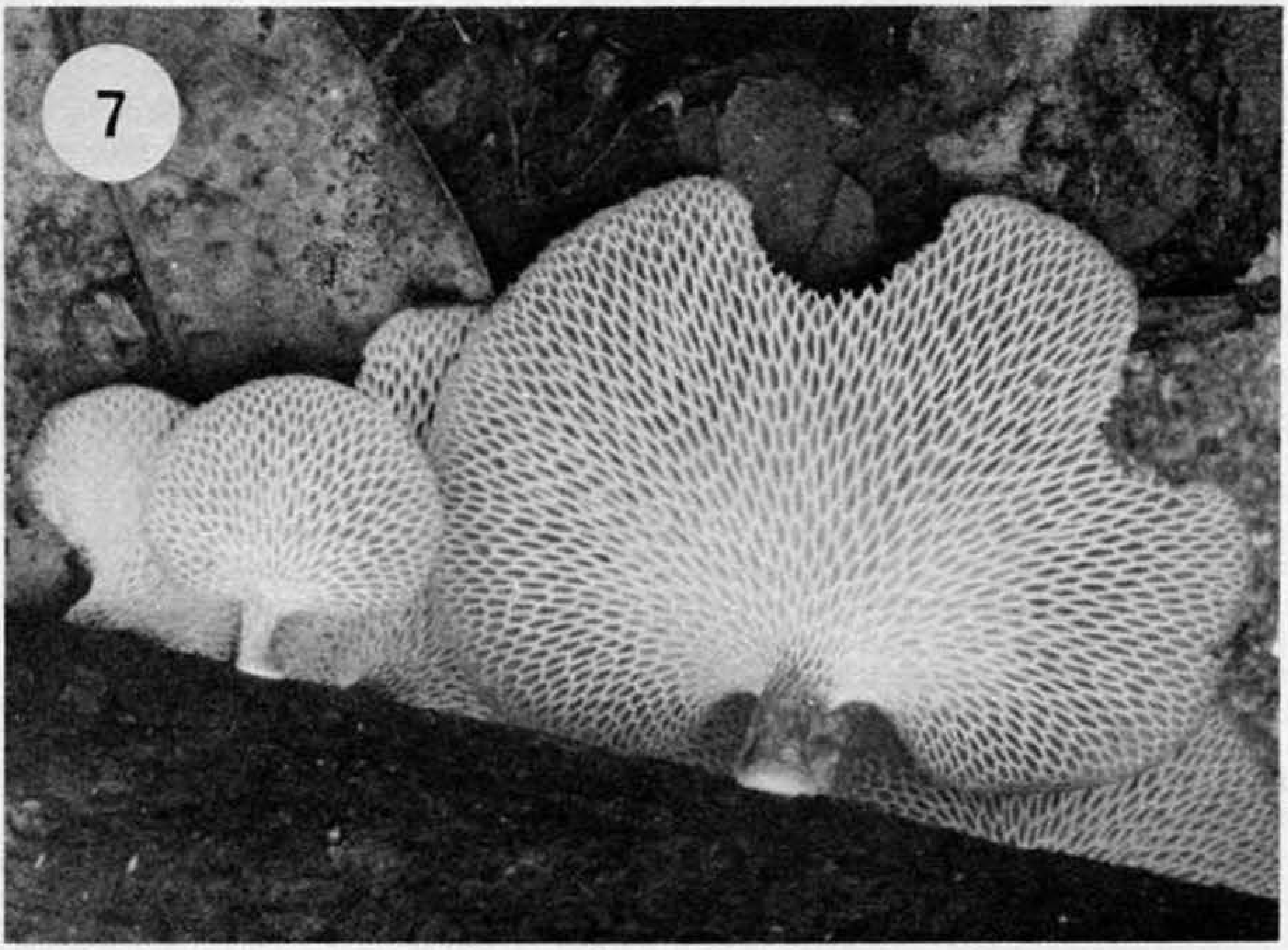


Figs. 6-7, Favolus sp.: 6. fruitbodies (x 1); 7. pore surface (x 1,5).

Collections from the French Antilles differ from typical ones in having smaller pores (6-8 per mm) and generative hyphae with relatively thicker walls (when compared with European materials).

Flaviporus brownei (Pers.)Donk

LYAD 1977 G, St. Claude, J. Boidin 11.VII.75; LYAD 1317 M, on an old fallen log in humid forest, 18.VII.72 .

Flaviporus liebmanii (Fr.)Ginns

LYAD 1371 and 1372 G, Basse Terre, Natural Park, 31.VII.72; LYAD 1386 G, Basse Terre, Deux Mamelles route, 2.VIII.72; LYAD 1961 G, Ecrevisses cascade, J. Boidin 29.VII.75; LYAD 1967 G, As de Pique road, J. Boidin 31.VII.75; LYAD 2232 G, Grosse Montagne forest road, 30.IX.76; LYAD 2268 G, Petit Bourg, facing the INRA's laboratory, X.77; LYAD 2278 G, Morne a Louis, X.77; LYAD 1319 M, 18.VII.72; LYAD 1345 and 1346 M, la Falaise gorge, 25.VII.72; LYAD 1355 M, path between Couleuvre's inlet and Grand Riviere, 28.VII.72.

Flaviporus hydrophilus (Berk. & Curt.)Ginns
=*Polyporus hydrophilus* Berk. & Curt. (K !)

LYAD 1370 G, Basse Terre, Natural Park, 31.VII.72; LYAD 1379 G, Deux Mamelles route, 1.VIII.72 .

Both collections agree with the type material at Kew (Berkeley's herbarium, n° 353). An excellent description was given by Ginns (1980). Only color differences have been noted: according to Ginns this species is "...pale yellow to Ridgway's Clay Color (near Munsell 7,5YR 5/6)". Our collections were orange-cream 10YR 8/6 (LYAD 1370) and 10YR 6/8 7/8 (the latter being closer to the color given by Ginns).

Flaviporus subundatus (Murr.)Ginns
=*Poria subundata* Murr. (NY !)

LYAD 1971 G, Basse Terre, J. Boidin, VII.75; LYAD 2181 G, Lézarde forest house, 30.IX.76; LYAD 2187, Jules' forest road, 27.IX.76; LYAD 1336 M, between Morne Rouge and St. Pierre, 23.VII.72 .

The species was described by Lowe (1966) under *Poria* Pers. and by Ginns (1980).

Flaviporus Murr., as defined by the type species, has a dimitic hyphal system with regularly simple-clamped generative hyphae. In *F. subundatus* the dimitic hyphal system with simple-septate hyphae (verified after careful examination in the type material and our collections) and skeletal hyphae, the horny consistency, the salmon pink pore surface and the pseudoparenchymatous context point out to a better disposition of the species in *Rigidoporus* Murr. However the presence of thin-walled cystidia that emerge from the hymenium and stain strongly with cotton blue and the small, thin-walled, acyanophilous spores prevent such a transfer.

The description of *Antrodiella straminea* (Bres.)Ryv. & Johans., a species found in the Philippines and Africa, by Ryvarden & Johansen (1980), fits very well that of *F. subundatus* and a collection from Ryvarden's herbarium (Tanzania, Tanga, Usambara Mts., Amani, leg. Ryvarden n° 10719A, 18-19. II.73) is the same species. But our study of the type material of *Poria straminea* Bres.[3] deposited at BPI (leg. Elmer n° 10162) showed that it has a di-trimitic hyphal system with simple-clamped generative hyphae and spores are ellipsoid and truncate; its affinities are among Perenniporia Murr. species, as already pointed out by Bresadola (1912) when he related the species with Poria medulla-panis (Jacq.) Bres. var. pulchella Schw.

Flaviporus venustus David & Rajchenberg sp. nov.

Basidiocarpus annuus, magnus, dimidiatus, 15 x 6 x 4 cm, in vivo aquosus, hyalinus et fragilis, in sicco duro. Pileo albo sordido vel roseo pallido. Contexto translucido albo vel roseo pallido. Poris 6-10 per mm in sicco, roseo pallidis. Dissepimenti hyphis generativis fibulatis 2,5-4 µm valde agglutinatis. Contextus probabiliter monomiticus, cum hyphas generativas parietibus valde incrassatis, in substantia resinacea immersam et non discedens. Chlamydosporis clavatis in orem pororum adsunt. Basidiis claviformibus, tetrasporis, 8-12 x 4,5-5 µm . Basidiosporis subglobosis, 3,5-4,3 x 2,5-3,2 µm acyanophilis. Holotypus LY-AD 2239 Martinique ad fauces Clark prope Absalon, in sylva hygrophyla ad truncis putrefactos, leg. A. David 10.X.1976 .

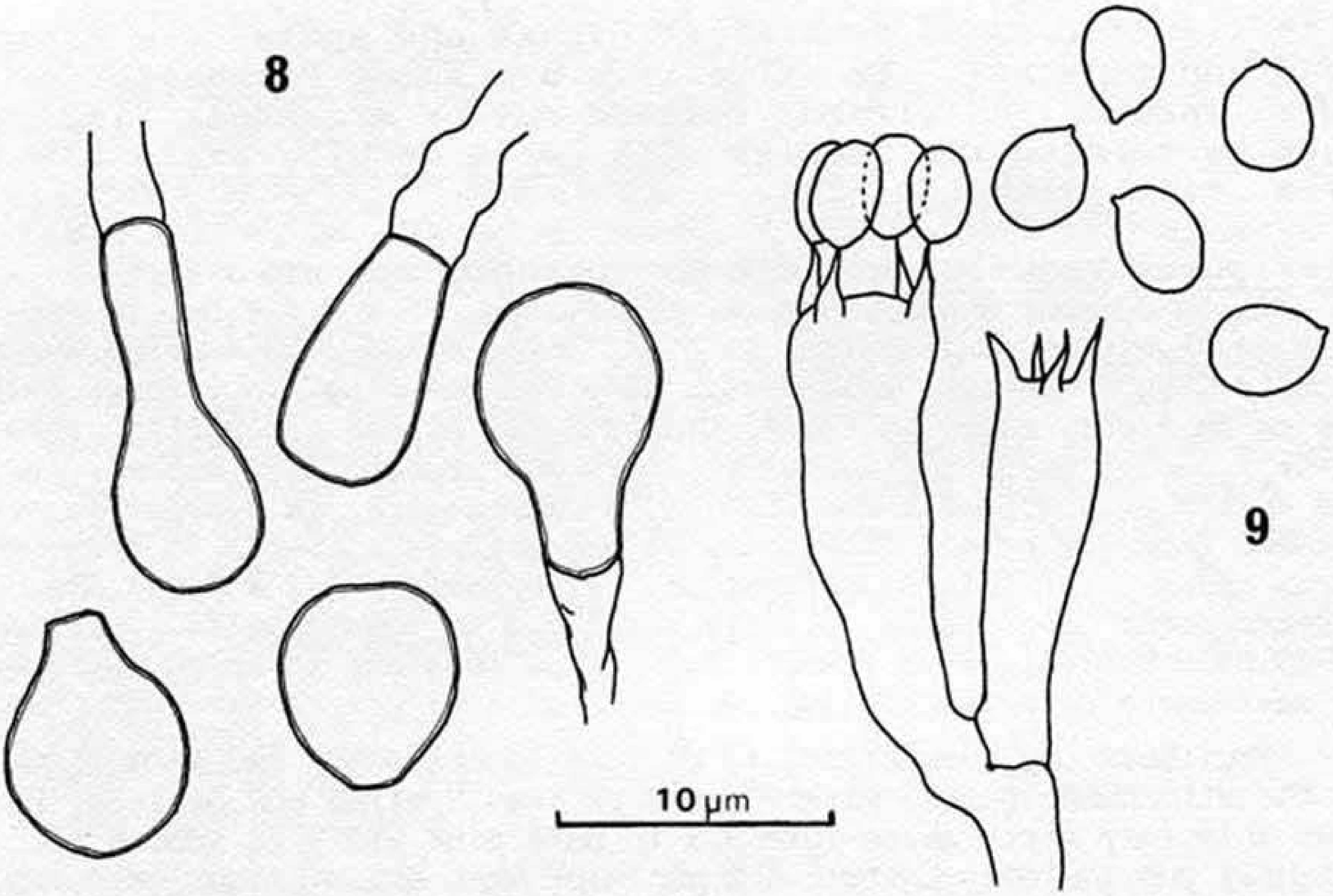
Fruitbody big, dimidiate, 15 cm long, 6 cm radius and 4 cm thick at the attachment point, watery, more or less hyaline and brittle. Pileus uniformly dirty white 10YR 9/2 to pale pink 5YR 9/2, smooth to slightly tuberculate. Context 5-6 mm thick when dried, translucid, whitish to pale pink when fresh, becoming chestnut and resinous horny when dried. Pore surface pale pink 5YR 9/3 to 8/4 when fresh. When dried pores 6-10 per mm and tubes up to 2 mm long. Above the tubes and in the context there may appear dark reddish lines in the dried fruitbody.

Hyphal system quite difficult to interpret: monomitic in the tubes with simple-clamped generative hyphae 2,5-4 µm diam, slightly thick-walled with a parallel disposition, very coherent and agglutinated and very difficult to dissociate. The context apparently monomitic but there are hyphae with very thick walls and even solid, not numerous, which are inmersed in a resistent resinous umber matter and are impossible to dissociate. The resinous matter is not stainable, has a more or less laminar structure, and seems to originate from hyphae with a particular disposition whose walls become thickened at the extremities. Club-shaped chromophile vesicles are found in the dissepiments at the pore mouths (fig. 8). Basidia clavate, tetraspored, 15-20 x 4,5-5 µm. Spores subglobose, 3,5-4,3 x 2,5-3,2 µm, acyanophilous (fig. 9).

REMARKS: F. venustus is a very beautiful species, very easy to recognise in the field in the fresh condition, as its flesh is pink, quite pale, translucid and brittle. Alternatively it becomes unrecognisable when dried as it hardens very much and becomes horny, ressembling a Flaviporus liebmanii (Fr.)Ginns but much thicker, and shrinks markedly, changing from 4 cm thick to 1 cm thick.

This taxon presents the features assigned to the species placed in the genus Flaviporus Murr.: a cartilaginous and brittle fruitbody in fresh condition, agglutinated hyphae and small, broadly ellipsoid to subglobose, acyanophilous spores. As in F. hydrophilus (Berk. & Curt.)Ginns and F. minutisporus (Reid, Thind & Chatrath)Ginns the hymenium lacks cystidia.

3.Not to be confused with Polyporus straminellus Bres., a true Polyporus species related to Polyporus virgatus Berk. & Curt. fide Bresadola(1920).



Figs. 8-9, Flaviporus venustus (holotype): 8. vesicles present in the pore mouths; 9. basidia and spores.

Cultural studies

SPORES AND GERMINATION: spores are uninucleate and germinate in 1-2 days after shedding, giving rise to a simple septate mycelium with coenocytic articles.

SEXUALITY: bipolar, ten single spore cultures were distributed as:

A_1: 1-2-8 A_2: 3-4-5-6-7-9-10

POLYSPERM:

Growth: very rapid, dishes are covered in two weeks.

Aspect of the mat: aerial mycelium little developed, adherent to the agar and giving the impression of a peach peel. Around the dishes there is formation of more or less cartilaginous translucid shells which become light pink coloured with age and recall the fresh fruitbodies. Fructifications were obtained by leaving the dishes exposed to the light. Odor none. Reverse unchanged.

Microscopic features and cytology: the polysperm is irregularly simpe-clamped and binucleate. Chalmydospores are found in the cultures and are generally binucleate but sometimes they contain 1, 3 or 4 nuclei. Some chlamydospores germinate giving rise to a simple-septate mycelium with highly coenocytic articles; the following are some assays of nuclei made from the terminal cell backwards:

625-9-4
581-3-6
448-46-38-4-3

When submerged in liquid media the polysperm loses its clamps and the articles become simple-septate and coenocytic.

Oxidases: guaiacol 0,02%: +++++, 6,5 cm p-crésol: -
0,2 %: +++, 0 cm tyrosine: -
gallic ac. : +++++

NUCLEAR BEHAVIOR: astatocoenocytic.

CODE: 2a. 3s. 7. 34. 36. 38. 42. 48. 54. 59. 65.

Fomes meliae (Underw.)Murr.

LYAD 1361 M, Source Didier road, 27.VII.72 .

Fomes fasciatus (Sw.:Fr.)Cke.

LYAD s.n. GI, P. Berthet X.68, two collections; LYAD s.n. GI, in the field with logs of St. Laurent de Marony on *Vochysia* sp. beam, S.Lucas; LYAD 2221 M, Pointe Rouge forest, 7.X.76 .

Fomitopsis supina (Sw.:Fr.)Ryv.

LYAD 1361 G, Source Didier region, 27.VII.72; LYAD 1367 G, Deux Mamelles route, 30.VII.72; LYAD 2140 G, Jules' forest road, 27.IX.76; LYAD 1714 GI, Crique Grégoire, P.Berthet 22.I.74 .

Funalia fulvocinerea (Murr.)David & Rajchenberg comb. nov.

Basionym: *Coriolopsis fulvocinerea* Murr., N. Amer. Fl. 9: 76, 1908 .

LYAD 2193 G, St. Anne region, in a pole in a plantation, 3.X.76; LYAD 671 G, on calcinated wood, J.Berthet X.68; LYAD 2463 GI, Cayenne region, on a fence pillar, M. Fougerousse III.82 .

This species was included in *Coriolopsis* by Murrill and was described by Fidalgo & Fidalgo (1967). It was excluded from the genus by David (1970) who showed that it had binucleate spores and a heterocytic nuclear behavior, features found in *Funalia trogii* (Berk.)Bond. & Sing. and *Trametes hispida* Bagl. (David, 1967), and characteristic of *Funalia* Pat. *Trametella* Pinto Lopes, where it was previously placed is a nomenclatural synonym of *Funalia* Pat.

Coriolopsis floccosa (Jungh.)Ryv., a species described from East Africa and recorded as pantropical (Ryvarden & Johansen, 1980) presents a similar greyish tint of the pore surface and spores. It would be very interesting to know the number of nuclei in the spores of this species. In any case cytological and interfertility tests are necessary to verify the limits of both taxa.

Gloeophyllum striatum (Sw.:Fr.)Murr.

LYAD 2274 G, Bouillante region, on a beam of an old house, 9.X.76; LYAD 672 GI, Cayenne region, P.Berthet X.68; LYAD 2462 GI, St. Laurent, M.Fougerousse I.82; LYAD 1331 M, Caravelle peninsula, 22.VII.72.

David (1970) undertook the cultural and cytological studies of this species which, as in other taxa of the genus (David, 1968), she demonstrated to have astatocoenocytic nuclear behavior, binucleate spores and bipolar sexuality. It also produces a brown rot in the substrate.

Gloeoporus thelephoroides (Hook.)Cunn.

LYAD 1722 GI, Saül environments, P.Berthet I.74; LYAD 2234 M, forest of La Charles district.

David (1972 a) studied the cultural and cytological characters of this species under the name *Gloeoporus conchoides* Mont.

Grammothele fuligo (Berk. & Br.)Ryv.

LYAD 2205 G, Basse Terre, Mamelle Pigeon road, on Arecaceae, J.Boidin; LYAD s.n. GI, P.Berthet X.68 .

Grammothele lineata Berk. & Curt.

LYAD 2198 G, Grosse Montagne road, Petit Bourg side, 4.X.76; LYAD 2207 G, Morne Leger, 6.X.76 .

Cultural studies

SPORES AND GERMINATION: spores are uninucleate and germinate in 3-4 days after shedding, producing primary mycelia with simple septate uninucleate articles.

SEXUALITY: tetrapolar, ten single spore cultures were distributed as: A_1B_1: 1-5 A_2B_2: 2-8-9
A_1B_2: 7-10 A_2B_1: 3-4-6

POLYSPERM:

Growth: Petri dishes are covered in 2 wk.

Aspect of the mat: margin regular and appressed. Aerial mycelium white, radially striate, denser and gossypine, growing over the edge of the Petri dish. From the 2nd wk onwards there appear distinct narrow lines of mycelium that form crusts which become circular strips 0,5-1 cm wide, of felty sulcate and detachable mycelium, beige pink 7,5YR 8/6 8/7 8/4, beige ochraceous and/or light chestnut 5YR 6/6 (fig. 10). Odor: none. Reverse unchanged.

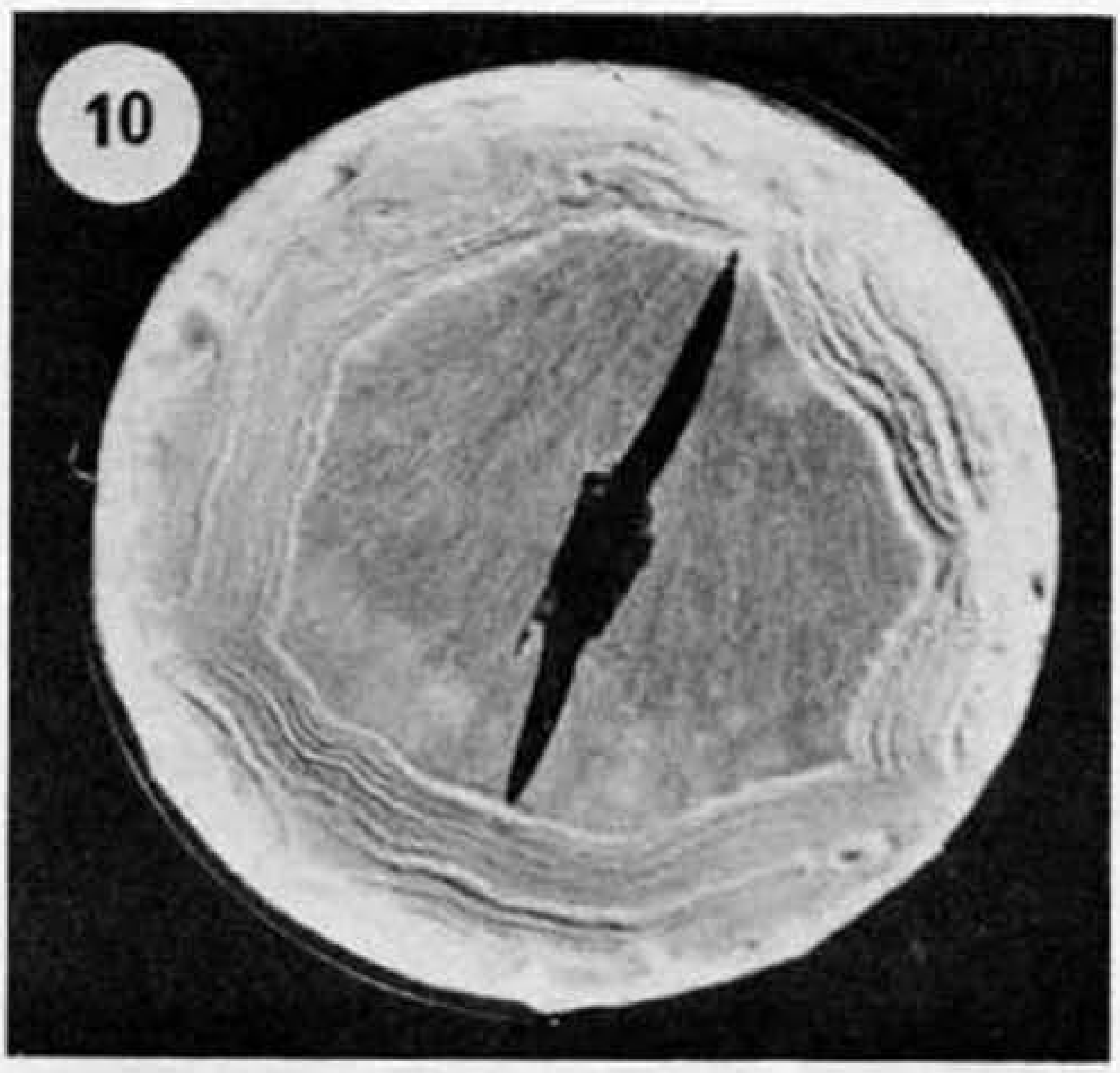


Fig. 10, Grammothele lineata (LYAD 2198): aspect of the mat (x 0,6).

Microscopic characters: marginal zone with generative hyphae 4 µm diam., with first clamps at 180-300 µm from hyphal tips, and narrower ramifications. Aerial mycelium with regularly simple-clamped, thin walled hyphae 2-3 µm diam. with very narrow ramifications, in most cases aseptate, that form an undissociable intricate net. Forming numerous octahedric crystals condensed in 'baguettes' 100-150 x 10 µm. Crusts are formed of a plectenchyma composed of sclerified generative hyphae, many times coralloid, tightly interwined and embedded in an amorphous, coloured substance. Some fibers are also found in the crusts.

Cytology: hyphae are formed by binucleate articles.

Oxidases: guaiacol 0,02%: +++++, 3,5 cm p-crésol: -
0,2 %: +++, 3,5 cm tyrosine: -
gallic ac.: +++++

NUCLEAR BEHAVIOR: normal.

CODE: 2a. 3c. 8. 11. 32. 36. 42. 54. 60. 61.

Grammothele subargentea (Speg.)Rajch.

=Poria subargentea Speg. (LPS !).

LYAD 2167 G, la Lézarde forest, Fougeres Forest House, on bamboo, 30.IX.76; LYAD 2182 G, la Lézarde forest, 30.IX.76; LYAD 2197 and 2199 G, Grosse Montagne, Deux Mamelles route, 4.X.76; LYAD 2210 G, Deux Mamelles route, Morne Leger, 6.IX.76; LYAD s.n. M, Fort de France.

Rajchenberg (1983 b) described the cultural characters of this species. Thus we present only polarity and nuclear behavior data.

SPORES AND GERMINATION: spores are uninucleate and germinate in 1-2 days after shedding, forming mycelia with uninucleate simple-septate articles.

SEXUALITY: tetrapolar (observation made from LYAD 2182):

A_1B_1: 1-6-9 A_2B_2: 7-10
A_1B_2: 2-8 A_2B_1: 3-4-8

POLYSPERM: cultures LYAD 2182 and LYAD 2197 developed identical macro and microscopic features as described previously from Argentine cultures (BAFC 2476 and BAFC 542, Rajchenberg, op. cit.).

Cytology: articles of polyspermic mycelium are binucleate.

Oxidases: guaiacol 0,02%: +++++, 6 cm p-crésol: -
0,2 %: ++++ tyrosine: -
gallic ac.: +++++

NUCLEAR BEHAVIOR: normal.

CODE: 2a. 3c. 8. 11. (21). 35. 36. 37. 39. 40. 42. 50. 54. 60. 61.

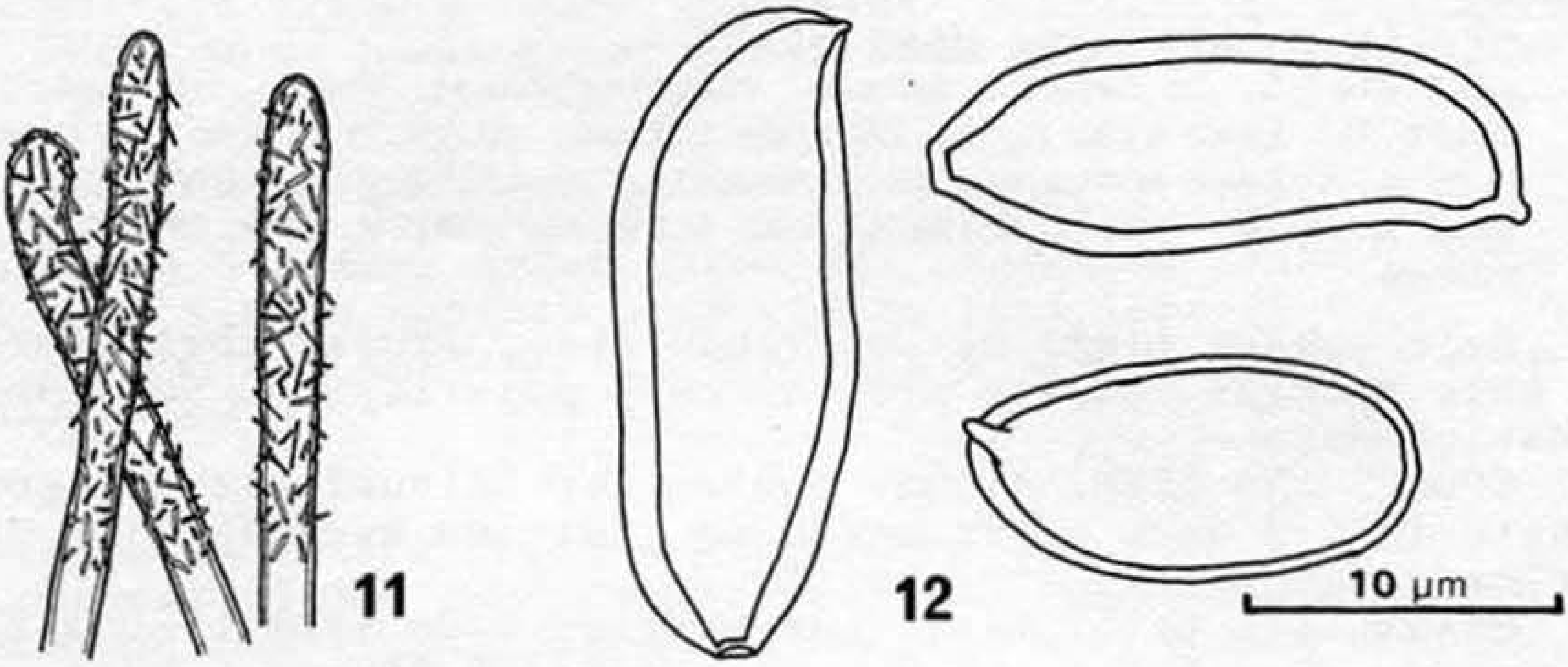
REMARKS: Buller tests between monosperms from the Argentine BAFC 2476$_{2-5-6-10}$ cultures and the polysperm from the French Antilles LYAD 2182 were positive.

Grammothelopsis incrustata David & Rajchenberg sp. nov.

Basidiocarpo annuo, resupinato, circulari, corneo, in vivo luteo canarino, margini sterili gossypino. Poris circularibus 3-4 per mm. Contexto et tubis brevibus atro luteis. Oribus porum et margo cum pruina luteo albida obtectus. Systema hypharum dimiticum. Hyphis generativis fibulatis 2-3 µm diam. Hyphis skeletibus ramosissimis 2-3,5 µm diam., parietibus incrassatis cyanophilis. Pruina facta hyphis generativis cum parietes incrassati crystallia bacilliformes obtectus. Basidia non visu. Basidiolis claviformes 20-30 x 9-15 µm. Basidiosporis copiosis, cylindraceo-ellipsoideis, truncatis 16-22 x 6-8 µm, parietibus incrassatis 0,5-1,5 µm, cyanophilis, indextrinoideis, apiculatis cum poro germinalis perspicuo. Putrefactione ligno alba. Holotypus LY-AD 2204 Guadeloupe, Grosse Montagne, via sylvatica, leg. A. David 4.IX.1976

Fruitbody annual, resupinate, forming circular plates with irregular outline, 1-4 cm diam., and a gossypine, sterile margin. Pores circular, 3-4 per mm. Pore surface duckling yellow 5Y 9/6 9/8 when fresh. Context very thin (40 µm) and tubes short (0,4-0,75 mm) with a horny trama, more or less dark yellow 7,5YR 7/8. Pore mouths and margin covered with a white yellowish pruina.

Hyphal system dimitic. Generative hyphae regularly simple-clamped 2-3 µm diam. and thin walled; skeletal hyphae sinuose, much branched, 2-3,5 µm diam. with thickened and strongly cyanophilous walls. Pruina and margin formed of generative hyphae with slightly thickened walls and



Figs. 11-12, Grammothelopsis incrustata (holotype): 11. incrusted generative hyphae present in the pore mouths and margin of the fruitbody; 12. spores.

covered with numerous bacillar crystals (fig. 11).

Basidia not seen. Basidioles claviform, 20-30 x 9-15 µm, with abundant oily contents. Spores very abundant, cylindric-ellipsoid and truncate, 16-22 x 6-8 µm, with thickened walls 0,5-1,5 µm, strongly cyanophilous, IKI -, with a distinct apiculus and a germ pore (more or less distinct according to spore maturity) responsible for the truncate shape (fig. 12).

Holotype: LYAD 2204 Guadeloupe, Grosse Montagne, Forest road, leg. A. David 4.IX.76. Associate with a white rot.

REMARKS: the only material studied differs from Grammothelopsis macrospora Ryv.(Jül.) (=Grammothele macrospora Ryv. O !) by: a- the circular pores, b- the non-dextrinoid and narrower spores (7,5-11 µm in G. macrospora) and c- the presence of strongly incrusted hyphae in the pore mouths instead of dendrohyphidia.

AFFINITIES: spores of G. incrustata present distinctive characters such as the large size, the thick and strongly cyanophilous walls and a germ pore opposite the apiculus. All these characters suggest an affinity of Grammothelopsis Jül. with the genera Perenniporia Murr., Pyrofomes Kotl. & Pouz. and Loweporus Wright, already suggested by Jülich (1981) who assembled all these genera in the family Perenniporiaceae Jül.

Hapalopilus albo-citrinus (Petch)Ryv.
=Poria albo-citrina Petch (K !)
=Poria rhoadsii Murr. (NY !)
LYAD 1383 G, Deux Mamelles route, 2.VIII.72 ; LYAD 1320 M, 18.VII.72

Fruitbody resupinate with the margin narrow and fimbriate or absent. Pore surface gold yellowish 2,5Y 8/10 8/8, becoming strawberry red with KOH solution. Pores 4-5 per mm; tubes concolorous, up to 1 mm long. Context paler, more or less translucid with yellowish zonation.

Hyphal system monomitic with simple-clamped generative hyphae 3-5 µm diam., with thin to thickened walls up to 1-1,5 µm thick, compactly arranged in the trama, some of them covered here and there with conspicuous yellowish resinous matter and end in swollen extremities 4-8 µm diam. where the resinous matter is thickly deposited and confers on them a chestnut-yellowish colour (fig. 13). This matter dissolves in KOH solution.

REMARKS: our collections match very well the type material of the species as well as the description given by Ryvarden & Johansen (1980). Lowe (1966) overlooked the presence of the incrusted swollen hyphae when describing Poria rhoadsii Murr. but they were found in the type material as well as in a collection from Lowe's herbarium (n° 4302, U.S.A., Florida, Gainsville, on pine log, leg. & det. J.L. Lowe 11.VIII.50).

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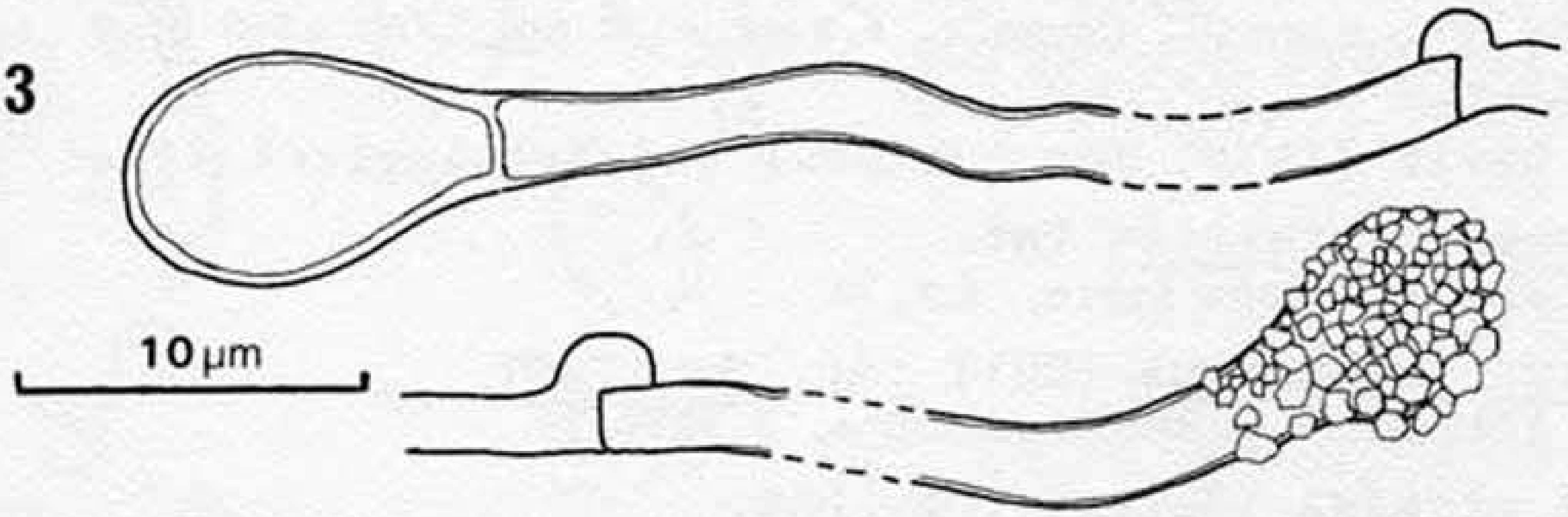


Fig. 13, Hapalopilus albo-citrinus: swollen extremities of generative hyphae.

Cultural studies (from LYAD 1383)

MONOSPERM: unfortunately we have no monosporous cultures but the polysperm loses its clamps when submerged in liquid media (anaerobic conditions) and is then formed of hyphae with coenocytic articles. This behavior is distinctive of the astatocoenocytic species. Their submerged polysperm cultures have the same cytology as their monosporous cultures. It is probable that monosporic cultures of H. albo-citrinus have hyphae with coenocytic articles.

POLYSPERM:

Growth: very slow, dishes covered in 6-7 wk.

Aspect of the mat: margin submerged and dendroid. Aerial mycelium poorly developed, appressed, at first white felty, becoming denser, finely granular, and gold yellow 2,5Y 8/10 8/12 turning to strawberry red with ammoniacal vapors.

Microscopy: submerged margin formed by simple-septate generative hyphae 2-3 µm diam. Aerial mycelium formed by regularly simple-clamped generative hyphae frequently covered with a gold yellowish seemingly amorphous matter. Some 30-50 µm long branches present swollen extremities covered with crystals; these elements correspond to those found in the fruitbodies.

Cytology: the polyspermic mycelium has a majority of binucleate simple-clamped articles and other irregularly clamped articles with 1-2 nuclei. The submerged mycelium loses its clamps and the articles become coenocytic. The following are some assays of nuclei made from the terminal cell backwards: 83-10-4-5-2-3-6-3-2
60-8-2-4-2-2-4

Frequently the polysperm grows poorly under collodion and then it is composed by hyphae with short articles containing 1-4 nuclei.

Oxidases: guaiacol:0,02%: ++ p-crésol: -
0,2 %: + tyrosine: +, 0
gallic ac.: ++++

NUCLEAR BEHAVIOR: seemingly astatocoenocytic.

CODE: 2. 3s. 4. 7. 32. 36. 37. 38. 46. 47. 54. 65.

REMARKS: H. albo-citrinus has then the same nuclear behavior as other temperate species of Hapalopilus Karst.: H. nidulans (Fr.)Karst. and H. croceus (Fr.)Donk (David, 1969).

Hexagonia hydnoides (Sw.:Fr.)Fidalgo
LYAD 1972 G, Petit Canal, on Casuarina, 7.VIII.75; LYAD 2128 G, Pointe de la Vigie, on dead Casuarina, 26.IX.76; LYAD s.n. GI, Kourou, leg. CTFT B-148; LYAD s.n. GI, Lassore Park, leg. CTFT B-184; LYAD s.n. GI, Cayenne, P.Berthet X.68; LYAD 1340 M, Trinité, 24.VII.72 .

See David (1970) for cultural and cytological studies.

Hymenogramme lateritia Pat.
LYAD 2189 G, Basse Terre, 4.X.76 .

Laetiporus sulphureus (Büll.:Fr.)Murr.
LYAD 1382 G, Deux Mamelles route, 2.VIII.72 .

Lenzites elegans (Spreng.:Fr.)Pat.
LYAD 1365 and 1368 G, Deux Mamelles route, 30.VII.72; LYAD 1413 G, Grande Savane region, 6.VIII.72; LYAD 667 GI, Cayenne environs, P. Berthet 12.X.68.

For cultural and cytological studies see David (1970).

Loweporus roseo-albus (Jungh.)Ryv.
LYAD 1407 G, Basse Terre, Sofaïa region, 7.VIII.72 .

Loweporus tephroporus (Mont.)Ryv.
LYAD 2482 GI, on open-air woodwork, S.Lucas 1975 .

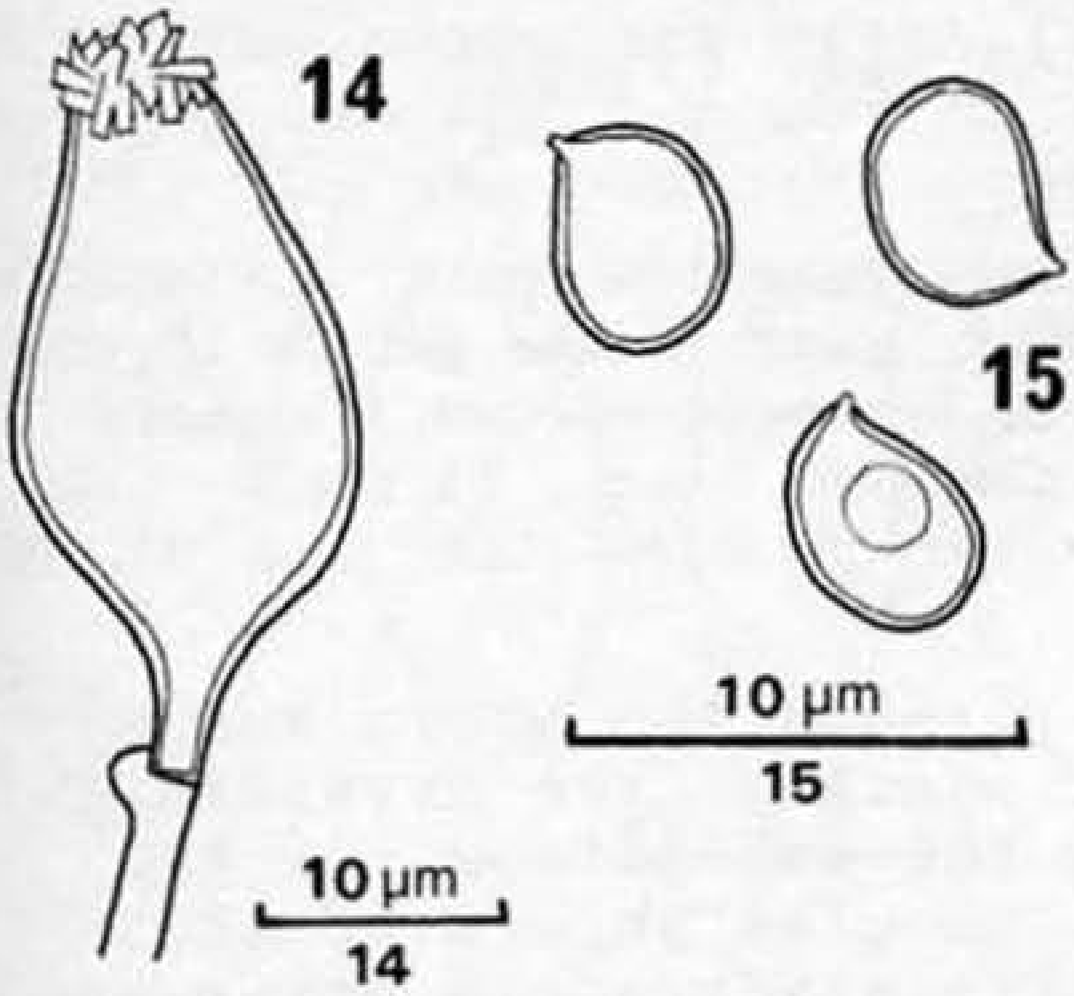
The species is tetrapolar and has a normal nuclear behavior. Intercompatibility tests performed between the monosporic cultures from the French Antilles LYAD 2482$_{1-2}$ and the Argentine ones of BAFC 41$_{4-7-9-10}$ (Argentine, Salta, Campo Durán, leg. Wright, Deschamps & del Busto S-2660 11. XI.74) were positive and interfertile (with production of fruitbodies in culture). Bullerizations performed between LYAD 1915 (n+n) from Congo (Fuola Kari) and the Argentine monospermes BAFC 41$_{3-5-6-8}$ were also positive with fruitbodies forming in the confrontations with the monosperms 3 and 8 .

Microporellus dealbatus (Berk. & Curt.)Murr.
=Polyporus dealbatus Berk. & Curt. (K !)
LYAD 1410 G, Vernou region, behind INRA's laboratory, 7.VIII.72; LYAD 2176 G, Lézarde forest, Fougeres House, 30.IX.76 .

We refer to Murrill (1907) and Overholts (1953, Pl. 54 fig. 326) for macromorphological descriptions. These authors give different pore sizes for this species: Murrill, 8-10 per mm and Overholts 6-7 per mm. Our collections agree with the size given by the former: 10-12 per mm. The micromorphological data below supplements earlier author's descriptions:

Hyphal system dimitic. Generative hyphae regularly simple-clamped, 2-4 µm diam.; skeletal hyphae straight, not branched, 3-7 µm diam. in the context, 2-5 µm diam. in the dissepiments, generally with a distinct lumen, walls up to 2 µm wide, strongly dextrinoid and cyanophilous.

Basidia claviform and tetraspored, 15 x 6-8 µm. Cystidia ventricose, subhyaline with walls up to 1 µm thick wide especially in the apex where they are generally incrusted, more abundant near the pore mouths, 20-30 x 15-19 µm (fig. 14). Spores broadly ellipsoid, hyaline, 4,5-5,5 x 3-4-(4,5) µm, with slightly thickened walls, strongly cyanophilous and weakly dextrinoid (fig. 15).



Figs. 14-15, Microporellus dealbatus: 14. cystidium; 15. spores .

REMARKS: macro and micromorphological features have been verified in the type collection of Polyporus dealbatus Berk. & Curt. at Kew (n° 836). The presence of dextrinoid skeletal hyphae and incrusted cystidia were not previously reported in M. dealbatus and make of them a unique and particular set of characters among Polypores. This set was used to erect the genus Cystostiptoporus by Dhanda & Ryvarden (1975) with C. indica Dhanda & Ryv. as type species (a nomenclatural synonym of C. violaceo-cinerascens (Petch)Ryv., see Ryvarden & Johansen, 1980), but it must fall into synonymy of Microporellus Murr. because of priority. The latter must contain both species and we propose the new combination: Microporellus violaceo-cinerascens (Petch)David & Rajchenberg comb. nov.; basionym: Polyporus violaceo-cinerascens Petch, Ann. Roy. Bot. Gard. Peradeniya 6:41, 1916.

Cultural studies:(performed with LYAD 1181, U.S.A., Louisiana, St. Tammany, Talisheek, on the ground, leg. & det. A. Welden 13.VIII.71).

SPORES AND GERMINATION: spores are uninucleate and germinate in 6-7 days after shedding, giving rise to simple septate hyphae with uninucleate articles.

SEXUALITY: tetrapolar

A_1B_1: 3-6-8 A_2B_2: 1-4-5-10
A_1B_2: 2-7 A_2B_1: 9

POLYSPERM:

Growth: rapid, covering the Petri dish in 3 weeks.

Aspect of the mat: margin regular. Mycelium downy, becoming cottony felty with age, at first pure white becoming white to violaceous grey at the margin of the dish 5YR 8/2 8/3; forming a soft elastic pellicle that may be detached from the medium; more woolly in the centre of the dish. Odor none. Reverse unchanged.

Microscopy: margin formed with regularly simple-clamped generative hyphae. Aerial mycelium formed with simple-clamped generative hyphae 2-3 µm diam. and a great number of fiber hyphae 1-1,5 µm diam. that give rise to extremely thin branches that form a net. These fibers are slightly dextrinoid and strongly cyanophilous.

Cytology: hyphae are formed by binucleate articles.

Oxidases: guaiacol 0,02%: +++++, 3 cm p-crésol: -
0,2 %: +++, 0 tyrosine: -, 2 cm
gallic ac.: ++++, 0

NUCLEAR BEHAVIOR: normal.

CODE: 2a. 3c. 8. 32. 36. 38. 43. 56. 60. 61.

Microporellus obovatus (Jungh.)Ryv.

LYAD 1384 and 1385 G, Basse Terre, Deux Mamelles route, 2.VIII.72; LYAD 1405 G, Basse Terre, Natural Park, path in the Quiock river, 6.VIII.72; LYAD 1974 G, Basse Terre, Corrosol's ford, J.Boidin 8.VI.75; LYAD 2119 G, Basse Terre, Corrosol River, 24.IX.76; LYAD 2266 G, Grand Etang, St. Sauveur region, 10.X.76; LYAD s.n. GI, P. Berthet X.68, three collections.

REMARKS: for the above cited reasons the macro and micromorphological features of this species (see Ryvarden & Johansen, 1980) do not match with the definition of the genus Microporellus Murr. and the species should be excluded from the genus. Nevertheless its place among other genera of Polyporaceae is uncertain. The creation of a new genus should be preceded by a careful study of other species included by Murrill in Microporellus. Thus we prefer to provisionally employ the binomial M. obovatus.

Microporellus af. violaceo-cinerascens (Petch)David & Rajch.

LYAD 1721 GI, Mahury, P. Berthet 17.I.74 .

This collection differs from the holotype (Polyporus violaceo-cinerascens Petch, n° 2678, Peradeniya X.1908, at K !) and from the description of the species given by Ryvarden & Johansen (1980) by the following characters: a)The material from the French Guiana has a thinner and more flexible pileus and the abhymenial surface is covered and overrun by dark greyish fibrills (as seen in the photograph of the collection named as Polyporus dealbatus Berk. & Curt. in Overholts - 1953, Pl. 51 fig. 306, compare also with Pl. 54 fig. 326 with more typical collections of that species-), b) Spores in the French Guiana collection are 6-7 x 5-5,5 µm and Ryvarden & Johansen give larger sizes, 8-10 x 5,5-7 µm (but 7-8,5 x 5-6 µm according to our observations in the type material).

Microporellus dealbatus and M. violaceo-cinerascens are allied species similar in external aspect but differ in: a) Size of pores, which are 8-10-(12) per mm in the former and 2-3 per mm in the latter; b) Spores are larger and have a stronger dextrinoid reaction in the second; c) Geographical distribution is so far known restricted to temperate and tropical America for M. dealbatus and East Asia (India and Sri Lanka) for M. violaceo-cinerascens. The study of the French Guiana collection (and another from Singapour, LYAD 1767) suggests the probable existence of a third taxon near to M. violaceo-cinerascens that differs by the coloration and consistency of the pileus and the pore size (intermediate between the latter and M. dealbatus). Only interfertility tests and the study of more collections can determine the range, limits and affinities of all the taxa.

Navisporus sulcatus (Lloyd)Ryv.

LYAD 1404 G, path in the Quiock river, Natural Park, 6.VIII.72 .

Our collection is similar to the photograph published by Lloyd (1922) and the description given by Ryvarden (1983). Only the pores are slightly different, being 5 per mm in our collection and 2-3 per mm in Ryvarden's description. Spores (fig. 16) and skeletal hyphae are slightly cyanophilous.

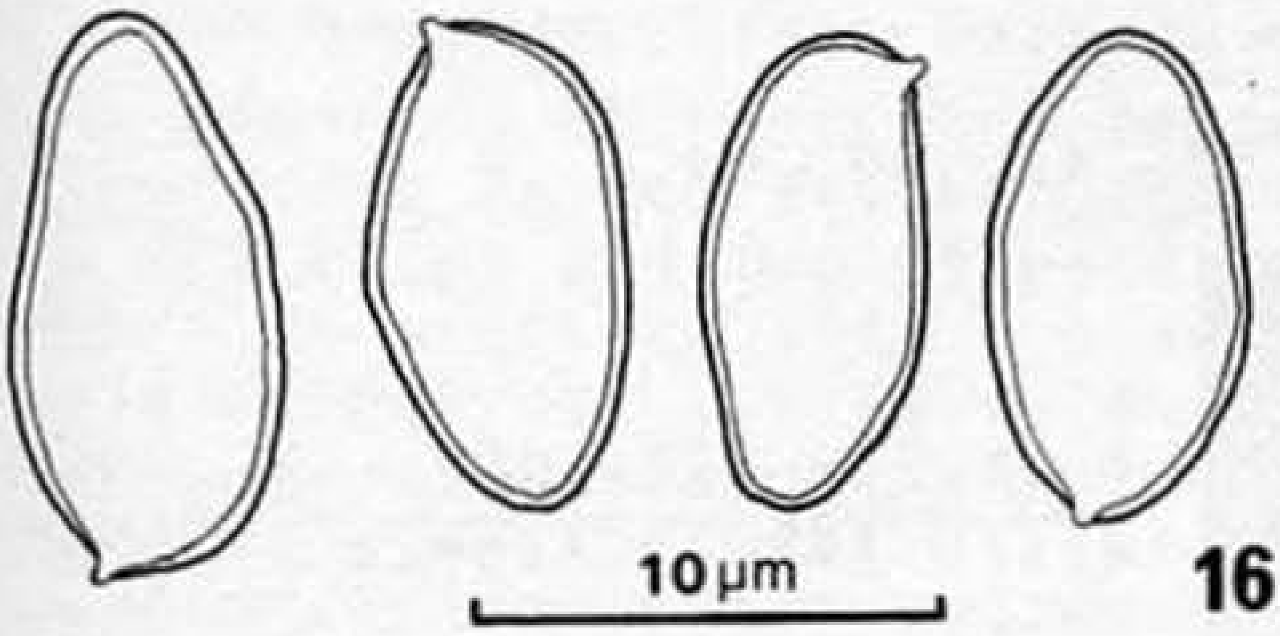


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Fig. 16, Navisporus sulcatus: spores.

Nigroporus vinosus (Berk.)Murr.

LYAD 1376 G, Basse Terre, Natural Park, 31.VII.72; LYAD 2201 G, Deux Mamelles route, 4.IX.76; LYAD 2277 G, Clark's Ravine forest, 10.X.76; LYAD 1333 M, La Trace, 22.VII.72 .

The species is tetrapolar and has a normal nuclear behavior (observations made form LYAD 1333 and 2277, which were also intercompatible). Intercompatibility tests between the monosporic cultures LYAD 1333_{1-2} and 2277_{I-III} with the Argentine ones BAFC $588_{I-II-III-IV}$ (Argentine, Corrientes, Mburucuyá, Sta. Teresa ranch, leg. Wright, Deschamps and del Busto C-1913 16.VIII.72) were all positive.

Oxyporus latemarginatus (Dur. & Mont.)Donk

LYAD 2178 G, Traversée des Mamelles, 30.IX.76 .

The material studied has similar microscopic features shown by typical European collections but is macroscopically not as massive with tubes only up to 0,5 mm long.

Pachykytospora alabamae (Berk. & Cke.)Ryv.

LYAD 2186 G, Deux Mamelles route, 3.X.76; LYAD s.n. GI, P.Berthet X.68 .

Cultures of this species had never been studied; the isolate from LYAD 2186 fructified in the laboratory.

SPORES AND GERMINATION: spores are uninucleate and germinate in 12-15 days after shedding, giving rise to simple septate hyphae with uninucleate articles.

SEXUALITY: tetrapolar,

A_1B_1: 1-6-8-12-14-16-17 A_2B_2: 2-3-4
A_1B_2: 5-7-10-11- 13-15-18-20 A_2B_1: 19

POLYSPERM:

Growth: very slow, covering 5-6 cm of the Petri dish in six weeks.

Aspect of the mat: margin submerged, irregular and broadly lobate. Aerial mycelium at first little developed, and the agar can be seen by transparence; later becoming powdery around the inoculum and clotted cottony in the rest of the colony (fig. 17). There is formation of fructifications from the 2nd week on, principally around the inoculum.

Microscopy: margin formed with regularly simple-clamped generative hyphae 3 µm diam. which rapidly give rise to extremely thin, branched and aseptate hyphae 0,5 µm diam. with cyanophilous walls, that form a characteristic net as found in cultures of species of Perennipo-ria Murr. The same kind of hyphae are found in the aerial mycelium.

Cytology: hyphae are formed by binucleate articles.

Oxidases: guaiacol 0,02%: +++ p-crésol: -, 0
0,2 %: ++++ tyrosine: -, 0
gallic ac.: +++++

NUCLEAR BEHAVIOR: normal.

CODE: 2a. 3c. 8. 32. 36. 38. 47. 60. 61.

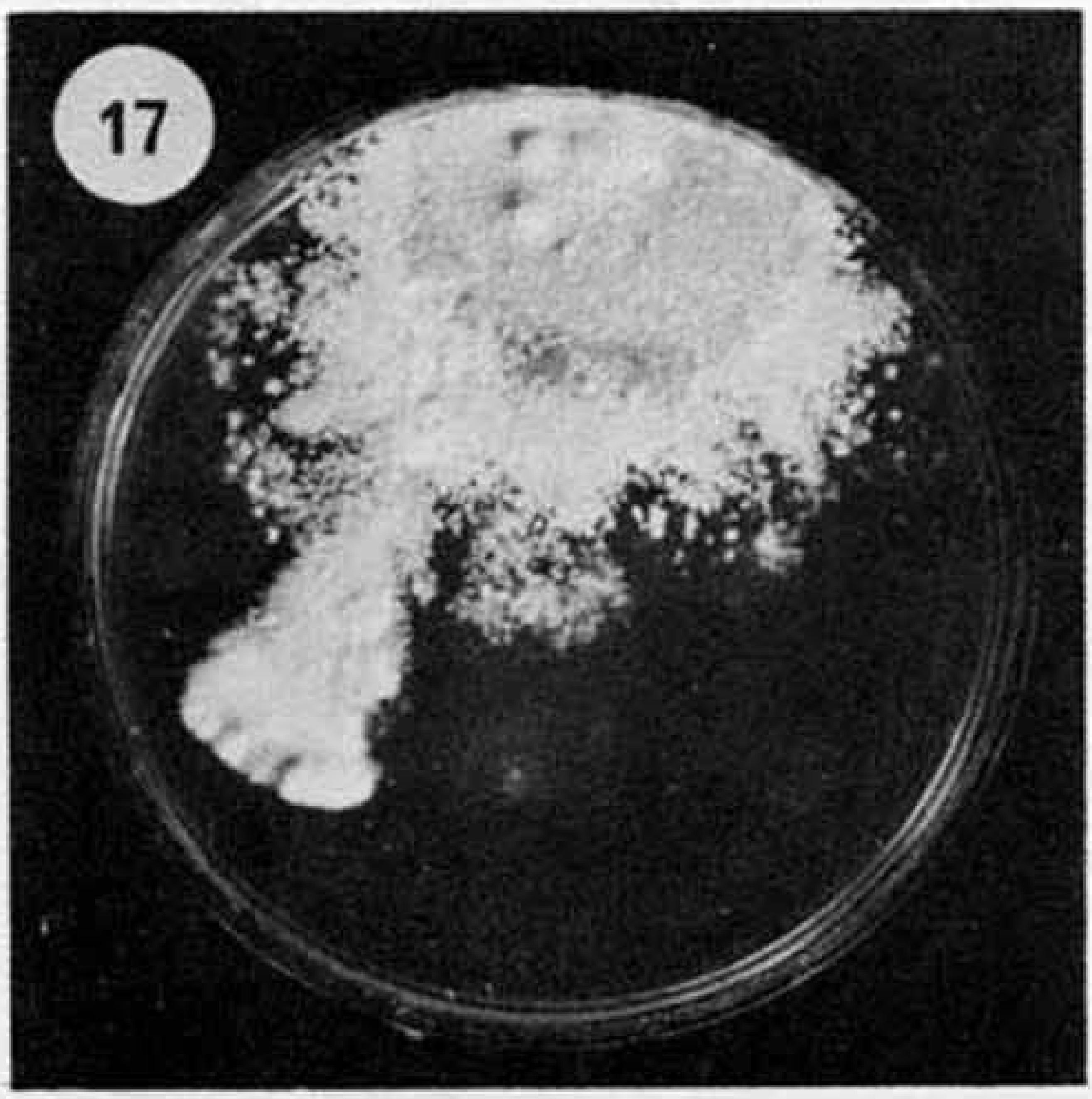

Fig. 17, Pachykytospora alabamae (LYAD 2186): aspect of the mat (x 0,6).

REMARKS: it is interesting to point out that this tropical species behaves as the European P. tuberculosa (D.C.:Fr.) Kotl. & Pouz., which also exhibits a very slow growth, a normal nuclear behavior and tetrapolar sexuality as shown by David (1972 b).

Perenniporia albida Rajchenberg & Wright (BAFC !)
LYAD 2153 G, Petit Bourg, towards INRA's laboratory, 28.IX.76; LYAD 2234 M, St. Esprit, 9.X.76 .

This species was recently described from subtropical forests in Argentine (Rajchenberg & Wright, 1982).

Polyporus arcularioides David & Rajchenberg sp. nov.

Basidiocarpus annuus, infundibuliformis, stipite crasso centralis. Pileus 3-7 cm diam. leviter pubescens, castaneus, margine incurvato. Poris 2-2,5 per mm longe decurrentibus. Systema hypharum dimiticum. Hyphis generativis fibulatis et hyphis skeletibus ramosissimis. Basidiis claviformibus, tetrasporis, 20-25 x 5 µm . Basidiosporis cylindraceis 6-7-(8,5) x 2,5-3,5 µm. A Polyporus arcularius Batsch:Fr. valde affine sed differt agendi nucleatus normalis. Holotypus LY-AD 1323 Martinique regio Precheur, leg. A. David 19.VII.1974 .

Fruitbody annual, centrally stipitate, infundibuliform. Pileus 3-7 cm diam., slightly downy when seen with the lens, pale to yellowish chesnut 10YR 7/4 7/6; margin becoming acute, entire or lobed, generally incurved (Fig. 17). Pores 2-2,5 per mm, radially elongated and decurrent on the stipe. Stipe stout, 2-3 cm long and 0,3-0,5 cm diam., narrowing from top to bottom. Context thinner than tubes, 0,3-0,5 mm thick; tubes 1-1,3 mm long.

Hyhpal system dimitic with simple clamped generative hyphae and branched skeletals. Basidia claviform and tetraspored, 20-25 x 5 µm. Spores cylindric, hyaline, 6-7-(8,5) x 2,5-3,5 µm.

Material studied: LYAD 1323 M, Précheur region, 19.VII.74 (Holotype); LYAD 1349 M, Grand Riviere region, 26.VII.72; LYAD 1400 M, Contrebandiers' path, Atlantic side, 5.VIII.72 .

REMARKS: this species reminds in a general way Polyporus arcularius Batsch:Fr. but the tubes are a lot more decurrent on the stipe and the stipe is stouter. P. arcularius also exhibits a heterocytic nuclear behavior, germinating spores have coenocytic articles (David & Romagnesi, 1972). The collections LYAD 1323 and 1400 were tetrapolar and had a normal nuclear behavior. The latter were intercompatible but the confrontations performed with the European (French) monosporous cultures from LYAD 726 of P. arcularius were negative. However the confrontations between an American collection of P. arcularius (LYAD 1171, Louisiana, Plaquemines Parish, Louisiana Riverside Campus, leg. A. David 12.VIII.72) and the French collection LYAD 726 were positive and also produced a fertile fruitbody in culture. This proves the isolation and independence of this species with regards to P. arcularius in the European sense.

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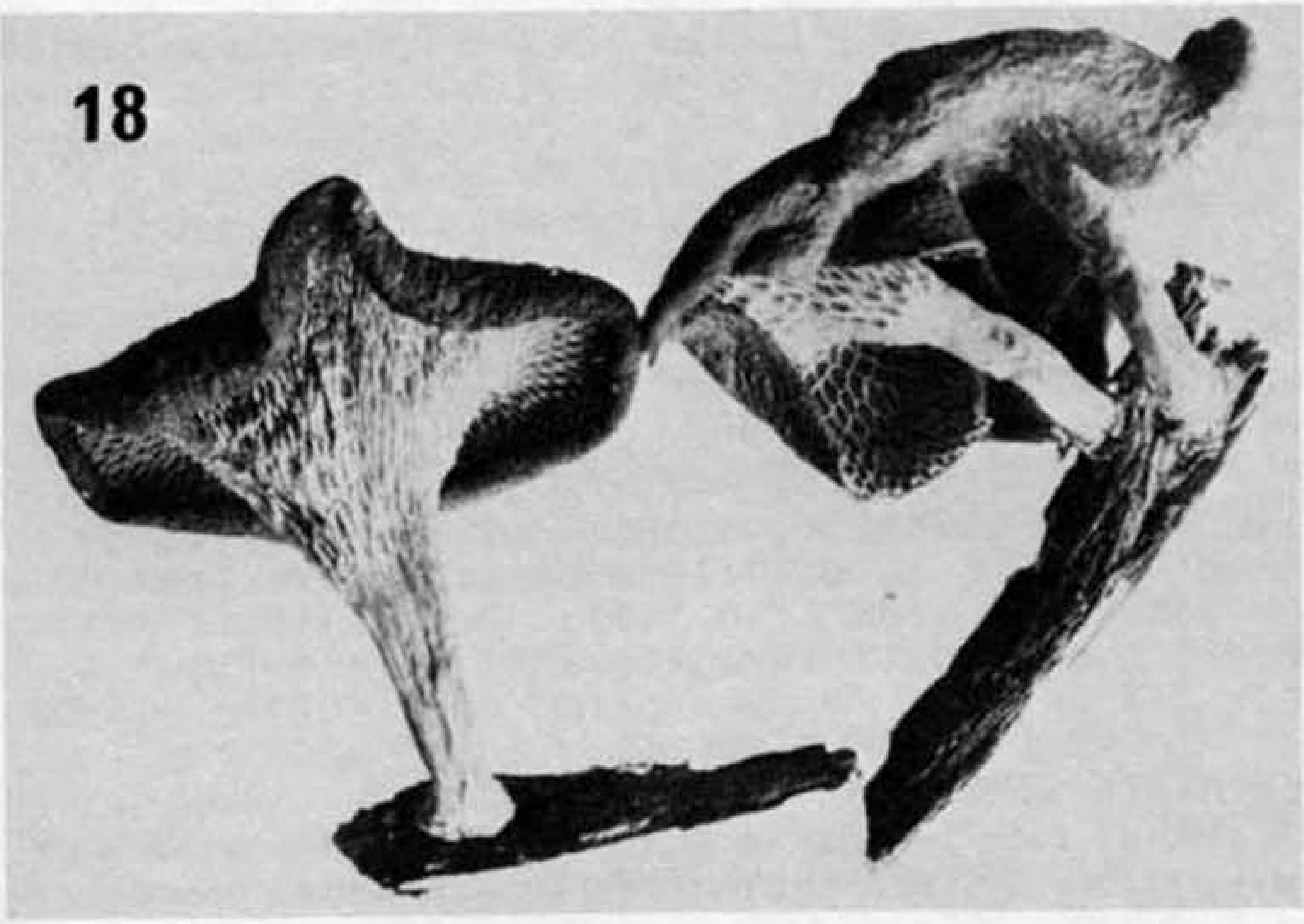


Fig. 18, Polyporus arcularioides (holotype): fruitbodies (x 1,5).

Polyporus cf. *dictyopus* Mont.

LYAD 1406 G, Natural Park, 6.VIII.72; LYAD 2120 G, Piolet's Youth Village, Deux Mamelles route, 25.IX.76; LYAD 1711 GI, Cayenne, P. Berthet I.74; LYAD 1719 GI, Crique Grégoire, P. Berthet I.74 .

Polyporus guianensis Mont.

LYAD 2152 G, Jules' Forest road, 27.IX.76; LYAD 1720 GI, Saül's environs, P. Berthet I.74; LYAD 1724 GI, Mahury Hills, P. Berthet 30.XII.73; LYAD s.n. GI, P. Berthet X.68, two collections.

Polyporus leprieurii Mont.

LYAD 2270 G, Douville region, X.76; LYAD s.n. GI, P. Berthet X.68, three collections

Polyporus puttemansii Henn.

LYAD 1408 G, Sofaïa region, 7.VIII.72.

The collection from the French Antilles is similar to the illustrations published as *P. puttemansii* Henn. by Lloyd (1912, fig. 486) and as *P. wrightii* Murr. (op. cit., fig. 487). The latter is a misnamed collection as *P. wrightii* is a synonym of *Polyporus guianensis* Mont. -quite a different species- as stated by Fidalgo & Fidalgo (1967). The following description is furnished from LYAD 1408:

Fruitbody stipitate, mesopod; pileus circular, umbilicate, 5 cm diam. and 0,25 cm thick. Margin entire, regular and thin; pileus surface finely velutinate under the lens, beige 2,5YR 5/6 5/8 4/6 4/8. Pores 1-2 per mm towards the margin, elongated toward the stipe up to 1,5 cm long but not decurrent. Context and tubes up to 2 mm thick at the base. Stipe 3 cm long, 0,4 mm wide toward the pileus, 0,8 mm wide toward the base, finely velutinate, dark chestnut 5YR 2/4.

Hyphal system dimitic. Generative hyphae simple-clamped 2-6,5 µm diam.; skeletal hyphae thick-walled, profusely branched, flexuose and irregular, 1,5-5-(6,5) µm diam. Basidia claviform, tetraspored, 20-28 x 6-7,5 µm. Spores cylindric, hyaline, 8-10 x 3-4 µm, inamyloid and acyanophilous.

The species is tetrapolar:

A_1B_1: 3 A_2B_2: 5-9
A_1B_2: 2-8-10 A_2B_1: 4-6-7

Polyporus tricholoma Mont.

LYAD 2134 G, Basse Terre, Corrosol river, 24.X.76; LYAD s.n. GI, two collections, P. Berthet X.68; LYAD 1401 M, Contrebandiers' path Atlantic side, 5.VIII.72; LYAD 1312 M, La Trace road, 17.VII.72; LYAD 1344 M, region between Grand Riviere and Macouba, 25.VII.72 .

Cultural and sexuality studies of the species have been undertaken by Roy & De (1977). Nuclear behavior is normal (observations made from LYAD 1401). Sexuality is tetrapolar:

A_1B_1: 2-5-6-9-10-11-14-15-16-17 A_1B_2: 1-8
A_2B_2: 3-4-7-12 A_2B_1: 13-18

Poria carneola Bres.

LYAD 1390 G, path leading to Garbet falls, on lying log in a banana plantation, 3.VIII.72; LYAD 1965 G, Ecrevisses cascade, J.Boidin 29.VII.75; LYAD 1979 G, Piolet's road, in natural park, J.Boidin 12.VIII.75; LYAD 2157 G, Petit Bourg, towards the INRA's laboratory J.Boidin 28.IX.76; LYAD 2165 G, Deux Mamelles route, road leading from the Forest House, 30.IX.76; LYAD 2261 G, Douville, 7.X.76 .

Descriptions of this species were given by Lowe (1966) and Ryvarden & Johansen (1980). We will present here the results of cultural studies undertaken with cultures LYAD 1965 1979, 2152 and 2165.

SPORES AND GERMINATION: spores are uninucleate, germinate in 6-10 days after shedding, and produce primary mycelia with simple septate coenocytic articles. The principal axes of the mycelium have long and branched terminal cells with hundreds of nuclei. The following are two assays of nuclei made from the terminal cell backwards:

720-112-52-35
436-210

The collateral and narrower axes have a smaller number of nuclei: up to 45 in the terminal cells but 2-10 in the intercalary ones.

SEXUALITY: bipolar (from LYAD 1965)
A_1: 1-4-6-8-9-10-12-13-14-15-16-17-18
A_2: 2-3-5-7-11-19

POLYSPERM:

Growth: dishes are covered in 2 wk (except LYAD 1979 which covered them in 3 wk).

Aspect of the mat: margin irregular, dendroid and adhering to the agar. Aerial mycelium little developed, webby, dendroid, at first white, becoming yellowish 7,5Y 9/6, 5Y 8/8 or ochre yellow 10YR 7/10. This coloration corresponds in cultures 1965, 1979 and 2152 to the formation of diffuse fructifications without pores, with the hymenium directly arranged on aerial hyphae. In cultures 2165 and 2152 a diffuse ochre-yellow coloration of 1 mm depth is seen in the agar under the aerial mycelium. Morover, small cartilaginous and translucid plates are present in culture 2165.

Microscopy: margin formed with generative hyphae at first poorly branched, simple-septate 2,5-4 µm diam.; at 1-1,5 cm from the margin narrower branches with simple-clamps appear, with short 30-70 µm long branches covered with bacilliform crystals. Aerial mycelium with simple septate generative hyphae, 3-6,5 µm wide with narrower simple-clamped hyphae 1,5-3,5 µm diam. All the hyphae are covered with bacilliform crystals. Submerged hyphae are regularly simple-clamped with thin or thickened hyaline walls. When thickened they are associated to a 'cloud' of crystals that recall the structure of snow (fig. 18) and confer the yellowish colour to the agar; only a small quantity of these crystals are free in the agar. Fructifications: all the hymenial elements appear in bouquets on aerial hyphae. Lanceolate to claviform thick-walled cystidia are abundantly present, incrusted or not (fig. 19).

Cytology: irregularly clamped hyphae have some regularly binucleate articles and other moderately coenocytic: 12-1-2-2-1
9-5-1-2-2

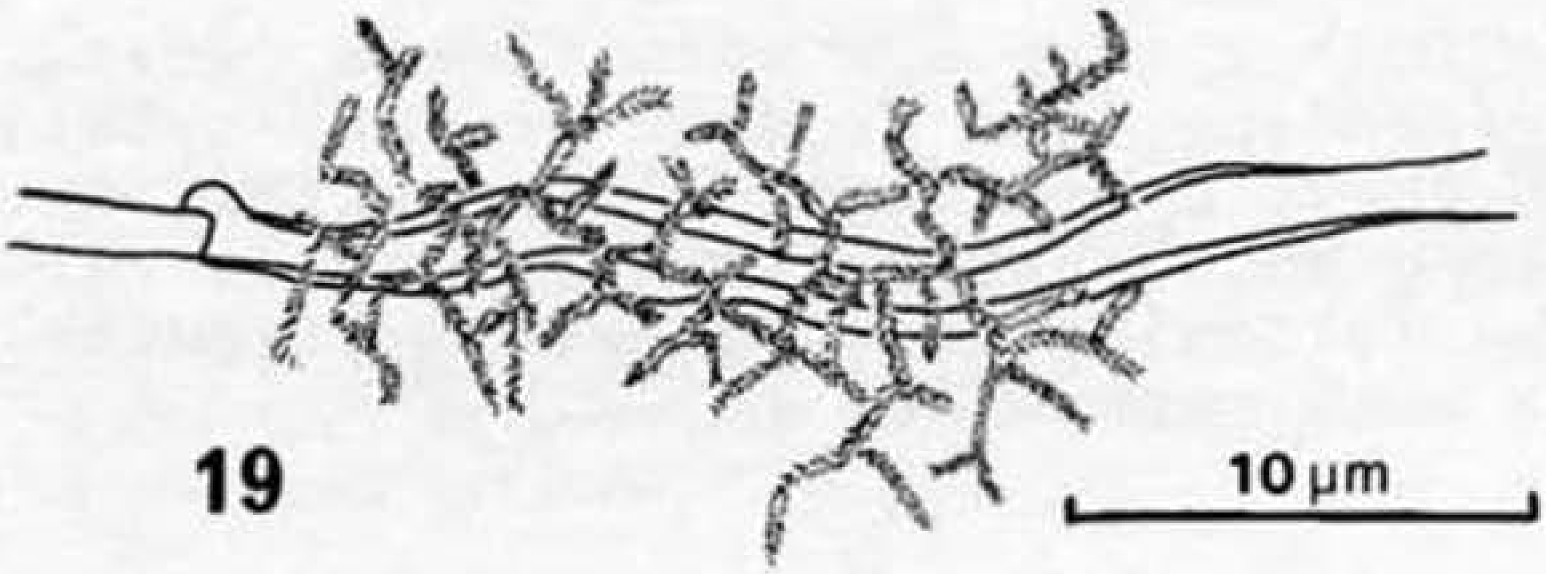
Simple-septate hyphae are, on the contrary, strongly coenocytic with dozens of nuclei in the terminal cells.

When deeply submerged in liquid media (anaerobiosis) the polyspermic mycelium loses completely its clamps and becomes totally coenocytic as in the primary mycelium.

Oxidases: guaiacol 0,02%: ++++ to +++++, 0-1 cm
guaiacol 0,2 %: + to +++ p-crésol: -, tr.
gallic ac.: + to ++++ tyrosine: -

NUCLEAR BEHAVIOR: astatocoenocytic.

CODE: 2a. 3s. 4. 7. 14. 32. 36. (37). 39. 42.43. (48).
50. 54. 59. 65.



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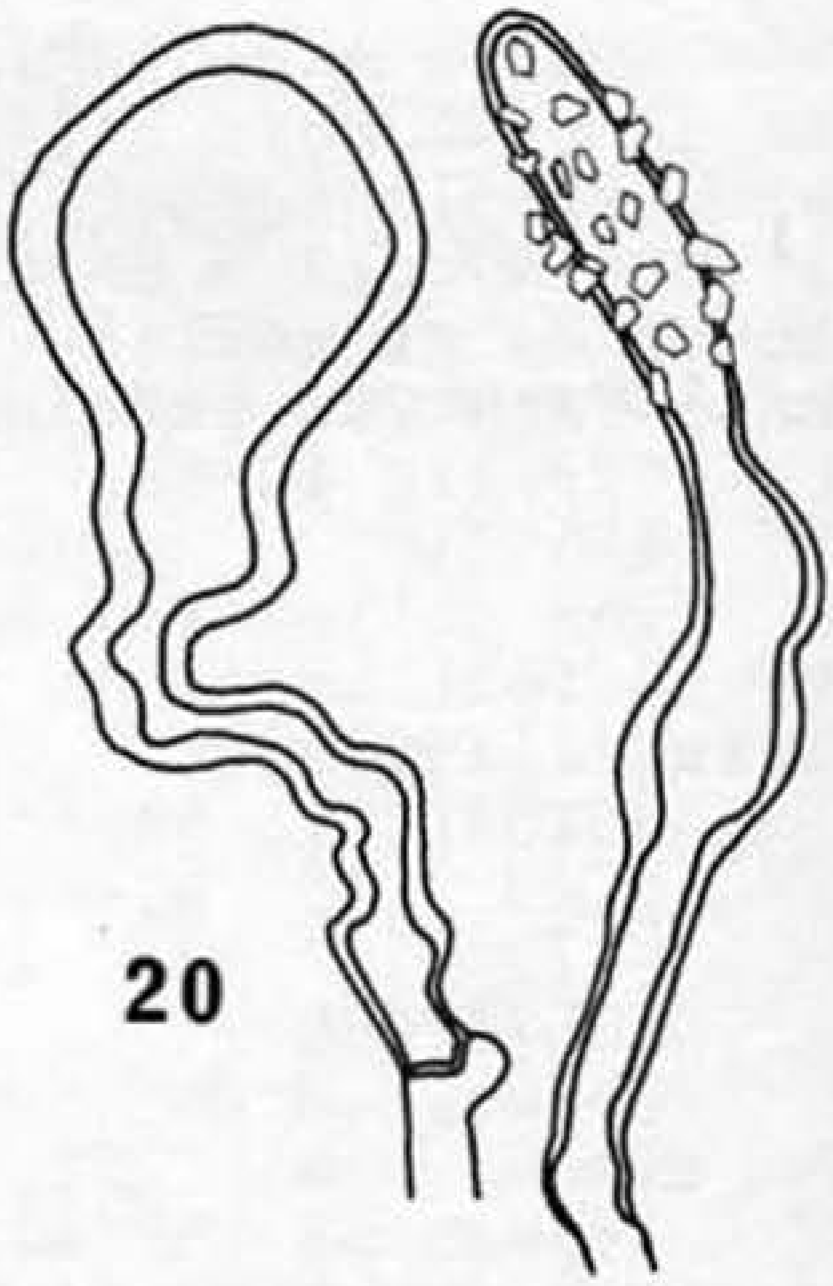

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Figs. 19-20, Poria carneola, cultural characters: 19. 'cloud' of crystals; 20. cystidia presnet in the fructifications.

REMARKS: Poria carneola Bres. had been included by Ryvarden (1972) in Incrustoporia Dom. (a nomenclatural synonym of Skeletocutis Kotl. & Pouz.,see Keller, 1979, and David, 1982 a) because of the presence of incrusted hyphae in tubes and dissepiments. Keller excluded this possibility by showing that the crystal's structure in P. carneola was different from that in Skeletocutis species. On the other hand the strong incrustation present in several hyphae that overpass the hymenium suggests the possibility of considering them intermediate structures with truly incrusted cystidia (lamprocystidia); in such case, a clear relation with species pertaining to Junghuhnia Corda could be established. Nevertheless, cultural, cytological and sexuality data eliminate this possibility and also excludes it from Skeletocutis, i.e., Junghuhnia has tetrapolar species with normal nuclear behavior (David, unpublished) and Skeletocutis has tetrapolar species with heterocytic nuclear behavior (David, 1982a) and both have regularly simple-clamped hyphae in culture.

For these reasons we prefer to maintain P. carneola in the artificial genus Poria until its affinity is more evident.

Poria lenis (Karst.)Sacc.

LYAD 1966 G, As de Pique road, J. Boidin 31.VII.75 .

Porogramme albocincta (Cke. & Massee)Lowe

LYAD 2190 G, Deux Mamelles route, 3.X.76; LYAD 2200 G, Grosse Montagne, Petit Bourg side, 4.X.76; LYAD 2208 G, Morne Léger, 6.X.76.

The species was described by Lowe (1964) and Ryvarden & Johansen (1980); typification problems were treated by Ryvarden (1979). We present here cultural studies made with the polysperms LYAD 2190 and 2208.

POLYSPERM:

Growth: very rapid, dishes covered in 1-2 wk.

Aspect of the mat: margin regular and adherent to the agar. Aerial mycelium adherent to the agar when young, appearing combed, the medium seen by transparence: inoculum surrounded by pure white, cottony mycelium. From the third wk on there appears a chestnut orange coloured crust 2,5YR 6/12 6/10 5/10, 10R 4/10, with pigment diffusion in depth in the agar which exhibits a variety of ochraceous hues tending to red 10R 4/10 5/10, to orange 2,5YR 6/14 6/10 or to yellow 10YR 8/8. With age the texture of the mycelial mat becomes different in both cultures: in LYAD 2190 the coloured crust, not covered by mycelium, is wrinkled--wavy and waxy; in LYAD 2208 the coloured crust is covered with a white cottony mycelium. From the fourth wk on there appears in depth in the agar a bouquet of white rhizomorphs of up to 1 cm long (fig. 20).

Microscopy: margin with simple-clamped generative hyphae of 3-5 µm diam. At 1 cm of the margin there appear a great number of spheric to prismatic thin-walled arthrospores 4-5 times longer than wide. Aerial mycelium, the white zone is formed by: a) simple clamped generative hyphae 1,5-4,5 µm diam. that give rise to b) pseudoparenchyma whose articles are very thick-walled (1,5-2,5 µm), c) regularly branched thick-walled fiber hyphae 0,8-2 µm diam., d) numerous arthrospores. Coloured zone: formed by a much differentiated and separable crust, formed by a pseudoparenchyma whose strong apressed and interwined elements are embedded in an ochraceous amorphous substance. Rhizomorphs are formed by a pseudoparenchyma covered by undifferentiated generative hyphae.

Cytology: articles of the polyspermic mycelium are binucleate. Neohaplonts obtained from the polyspermic mycelia LYAD 2190 and 2208 (grown in bile media) were uninucleate.

Oxidases: guaiacol 0,02%: +++++, 5-6 cm   p-crésol: -
0,2 %: ++++, 4 cm   tyrosine: -
gallic ac.: ++++

NUCLEAR BEHAVIOR: normal.

CODE: 2a. 3c. 8. 11. 16. 35. 36. 37. 39. 40. 41. 42. 54. 61.

REMARKS: cultural characters of P. albocincta are identical to those of Tinctoporellus epimiltinus (Berk. & Br.) Ryv. (see Rajchenberg, 1983 b) having the same texture with coloured crust formation, same microscopic characters, presence of arthrospores and rhizomorphs (the latter not pointed out by Rajchenberg but verified in cultures of the species deposited in Lyon University, LYAD 2283 and LYAD 2284, fig. 21).

Rhizomorphs are not frequently found in axenic cultures of Polyporaceae. Cariological data was the same in both species, the binucleate polyspermic mycelium of T. epimiltinus (LYAD 2283 and 2284) gave uninucleate neohaplonts when grown in bile media and the nuclear behavior was normal in this species. Both species have also similar spore shape and have the particularity of intensively reddening the substratum. It seems therefore quite evident that P. albocincta and T. epimiltinus are two highly related taxa in spite of their respective disposition in the Corticiaceae and Polyporaceae. Nevertheless they are still kept separated because of their different macromorphology and hyphal system.

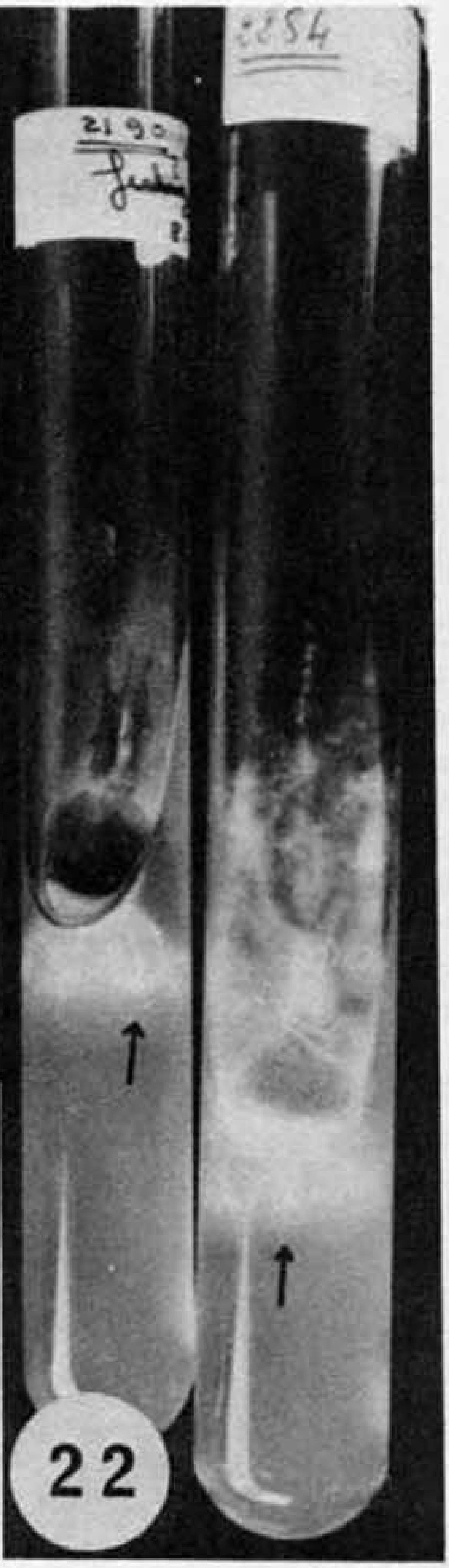

Fig. 21, *Porogramme albocincta*: rhizoids seen in the culture (LYAD 2190) from the reverse side of the dish.
Fig. 22, Rhizoids seen in cultures of *Porogramme albocincta* (left, LYAD 2190) and of *Tinctoporellus epimiltinus* (right, LYAD 2284).

Pseudofavolus cucullatus (Mont.)Pat.
LYAD 2126 G, Petit Bourg, 24.X.76; LYAD 2179 G, Lézarde forest, 30.IX.76; LYAD 1322 M, Précheur region, 19.VII.72 .

Pycnoporus sanguineus (L.:Fr.)Murr.
LYAD 1980 G, Petit David ford, J. Boidin 13.VIII.75; LYAD 2210 G, Morne Léger, 6.X,76.

Pyrofomes aurantiacus David & Rajchenberg sp. nov.
Basidiocarpo annuo vel perenni, resupinato, circulari vel ellipsoideus, in vivo pallido aurantiaco, in sicco castaneo aurantiaco. Poris 8-9 per mm. Margini tenui, anguste vel obsoleto. Contexto angustissimo 30-40 µm lato, tubis in 1-2 stratiis. Systema hypharum dimiticum. Hyphis generativis fibulatis, 1,5-3 µm diam. Hyphis skeletibus sinuatis et ramosis 2-3,5 µm diam., parietes incrassatis leviter castaneis, parce dextrinoideis cyanophilicisque. Basidiis claviformibus, tetrasporis,

12-14 x 5-7 µm. Basidiosporis copiosis, ellipsoideis truncatis 4,5-5,5 x 3-3,5 µm, parietibus leviter incrassatis, indextrinoideis, cyanophilis. Holotypus LY-AD 2492 Guiane Gallica, Lacunae Rorota, Montis Mahury circa Cayenne, leg. P. Berthet 22.X.1968 .

Fruitbody annual to perennial, resupinate, forming circular plates of 1-2 cm diam. or elongated ones 16 x 1 cm, 0,3 mm thick when young, up to 1,5 mm when mature. Pore surface palid orange when fresh 5YR 7/10 becoming chestnut orange when dried (around 2,5YR 5/10). Pores 8-9 per mm (but 6-7 per mm in one young specimen). Context extremely thin 30-40 µm thick, tubes in 1-2 strata each up to 0,6 mm long; both concolorous with pores, darker with 5% KOH. Margin narrow to almost absent.

Hyphal system dimitic. Generative hyphae regularly simple-clamped 1,5-3,0 µm diam., thin-walled. Skeletal hyphae very sinuous and branched, 2-3,5 µm diam., thick-walled, sometimes solid, slightly chestnut, slightly dextrinoid and cyanophilous.

Basidia claviform, tetraspored, 12-14 x 5-7 µm. Spores numerous, ellipsoid and truncate, 4,5-5,5 x 3-3,5 µm (fig. 23) with slightly thickened walls, IKI - ,cyanophilous.

Material studied: LYAD 2482 GI, Rorota Lakes, Mahury Massif, Cayenne environs, P. Berthet 22.X.68 (holotype); LYAD 2483 GI, Cayenne environs, P. Berthet 12.X.68; Chicago Nat. Hist. Mus. Exp. n° 198 (NY), Venezuela, Estado Bolívar, Chimantá Massif, 500-550 mts., 2nd growth clearing at Base Camp along Río Tirica, J.A. Steyermark and J.J. Wurdack 22.I.55 .

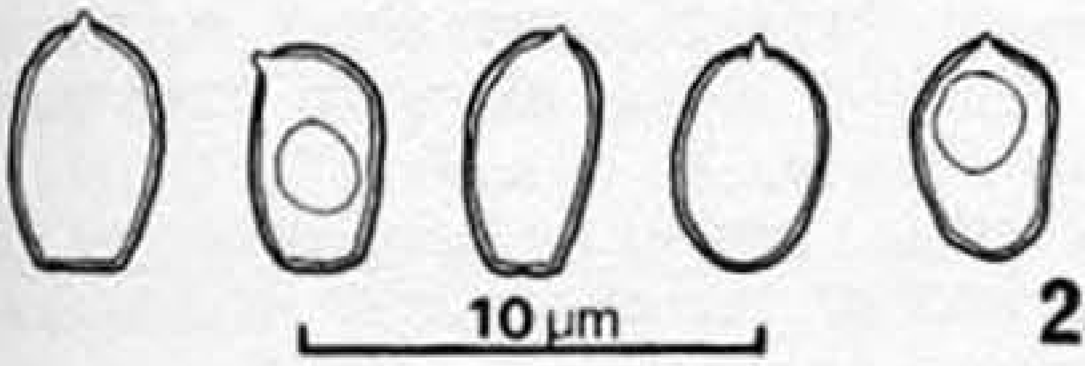

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Fig. 23, Pyrofomes aurantiacus (holotype): spores

REMARKS: this species is placed in Pyrofomes Kotl. & Pouz. only because of the color of the fruitbody. There is a strong possibility that further studies may result in this genus being merged with Perenniporia Murr.

Pyrofomes aurantiacus was found to come close to Fomes fulvo-umbrinus Bres. which was described from Brazil (Blumenau) and also has a resupinate fruitbody with orange tubes and context. The type studied (S !) was identical in microfeatures with Perenniporia gomezii Rajch. & Wright (BAFC !) recently described from northern Argentine (Rajchenberg & Wright, 1982). Only the consistency and color of the fruitbodies are different, being woody and orange in F. fulvo-umbrinus and bony and brown in P. gomezii. Probably different growth and/or drying conditions are responsible for these differences. Fomes fulvo-umbrinus pertains to Pyrofomes Kotl. & Pouz. and the following new combination is proposed: Pyrofomes fulvo-umbrinus (Bres.)David & Rajchenberg comb. nov.; basionym: Fomes fulvo-umbrinus Bres., Hedwigia 35: 280, 1896 (S !), = Perenniporia gomezii Rajch. & Wright, Mycotaxon 15: 306, 1982 (BAFC !). This species differs from P. aurantiacus in having more massive fruitbodies (up to 1,5 cm thick), larger spores 7,3-9,4-(11,5) x

3-4-(4,7) µm, and peculiar thick-walled generative hyphae (see Rajchenberg & Wright, op. cit., for a detailed description).

Other oranged-colored species described from South America are *Pyrofomes lateritius* (Cke.)Ryv. and *P. perlevis* (Lloyd)Ryv. which differ in being pileate and in having subglobose to globose truncate spores (Ryvarden & Johansen, 1980).

Rigidoporus biokoensis (Lloyd)Ryv.

LYAD s.n. GI, P. Berthet X.68, eight collections

Rigidoporus lineatus (Pers.)Ryv.

LYAD 1381 G, Natural Park, Basse Terre, 2.VIII.72; LYAD 1968 G, As de Pique path, J. Boidin 31.VII.75; LYAD 2267 G, Petit Bourg, 11.VII.76; LYAD 1337 M, between Morne Rouge and St. Pierre, 23.VII.72; LYAD 1339 M, Précheur region, 24.VII.72; LYAD 1356 M, between Anse Couleuvre and Grand Riviere, 28.VII.72; LYAD 2240 M, Plateau Michel, 10.VII.76 .

Rigidoporus microporus (Fr.)Overeem.

LYAD 1423 G, Basse Terre, Deux Mamelles route, 8.VIII.72; LYAD 1960 G, Natural Park, Ecrevisses cascade, 29.VII.75; LYAD 1338 M, Anse Couleuvre, 23.VII.72; LYAD 1351 M, Grand Riviere region, 28.VII.72 .

Rigidoporus vinctus (Berk.)Ryv. var. *vinctus*

LYAD 1412 G, Basse Terre, path leading from Grande Savane, 6.VIII.72; LYAD 2145 G, Jules' Forest road, 27.VIII.76; LYAD 2170 G, Lézarde forest, in front of a bamboo forest, 30.IX.76; LYAD 2253 G, Clark's Ravine forest, 10.X.76; LYAD 1315 M, La Trace, 17.VII.72; LYAD 1316 M, Morne Vert, 18.VII.72; LYAD 1362 M, path between Grand Riviere and Couleuvre's inlet, 28.VII.72; LYAD 2228 M, Pointe Rouge forest, 7.X.76 .

Rigidoporus vinctus (Berk.)Ryv. var. *cinereus* (Bres.)Setliff

LYAD 2214 G, Basse Terre, Morne Leger, 6.X.76 .

Schizopora carneo-lutea (Rodw. & Clel.)Kotl. & Pouz.

LYAD 1970 G, J. Boidin, 4.VIII.75; LYAD 2175 and 2184 G, Mamelles crossroad in the path leading from the Forest house, 30.IX.76; LYAD 2280 and 2282 G, Douville, 12.X.76 .

The collections from the French Antilles are very similar to the French ones. Intercompatibility tests or bullerisations were made between cultures coming from both regions (French cultures: LYAD 507, Atlantic Pyrinees, Pau region, on *Fagus*; LYAD 3577, Ain, Rena forest, on *Quercus*, 13.IX.78).

$507_1 \times 2286_6$
$3577_{II} \times 2286_6$
$3577_{IV} \times 2286_6$

$507_1 \times 2184$
$507_1 \times 2282$
$507_1 \times 2175$
$3577_{III} \times 2184$
$3577_{II} \times 2282$
$3577_{II} \times 2184$

All the results were positive which confirmed the cospecificity of all the collections.

Cultural and sexuality data were accomplished by several authors (e.g., Van der Westhuizen (1971), Domański (1969), and Stalpers (1978)). We shall only add here data referring to the nuclear behavior: spores are uninucleate and give rise to simple septate mycelium with uninucleate articles; polysperm cultures are regularly dikaryotic. Nuclear behavior is, then, of the normal type.

Spongiporus af. *leucomallellus* (Murr.)David
LYAD 2161 G, Grand Montagne Forest road, 30.IX.76 .

Our collection consists of a small fruitbody of 2 x 4 cm that presents the distinctive elements of *S. leucomallellus*: gloeocystidia that are more frequent at the bottom of the tubes. The only difference is the thin walls of the gloeocystidia. In typical material the walls are thicker.

Tinctoporellus *epimiltinus* (Berk. & Br.)Ryv.
LYAD 1964 G, Ecrevisses cascade, J. Boidin 29.VII.75; LYAD 2283 and 2284 G, IX.76 .

Trametes *maxima* (Mont.)David & Rajchenberg comb. nov.
Basionym: *Irpex* *maximus* Mont., Ann. Sci. Nat. II, 8:364, 1837 .
LYAD 2131 G, Pointe Rouge de la Vigie, IX.76; LYAD 2191 G, St. Anne surroundings, 3.X.76; LYAD 1324 M, north of Précheur, 20.VII.72 .

Tetrapolar polarity and normal nuclear behavior (data obtained from LYAD 2131) exclude this species from *Cerrena* S.F. Gray where it was transfered by Kreisel (1971), because the type species, *C. unicolor* (Fr.)Murr., has binucleate spores (David, 1982 b).

Trametes *membranacea* (Sw.:Fr.)Kreisel
LYAD 1411 G, Basse Terre, path in the Sofaia region, 7.VIII.72; LYAD 1962 G, Ecrevisses cascase, J. Boidin 29.VII.75; LYAD 2139 G, Basse Terre, Jules' Forest road, 27.IX.76; LYAD 2156 G, Grosse Montagne Forest road, 30.IX.76; LYAD 2213 G, Basse Terre, road at right after beginning of Deux Mamelles route, 6.X.76; LYAD 1334 M, Montravail Forest, 22.VII.72; LYAD 1353 bis M, Grande Riviere region, 28.VII.72; LYAD s.n. M, Fort de France, 2 collections.

This species was described by Overholts (1953) as *Polyporus tenuis* (Sacc.)Overh. It differs from other typical *Trametes* Fr. species because its hyphal system has: a)skeletal hyphae 5-10 µm diam., unbranched, with thickened walls 0,5-2 µm but usually with a distinct lumen, b) typical binding hyphae, and c) vegetative hyphae with an intermediate structure between a and b, i.e., they appear as skeletal hyphae 4-8 µm diam. but with few to abundant short to long lateral almost solid branches 2-3 µm diam. (fig. 24).

We give here the cytological, cultural and sexuality data obtained from LYAD 1411, LYAD 2139 and BAFC 448 (Argentine, Misiones, Iguazú Nat'l Park, leg. M.Rajchenberg M-3486, 1.III.82).

SPORES AND GERMINATION: spores are uninucleate and germinate in 1-4 days, giving rise to simple septate hyphae with uninucleate articles.

SEXUALITY: tetrapolar,
LYAD 1411: A_1B_1: 1-6-8-9-12-16-17

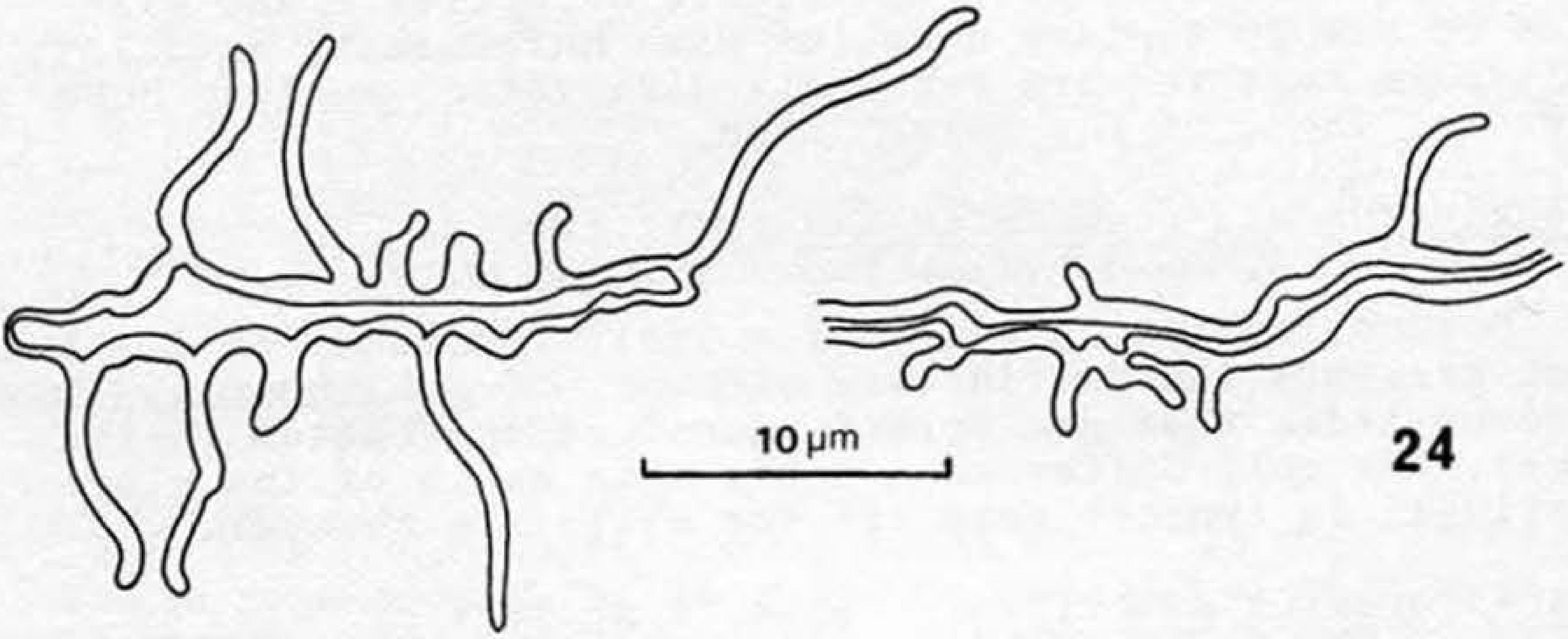

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Fig. 24, Trametes membranacea: vegetative hyphae with intermediate structure between skeletal and binding hyphae.

LYAD 1411: A_2B_2: 2-4-5-10
A_1B_2: 3-7-15
A_2B_1: 13-14
BAFC 448 : A_1B_1: 5-8 A_2B_2: 2-3-10
A_1B_2: 4-7 A_2B_1: 1-6-9

POLYSPERM:

Growth: rapid, covering the dishes in 2 wk.

Aspect of the mat: margin of regular growth and adherent to the agar. Aerial mycelium pure white, evenly raised, with slightly snowy aspect and with radial striae that begin in the inoculum and dissapear with age; mycelium cobwebby, felty, with denser zones forming clusters that are more developed in the center and around the dishes. In BAFC 448 zones with white dense and pellicular mycelia are formed which are surrounded by waxy zones deprived of mycelium in the last weeks. Reverse bleaching from the first week on. Fructifications are formed from the 5th wk. on. Odor: none or fungic.

Microscopy: margin formed by simple clamped, little branched generative hyphae 2,5-5 µm diam. Aerial hyphae formed by similar generative hyphae and others more branched and irregular with swollen portions 5-6-(10) µm diam., narrower ones 2-3 µm diam. All the hyphae are regularly simple-clamped and several hyphae have lipidic granulations in the innerside of the walls and are covered with bacilliform crystals. In BAFC 448 fiber hyphae 1,5-4 µm diam. appear in the white mats; underneath and in the waxy areas a pseudoparenchyma develops that may cover all the dish. During the last weeks it becomes a plectenchyma because of the tight intermingling of cuticular hyphae with numerous sclerified and protuberant generative hyphae.

Cytology: articles are regularly binucleate.

Oxidases: guaiacol 0,02%: +++++ p-crésol: -
0,2 %: + tyrosine: -
gallic ac.: +++++

NUCLEAR BEHAVIOR: normal.

CODE: 2a. 3c. (8). (11). 32. 36. 40. 42. 48. 54. 60. 61.

REMARKS: bullerisations made between the monosporic cultures BAFC 448_{6-8} and the polysperm LYAD 2139 were positive.

Trametes modesta (Kunze ex Fr.)Ryv.
LYAD 1364 G, Deux Mamelles route, 30.VII.72; LYAD 1420, ibid., Natural Park, 9.VIII.72; LYAD 2116 G, Corrossol region, 24.IX.76; LYAD 2121 G, Piolet Village in Deux Mamelles route, 25.IX.76; LYAD 2146 G, Jules' Forest road, Basse Terre, 17.IX.76; LYAD 2263 G, Jules' road, J. Boidin 8.X.76; LYAD 2272 G, Douville, 12.IX.76; LYAD 2279 G, Morne a Louis, X.76; LYAD 686 GI, Crique Grégoire, P. Berthet X.68 .

Trametes pavonia (Hook. in Kunth.)Ryv.
LYAD 1342 M, Montravail forest, 25.VII.72; LYAD 1314 M, La Trace, on Bambuseae, 17.VII.72; LYAD 2149 G, Petit Bourg, IX.76; LYAD 2271 G, Douville,12.X.76; LYAD s.n. M, Fort de France, 2 collections.

Good descriptions of this species were given by Overholts (1953) and Fidalgo & Fidalgo (1966). Rajchenberg (1982) gave cultural data. Observations made on LYAD 1314 and 2149 showed that the species is tetrapolar with a normal nuclear behavior.

Trametes scabrosa (Pers.)Cunn.
LYAD s.n. GI, P. Berthet X.68; LYAD s.n. GI, Lassore Park, leg. S. Lucas .

Trametes villosa (Fr.)Kreisel
LYAD 2130 G, Pointe de la Vigie, 26.IX.76; LYAD s.n. GI, Cayenne, P. Berthet X.68, on Pagode tree; LYAD 1311 M, Fort de France, 16.VII.72; LYAD s.n. M, Fort de France, 3 collections.

Observations made from LYAD 2130 revealed that the species is tetrapolar with a normal nuclear behavior.

Trechispora regularis (Murr.)Liberta
LYAD 2254 G, Douville, 7.X.76 .

Trichaptum perrottetii (Lév.)Ryv.
LYAD 670 GI, P. Berthet X.68 .

See David (1970) for cultural, sexuality and nuclear behavioral data, under T. trichomallum (Berk. & Mont.)Murr.

Trichaptum sector (Ehrenb.:Fr.)Kreisel
LYAD 1375 G, Deux Mamelles route, 31.VIII.72; LYAD 1959 G, Gosier, J. Boidin, 27.VII.75; LYAD 668 GI, Crique Grégoire, P. Berthet X.68; LYAD 1716 and 1723 GI, Crique Grégoire, P. Berthet 22.I.74; LYAD 2479 GI, Sinamary, Vaudet's exploitation, on Amaranthaceae, S. Lucas VI.82 .

David (1970) published the cultural, sexuality and nuclear behavioral studies of this species.

Tyromyces duracinus (Pat.)Murr.
=Leptoporus duracinus Pat. (FH !)
LYAD 1968 G, starting of Victor Hughes' path, on the extremity of a dead stem, J. Boidin 2.VIII.75 .

Our collection fit very well the type and the descriptions given by Overholts (1953), Lowe (1975) and Ryvarden & Johansen (1980). Only the nature of the hyphal system needs explanation because Ryvarden & Johansen described it as probably monomitic "generative hyphae with clamps... present also are some thick walled hyphae with rare clamps, in preparations these hyphae break off at the clamps and the long segments may easily be taken for skeletal hyphae". In fact, the hyphal system in the context is different from that in the trama. Although rare clamps may be seen on the 'skeletal hyphae' in the context, the hyphal system in the trama is distinctly dimitic. Also rare binding-like hyphae were seen in the type of Leptoporus duracinus Pat. (n° 958 herb. Patouillard, FH !) (fig. 25) but they may have been branched terminal hyphae of generative hyphae

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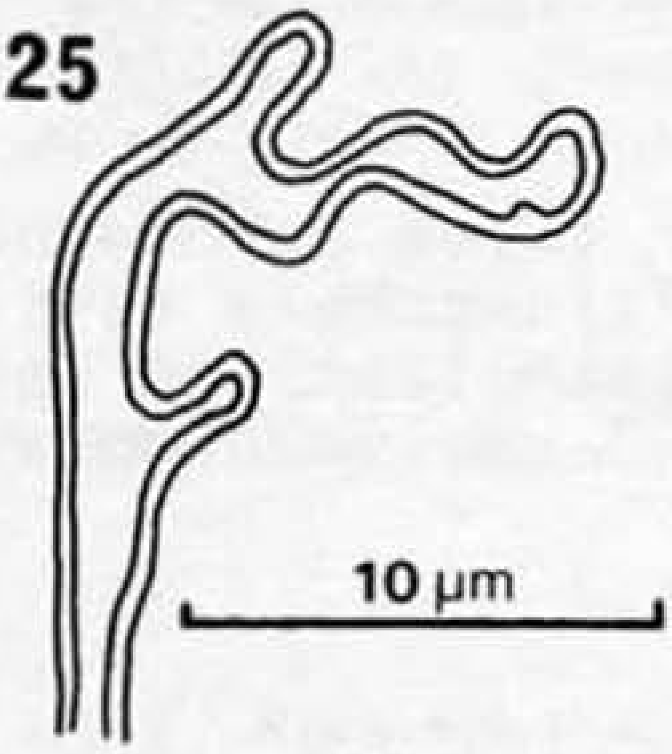


Fig. 25, Leptoporus duracinus (holotype): binding like hyphae .

Tyromyces palustris (Berk. & Curt.)Murr.

LYAD 1425 G, Deux Mamelles route, 10.VIII.76; LYAD 2141 G, Basse Terre, Jules' Forest road, 29.IX.76; LYAD 2159 and 2160 G, Grosse Montagne, Forest road, 30.IX.76; LYAD 2194, on a pilar in St. Anne plantation, 3.X.76; LYAD 2265 G, Amandiers' beach near St. Rose, 9.X.76; LYAD 2465 and 2468 GI, St. Laurent, S.Lucas I.82; LYAD 1310 M, Fort de France, 16.VII.72 .

Polyporus palustris was described by several workers, Overholts (1953), Bakshi (1971), Lowe (1975) and Wright et al. (1973) among others. Their opinions differ on the mitism of the species; for Lowe it is trimitic but Wright et al. describe a "sistema hifal monomítico..." . Our investigations with our collections and one exsiccata sent by Dr. Lowe (P. palustris n° 4826, U.S.A., Mississipi, on pine stump, leg. & det. J.L. Lowe 8.VIII.51) revealed the presence of solid hyphae that only differ from typical skeletals by the presence of clamps. The species seems to have a pseudodimitic hyphal system.

The monosporic cultures obtained from LYAD 1310 and LYAD 1425 were all intercompatible and also compatible with those obtained from the culture from CBS n° 28365 (P. palustris, leg. H.H. Mc Kay, on Pinus sp.) which fructified in culture.

NUCLEAR BEHAVIOR: the uninucleate spores germinate in 2-3 days giving rise a simple septate mycelium with uninucleate articles; the polysperm is regularly binucleate in each article. Nuclear behavior is, then, normal.

REMARKS: the affinities of T. palustris are still not clear. It can not be included in Tyromyces Karst. sensu stricto (as defined by David, 1980) because it produces a brown type of rot). The bipolar sexuality and the rapid germination of the spores excludes it from Spongiporus Murr. emend. David. It may be allied to the species in groups n° 18 and 19 of Nobles (1958). These species are grouped toghether in Stalpers' work (1978), but studies on the sexuality, nuclear behavior and cultural characters as well as of the mitism of these species should clarify this possibility.

Tyromyces pusillus (Fr.)Cunn.
LYAD 2258 G, Douville, J. Boidin 7.X.76 .

Wrightoporia brunneo-ochracea David & Rajchenberg sp. nov.

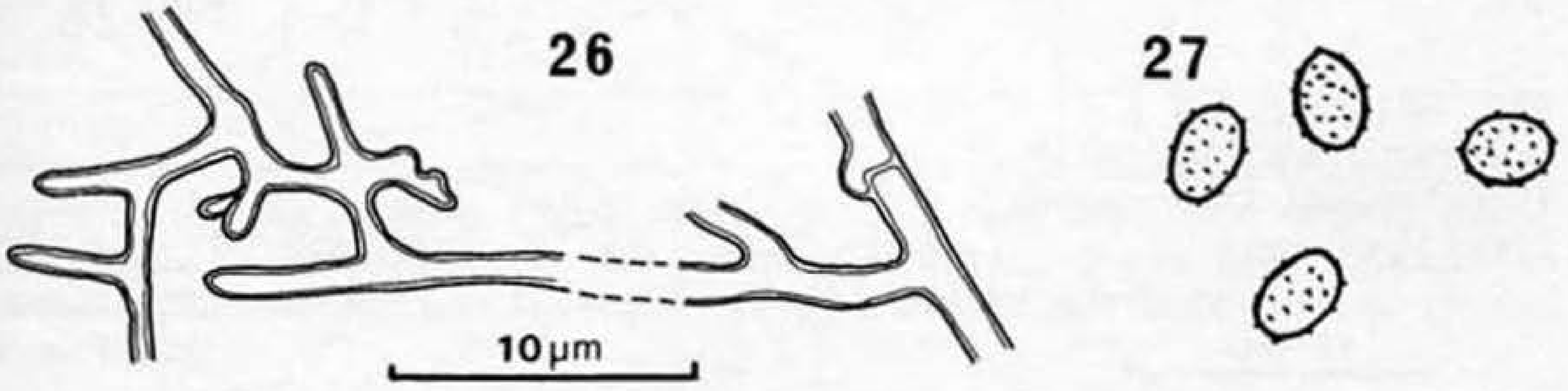
Basidiocarpo annuo effuso-reflexo, pileo 1 cm radii et 7 mm crasso, superficie gossypina, scruposa, castanea. Poris 4-5 per mm, ochraceis. Contexto bicolorato. Margine sterile gossypino. Hyphis skeletibus contextus 2-6 µm diam. indextrinoideis' hyphis generativis fibulatis 2-3,5 µm diam. non ramificatis vel tenuis ramificatis 1-1,5 µm diam. parietes tenuis vel leviter incrassatis aseptatis et hyphis colligantibus simulans. Trama cum structuram similaris sed hyphis skeletibus dextrinoideis. Basidia non visu. Basidiolis claviformibus 7-10 x 4-5 µm. Sporae numerosae, ellipsoidae, asperulatae, 3-3,5 x 2 µm, amyloideae. Holotypus LY-AD 1415, Guadeloupe, Grande Savane, leg. A. David 6.VIII.1972 .

Fruitbody annual, effused-reflexed, with a pileus of 1 cm radius and 7 mm thick, abhymenial surface cottony, scrupose, chestnut 5YR 5/8 4/8, lighter at margin 10YR 8/6. Pore surface ochraceous 10YR 7/4. Pores irregular, 4-5 per mm, sometimes open and elongated up to 2 mm long. Context bicolored: one thin layer placed over the tubes and concolorous with them and the pore surface and one thicker and darker layer concolorous with the abhymenial surface 5YR 5/6. Margin sterile and cottony.

Hyphal system subtrimitic. Context with slightly chestnut, unbranched skeletal hyphae 2-6 µm diam., indextrinoid, and generative hyphae regularly simple-clamped 2-3,5 µm diam. with thin to slightly thick walls, that may give rise to narrower hyphae 1-1,5 µm diam. with slightly thickened walls and clamps near the generative hyphae but lose them in the distal, much branched extremities (fig. 26); this kind of hyphae may be taken for binding. Trama with almost identical structure but skeletal hyphae are strongly dextrinoid and binding hyphae are less numerous.

Basidia not seen. Basidioles claviform 7-10 x 4-5 µm. Spores very abundant, ellipsoid with hyaline, slightly thickened walls, 3-3,5 x 2 µm asperulate (when seen with Melzer's reagent, but smooth when seen with 5% KOH solution), strongly amyloid (fig. 27).

Holotype: LYAD 1415 G, in a path in the Grande Savane region, on a vertical support, leg. A. David 6.VIII.1972 .



Figs. 26-27, Wrightoporia brunneo-ochracea (holotype): 26. binding-like hyphae; 27. spores .

AFFINITIES: this species has been included in Wrightoporia Kotl. & Pouz. because of the dextrinoid reaction of the skeletal hyphae of the trama. In fact the species presents intermediate characters between Wrightoporia Kotl. & Pouz. (with dextrinoid skeletal hyphae in the trama) and Amylonotus Ryv. (with indextrinoid and slightly chestnut skeletals in the context), thus the features which delimit these genera are uncertain.

Wrightoporia tropicalis (Cke.)Ryv.
LYAD 2143 G, Jules' Forest road, 27.IX.76 .

Descriptions of this species were given by Lowe (1966), Ryvarden (1982) and Ryvarden & Johansen (1980). The principal features of the species are: fruitbody resupinate and perennial, up to 1,5 cm thick, with indurated trama and dark greyish pore surface (but dark brown in the margin); dimitic hyphal system with simple septate generative hyphae and slightly dextrinoid skeletals; spores largely ellipsoid to subglobose, 3-4 x 2-3 µm, amyloid and finely asperulate; with incrusted cystidia and sulfo positive gloeocystidia.

Wrightoporia gloeocystidiata Johan. & Ryv. described from Kenya was placed in synonymy with Poria tropicalis (Cke.)Rick described from British Guiana (Ryvarden, 1983). In the same work Ryvarden pointed out some differences between the American and the African collections: a) absence of gloeocystidia in the American material; b) difficulty in finding clamps in the African collection whereas clamps were easier to find in the American specimens.

Our collection was compared with one from Ryvarden's herbarium (Kenya n° 9787) and another from NY (Venezuelan Expedition 1950-51 n° 29375, Amazonas, Río Orinoco, Río Cunucunuma, Playa Alta, 100 mts, leg. B. Maguire, R.S. Cowan and J.J. Wurdack 3.XI.50). From this study we can conclude that: a) All the collections have sulfo positive gloeocystidia; b) American collections differ in having abundant spheroid masses of crystals 15-20 µm diam. After dilution in acid the crystals were concentrically arranged around an amorphous substance which is itself disposed on the sharpened extremity of skeletal hyphae (fig. 28). These cystidia, already cited by Lowe were not seen in the African collection and distinctly separate South American and African materials; c) No clamps were found in any collection in spite of a persistent search .

28

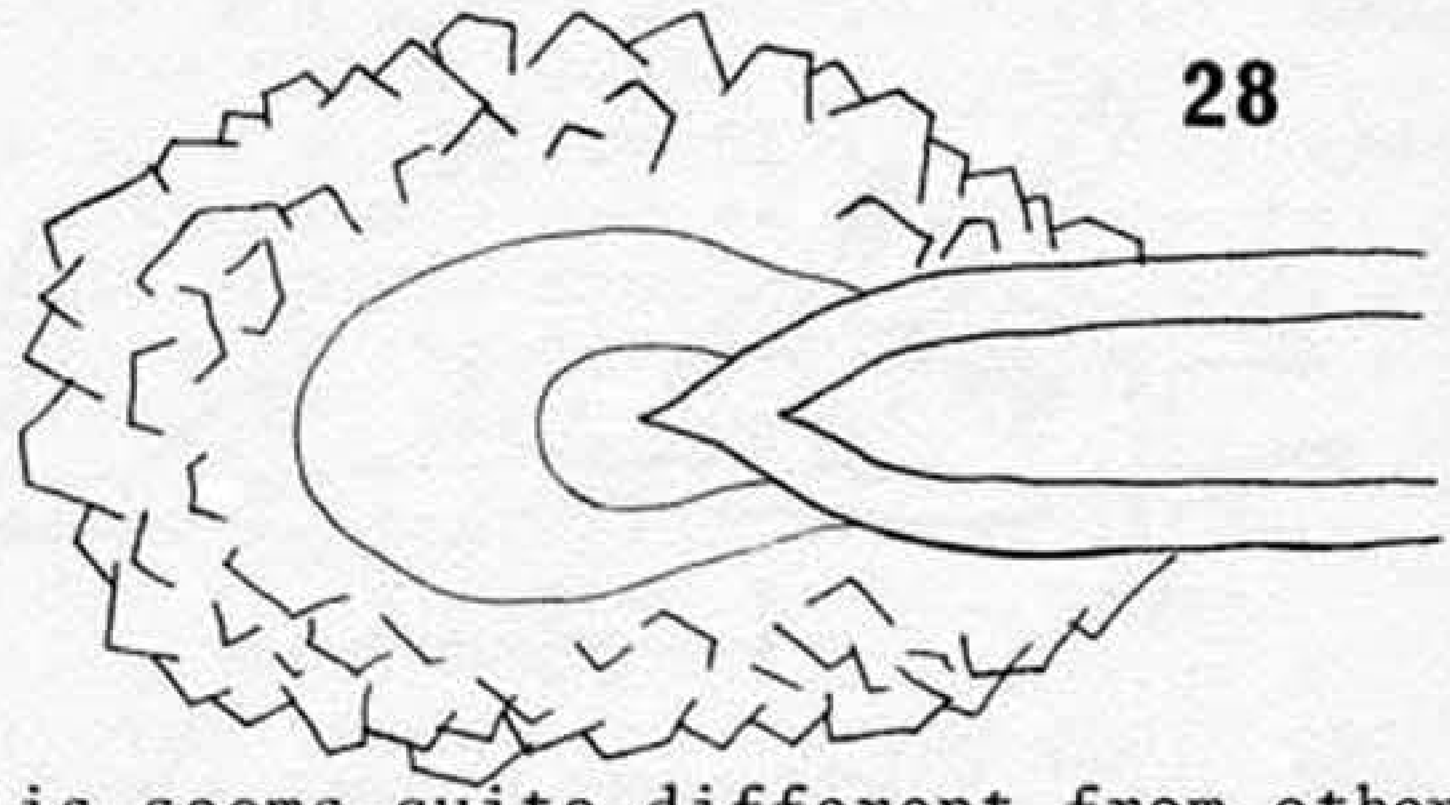


Fig. 28,
Wrightoporia tropicalis (neotropical collection): cystidium .

Wrightoporia tropicalis seems quite different from other members of the genus because of its massive habit and the absence of clamps. We want to emphasize that the assemblage of highly specialized characters (ornamented amyloid spores plus sulfo positive gloeocystidia) is also found in other genera and families of very different Hymenomycetes (Gluschoff-Fiasson et al., 1983).

TREMELLACEAE

Aporpium dimidiatum David (LY !)

LYAD 2158 G, Grosse Montagne, Forest road, 30.X.76; LYAD 2220 M, Pointe Rouge forest, 7.X.76; LYAD 2245 M, in a plantation in Michel Plateau, 10.X.76 .

CONCLUSIONS

This work presents the list of species of Polyporaceae and other pore fungi gathered in the French Antilles principally during two expeditions of one month each during 1972 and 1976. This study has shown to have multiple interests. We have described five new species. For one of them, *Wrightoporia brunneo-ochracea*, the choice of a genus was not easy and we have hesitated between *Amylonotus* and *Wrightoporia* because the delimitation of both genera seems uncertain. In a similar way *Pyrofomes aurantiacus* was placed in that genus only because of macroscopic characters. *Wrightoporia tropicalis* and *W. gloeocystidiata* have an assemblage of characters (amyloid ornamented spores and sulfo positive gloeocystidia) which are found in other genera and families of Hymenomycetes morphologically different.

Judged by their European representatives the relation of the genera *Antrodiella* Ryv. & Johans. and *Rigidoporus* Murr. seems remote but the study of the tropical species has shown that these genera could be interrelated through the genera *Flaviporus* Murr. and *Henningsia* Möller, as is shown by the following table:

	Agglutinated hyphae	presence of clamps	spores	
			size	cyanophily
Antrodiella	-	+*	< 4-5 µm	-
Flaviporus	+	+	< 4-5 µm	-
Henningsia (after Ginns 1979)	+	-	< 4-5 µm	+
Rigidoporus	+	-	> 4-5 µm	+

***Antrodiella onychoides* (Egel.)Niemelä is a species whose hyphae are deprived of clamps but the fact that the articles are all uninucleate permits the assumption that the species may be parthenogenetic (David, unpublished).

In the genus *Rigidoporus* the articles are slightly coenocytic. *Flaviporus subundatus* presents all the characters of the genus *Flaviporus* but generative hyphae are simple-septate and their articles are also slightly coenocytic as in *Rigidoporus*. *R. dextrinoideus* Johans. & Ryv., a species described from tropical East Africa, has acyanophilous ellipsoid spores which are intermediate in size between those found in *Rigidoporus* and *Flaviporus*. All these intergradations show the probable interralation between these genera and stress the need to deepen the investigations, notably in the sense of cultural and cytological studies to solve taxonomic problems. When possible we have performed interfertility tests and studied nuclear behavior and cultural features. Such data are unknown in many tropical species.

The genus *Hapalopilus* Karst. is astatocoenocytic according to the European species, *H. croceus* (Fr.)Donk and *H. nidulans* (Fr.)Karst. and the same nuclear behavior was found in the tropical *H. albo-citrinus* (Petch)Ryv.

Sometimes unsuspected affinities are pointed out through the study of cultures as was the case in the presence of colored crusts and rhizomorphs in the cultures of *Porogramme albocincta* and *Tinctoporellus epimiltinus*. Once again it is shown that the hymenial configuration ought not to be considered an absolute character for family delimitation in Aphyllophorales.

The few interfertility tests that could be performed proved the identity of the French Antillean and Argentine collections of *Grammothele subargentea*, *Nigroporus vinosus* and *Loweporus tephroporus* (the latter also compatible with an African collection) which is not surprising since they came from New World countries. Tests also proved the conspecificity of French Antillean and European collections of *Schizopora carneo-lutea*.

The species collected in the French Antilles and Guiana were strictly neotropical, or pantropical or some were cosmopolitan in distribution. Interfertility criteria will solve problems of synonymy and clarify the patterns of distribution, and even evolution, of many species and genera. It is difficult to obtain cultures of many species from different countries and in consideration of the enormous task that this type of study implies it seems highly desirable that more collaboration should be established among mycologists interested in tropical floras.

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ADDENDUM

Mycologists with the possibility of making shipments of fresh materials and/or spore prints from specimens of Polyporaceae are invited to join in monographic studies of any group in this family.

Collaboration should result in a scientific article. A. David is now engaged in the study of the genera *Perenniporia* Murr., *Nigroporus* Murr. and *Loweporus* Wright. M. Rajchenberg is interested in *Poria sensu lato*, stipitate polyporoids and *Microporellus* Murr.

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BASIDIOMYCETES THAT DECAY GAMBEL OAK IN SOUTHWESTERN COLORADO

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SUMMARY

Thirty wood-rotting Basidiomycetes are illustrated and described as decay fungi on Gambel oak (*Quercus gambelii* Nutt.) in southwestern Colorado. No brown rot fungi are included. *Inonotus andersonii* (Ell. et Ev.) Černy plays a role in creating habitats for cavity-nesting birds.

Gambel oak, *Quercus gambelii* Nutt., is the most abundant oak in the Four Corners area (at the intersection of state lines of Arizona, Colorado, New Mexico, and Utah). It extends northward throughout western Colorado at altitudes ranging from 990 to 3050 m and occurs in extreme southcentral Wyoming; its range extends father north into the Utah panhandle, but it does not occur in the Uinta Mountains or the Great Basin area of Western Utah. All parts of Arizona and New Mexico, except the extreme west-southwest and east-southeast respectively, are included in the range of Gambel oak (Christensen, 1949; Christensen, 1949b). Records also exist from northern Sonora, Mexico, and extreme southern Nevada. Other *Quercus* spp. occur within the range of Gambel oak, but these occur mainly in southern Arizona and New Mexico.

Although Gambel oak is an important browse plant for deer and domestic animals such as sheep, and although it provides nesting sites for various animals, including cavity-nesting birds, there has been a concerted effort by range improvement groups to eradicate oak brush. In many cases eradication of brush has been demonstrated to increase beef gains dramatically (Marquiss and Norris, 1967).

Gambel oak is increasing in importance as a fuel species. Next to piñon pine, *Pinus edulis* Engelm., Gambel oak produces the hottest fire of any native wood in the area. Stands of oak are easily accessible and plentiful for wood cutters.

Gambel oak is host to a large number of wood-rotting fungi in the Subdivision Basidiomycotina. These fungi include both parasites and saprophytes and are most conspicuous during the August - September rainy periods in southwestern Colorado. This paper is intended to be the first of a series enumerating and illustrating these fungi and describing their role in the ecology of Gambel oak.

Microscopic observations were made from free-hand sections and crush preparations in 3% KOH and phloxine. Camera lucida drawings were made with an Olympus LHB microscope. Numerical color names are from Munsell's Book of Color (Munsell, 1976); descriptive color names are the author's.

List of Species that Decay Gambel Oak

ALEURODISCUS CERUSSATUS (Bres.) Höhn. et Litsch., K. Akad. Wiss. Wien Math.- Nat. Kl. Sitzungsb. 116: 807. 1907.
Basidiocarps on decorticated wood, resupinate, irregularly effused, buff to pinkish-buff in older regions (5YR 8/4 to 7.5YR 8/4), cracking on drying; margin white, thinning out to abrupt, not fertile. *Hyphal system* monomitic; subicular hyphae thin-walled, nodose-septate, 2-3.5 µm diam. *Pseudocystidia* embedded, mammillate, some moniliform, with refractive contents, with a basal clamp, 49-66 x 10-13 µm. *Acanthohyphidia* abundant, barely projecting, some thick-walled in the lower portions, with a basal clamp, (18)-30-40 x 2.5-7 µm. *Basidia* in a catahymenium, slender-clavate, 4-sterigmate, some with lateral acanthophysis-like projections, with a basal clamp, 40-42 x 6-7 µm. *Basidiospores* hyaline, smooth, amyloid in Melzer's reagent, ovoid to ovoid-ellipsoid, 6-8 x 4.5-5.5 µm. *Voucher specimen* - JPL 1167.

ATHELIA BOMBACINA Pers., Mycol. Eur. I:85. 1822.
Basidiocarps effused-resupinate, bright white (near 5PB 9/1); hymenium pellicular; margin narrow to lacking. *Hyphal system* monomitic; subicular hyphae nodose-septate, thin-walled, hyaline, encrusted, 2-3 µm diam. *Sterile hymenial elements* lacking. *Basidia* clavate, 4-sterigmate, with a basal clamp, 16-18 x 4.5-5.5 µm. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, narrowly ellipsoid to pip-shaped, with a distinct apiculus, 5-6 x 2-3 µm. *Voucher specimen* - JPL 1109.

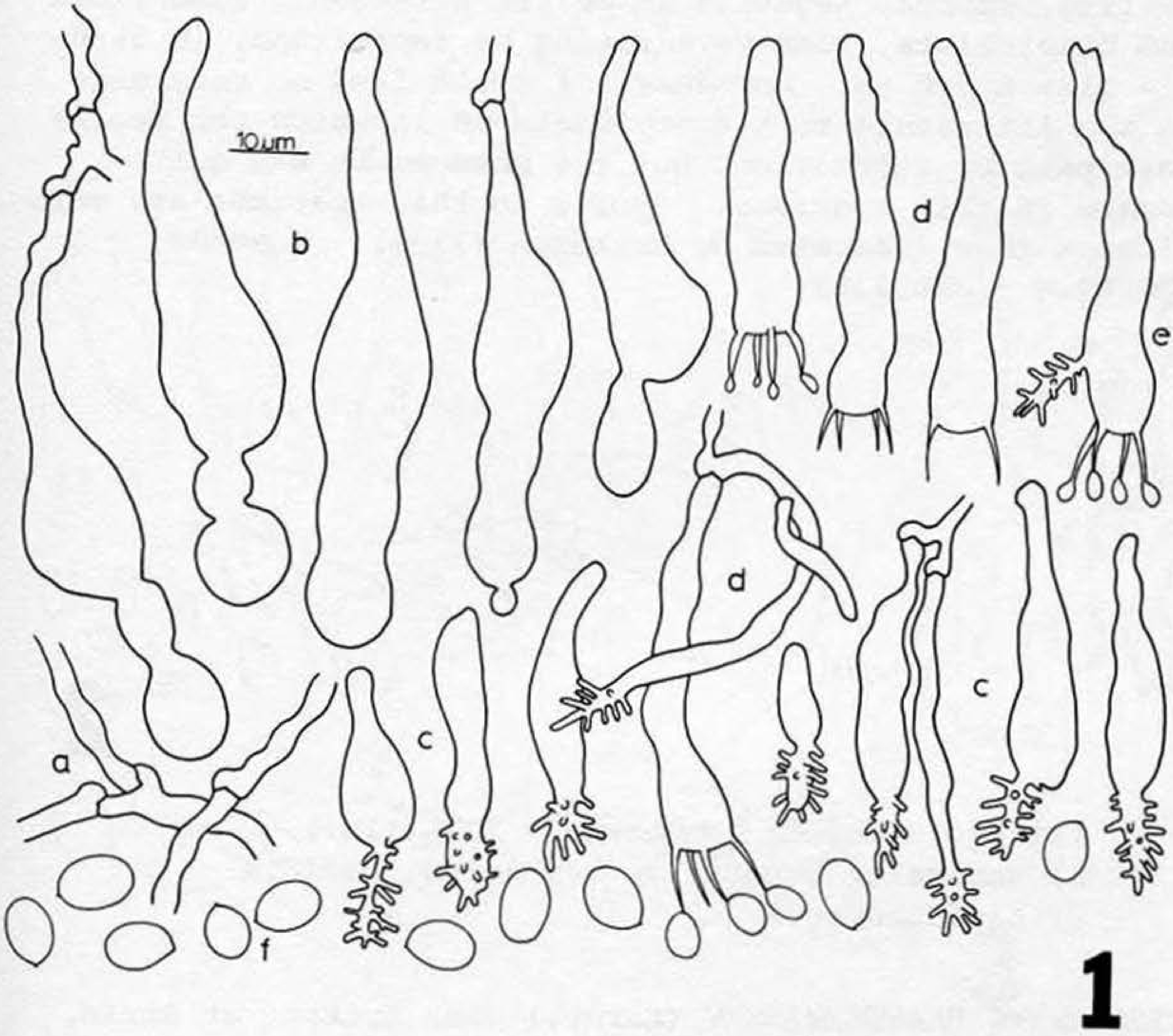

Fig. 1. *Aleurodiscus cerussatus.* (JPL 1167). a) subicular generative hyphae; b) pseudocystidia; c) acanthohyphidia; d) basidia; e) basidium with acanthophysis-like branch; f) basidiospores.

BOTRYOBASIDIUM BOTRYOSUM (Bres.) John Erikss., Symb. Bot. Upsal. XVI:1, p. 53.

Basidiocarps resupinate, mealy to hypochnoid, becoming widely effused, pale yellowish-gray (near 5Y 8.5/2), on bark. *Hyphal system* monomitic; subicular hyphae simple-septate, thin-walled, hyaline, 6-7.5 µm diam; basal hyphae similar but thick-walled. *Sterile hymenial elements* lacking. *Basidia* short-clavate, 4-6 sterigmate, with a simple septum at the base, 15-23 x 7-10 µm. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, limoniform and biapiculate, some germinating by repetition, (6.5)-8-9 - (12) x 5-6 µm. *Comments* - I could find no reference in the literature to a *Botryobasidium* in which the spores germinate by repetition, but the phenomenon was quite common in this specimen. Spores in this specimen are more globose than indicated by Eriksson (1973). *Voucher specimen* - JPL 1165.

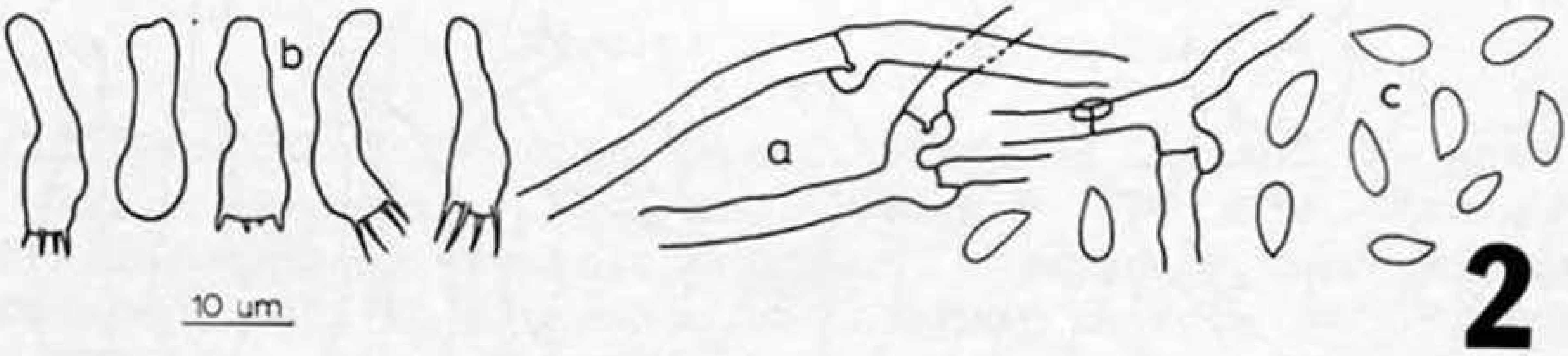

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Fig. 2. *Athelia bombacina.* (JPL 1109).
a) subicular generative hyphae; b) basidia;
c) basidiospores.

HYPHODERMA PRAETERMISSUM (Karst.) John Erikss. et Strid, in John Erikss. et Ryv., The Corticiaceae of North Europe 3:505. 1975.

Basidiocarps bright white, effused-resupinate, appearing floccose to arachnoid under a 30X lens; margin abrupt, fertile. *Hyphal system* monomitic; subicular hyphae thin-walled, nodose-septate, 3-5 µm diam. *Cystidia* capitate, thin-walled, projecting, with a basal clamp, 55-65 x 3.5-6 µm. *Gloeocystidia* embedded, fusiform, sinuous, thin-walled, with a basal clamp, 50-88 x (5)-6-10 µm. *Stephanocysts* embedded in deep subiculum, two-parted, the terminal cell thin-walled, expanded and balloon-like, the subterminal cell smaller, with a ring of spine-like projections subtending the terminal cell, and with a basal clamp, 22-24 x 12-13 µm, some appearing to germinate. *Basidia* cylindric-clavate, 4-sterigmate, 28-36 x 6.5-8.5 µm, with a basal clamp. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, ellipsoid-cylindric, somewhat allantoid, 7-9 x 4-5 µm. *Voucher specimens* - JPL 1071, JPL 1175.

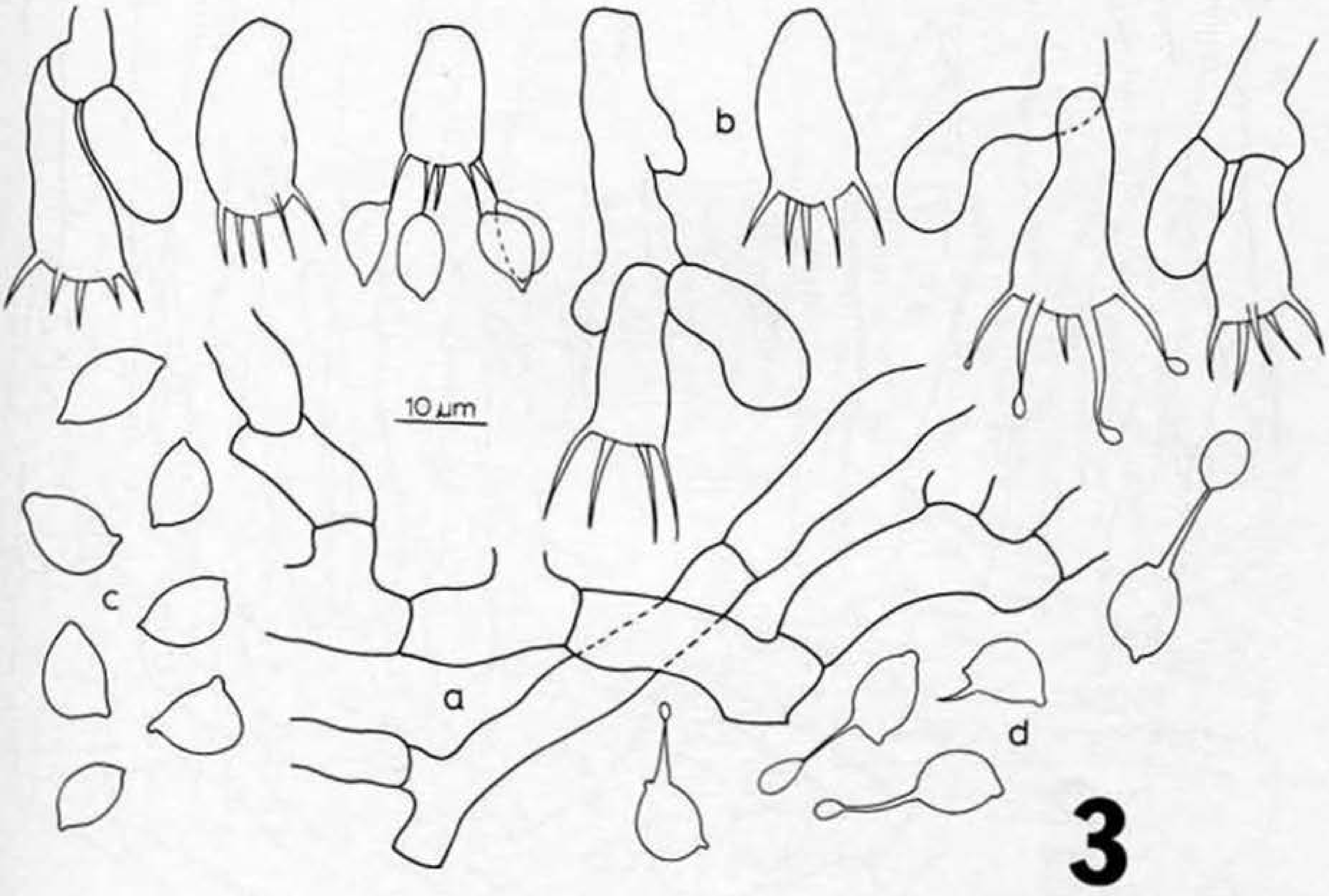

Fig. 3. *Botryobasidium botryosum*. (JPL 1165). a) subicular hyphae; b) basidia; c) basidiospores; d) basidiospores germinating by repetition.

HYPHODONTIA CRUSTOSA (Fr.) John Erikss. Symb. Bot. Upsal. XVI:1, p. 104. 1958.

Basidiocarps off-white to cream-color (near 2.5Y 9/4), circular patches erupting through bark or effused on decorticated wood, aculeate with fimbriate apices to the aculei, the aculei fairly regularly spaced, 2-3 per mm; subiculum smooth to cracked between the aculei; margin white, sterile, appressed-floccose. *Hyphal system* monomitic; subicular hyphae somewhat thick-walled, nodose-septate, 2.5-3.5 µm diam. *Cystidioles* present, particularly in the

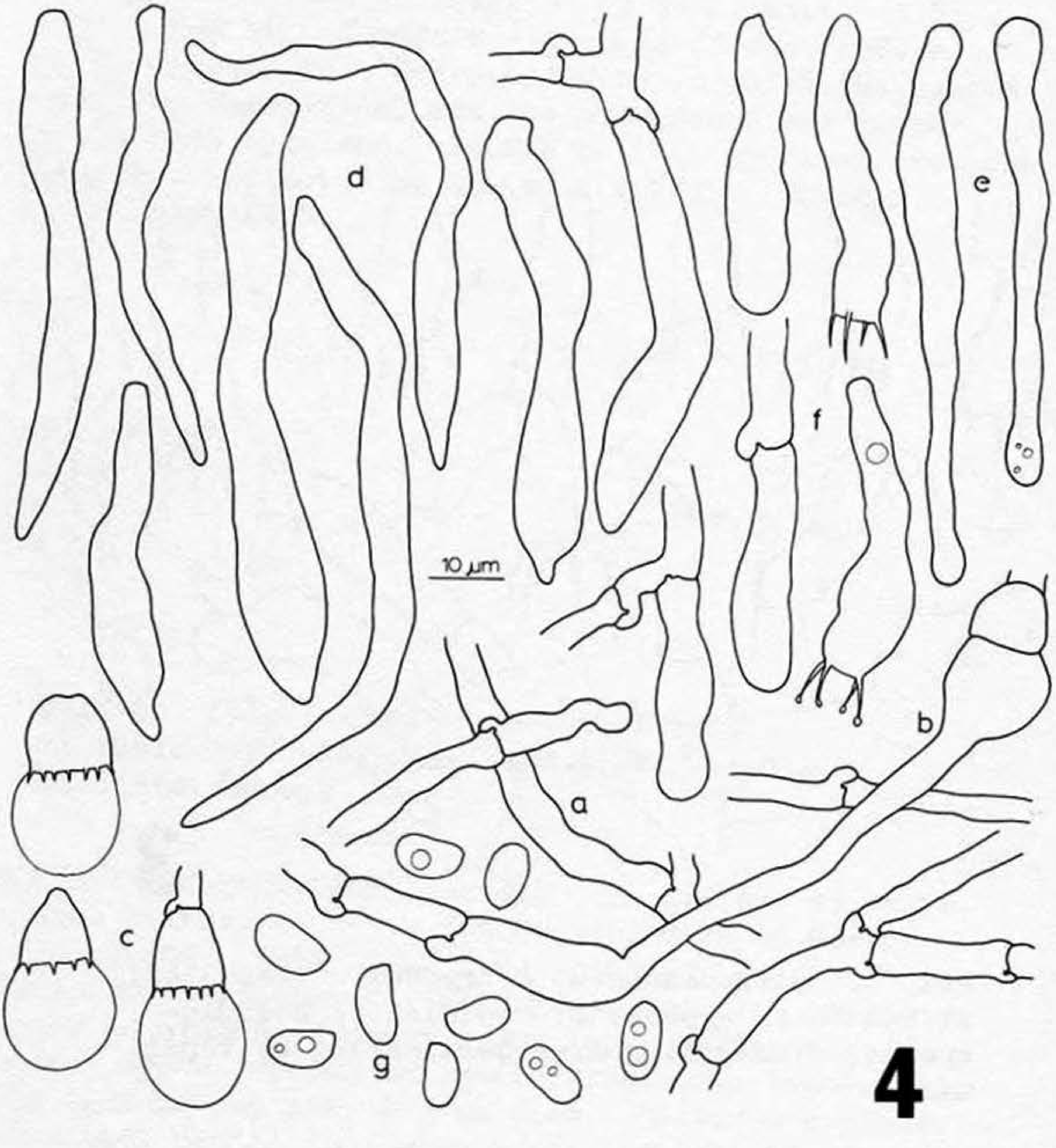

Fig. 4. *Hyphoderma praetermissum*. (JPL 1071). a) subicular hyphae; b) stephanocyst germinating; c) stephanocysts; d) fusoid gloeocystidia; e) capitate cystidia; f) basidia; g) basidiospores.

tips of the aculei, 30-51 x (3)-4-7 µm, with a basal clamp. *Basidia* slender, clavate, often constricted in the middle, 4-sterigmate, 22-35 x 4-5 µm, with a basal clamp. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, often with a single, large guttule, cylindric-ellipsoid, 6-7.5 x 3-4 µm. *Voucher specimens* - JPL 1066; JPL 1097; JPL 1145.

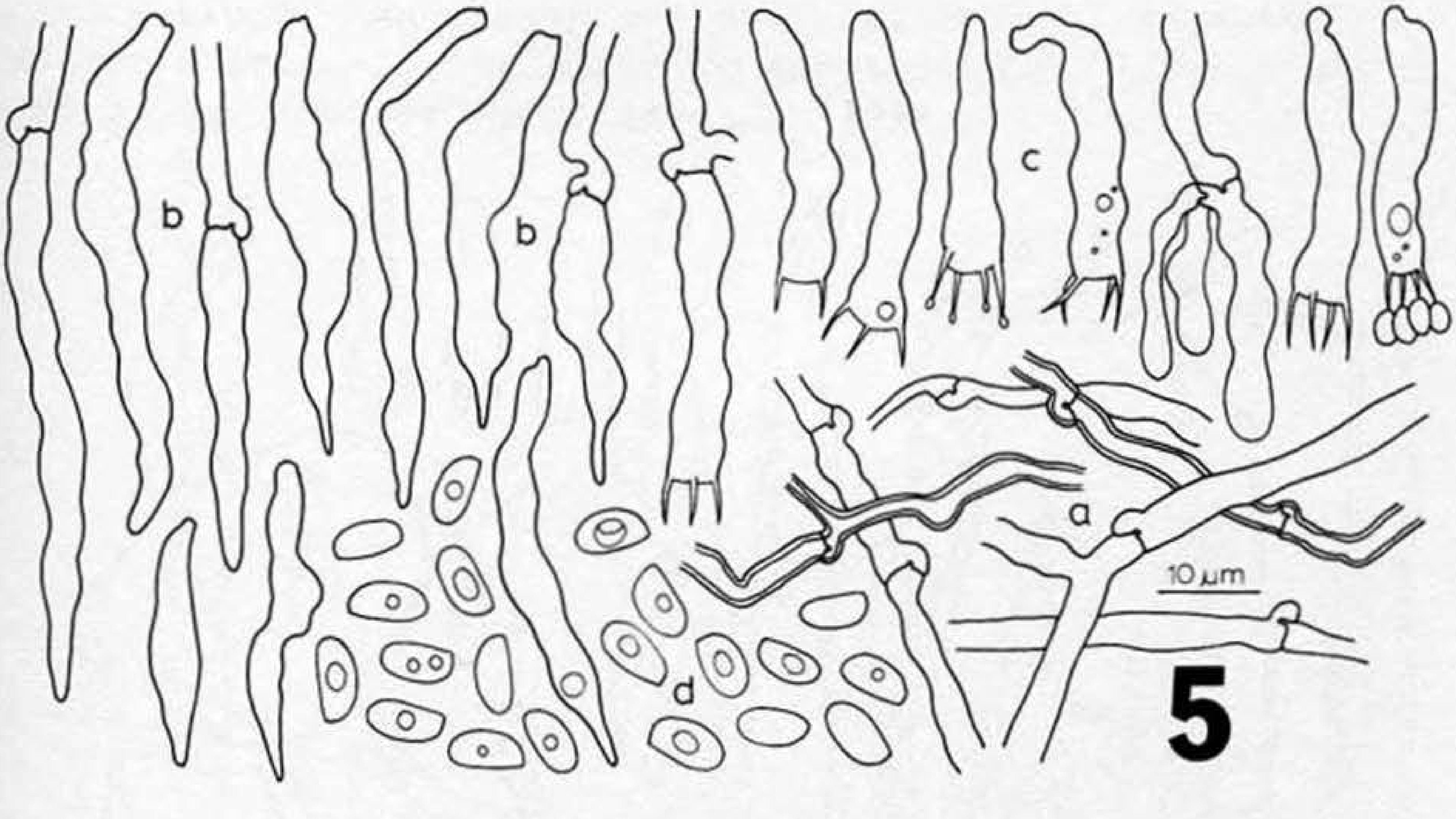

Fig. 5. *Hyphodontia crustosa.* (JPL 1066, 1097, & 1145). a) subicular hyphae; b) fusoid cystidioles; c) basidia; d) basidiospores.

HYPHODONTIA SUBALUTACEA (Karst.) John Erikss. Symb. Bot. Upsal. XVI:1, p. 104. 1958.

Basidiocarps resupinate, effused, thin, porose-reticulate to furfuraceous, in some places with blunt aculei, cream-colored (near 2.5Y 8/4); margin thinning out, arachnoid. *Hyphal system* monomitic; subicular generative hyphae thin-walled, nodose-septate, 3-3.5 µm. *Cystidia* abundant, wider toward the apex, thick-walled toward the basal clamp, 65-115 x 7.5-8.5 µm, often projecting. *Basidia* clavate, 4-sterigmate, often with a median constriction, 17-21 x 4-5 µm. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, allantoid, 6.5-9 x 1.5-2.5 µm. *Comments* - JPL 1100 was somewhat odontioid, but was, for the most part, reticulate-poroid. Eriksson and Ryvarden (1976) indicate that *H. subalutacea* and *H. floccosa* intergrade. JPL 1100 obviously demonstrates this problem but spore size and the relative paucity of teeth indicated its placement in *H. subalutacea*. *Voucher specimen* - JPL 1100.

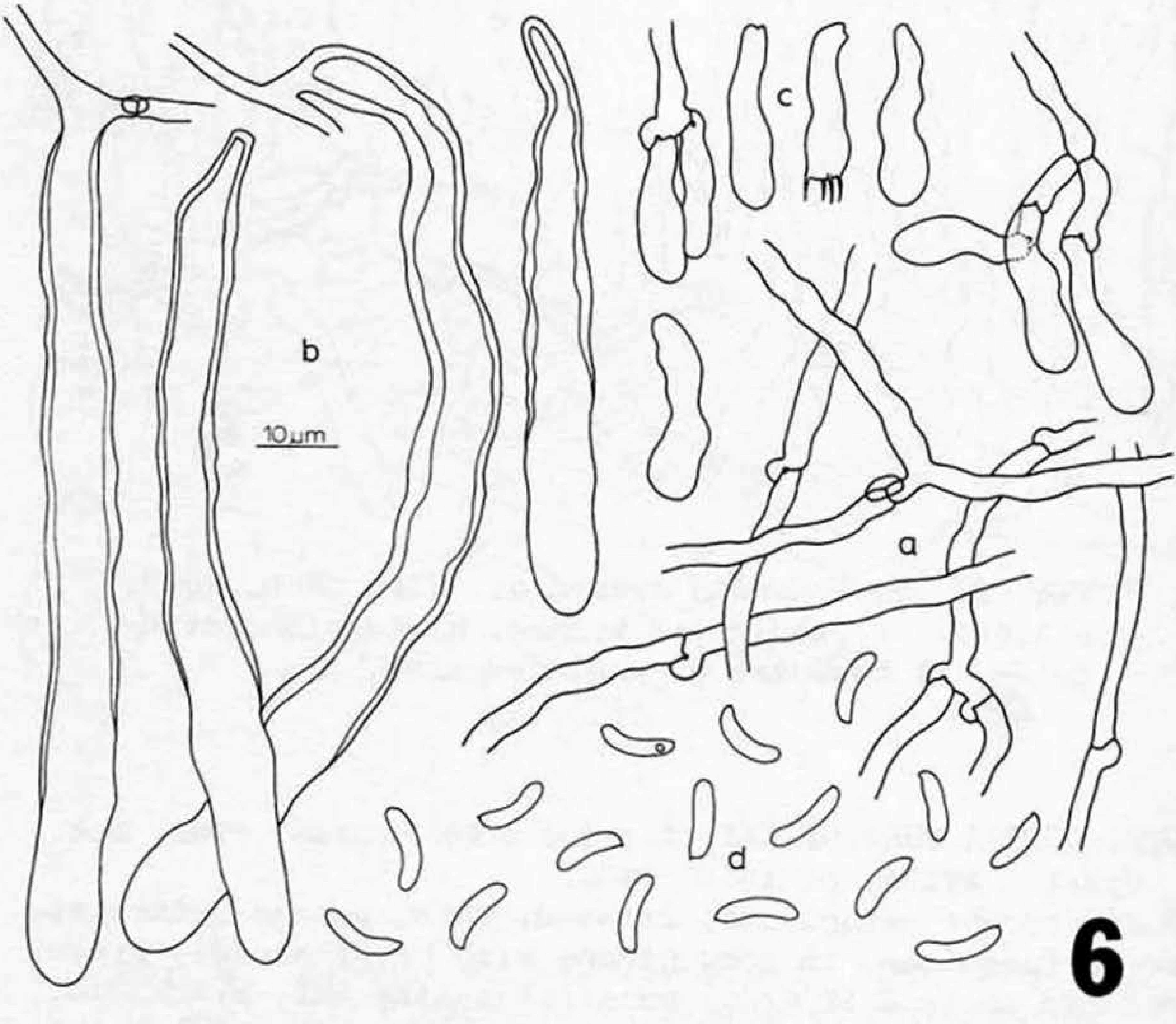

Fig. 6. *Hyphodontia subalutacea*. (JPL 1100). a) subicular hyphae; b) cystidia; c) basidia; d) basidiospores.

PENIOPHORA NUDA (Fr.) Bres., Rovereto Accad. Sci. Lett. Arti Agiati, Atti. ser. III vol. III p. 114. 1897. *Basidiocarps* adnate, resupinate, becoming widely effused, dry, pinkish-buff, (near 7.5YR 9/2 to 10YR 8/2), cracking at maturity; margin abrupt to finely tomentose, white, sterile. *Hyphal system* monomitic; subicular hyphae nodose-septate, thin-walled, branched, 3.5-4.5 µm diam. *Gloeocystidia* cylindric to vesicular, some tapering, blackening in sulfobenzaldehyde, with refractive contents, 42-48 x 8.5-11.5 µm, with a basal clamp. *Lamprocystidia* thick-walled, heavily incrusted up to 2/3 of their length, tapering, 30-55 x 7-8 µm. *Basidia* clavate, 4-sterigmate, 22-30 x 5-6 µm, with a basal clamp, occurring in dense candelabrums. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, cylindric to suballantoid, 7.5-8.5 x 3-3.5 µm. *Voucher specimen* - JPL 1094.

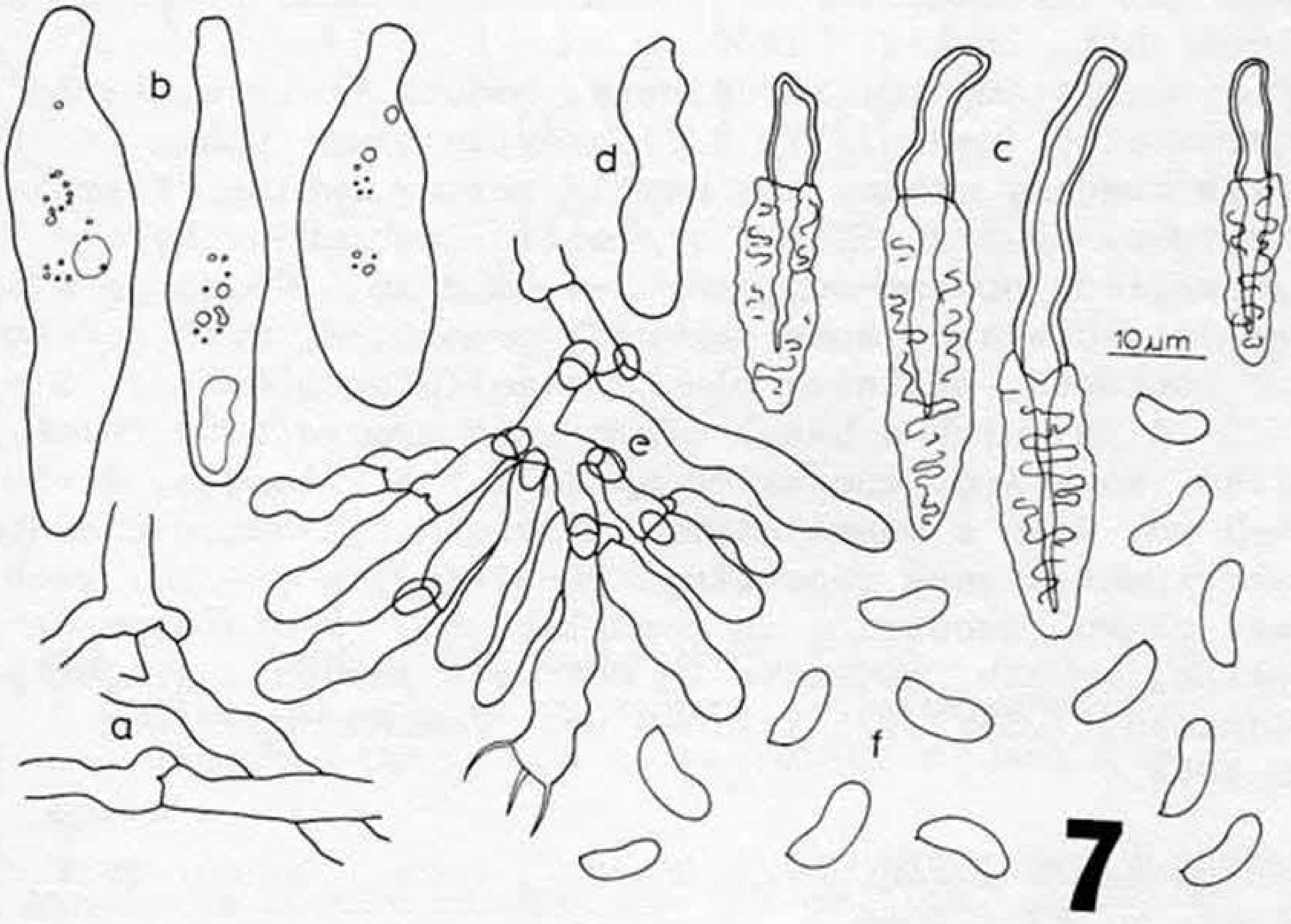

Fig. 7. *Peniophora nuda*. (JPL 1094). a) subicular hyphae; b) gloeocystidia; c) incrusted cystidia; d) immature basidium; e) basidial candelabrum; f) basidiospores.

PENIOPHORA PSEUDOVERSICOLOR Boid. Bull. Mens. Soc. Linn. Lyon 34:162. 1965.

Basidiocarps resupinate, starting as elongated patches and becoming effused 10-15 cm; smooth to slightly tuberculate, cracking upon drying, pinkish-to orangish-grey (near 5YR 7/4 to 7.5YR 6/4); margin thinning out to abrupt. *Hyphal system* monomitic; subicular hyphae hyaline, thin-walled, nodose-septate, 2.5-3.5 µm diam. *Gloeocystidia* cylindric to clavate, some slightly fusiform, 38-75 x 8-13 µm, with a basal clamp. *Lamprocystidia* embedded, thick-walled, incrusted up to ½ their length, blunt-tipped to pointed, 33-37 x 5-7 µm. *Basidia* cylindric to narrow-clavate, some with secondary septa, 4-sterigmate, with a basal clamp, 29-47 x 4.5-6 µm. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, cylindric-allantoid, 6.5-8 x 2.5-3.5 µm. *Comments* - This fungus has not been previously reported from North America, but it fits Jülich and Stalpers' description (1980) very well. It is very common on decorticated Gambel oak slash in the *Pinus ponderosa* - *Quercus gambelii* type in southwestern Colorado. *Voucher specimens* - JPL 1108; JPL 1168; JPL 1211.

PENIOPHORA VIOLACEOLIVIDA (Sommerf.) Massee, J. Linn. Soc. Lond. Bot. 25:152. 1890.

Basidiocarps adnate, resupinate, smooth to irregularly tuberculate, (near 7.5YR 8/2) greyish-blue; young fruiting bodies roughly orbicular; margin narrow, white, fimbriate-tomentose. *Hyphal system* monomitic; subicular hyphae thin-walled, nodose-septate, 3-4 µm diam. *Gloeocystidia* cylindric-clavate, some tapering, embedded, with refractive contents, staining black in sulfobenzaldehyde, 37-49 x 7.5-14 µm, with a basal clamp. *Lamprocystidia* thick-walled, tapering, encrusted up to ½ their length, 45-50 x 6-9 µm, with a basal clamp. *Basidia* cylindric-clavate, 4-sterigmate, some repeating, 26-32-(47) x 5-6 µm, with a basal clamp, occurring in candelabrums. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, slightly allantoid, 7.5-9-(12) x 2.5-3 µm. *Voucher specimen* - JPL 1064.

PHANEROCHAETE TUBERCULATA (Karst.) Parm., Consp. Syst. Cort. p. 83. 1968.

Basidiocarps becoming widely effused, white to cream or ochraceous (near 5Y 9/2 to 2.5Y 9/4), smooth to tuberculate, often cracking on drying; margin white, fibrillose, with white rhizomorphs. *Hyphal system* monomitic; hyphae thin-walled, simple-septate (subicular hyphae rarely show-

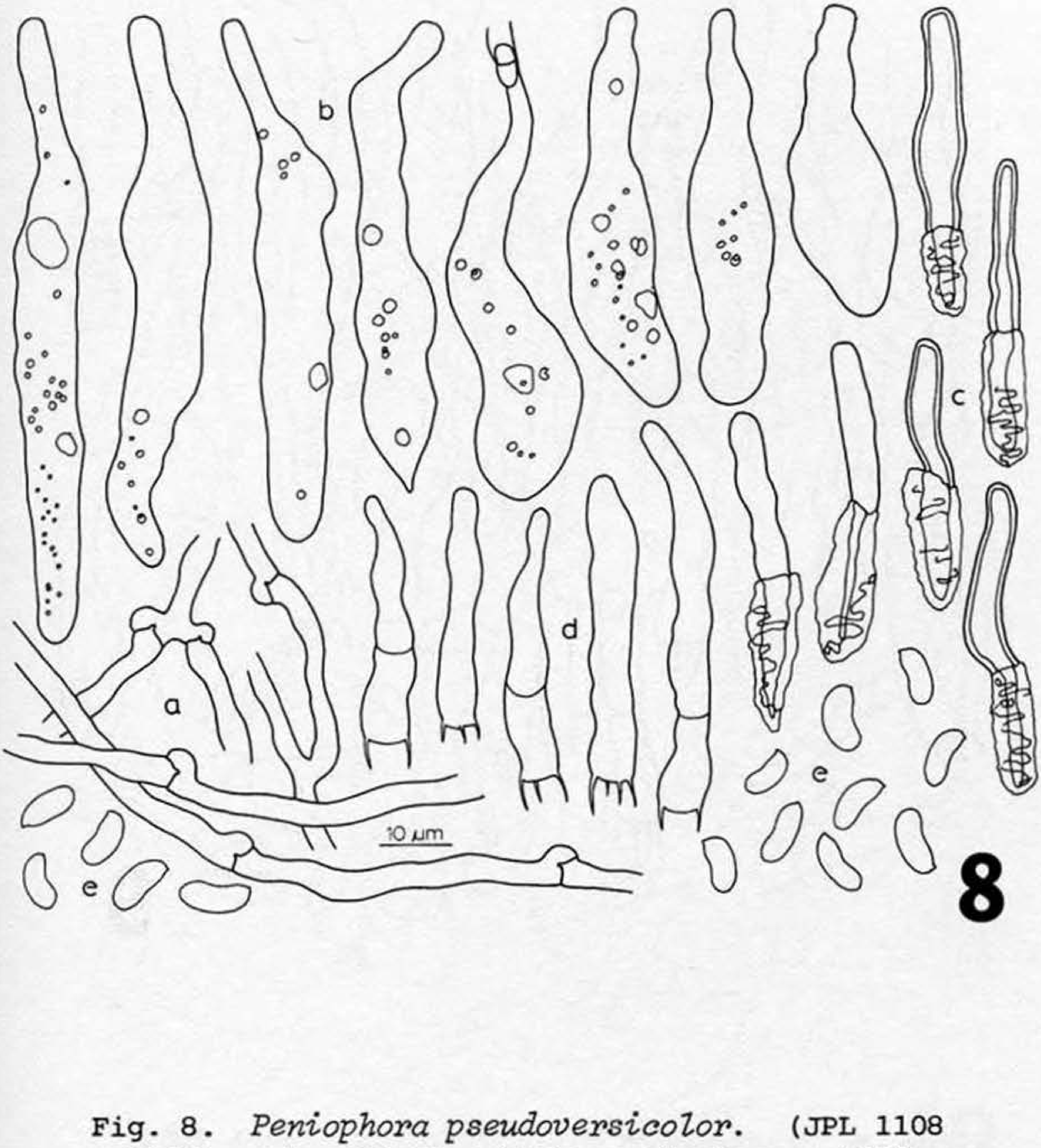

Fig. 8. *Peniophora pseudoversicolor*. (JPL 1108 & 1168). a) subicular hyphae; b) gloeocystidia; c) incrusted cystidia; d) basidium; e) basidiospores.

ing single to double clamps), 3-3.5 µm diam. *Sterile hymenial elements* lacking. *Basidia* cylindric-clavate, 4-sterigmate, 25-35 x 5.5-6.5 µm, with a simple septum at the base. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, short cylindric, 4.5-6.5-(7) x 3-4 µm. *Voucher specimen* - JPL 1070.

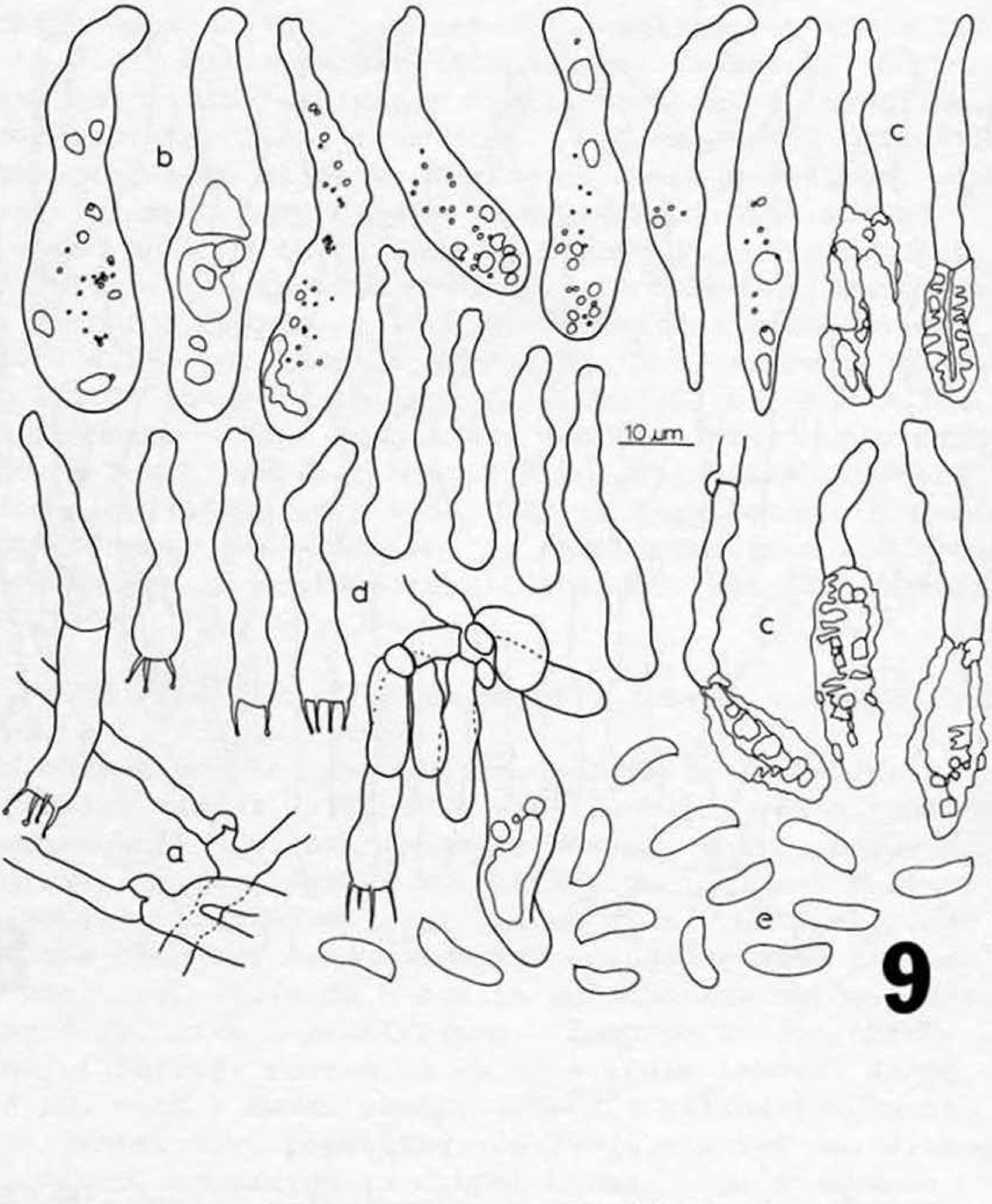

Fig. 9. *Peniophora violaceolivida.* (JPL 1064). a) subicular hyphae; b) gloeocystidia; c) incrusted cystidia; d) basidium; e) basidiospores.

PHANEROCHAETE VELUTINA (DC.:Fr.) Jülich, Willdenowia 7:274. 1972.

Basidiocarps annual, widely effused, resupinate; hymenial surface pinkish-orange, 7.5YR 9/2 to 5YR 8/4, sometimes cracking on drying; margin often with white rhizomorphs. *Hyphal system* monomitic; subicular hyphae thin- to thick-

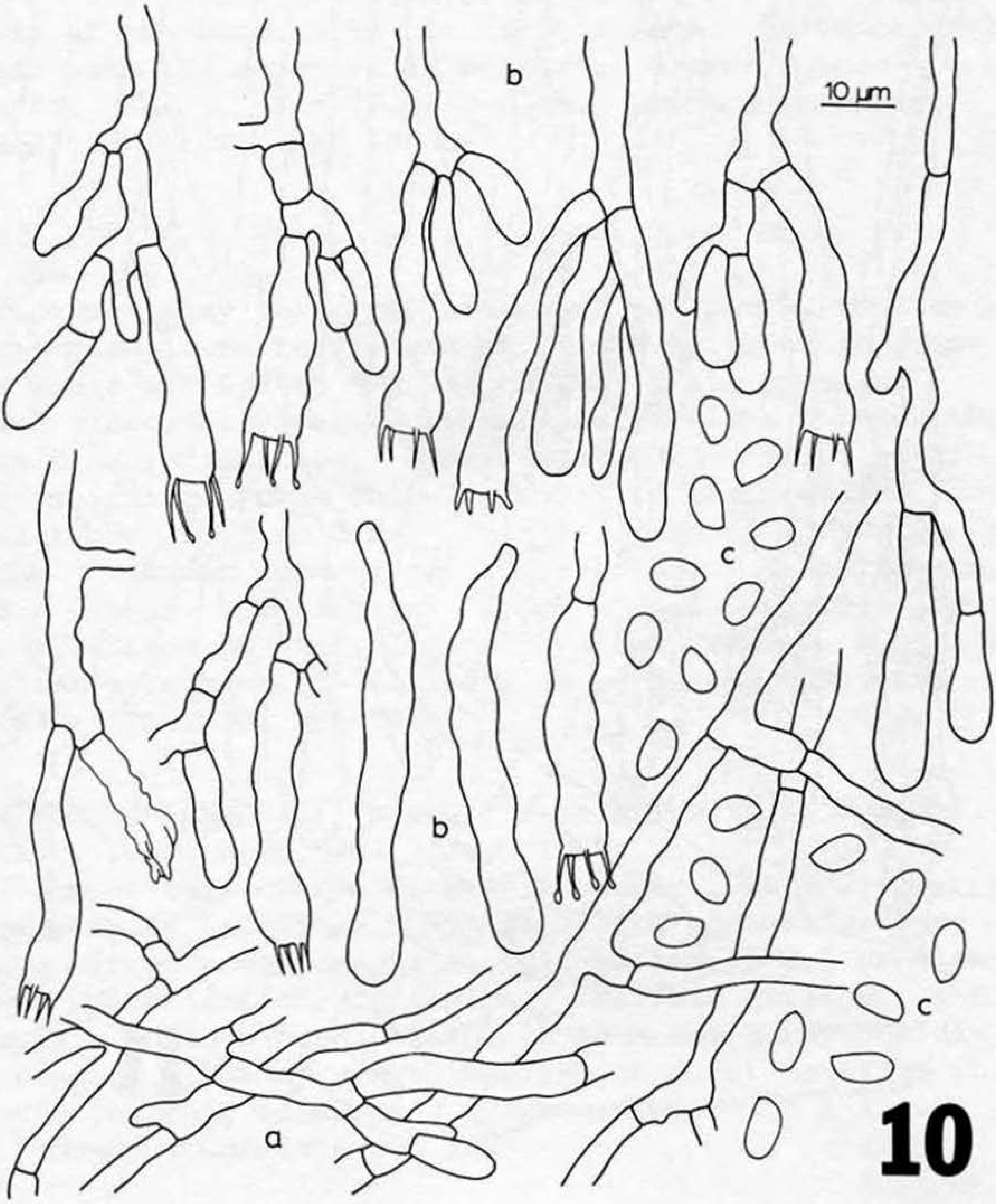

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Fig. 10. *Phanerochaete tuberculata.* (JPL 1070). a) subicular hyphae; b) basidia; c) basidiospores.

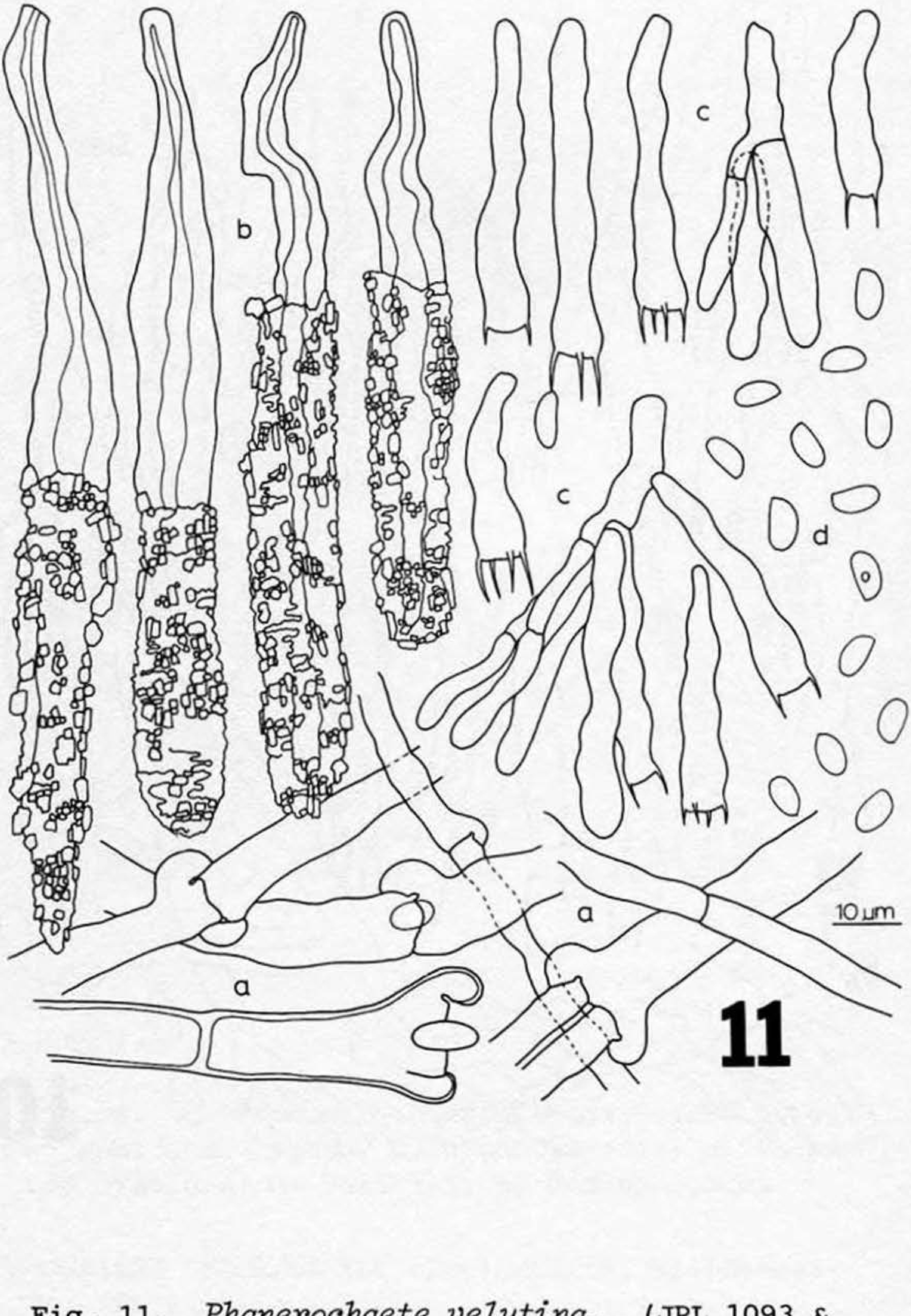


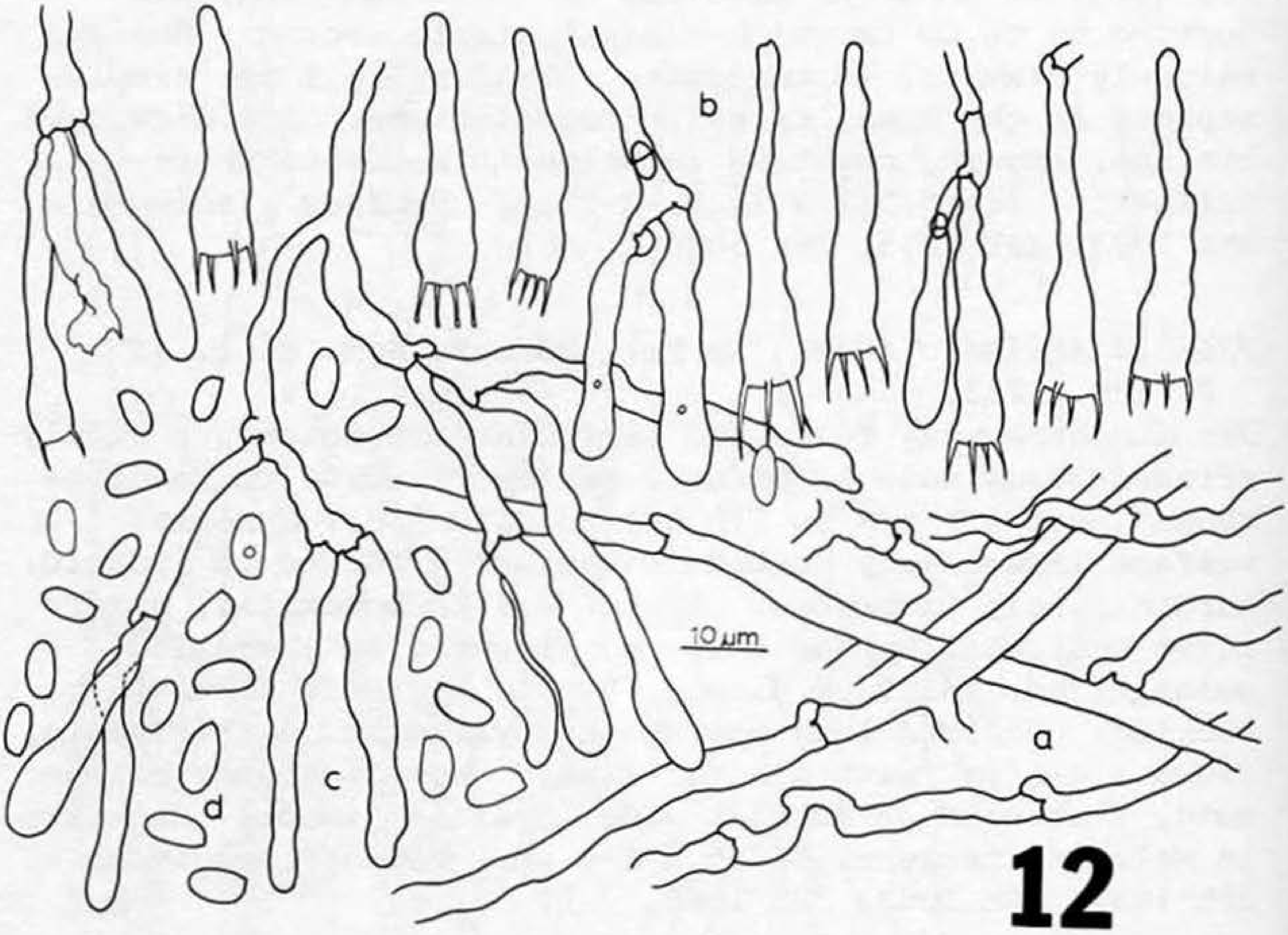
Fig. 11. *Phanerochaete velutina.* (JPL 1093 & 1095). a) simple-septate and nodose-septate subicular hyphae, some with double or multiple clamps; b) incrusted cystidia; c) basidia; d) basidiospores.

walled, mostly simple-septate but some with single to multiple clamp connections, 4 to 7 µm diam. *Lamprocystidia* numerous, thick-walled, heavily incrusted with coarse crystals, 10 to 15 µm wide and up to 165 µm long, projecting up to 60 µm, with a basal simple septum. *Basidia* narrowly clavate, 4-sterigmate, 32-42 x 5-6.5 µm, simple-septate at the base, often in candelabrums. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, short-cylindric, (4)-5.5-7 x (2.5)-3-4 µm. *Voucher specimens* - JPL 1093, JPL 1095, JPL 1096.

PHLEBIA ALBIDA v. Post. in Fr., Monogr. Hym. Suec. II p. 280, 1863.
Basidiocarps waxy to horny, orbicular and patchy to widely effused-resupinate to effused-reflexed, white to reddish-brown (near 5YR 5/8 to 5YR 3/4 to 10YR 5/8); hymenial surface irregularly warted to radiately folded to hydnoid; margin finely fimbriate. *Hyphal system* monomitic; generative subicular hyphae thin- to slightly thick-walled, gelatinized, 2-3.5 µm diam. *Sterile hymenial elements* lacking. *Basidia* long-clavate to cylindric, 4-sterigmate, 25-36 x 4-5 µm, with a basal clamp. *Basidiospores* ellipsoid, flattened on adaxial side, hyaline, smooth, negative in Melzer's reagent, 5-7.5 x 3-4 µm. *Voucher specimens* - JPL 1037; JPL 1053; JPL 1068.

SISTOTREMA BRINKMANNII (Bres.) John Erikss., K. Fysiogr. Sallsk. Lund. Forh. 18: 134. 1948.
Basidiocarps thin, white to grayish (near 10YR 9/2), pelliculose, easily separable. *Hyphal system* monomitic; generative hyphae nodose-septate, thin-walled, 2-3.5 µm diam. *Sterile hymenial elements* lacking. *Basidia* utriform, 4-6 sterigmate, with a basal clamp, 18-19 x 4.5-5 µm; basidioles present. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, ellipsoid, allantoid, 3.5-4.5 x 1-1.5 µm. *Voucher specimen* - JPL 1088.

TUBULICRINIS CALOTHRIX (Pat.) Donk, Fungus 26:14. 1956.
Basidiocarps thin, floccose, whitish (near 5PB 9/1); cystidia obvious under 30X lens. *Hyphal system* monomitic; generative subicular hyphae thin-walled, nodose-septate, 3-7 µm diam. *Cystidia* amyloid, thick-walled, tapering toward the apex, capillary lumen gradually widened, 67-88 x 8-12 µm, with a basal clamp. *Basidia* clavate, 4-sterigmate, 18-25 x 5 µm, with a basal clamp. *Basidiospores*



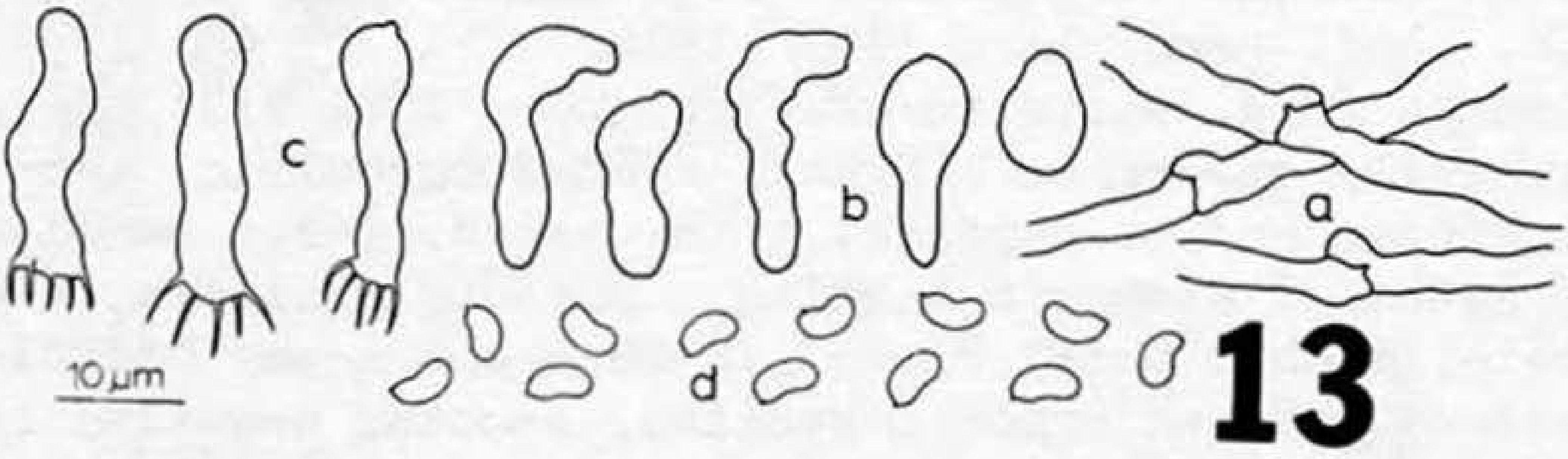


Fig. 12. *Phlebia albida*. (JPL 1037, 1053, & 1068). a) subicular hyphae; b) basidia; c) basidial candelabrum; d) basidiospores.

Fig. 13. *Sistotrema brinkmannii*. (JPL 1088). a) subicular hyphae; b) basidioles; c) mature basidia; d) basidiospores.

hyaline, smooth, allantoid, negative in Melzer's reagent, 5.5-6 x 1-1.5 µm. *Voucher specimen* - JPL 1060.

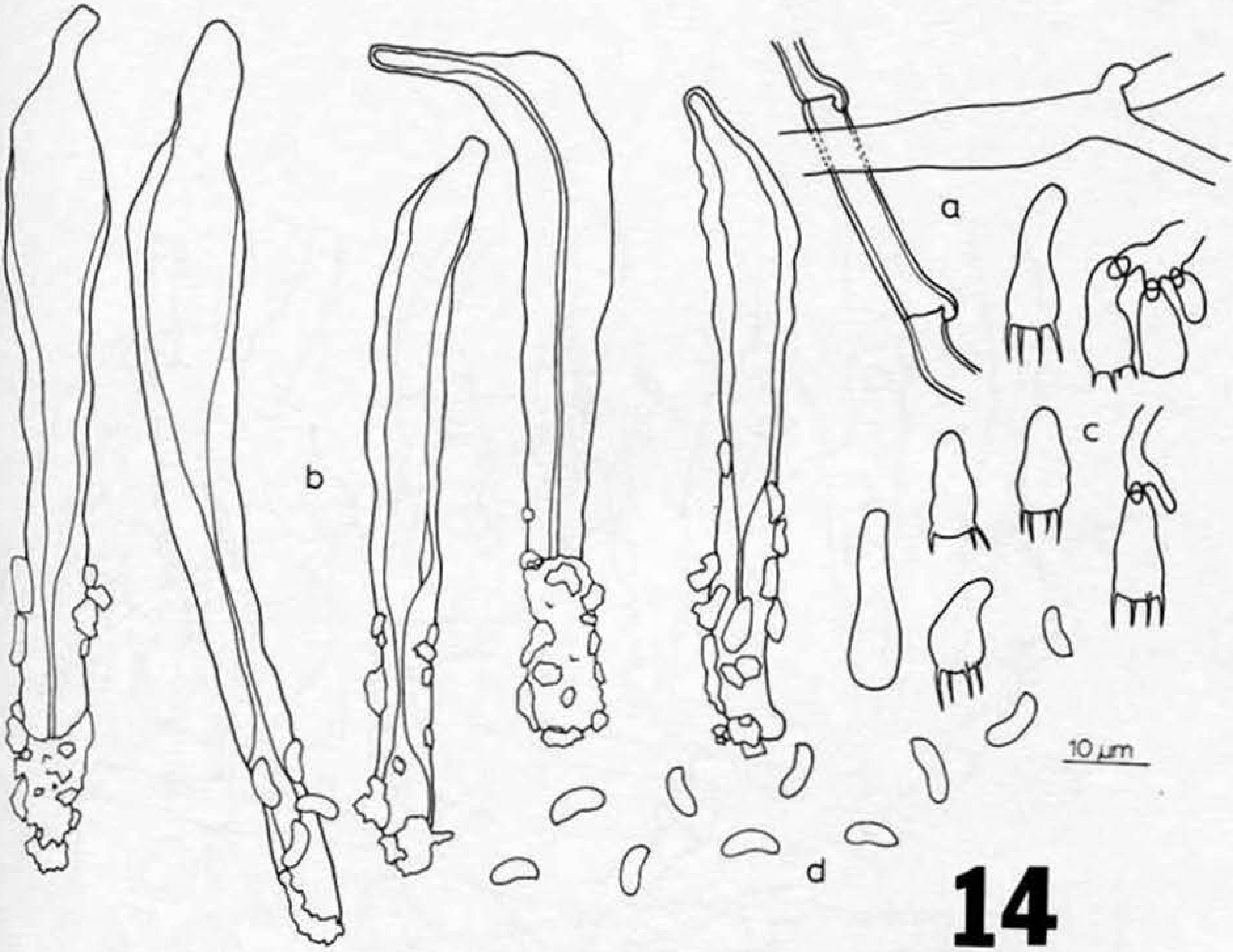


Fig. 14. *Tubulicrinis calothrix*. (JPL 1060). a) subicular hyphae; b) incrusted cystidia; c) basidia; d) basidiospores.

TOMENTELLA FERRUGINEA (Pers.) Pat., Hym. d'Eur., p. 154. 1887.

Basidiocarps effused-resupinate, appressed but separable, felty, rust-colored (near 2.5Y 3/2); margin sterile (near 10YR 4/8), fimbriate, appearing slightly strigose under 10X lens. *Hyphal system* dimitic; generative hyphae thin- to thick-walled, some simple-septate, 3.5-4 µm diam, others nodose-septate, 4-5 µm diam; skeletal hyphae thick-walled, aseptate, 3.5-4 µm diam; cordons of two kinds, nodose-septate generative and skeletal. *Sterile hymenial elements* lacking. *Basidia* cylindric-clavate, 4-sterigmate, often with one or more secondary septa, 33-43 x 6-8.5 µm, with a basal clamp. *Basidiospores* pale brown, several lobed or irregular, echinulate, 7-8 x 5-6 µm. *Voucher specimens* - JPL 1079; JPL 1092.

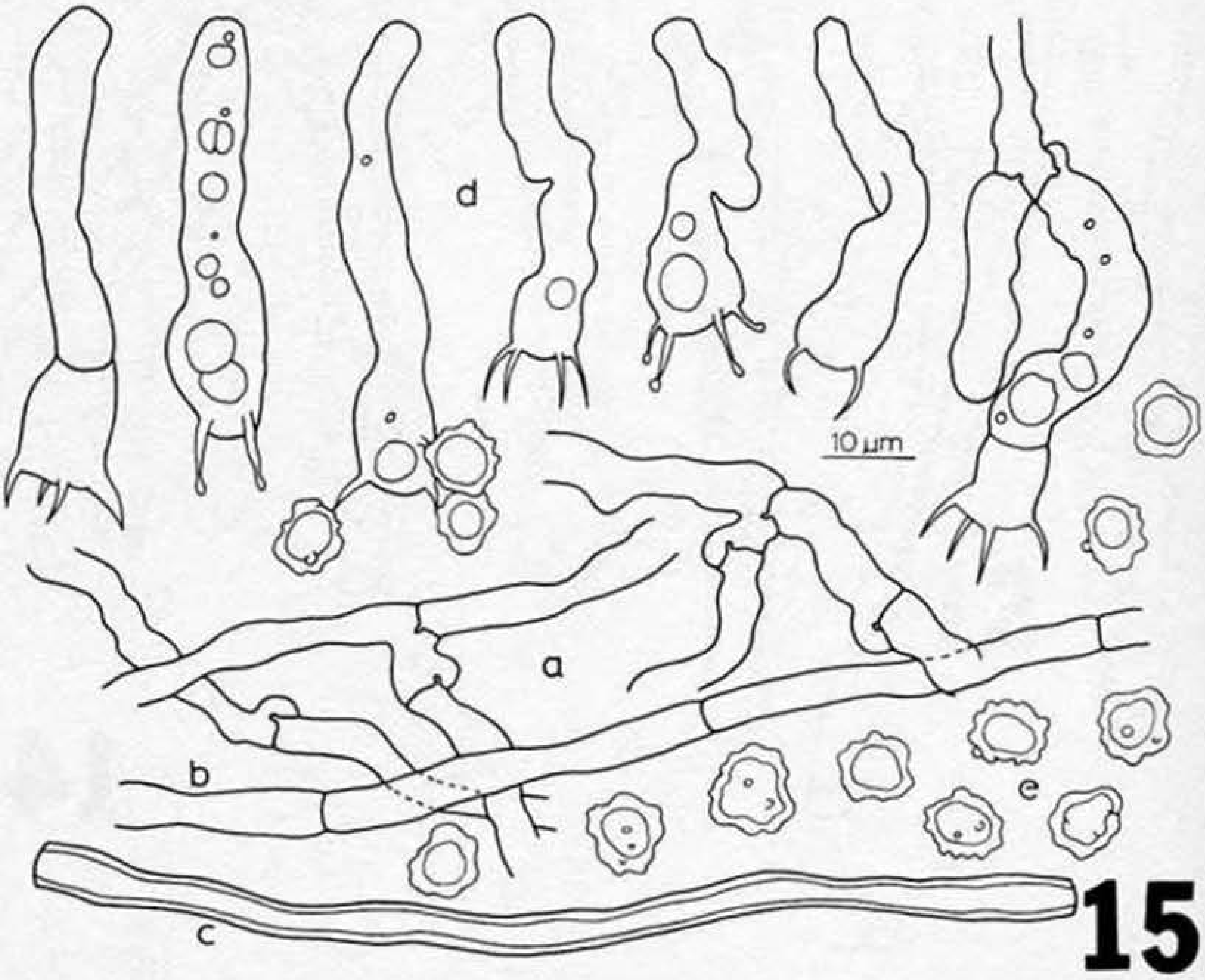


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Fig. 15. *Tomentella ferruginea*. (JPL 1079). a) nodose-septate subicular hyphae; b) simple-septate subicular hypha; c) skeletal hypha; d) basidia; e) basidiospores.

TOMENTELLA RAMOSSISSIMA (Berk. et Curt.) Wakef., Mycologia 52: 927. 1960.

Basidiocarps resupinate, widely effused up to 15 cm, smooth, dark reddish-umber (near 5YR 2/4 to 5YR 2/2), felty. *Hyphal system* monomitic; subicular hyphae brown, thick-walled, nodose-septate, 5.5-7.5 µm diam. *Sterile hymenial elements* lacking. *Basidia* stoutly cylindric, 4-sterigmate, with a basal clamp, 36.5-49 X 9-12 µm. *Basidiospores* globose, aculeate, light brown in KOH, negative in Melzer's reagent, 7.5-9 µm diam. *Voucher specimen* - JPL 1099.

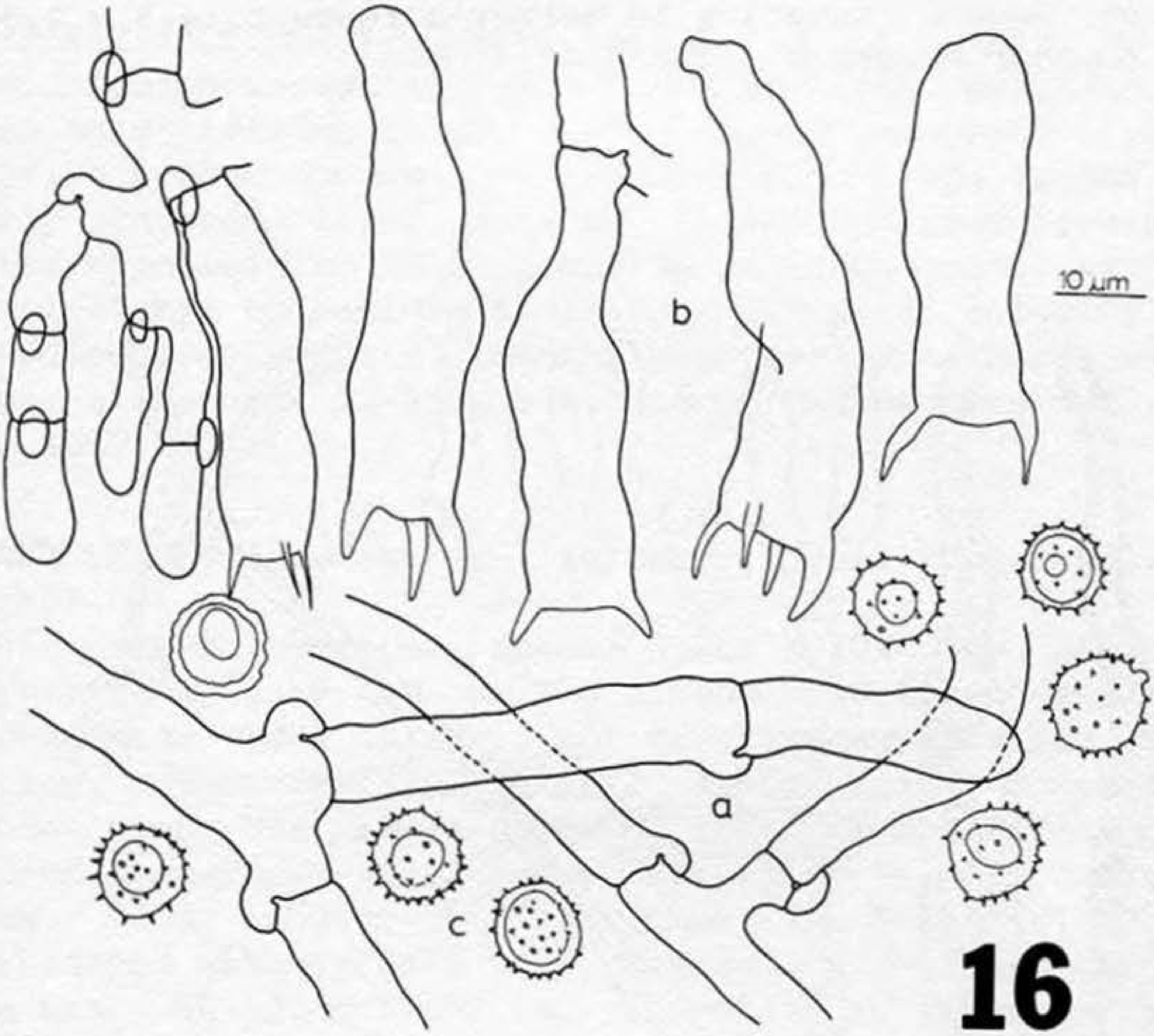

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Fig. 16. *Tomentella ramossissima*. (JPL 1099). a) subicular hyphae; b) basidia; c) basidiospores.

STECCHERINUM FIMBRIATUM (Pers.:Fr.) John Erikss., Symb. Bot. Upsal. XVI:1, p. 134. 1958.

Basidiocarps effused-resupinate, easily separable; hymenial surface hydnaceous, teeth apically fimbriate, light pink (near 5YR 8/4) fading to white at the margin; margin thinning out, strongly fimbriate and rhizomorphic. *Hyphal system* dimitic; subicular generative hyphae thin-walled, nodose-septate, 3.5-6.5 µm diam; skeletal hyphae thick-walled, hyaline, aseptate, often terminating as incrusted skeletocystidia, 2.5-4.5 µm diam. *Skeletocystidia* heavily incrusted, thick-walled, up to 80 µm long and 5-11 µm diam, arising from skeletal hyphae. *Basidia* clavate, 4-sterigmate, 17-20 x 4.5-5 µm, with a basal clamp. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, 4-5 x 2.5-3 µm. *Voucher specimen* - JPL 1102.

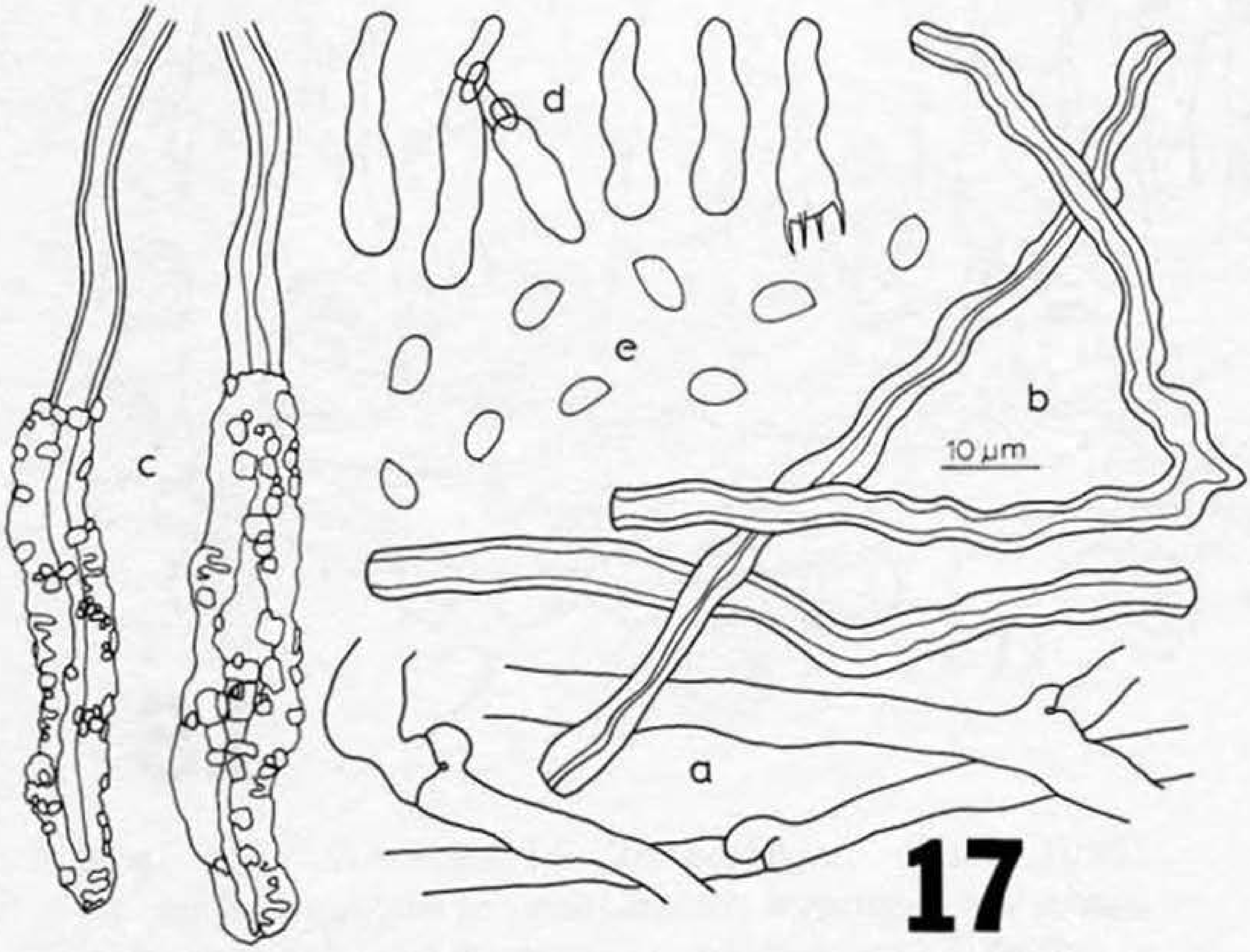

Fig. 17. *Steccherinum fimbriatum*. (JPL 1102). a) generative hyphae; b) skeletal hyphae; c) skeletocystidia; d) basidia; e) basidiospores.

DACRYMYCES MINOR Peck, Ann. Rep. N.Y. State Mus. 30:49. 1877.
Basidiocarps punctate, pulvinate, gelatinous, orange, drying near 5YR 3/6, 1-2 mm diam. *Hyphal system* monomitic; hyphae simple-septate, frequently branched, 2-3 µm diam. *Sterile hymenial elements* lacking. *Basidia* bifurcate; hypobasidium up to 60 µm long and 4-5 µm wide; epibasidia up to 20 µm long, 3-4 µm wide at maturity. *Basidiospores* hyaline, smooth, broadly allantoid, negative in Melzer's reagent, 1-2 celled, with a distinct blunt apiculus, often with 1 or more guttulae, 9-14 x 4-6 µm. *Voucher specimen* - JPL 1111.

EXIDIA GLANDULOSA Fr., Syst. Mycol. 2:224. 1822.
Basidiocarps irregular, dark brown to black, gelatinous when moist, drying horny. *Hyphal system* monomitic; generative hyphae nodose-septate, intricately and irregularly branched, 1.5-5 µm diam. *Basidia* cruciately-septate; hypobasidium 13-17.5 x 8-10 µm at maturity, with a basal clamp; epibasidia 4, 13-20 x 2-3 µm at maturity. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, allantoid, 11-15 x 3-4.5 µm. *Voucher specimen* - JPL 1067.

HYMENOCHAETE ARIDA Karst., in Sacc., Syll. Fung. 9:228. 1891.
Basidiocarps tomentose, setose under a 20X lens, effused, mostly resupinate but curling slightly at the edges, muddy brown (near 5YR 3/4), dry, not cracking appreciably on drying; margin fertile, abrupt. *Hyphal system* monomitic; subicular hyphae simple-septate, thin- to moderately thick-walled, branched, light brown, darkening in KOH, 3-5 µm diam. *Setae* subulate to ventricose, thick-walled, brown, ensheathed with primary wall material, simple-septate at the base, 60-120 x 5.5-8 µm, projecting up to 60 µm. *Basidia* slender-clavate, 4-sterigmate, 17-20 x 3.5-5 µm, with a simple septum at the base. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, ellipsoid to short-cylindric, 4-4.5 x 2-2.5 µm. *Voucher specimen* - JPL 1069.

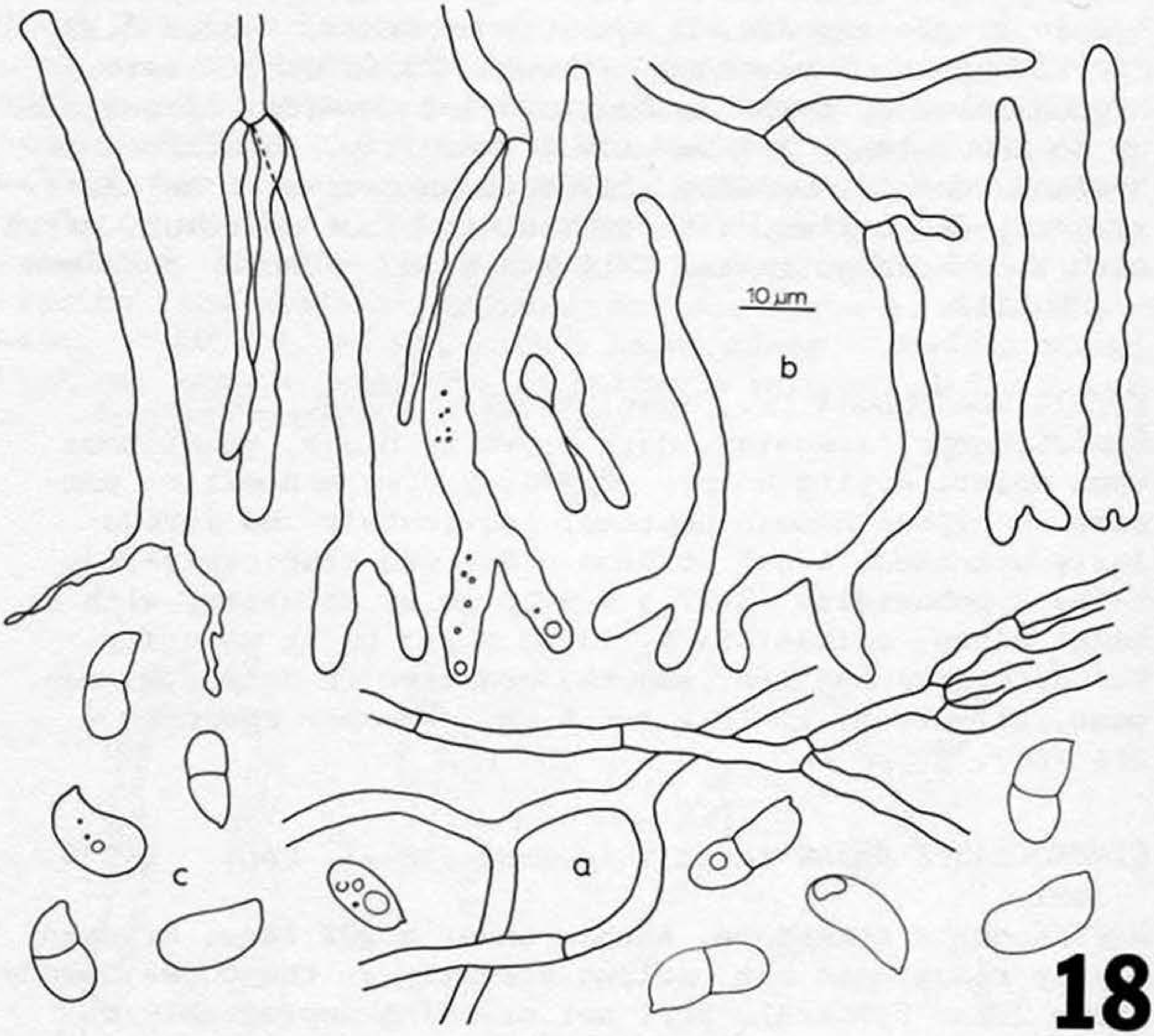

Fig. 18. *Dacrymyces minor*. (JPL 1111). a) subicular hyphae; b) basidia; c) basidiospores.

INONOTUS ANDERSONII (Ell. et Ev.) Černy, Česka Mykol. 17:1. 1963.

Basidiocarps annual, sometimes effused over entire surface of wood in branches or standing snags, developing under the bark or outer sapwood layers and causing decortication, resupinate but often with thick outgrowths of tubes that may appear almost pileate; deep golden-brown (from mass

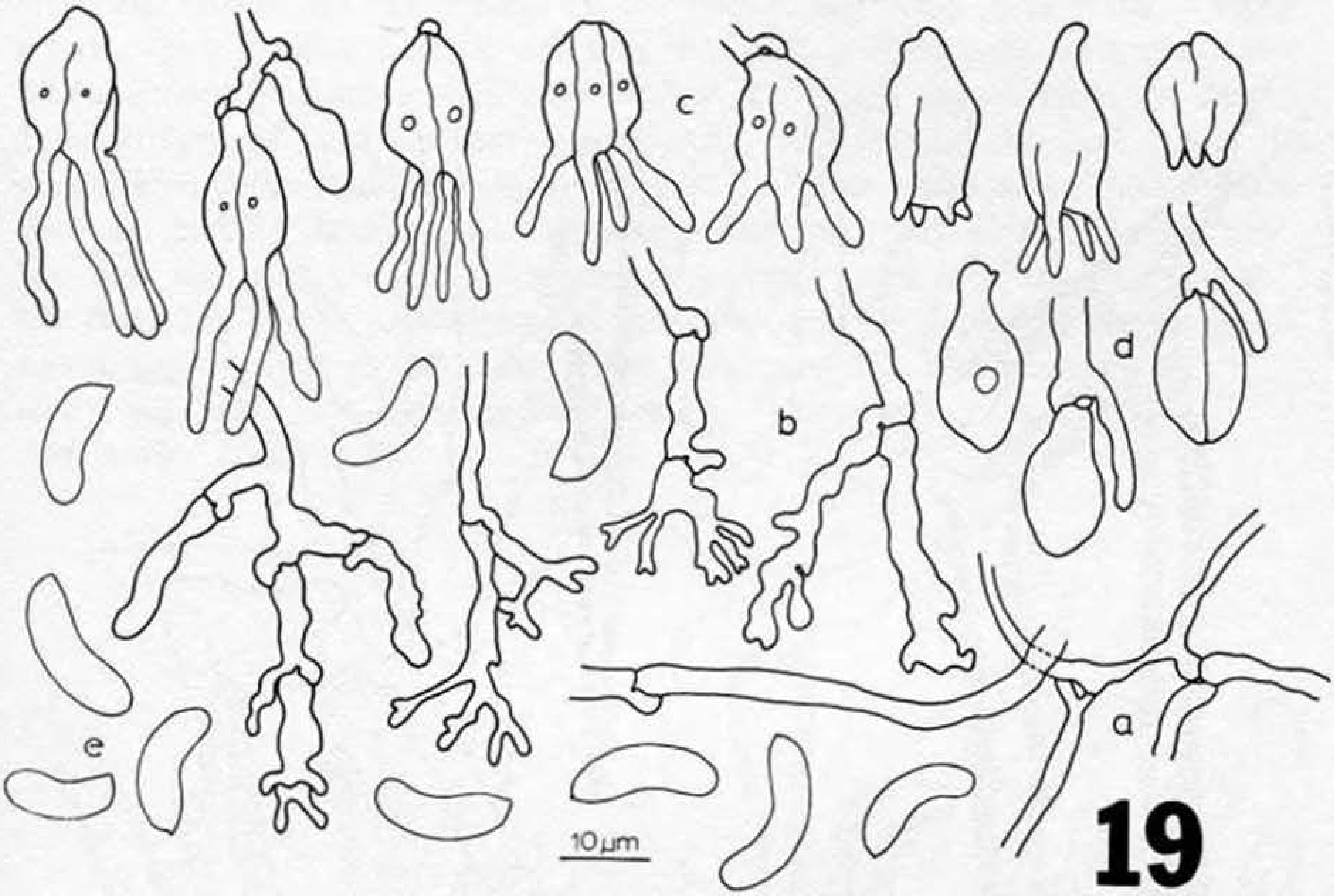

Fig. 19. *Exidia glandulosa.* (JPL 1067).
a) subicular hyphae; b) dendrohyphidia;
c) mature basidia; d) immature basidia;
e) basidiospores.

spore deposits) to dark brown to black (in older, disintegrating parts of the basidiocarp) (near 10YR 5/10 to 10YR 4/8 to 10YR 3/4); pores 1-4 per mm, with lacerate dissepiments as specimens age; margin abrupt, concolorous, fertile. *Hyphal system* dimitic; generative tramal hyphae hyaline to light yellow, simple-septate, 2-3 µm diam; contextual skeletal hyphae thick-walled, brown (darkening in KOH solution), some with secondary septa, 3-6 µm diam. *Setae* frequent, thick-walled, dark brown, ventricose, slightly projecting or embedded, 29-54 x 6.5-8.5 µm; setal hyphae frequent to lacking. *Basidia* clavate, 4-sterigmate, simple-septate at the base, 14-17 x 5-6.5 µm. *Basidiospores* yellowish to yellowish-green (Campbell and Davidson, 1963), thick-walled, negative in Melzer's reagent,

Fig. 20. *Hymenochaete arida*. (JPL 1069).
a) generative hyphae; b) setae; c) basidia;
d) basidiospores.

oval to broadly ellipsoid, 5-8 x 4-6 µm. *Comments* - *I. andersonii* is extremely common in southwestern Colorado, and probably follows Gambel oak to the northern extension of its range as it does with other *Quercus* species. However, the small boles of the clonal scrub oak stands in this area probably do not offer as much opportunity for formation of infection courts as do larger Gambel oaks in southern Arizona and New Mexico. Thus one sees this fungus in areas only where Gambel oak has not been recently burned or cut over, and where larger oaks have had time to develop. *I. andersonii* is important in its contribution to creation of habitats for cavity-nesting birds such as the red-shafted flicker. *Voucher specimens* - JPL 898; JPL 1138.

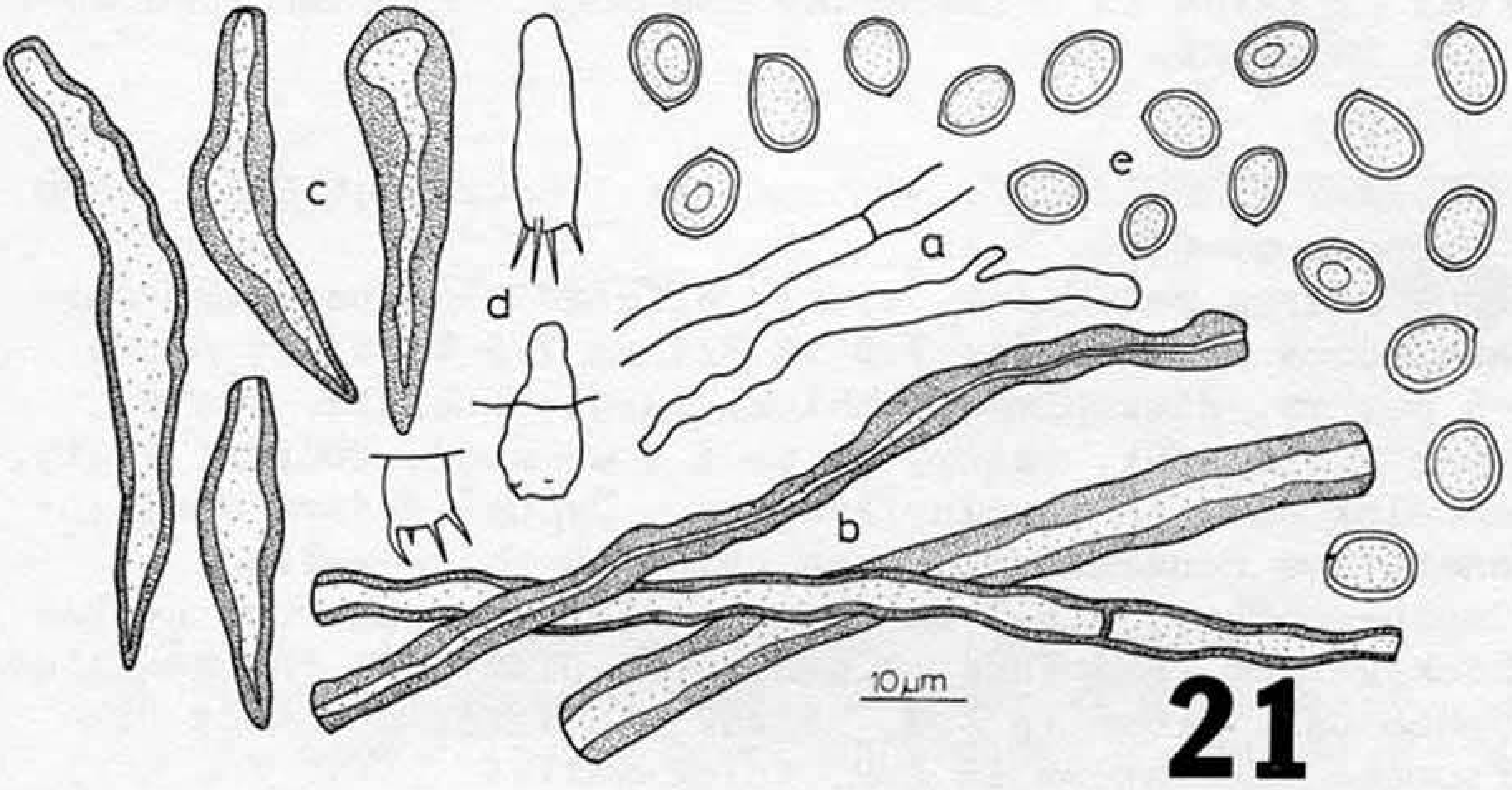

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Fig. 21. *Inonotus andersonii*. (JPL 898 & 1138). a) generative hyphae; b) skeletal hyphae; c) basidia; d) basidiospores.

INONOTUS DRYOPHILUS (Berk.) Murr., Bull. Torrey Bot. Club. 31:597. 1904. Fig. 6.

Basidiocarps annual, sessile, solitary, hoof-shaped, with a golden-brown (near 10YR 7/8), tomentose, often zonate upper surface; pore surface golden-brown (near 10YR 6/6), aging to reddish-brown, pores angular, 1-3 per mm; context with a granular core, speckled in appearance due to alternating light yellow and reddish-brown areas (near 7.5YR 3/6), and with a shiny, golden, fibrous layer between the tubes and the core. *Hyphal system* monomitic; hyaline hyphae from granular core thin-walled, simple-septate, 3-5 µm diam, some inflated up to 13 µm; hyphae from fibrous context thick-walled, simple-septate, light brown, 3-6 µm diam; tramal gloeoplerous hyphae lightly pigmented, simple-septate, 3-5.5 µm diam; hyphae from granular core thick-walled, darkly pigmented, contorted, breaking up into bluntly pointed seta-like structures, up to 15 µm diam. *Setae* and setal hyphae lacking. *Basidia* clavate, 4-sterigmate, with a simple septum at the base, 14-18 x 4-6 µm. *Basidiospores* brownish, thick-walled, smooth, negative in Melzer's reagent, ellipsoid, appearing somewhat truncate, 6-7.5 x 4-5 µm. *Comments* - This fungus is probably the most common cause of heartrot in fairly small diameter (10-15 cm) Gambel oaks, where the conks are often as large in diameter as the host. *Voucher specimens* - JPL 1091; JPL 1179.

PHELLINUS FERRUGINOSUS (Schrad.:Fr.) Bourd. et Galz., Hym. France. p. 625. 1928.
Basidiocarps perennial, widely effused, adnate; pore surface cocoa brown (near 7.5 YR 3/4 to 7.5 YR 5/8); pores 4-5 per mm, dissepiments thick; margin sterile, rusty (near 7.5YR 4/8), felty, up to 1.5 cm wide; context felty, concolorous with margin, azonate. *Hyphal system* dimitic; generative contextual hyphae thin- to thick-walled, simple-septate, 2.5-3 µm diam; skeletal contextual hyphae thick-walled, aseptate, 2.5-3.5 µm diam; all thick-walled hyphae dark brown in KOH. *Setae* subulate, somewhat ventricose, dark brown in KOH, thick-walled, 29-62 X 4.5-11 µm. *Setal hyphae* present in marginal tissue, 130-330 µm long. *Basidia* short-cylindric to subglobose, 4-sterigmate, 8.5-12 x 5 µm, simple-septate at the base. *Basidiospores* short-cylindric to oblong, hyaline, smooth, negative in Melzer's reagent, 5-6.5 x 3.5-4.5 µm. *Voucher specimens* - JPL 1104; JPL 1123.

POLYPORUS ARCULARIUS Batsch:Fr., Syst. Mycol. 1:342. 1821.
Basidiocarps annual, centrally stipitate, cartilaginous; pileus with a central depression, glabrous, wrinkled, tan (near 10YR 7/4), with a fringed margin; pore surface whitish; pores hexagonal and radially aligned; stipe lightly tomentose, concolorous with pileus. *Hyphal system*

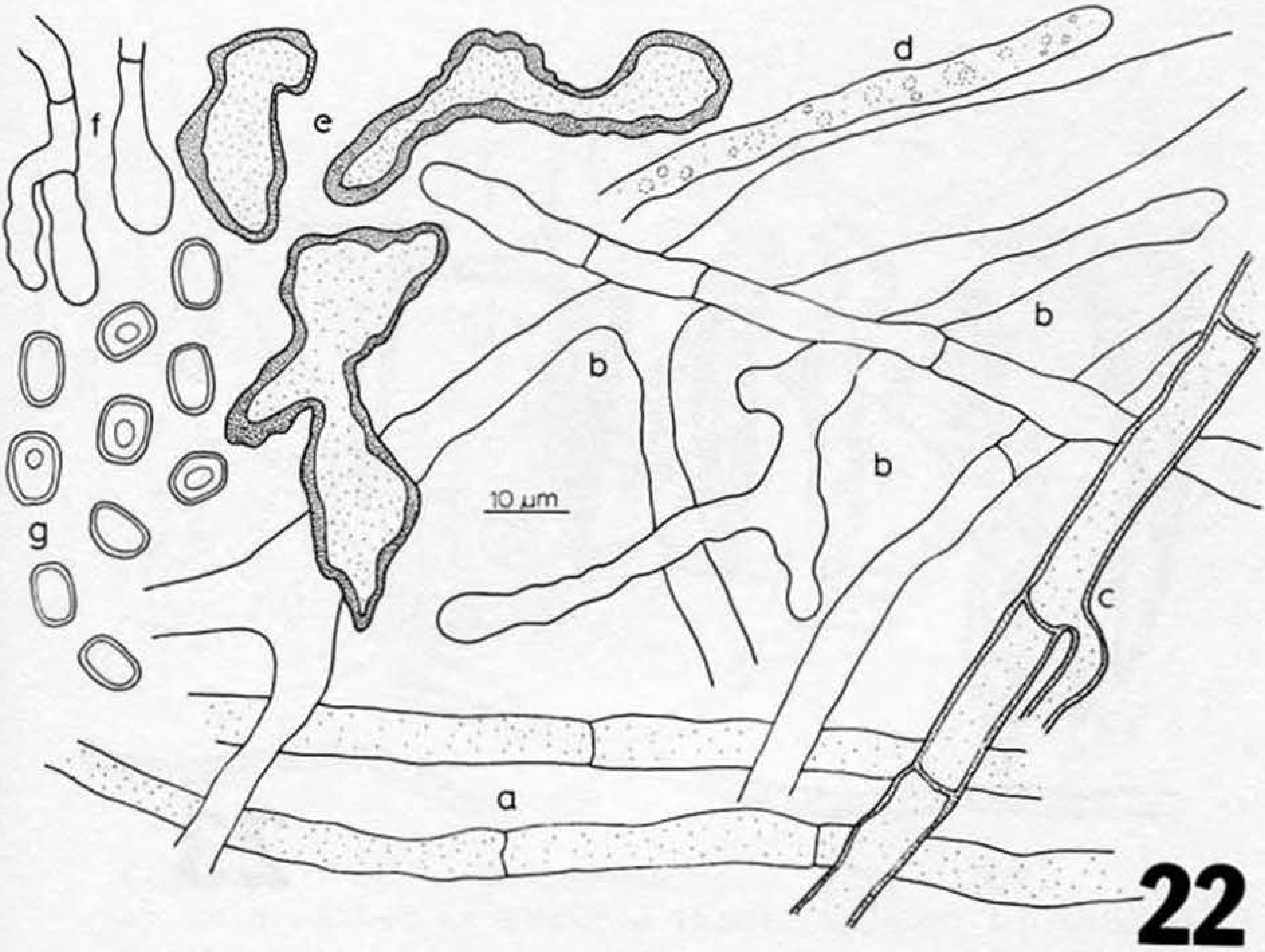

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Fig. 22. *Inonotus dryophilus.* (JPL 1091). a) lightly pigmented tramal hyphae; b) hyaline hyphae from granular core; c) lightly pigmented hypha from fibrous layer of context; d) tramal gloeoplerous hypha; e) seta-like pigmented hyphal cells from granular core; f) basidia; g) basidiospores.

dimitic; generative hyphae hyaline, thin- to thick-walled, nodose-septate, 1.5-6 µm diam; skeletal hyphae richly branched, thick-walled, aseptate, 2.5-4.5 µm diam. *Sterile hymenial elements* lacking. *Basidia* narrowly clavate, 4-sterigmate, with a basal clamp, 22.5-30 x 4.5-6.5 µm. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, cylindric, 7-9.5 x 1.5-3 µm. *Comments* - *P. arcularius* is one of the most frequently encountered fungi on dead Gambel oak, both on slash and standing wood. *Voucher specimen* - JPL 1169.

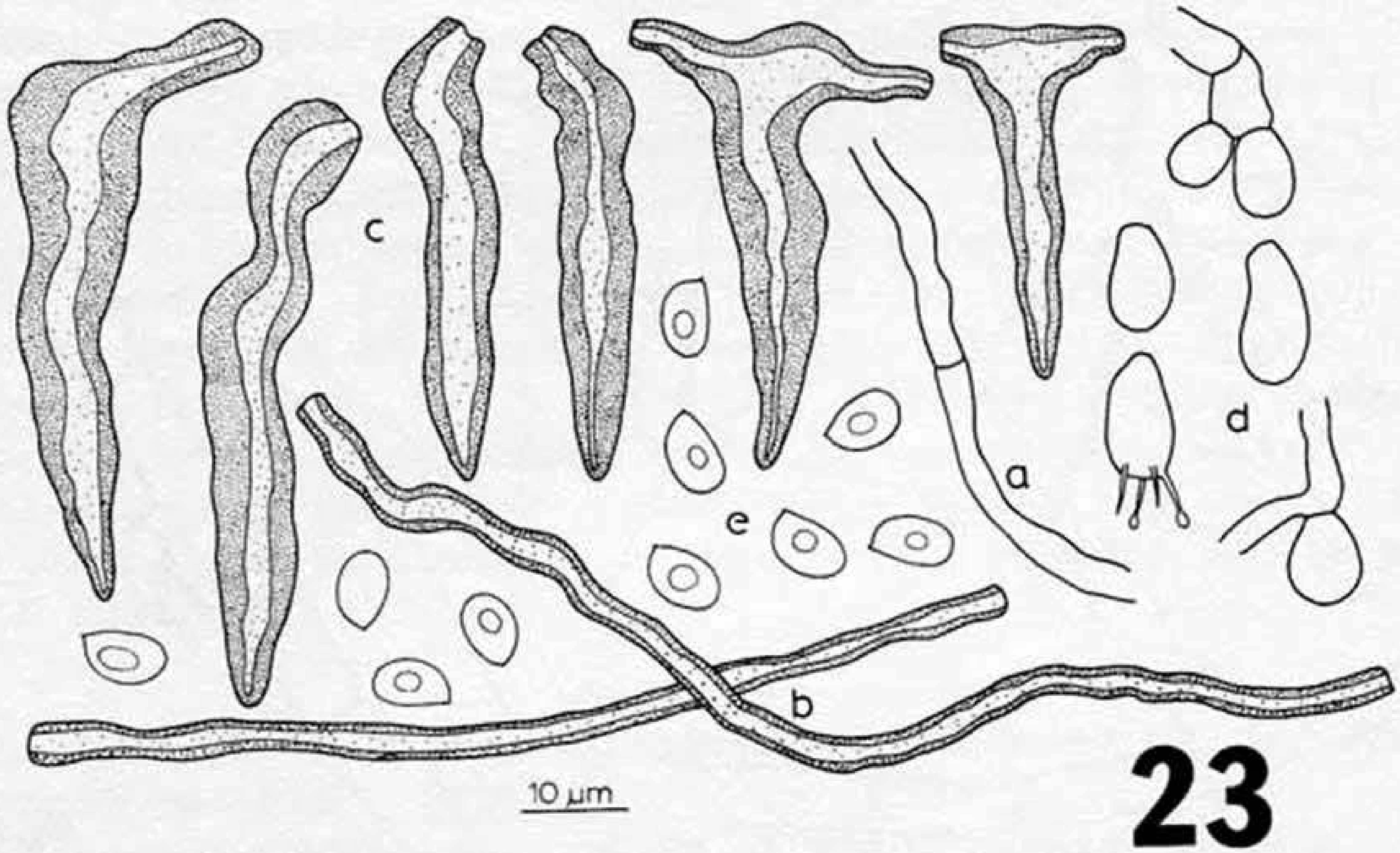


Fig. 23. *Phellinus ferruginosus.* (JPL 1104). a) generative hypha; b) skeletal hyphae; c) setae; d) basidia; e) basidiospores.

CERIPORIA EXCELSA (Lund.) Parm. Spor. Rast. 12:222. 1959. *Basidiocarps* annual, resupinate, becoming widely effused, whitish to pinkish-tan (near 7.5 YR 7/4); pores shallow, rounded, 3-4 per mm, with thick dissepiments; margin narrow, thinning out, sterile, whitish, floccose. *Hyphal system* monomitic; subicular hyphae hyaline, thin-walled, mostly simple-septate, often swollen at the septa and exhibiting whorled branching, 4-8.5 µm diam. *Sterile hymenial elements* lacking. *Basidia* short-clavate, 4-sterigmate, with a simple septum at the base, 12.5-16 x 4.5-5 µm, occurring in loose candelabrums. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, 4-5 x 3-3.5 µm. *Voucher specimens* - JPL 1087; JPL 1121.

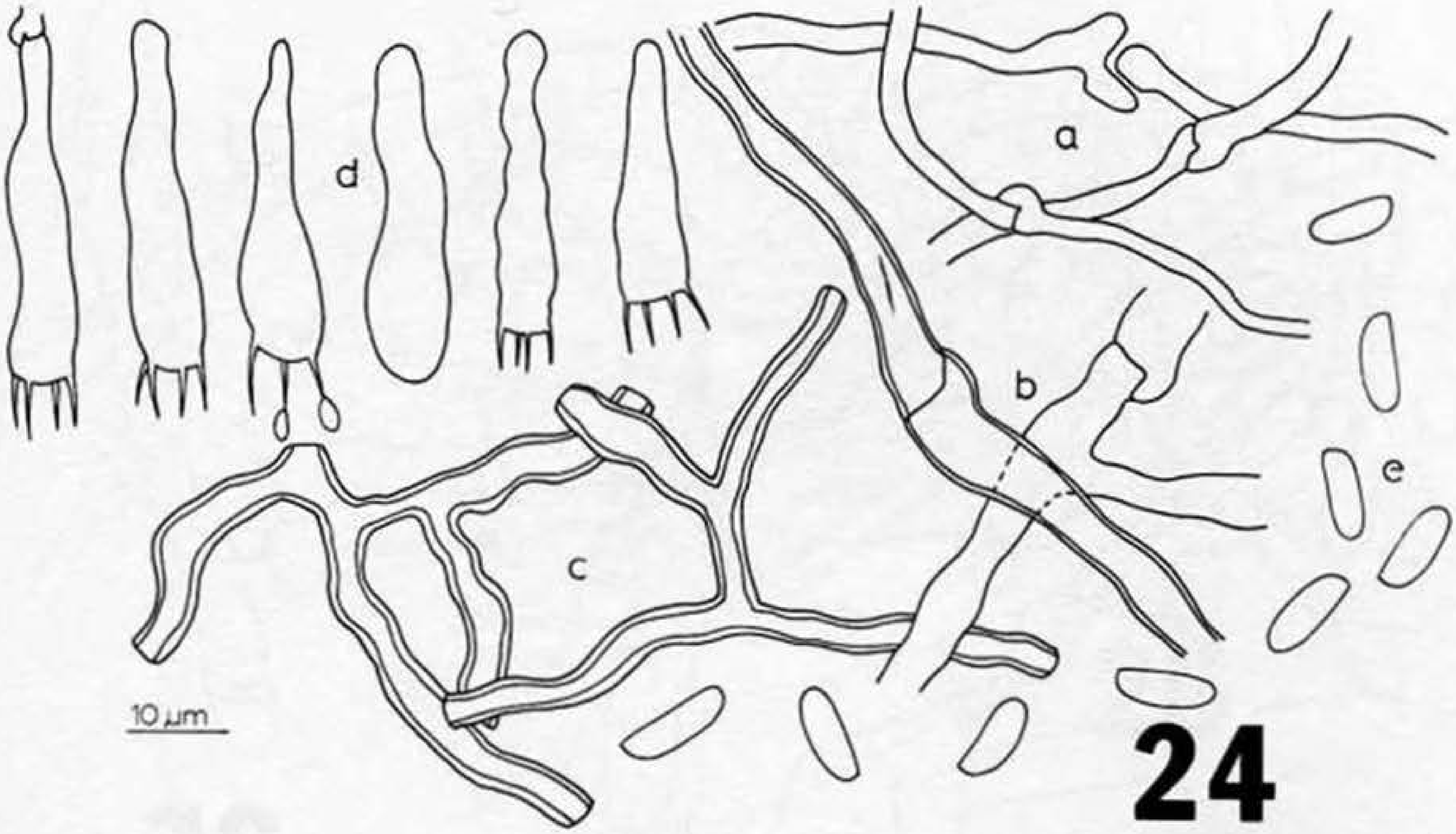


Fig. 24. *Polyporus arcularius.* (JPL 1169).
a) thin-walled generative tramal hyphae; b) thick-walled generative tramal hyphae; c) branched skeletal hyphae; d) basidia; e) basidiospores.

PERENNIPORIA MEDULLA-PANIS (Fr.) Donk, Persoonia 5:76. 1967.

Basidiocarps annual to perennial, effused; pore surface white, drying off-white to reddish-brown (near 2.5YR 9/4); pores 3-5 per mm, round to irregular in shape and size; margin narrow, slightly reflexed, sterile, white, thinning out, felty. *Hyphal system* trimitic; generative hyphae thin-walled, nodose-septate, 2.5-3 µm in diam; skeletal hyphae thick-walled, aseptate, 3-3.5 µm diam; binding hyphae richly branched, 1.5-3 µm diam; subicular tissue dextrinoid in Melzer's reagent. *Cystidioles* embedded, blunt-fusiform, 20-26 x 5-7 µm, with a basal clamp; hyphal pegs present. *Basidia* short-clavate to subglobose, 4-sterigmate, 19-22 x 7-10 µm, with a basal clamp. *Basidiospores* hyaline, smooth, thick-walled, often appearing truncate, dextrinoid in Melzer's reagent (reaction sometimes variable), ellipsoid to ovoid, 5.5-8.5 x 4-5 µm. *Voucher specimen* - JPL 1059.

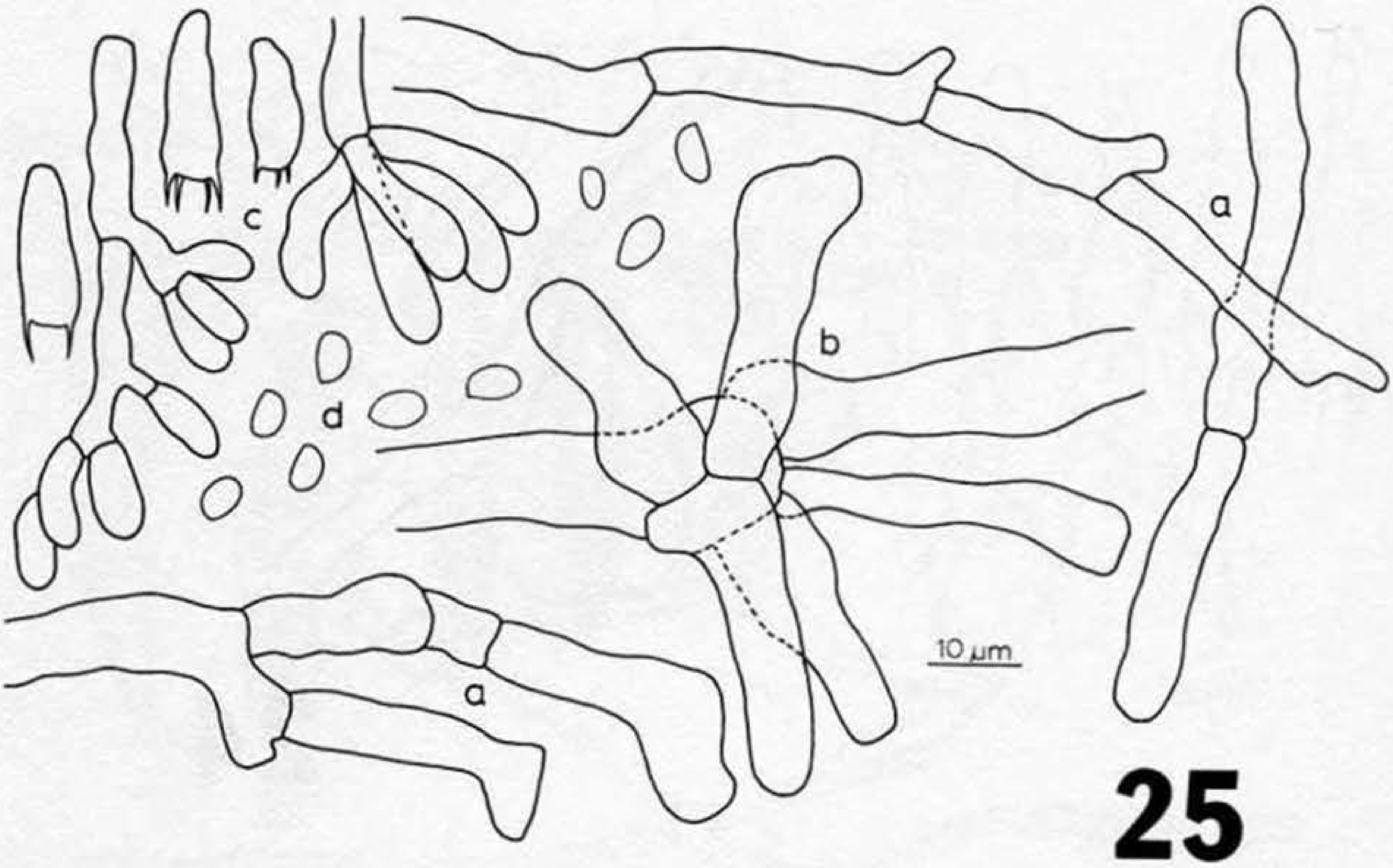
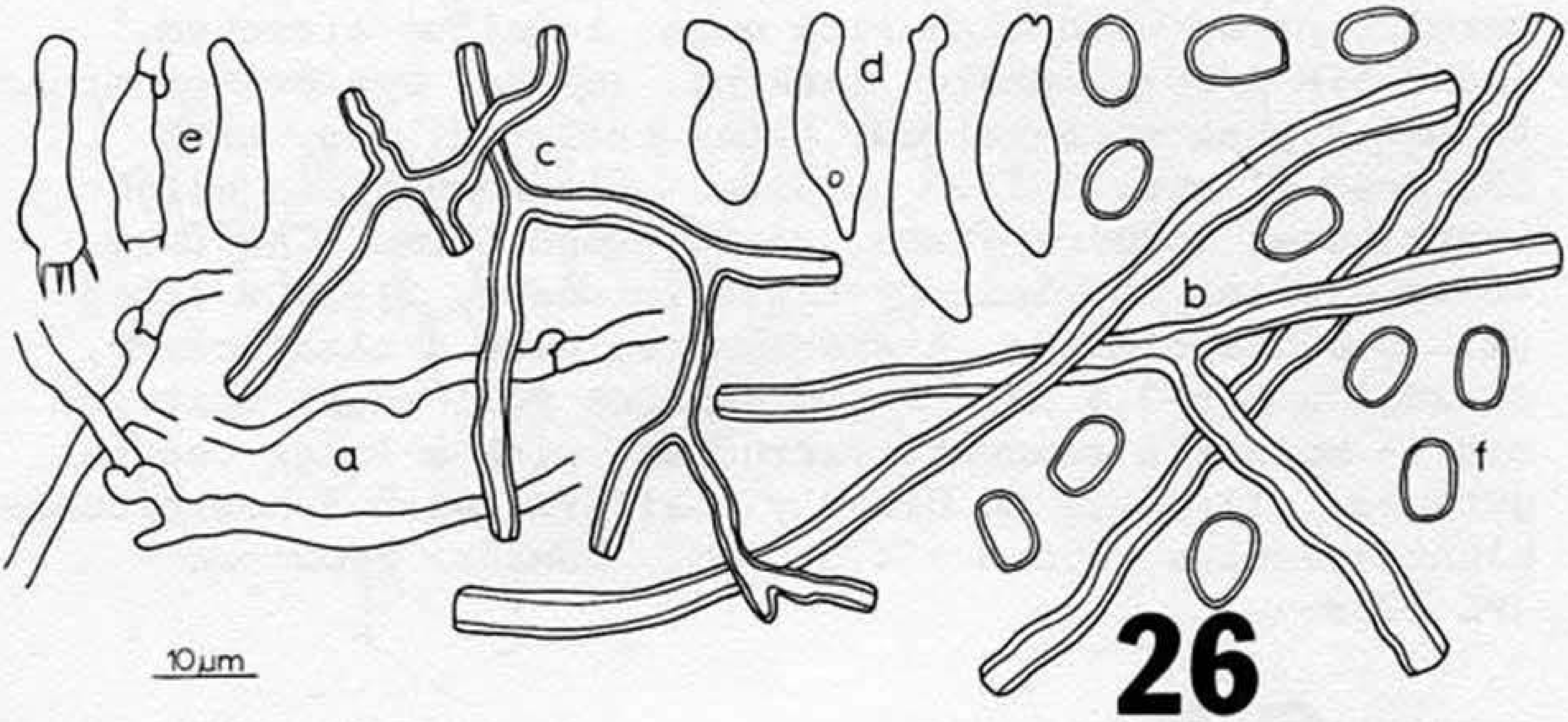


Fig. 25. *Ceriporia excelsa.* (JPL 1087). a) simple-septate generative hyphae; b) whorled branching pattern of generative hyphae; c) basidia; d) basidiospores.

PERENNIPORIA TENUIS (Schw.) Ryv., Norw. J. Bot. 30:9. 1973.

Basidiocarps annual, widely effused, adnate; pore surface bright lemon yellow, fading on drying to yellow or cream (near 2.5Y 8.5/6); pores 3-5 per mm, circular to angular; margin tomentose, cream-colored, sterile; subiculum thin, concolorous with tube layer; tube layer up to 3 mm thick. *Hyphal system* dimitic; generative hyphae thin-walled, nodose-septate, 2-3 µm diam; skeletal hyphae thick-walled, aseptate, some branched and approaching binding hyphae, 2-3 µm diam. *Cystidioles* fusoid, embedded, 17-18 x 4.5-6 µm, with a basal clamp. *Basidia* short-clavate, 4-sterigmate, 16-22 x 5-6 µm, with a basal clamp. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, ellipsoid to short-cylindric, some with a single, large guttule, 5-6 x 3-4.5 µm. *Voucher specimens* - JPL 1065; JPL 1126.



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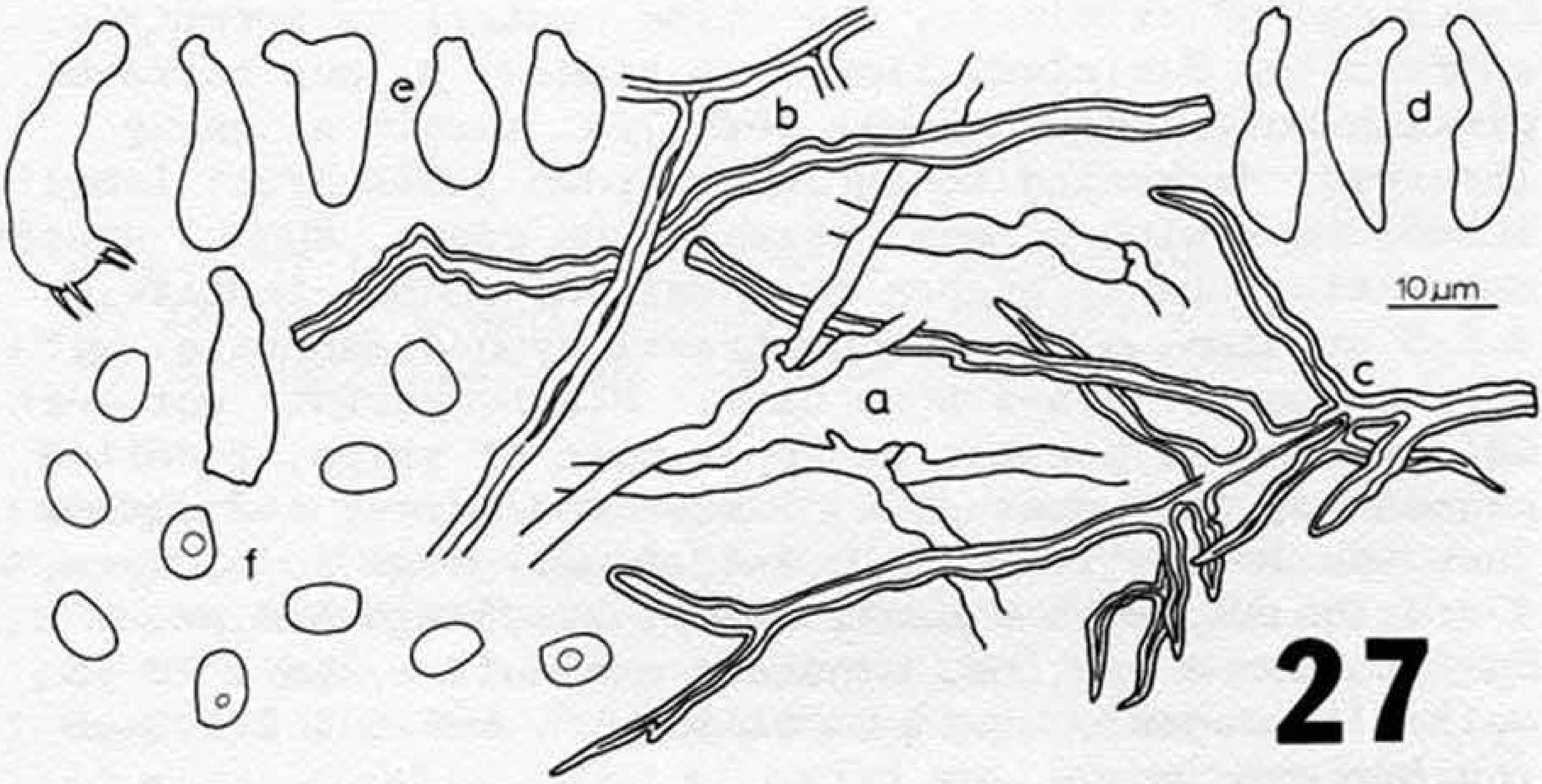

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Fig. 26. *Perenniporia medulla-panis.* (JPL 1059). a) generative hyphae; b) skeletal hyphae; c) binding hyphae; d) fusoid cystidioles; e) basidia; f) basidiospores. Fig. 27. *Perenniporia tenuis.* (JPL 1065). a) generative hyphae; b) skeletal hyphae; c) binding hyphae; d) fusoid cystidioles; e) basidia; f) basidiospores.

GYMNOPILUS SAPINEUS (Fr.) Maire, Publ. Junta Cienc. Nat. Barcelona 15(2):96. 1933.
Basidiocarps centrally stipitate, often solitary; pileus up to 2 cm diam, concentrically wrinkled, with fine hairs, rust-colored (5YR 5/10 to 5YR 4/8), lighter toward the margin, often with a shallow umbo; lamellae attached, (near 5YR 6/10); annulus lacking. *Hyphal system* monomitic; tramal hyphae thin-walled, often inflated, many with obscured clamps, 3-13.5 µm diam. *Pleurocystidia* slightly ventricose, some capitate, 23-26 x 6-6.5 µm. *Cheilocystidia* similar to pleurocystidia in shape, 21-25 x 4.5-5 µm. *Basidia* clavate, 4-sterigmate, with a basal clamp, 23-28.5 x 6.5-7.5 µm. *Basidiospores* yellowish, dextrinoid in Melzer's reagent, verrucose, with a large central guttule, ellipsoid to broadly fusiform, with a conspicuous blunt apiculus, 6.5-9 x 4.5-6 µm. *Voucher specimen* - JPL 1086.

LENTINELLUS COCHLEATUS (Fr.) Karst., Bidr. Kann. Finl. Nat. Folk 32:247. 1897.
Basidiocarps stipitate, the stipe central to eccentric, solitary or fasicled, fluted or ridged; pileus surface pinkish-buff, smooth, near 10YR 7/4, margin slightly incurved, darkening to an umber brown (10YR 2/2); lamellae concolorous with pileus, serrated on edge. *Hyphal system* monomitic; tramal hyphae thin-walled, nodose-septate, 2.5-5 µm diam; gloeoplerous tramal hyphae aseptate, with oily contents, 2.5-5.5 µm diam. *Pleurocystidia* not seen. *Chlamydospores* present on upper part of stipe, 2-celled, pigmented, the upper cell globose and larger and darker than the lower, 13-14 x 10.5-12.5 µm. *Basidia* clavate, 4-sterigmate, with a basal clamp, 22-25 x 5-6.5 µm. *Basidiospores* hyaline, minutely echinulate, amyloid in Melzer's reagent, ovoid to ellipsoid, 5-6 x 3.5-4.5 µm. *Voucher specimen* - JPL 1119.

PANUS RUDIS Fr., Epicrisis, p. 398. 1838.
Basidiocarps annual, tough, developing on slash with bark, eccentrically stipitate, pale buff (10YR 6/8); pileus hirsute, infundibuliform, with inrolled margin; lamellae crowded, wavy, decurrent; stipe up to 1.5 cm long, concolorous with pileus, hirsute, slightly swollen at the base; spore print white. *Hyphal system* dimitic; tramal generative hyphae thin-walled, nodose-septate, 2-4 µm diam; contextual and tramal skeletal hyphae thick-walled, aseptate, 3-5 µm diam; hyphae composing the pileus hairs

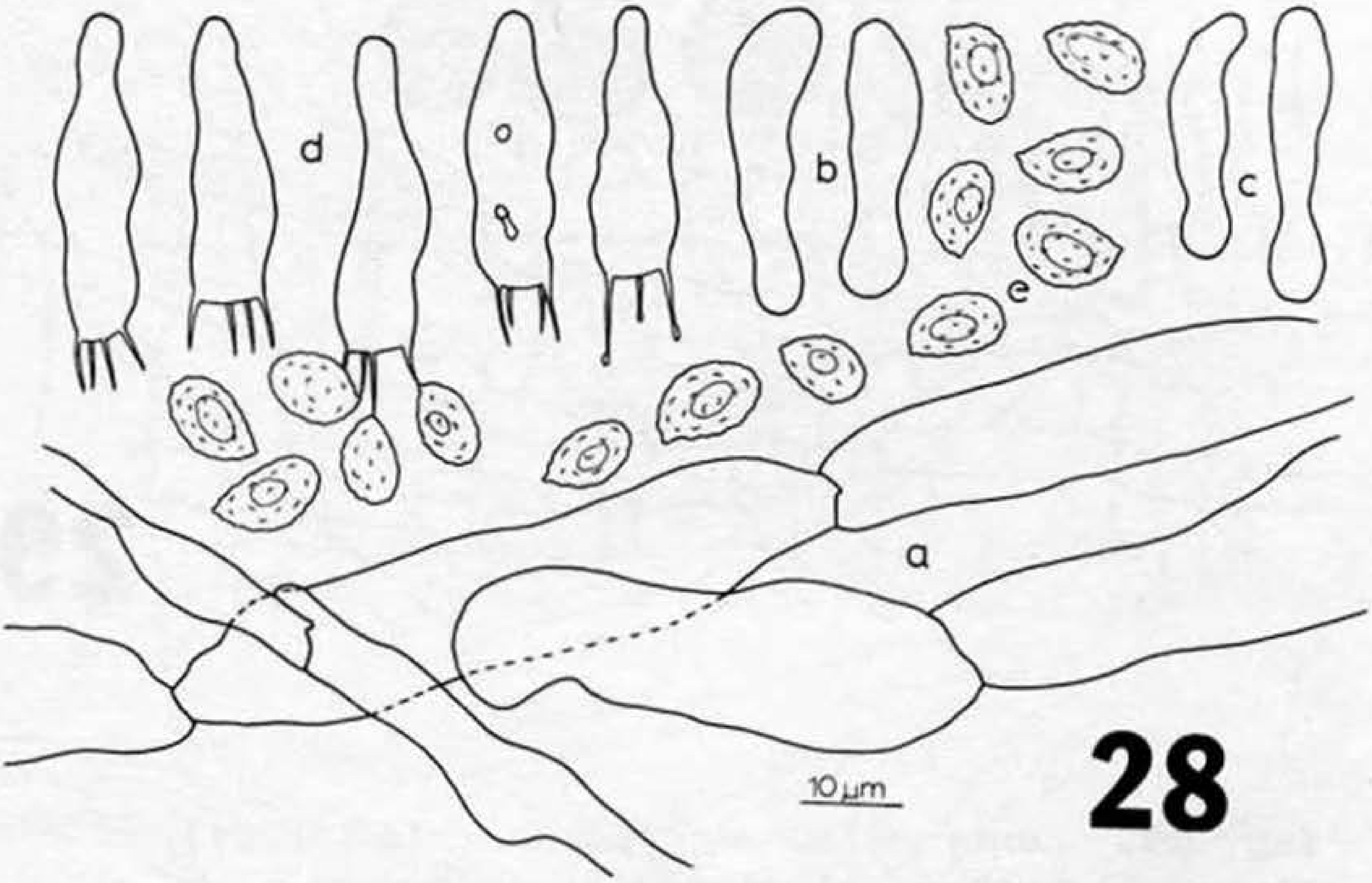

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Fig. 28. *Gymnopilus sapineus*. (JPL 1086).
a) inflated tramal hyphae; b) pleurocystidia;
c) cheilocystidia; d) basidia; e) basidiospores.

slightly thick-walled, nodose-septate, 4-5 µm diam. *Pleurocystidia* of two types; one type thin-walled, cylindric and tapering slightly at the tip, projecting up to 15 µm, with a basal clamp, 34-52 x 4.5-6 µm; another type thick-walled with the wall expanding to create a thin-walled apex, clavate (some slightly swollen in the middle), with a basal clamp, 51-60 x 8-12 µm. *Basidia* clavate, 4-sterigmate, with a basal clamp, 19-25 x 3-5 µm. *Basidiospores* hyaline, smooth, negative in Melzer's reagent, short-cylindric, slightly curved, 3.5-5 x 2 µm. *Voucher specimen* - JPL 1127.

Discussion

Thirty species of wood-rotting fungi occurring on Gambel oak are illustrated and briefly described in this paper. These fungi represent four orders in the class

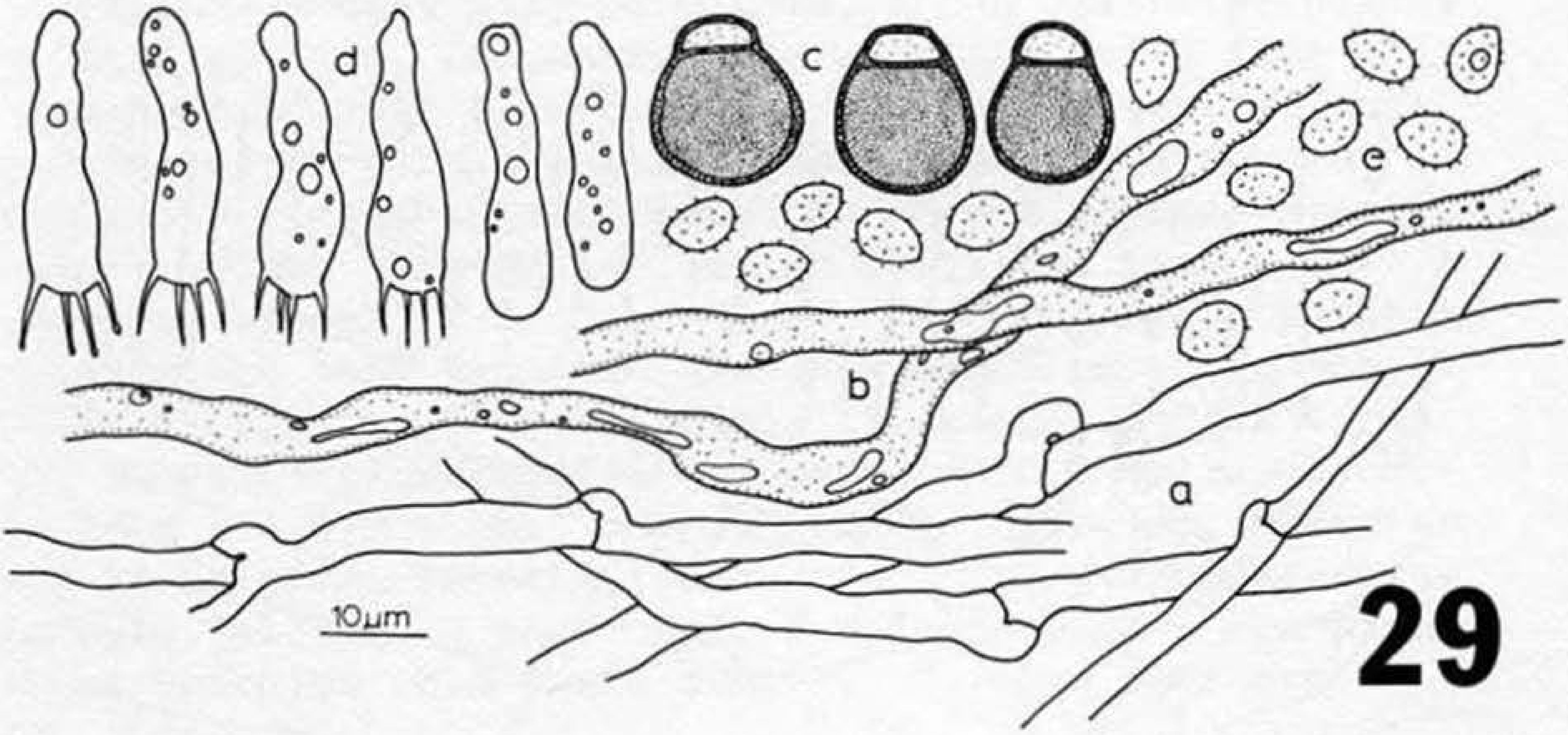

Fig. 29. *Lentinellus cochleatus*. (JPL 1119).
a) tramal hyphae; b) gloeoplerous hyphae;
c) chlamydospores; d) basidia; e) basidiospores.

Hymenomycetes: Tremellales, Dacrymycetales, Aphyllophorales, and Agaricales.

Several comments are worth mentioning based on these initial collections from Gambel oak. Most interesting is that no brown-rot fungi were collected; all are white-rotters. In southwestern Colorado Gambel oak grows in pure stands, as an understory in ponderosa pine and/or aspen, and less frequently with other species. All these associated species harbor brown-rot fungi. This situation could be due to the peculiar extractives, (e.g., tannins), of Gambel oak wood. Certainly brown-rot fungi should occur on Gambel oak in Colorado. Gilbertson et al. (1974) include brown-rot fungi in their list of Gambel oak fungi in Arizona. Shaw (1973) lists several brown-rotters on Garry oak (*Quercus garryana* Dougl. ex Hook.) in the Pacific Northwest, and Garry oak is thought to be a closely related species (Christensen, 1949). However, it seems apparent that brown-rot fungi are fairly uncommon on Gambel oak. It is interesting that *Gloeophyllum saepiarium* (Wolf.:Fr.) Karst., which grows on conifers and aspen, has not yet been collected on Gambel oak.

Because of the extensive eradication efforts, including periodic burning and foliar spraying with 2-4-5 T,

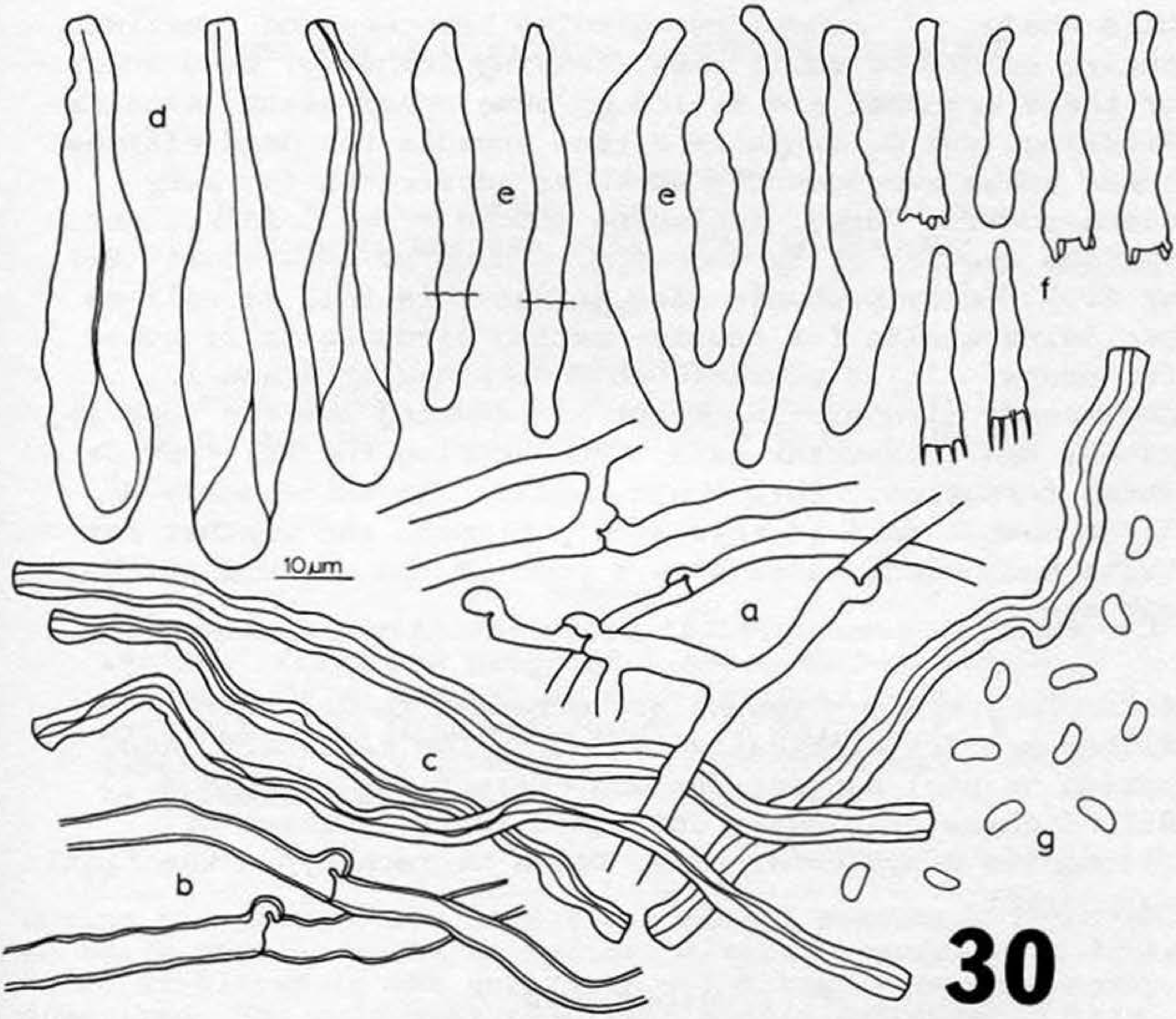

Fig. 30. *Panus rudis*. (JPL 1127). a) tramal generative hyphae; b) hyphae from pileus hairs; c) skeletal hyphae; d) thick-walled pleurocystidia; e) thin-walled pleurocystidia; f) basidia; g) basidiospores.

that have been practiced on Gambel oak in southwestern Colorado, it is possible that certain habitats have been created, or at least made more numerous, than would have been the case under natural situations. The fungi collected on the standing dead wood and charred remains of burned trees may reflect these habitats, thus giving an altered picture of the "normal" Gambel oak mycota.

Calopactis singularis H. and P. Sydow is the anamorph of *Endothia singularis* (Syd.) Shear and N.E. Stevens and is very common in at least one of the sites collected in this study. *C. singularis* girdles branches and sometimes entire trunks of small oaks, leaving standing, dead snags, or these branches are killed by some other means, such as freezing, and *C. singularis* then invades the dead tissues. These snags subsequently serve as substrates for many slash-rotting fungi, including *Exidia glandulosa* Fr. and various species of *Hyphodontia*. *Inonotus andersonii* (Ell. et Ev.) Černy probably also serves this role as well as providing a site for cavity-nesting birds to drill holes for nests. It is possible that *C. singularis* and *I. andersonii* also are important in breaking out the tops in rather small diameter oaks, thus keeping the oak type in a shrub formation. This would explain the infrequency of large Gambel oaks in this area. Climate and weather patterns undoubtedly also play a role in the stature of these oak stands.

Acknowledgements - Thanks are extended to Dr. R.L. Gilbertson for critically reviewing the manuscript and making helpful suggestions and corrections. Dr. M.E. Barr Bigelow graciously confirmed identification of *Calopactis singularis*. Mrs. Donna Giersch typed the final manuscript.

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MYCOTAXON

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SOME NEW COMBINATIONS IN THE POLYPORACEAE

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SUMMARY

In connection with the flora "Polyporaceae of North America" there are proposed 5 new combinations in Antrodia, 1 in Ceriporia, 4 in Ceriporiopsis, 1 in Datronia, 4 in Diplomitoporus 1 in Earliella, 2 in Fomitopsis, 1 in Gloeoporus, 22 in Oligoporus and 2 in Perenniporia.

During the preparation of a flora of all polypores reported in North America north of Mexico, several species were found to be misplaced in the genera in which they were originally described. The main reason is that modern taxonomy in this group of fungi places the main emphasis on microscopical characters while macromorphology in most cases plays a secondary role. Instead of making the necessary transfers in the flora, where they easily may be missed, we found it more convenient to publish them in a journal of mycological taxonomy. Thus, the following combinations are proposed:

ANTRODIA ALPINA (Litsch.) Gilbn. & Ryv. comb. nov. Basionym: Poria alpina Litsch. Oester. Bot. Zeitschr. 88: 143, 1939.

ANTRODIA FEROX (Long & Baxt.) Gilbn. & Ryv. comb. nov. Basionym: Poria ferox Long & Baxt. Mich. Acad. Sci.Arts. Let. Pap. 25: 149, 1940.

ANTRODIA ODORA (Peck ex Sacc.) Gilbn. & Ryv. comb. nov. Basionym: Poria odora Peck ex Sacc. Syll. Fung. 6:294, 1888. Polyporus odorus Peck 1885 is invalid as a homonym of P. odorus Fr. 1821.

ANTRODIA RADICULOSA (Peck) Gilbn. & Ryv. comb. nov. Basionym: Polyporus radiculosus Peck N.Y. State Mus. Ann.

Rep. 40:52, 1887.

ANTRODIA SITCHENSIS (Baxt.) Gilbn. & Ryv. comb. nov. Basionym:Poria sitchensis Baxt. Mich. Acad. Sci. Arts. Let. Pap. 23: 293, 1938.

CERIPORIA SPISSA (Schw.) Gilbn. & Ryv. comb. nov. Basionym: Polyporus spissus Schw. in Fries. Elench. Fung. 1: 111, 1828.

CERIPORIOPSIS CARNEGIEA (Baxt.) Gilbn. & Ryv. comb. nov. Basionym: Poria carnegiea Baxt. Mich. Acad. Sci. Art. Let. Pap. 16: 110, 1941.

CERIPORIOPSIS MUCIDA (Pers: Fr.) Gilbn. & Ryv. comb. nov. Basionym: Polyporus mucidus Pers: Fr. Syst. Mycol. 1: 382, 1821.

CERIPORIOPSIS PANNOCINCTA (Rom.) Gilbn. & Ryv. comb. nov. Basionym: Polyporus pannocinctus Rom. Arkiv f. Bot. 11(3):20, 1912.

CERIPORIOPSIS SUBVERMISPORA (Pil.) Gilbn. & Ryv. comb. nov. Basionym: Poria subvermispora Pil. Stud. Bot. Cech. 3: 2, 1940.

DATRONIA SCUTELLATA (Schw.) Gilbn. & Ryv. comb. nov. Basionym: Polyporus scutellatus Schw. Trans. Am. Phil. Soc. II, 4: 157, 1832.

DIPLOMITOPORUS LENIS (Karst.) Gilbn. & Ryv. comb. nov. Basionym: Physisporus lenis Karst. in Rabenh. Fungi Europ. & Extraeur. Exsic. 3527, 1886.

DIPLOMITOPORUS LINDBLADII (Berk.) Gilbn. & Ryv. comb. nov. Basionym: Polyporus lindbladii Berk. Grevillea 1: 54, 1872.

DIPLOMITOPORUS OVERHOLTSII (Pil.) Gilb. & Ryv. comb. nov. Basionym: Poria overholtsii (Pil. Stud. Bot. Cech. 3: 2, 1940.

DIPLOMITOPORUS RIMOSUS (Murr.) Gilbn. & Ryv. comb. nov. Basionym: Poria rimosa Murr. Mycologia 12: 91, 1920.

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NEW TAXA OF HYPOXYLON

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ABSTRACT

Hypoxylon dumontii sp. nov. is described from Brazilian collections. It produces a Nodulisporium anamorph and perithecial stromata in culture. Hypoxylon chestersii var. microsporum var. nov. is described from Brazilian collections. It produces a Geniculosporium anamorph in culture. The typical variety of this fungus is known only from the British Isles. Hypoxylon aeruginosum var. macrosporum var. nov. is described from Louisiana, USA. The typical variety is known only from British Guiana and Amazonian Brazil.

1. Hypoxylon dumontii J. D. Rogers & G. J. Samuels, sp. nov. Figs. 1-4, 11 and 12

Stromata pulvinata, 0.5-5 mm X 0.5-5 mm X 0.5-1 mm crassa, extus luteola vel ferruginea; proxime sub superficie aurantiaca, sub peritheciis nigra. Stromata mollia. Perithecia 0.2 mm diametro, forma peritheciorum manifesta in stromatibus. Ostiola umbilicata. Asci octospori, cylindrici, longe stipitati, 110-150 µm longitudine tota X

7-11 µm crassi, annulo apicali in liquore iodata Melzeri immerso cyanescente, triangulari in sectione opticali, 2-3 µm alto X 4-5 µm lato. Ascosporae brunneae, ellipsoideo-inaequilaterales vel rectangulares, leves, (11-)13-16(-20) X 6-8 µm, rimae germinativae longitudo minor quam sporae integrae. Status anamorphosis *Nodulisporium*.

Stromata pulvinate, 0.5-5 mm X 0.5-5 mm X 0.5-1 mm thick, externally yellowish to rusty red; orange immediately beneath surface and black beneath perithecia. Stromata soft. *Perithecia* 0.2 mm diam, the contours evident on stroma (Fig. 1). Ostioles umbilicate. *Asci* eight-spored, cylindrical, with long stipes, 110-150 µm total length X 7-11 µm broad. Ascus apical ring bluing in Melzer's iodine reagent, triangular in optical section (Fig. 3), 2-3 µm high X 4-5 µm wide. *Ascospores* brown, ellipsoid-inequilateral to rectangular, smooth, (11-)13-16(-20) X 6-8 µm, with germ slit less than spore-length (Figs. 2,4). Anamorph a *Nodulisporium*.

Colonies on 2% oatmeal agar incubated at ca. 22 C in natural daylight/darkness covering 9 cm Petri plate in 2-3 wk, with areas of aerial mycelium and compact appressed mycelium, sulfur yellow with rings or irregular sectors of orange brown. Reverse blackish. *Perithecial stromata* formed abundantly in orange brown areas, closely resem-

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Figs. 1-12. *Hypoxylon dumontii* and *Hypoxylon chestersii* var. *microsporum*. 1-4. *H. dumontii*. 1. Perithecial stromata on host, X 15. 2. Ascospore, partially out of focus to show germ slit, X 1100. 3. Ascus tip stained by iodine, X 1100. 4. Ascospores, X 1100. 5-10. *H. chestersii* var. *microsporum*. 5. Ascospore, X 6000. 6. Ascospore, X 2500. 7. Conidiophore with conidia, X 2000. 8. Conidiophore showing arrangement of conidia on conidiogenous region, X 2000. 9. Conidiophore showing geniculated conidiogenous region and tapered apex, X 2500. 10. Branched conidiophore, X 1000. 11-12. *H. dumontii*. 11. Conidia, X 1200. 12. Conidiophores, X 800.

Fig. 1 by macrophotography. Figs. 2-4, 6 by brightfield microscopy. Fig. 5 by scanning electron microscopy. Fig. 7 by differential interference microscopy. Figs. 8-10 by darkfield phase microscopy. Figs. 11 and 12 drawn from brightfield microscopy.

Figs. 1-4, 11 and 12 from DU-BR 1009. Figs. 5-7 from DU-BR 828. Figs. 8-10 from Samuels 391. See text for complete citations for collections.

All magnifications approximate.

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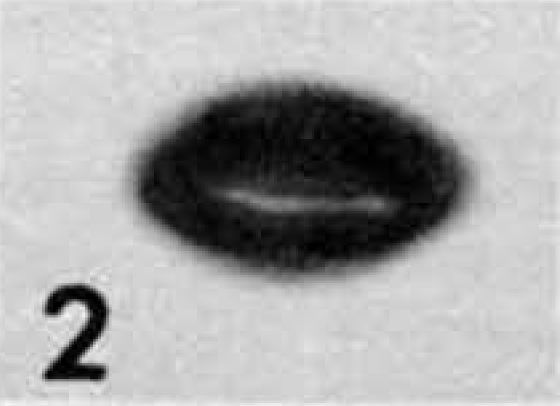

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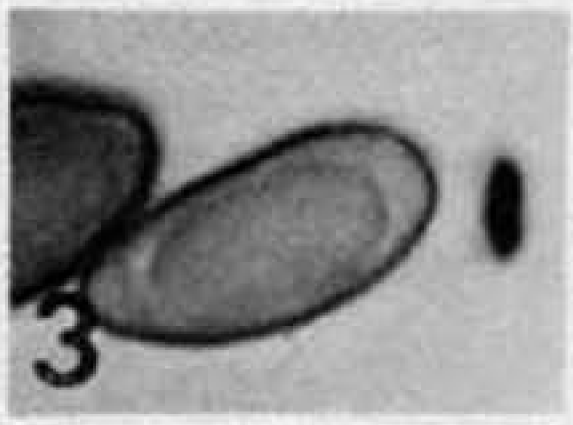

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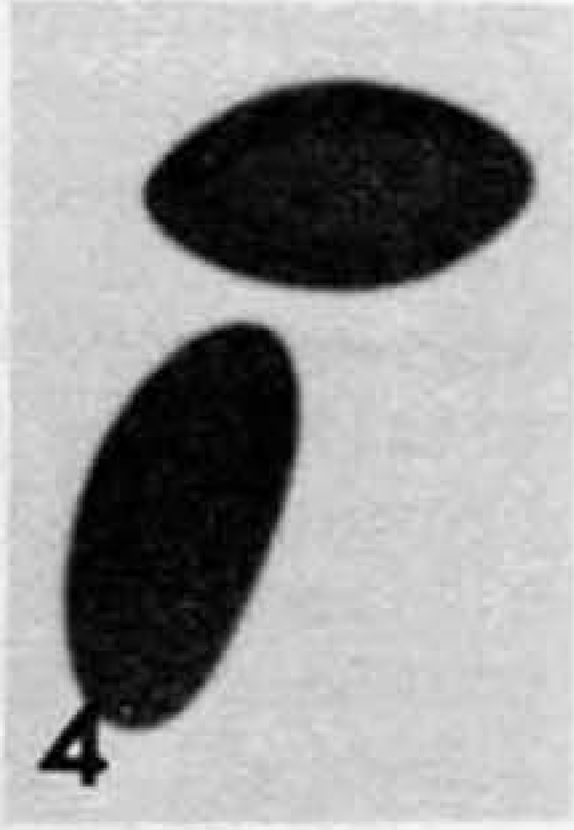

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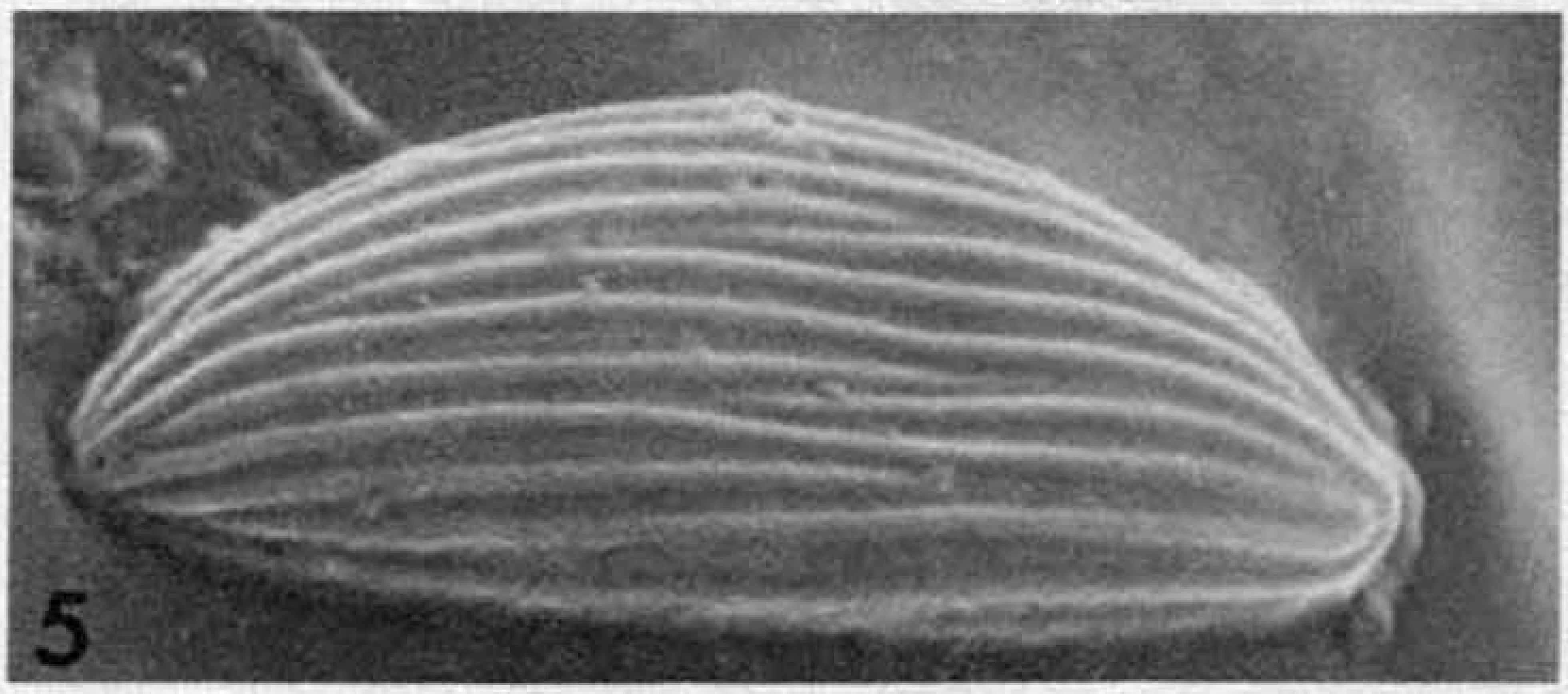

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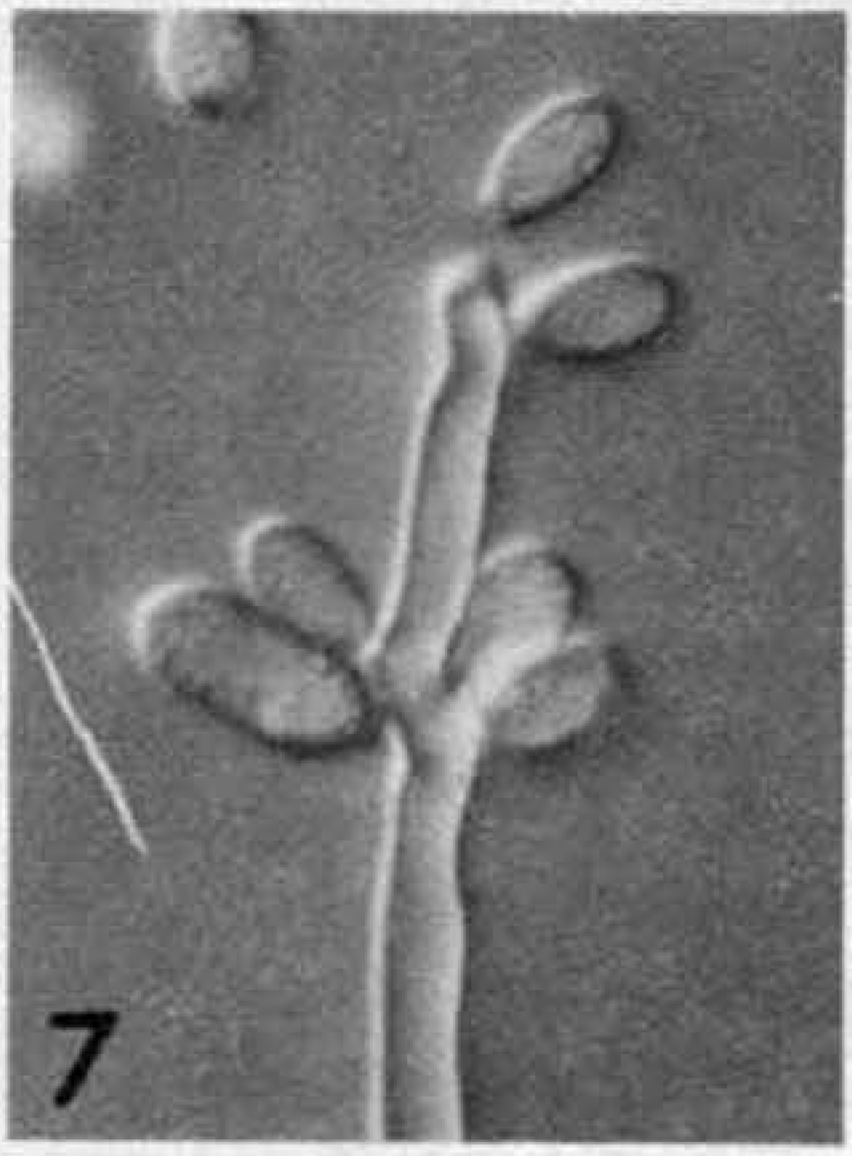

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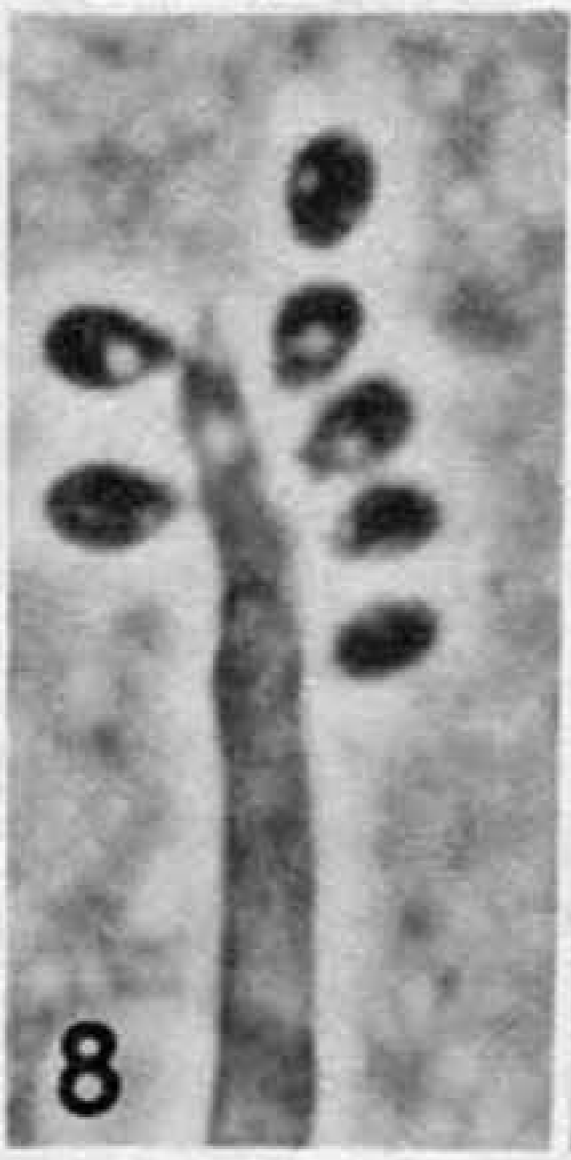

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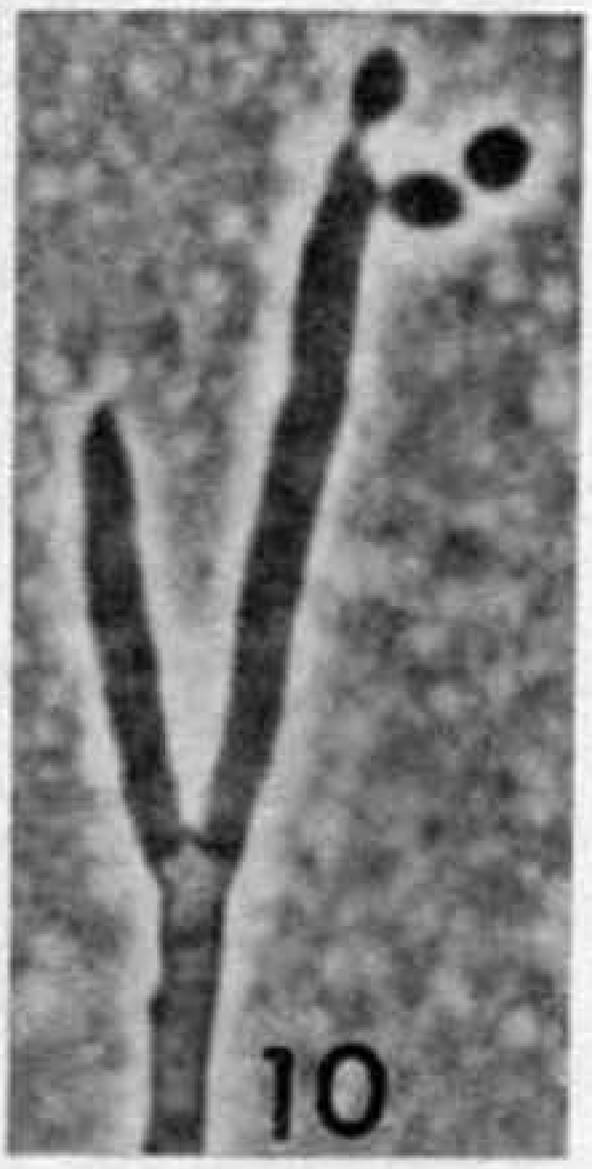

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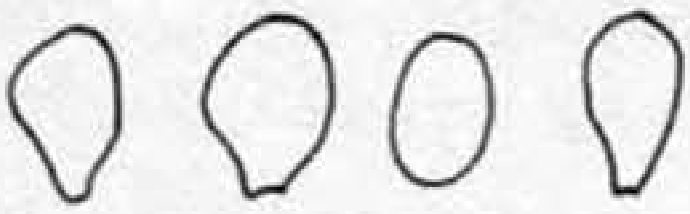

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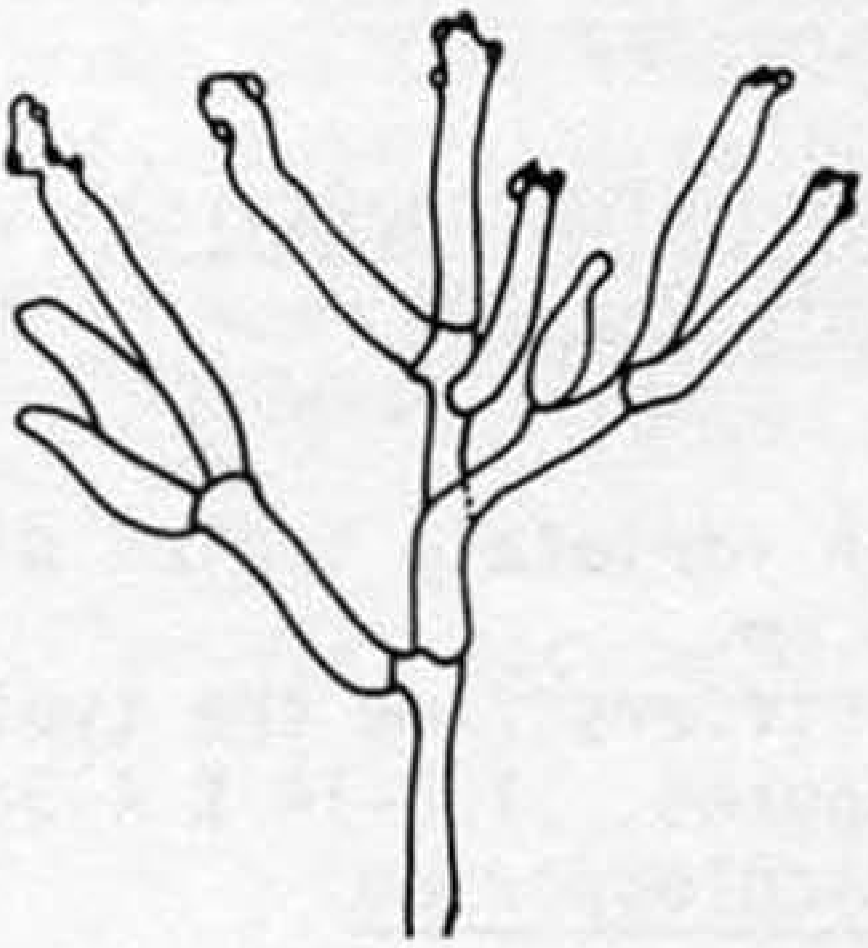

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bling those produced under natural conditions.

Conidiophores arising from areas of appressed mycelium, sparingly branched, 65-80 µm long, subhyaline to brownish, smooth to minutely spinulose in older regions (Fig. 12). *Conidiogenous regions* producing conidia holoblastically, the terminal parts swollen from repeated conidial production (Fig. 12). *Conidia* hyaline, smooth, obovoid to ellipsoid, with flattened scars indicating their former points of attachment to the conidiogenous cell (Fig. 11), 3.5-4(-5) X 2-3 µm.

Named in honor of our friend, K. P. Dumont, a member of the expedition during which the type collection was made.

COLLECTIONS EXAMINED: BRAZIL: Samuels, G. J., et al., DU-BR 1009, 14.XII.1977, shore of Rio Negro, Igapó, Estado de Amazonas, on dead monocot (INPA 122215, HOLOTYPE; NY, ISOTYPE); Samuels, G. J., nos. 26 and 29, 31.I.1984, Perimetral Norte highway, 45 km W of Caracarai Fazenda Repartimento, Igarapé Repartimento do Ajaraní, Territorio de Roraima, no. 26 on dicot bark, no. 29 on monocot stem (INPA; NY; J. D. Rogers herb.).

Hypoxylon dumontii is the only member of section *Hypoxylon* (Miller, 1961) which is known to produce fertile ascomata in culture. Its *Nodulisporium* anamorph is similar to those reported for some other species in section Hypoxylon (see Jong & Rogers, 1972). Unfortunately, our cultures of this fungus are no longer viable. The fungus resembles *Hypoxylon notatum* Berk. & Curt. in general morphology, but is more brightly colored. Moreover, *H. notatum* occurs chiefly on *Quercus* in USA (Miller, 1961) and, to our knowledge, has not been reported outside of the USA. *Hypoxylon dumontii*, on the other hand, is currently known only from Amazonian Brazil. Two of the three known collections are from monocot stems. Thus, although it is probable that *H. notatum* and *H. dumontii* are related we consider them to be separate and distinctive species.

2. *Hypoxylon chestersii* J. D. Rogers & A. J. S. Whalley var. *microsporum* J. D. Rogers & G. J. Samuels, var. nov.
Figs. 5-10

A varietate typica differt in ascosporis 11.5-14 X 4.5-6 µm.

Differs from the typical variety in the size of ascospores, 11.5-14 X 4.5-6 µm (Figs. 5 and 6). Anamorph a *Geniculosporium*.

Colonies on SME (see Kenerley & Rogers, 1976) incubated at ca. 22 C in natural daylight/darkness covering 9 cm Petri plate in 1 month, with mycelium appressed, whitish to pale tan. Reverse pale yellow.

Conidiophores produced at periphery of plate, sparingly branched, subhyaline, smooth, 35-95 X 3-3.5 µm long. *Conidiogenous regions* geniculated and bearing conspicuous conidial secession scars (Figs. 7-10), apical, usually conspicuously tapering, or becoming intercalary by interruption of sporulating regions by nonsporulating segments (Figs. 7-9). Conidia produced holoblastically. *Conidia* hyaline, smooth, obovoid, with flattened bases indicating former points of attachment to the conidiogenous cell (Figs. 7-10), 3-5 X 1.5-3 µm.

COLLECTIONS EXAMINED: BRAZIL: Dumont, K. P., BR 828, 11.XII.1977, Boca da Mata, Territorio de Roraima, on dicot wood (INPA 93340, HOLOTYPE; NY, ISOTYPE and dried cultures with anamorph; J. D. Rogers herb., ISOTYPE and dried cultures with anamorph); Samuels, G. J., no. 391, 19.II.1984, south side of northern massif, Plateau of Serra Aracá, Estado de Amazonas, on bark and old polypore (INPA; NY; J. D. Rogers herb.).

It is most interesting to discover a variety of *Hypoxylon chestersii* from tropical South America. The typical variety is known only from the British Isles (Rogers & Whalley, 1978). The teleomorph of var. *microsporum* seems very similar to the typical variety, differing primarily from the latter in having smaller ascospores on average. The ascospore ridges of var. *microsporum* (Figs. 5 and 6) seem identical to those of the typical variety. The anamorphs of var. *microsporum* and the typical variety are referable to *Geniculosporium* Chesters & Greenhalgh, the new variety separable from the typical variety primarily on the smaller average size of its conidia (Whalley & Rogers, 1980).

Hypoxylon chestersii is the second *Hypoxylon* with distinctly ornamented ascospores known to have varieties on different continental land masses. *Hypoxylon weldenii* J. D. Rogers which was described from Louisiana, USA has a small-spored counterpart, *H. weldenii* var. *microsporum* J. D. Rogers, which was described from Honduras (Rogers, 1977; 1980).

3. *Hypoxylon aeruginosum* J. H. Miller var. *macrosporum* J. D. Rogers.

A varietate typica differt in ascosporis 11-14 X 5-7 µm.

Differs from the typical variety in the size of ascospores, 11-14 X 5-7 µm.

COLLECTION EXAMINED: USA: Lowy, B., 19.I.1957, Zemurray estate, Tickfaw, Tangipahoa Parish, Louisiana, on bark (WSP 67594, HOLOTYPE).

Hypoxylon aeruginosum was until recently known only from the type collection from British Guiana. Recently, we examined a second collection of the typical variety: BRAZIL: Samuels, G. J., no. 902, 28.II.1984, base of west slope of Serra Aracá, Estado de Amazonas, on wood (INPA; NY; J. D. Rogers herb.). Attempts to obtain cultures failed.

Hypoxylon aeruginosum var. *macrosporum* seems identical to the typical variety in its distinctive blue-green color and general morphology (see Miller, 1961). It appears to differ from the typical variety principally in the larger size of the ascospores.

ADDITIONAL COMMENTS

It is perhaps noteworthy that in the cases of *H. chestersii* and *H. aeruginosum* as well as *H. weldenii*, the small-spored subtaxa have been described from tropical regions whereas the large-spored subtaxa have been described from more temperate localities (Miller, 1961; Rogers, 1977, 1980; Rogers & Whalley, 1978). This might indicate that, for a given taxon, larger spores are advantageous in cooler, or seasonally cool, environments and are selectively favored. Any advantage of larger spores probably involves a greater capacity to store substrates for eventual germination over cool or cold periods.

Perusal of Miller's monograph (1961) does not necessarily support a trend toward small-spored subtaxa in the tropics. However, some of Miller's subtaxa are probably, in reality, separate species. The subtaxa that we cite herein are almost certainly varietal pairs. It must be noted contrariwise, however, that some of the xylariaceous fungi with the largest ascospores known in the family are tropical. Unfortunately, most of these do not have temperate counterparts that can be investigated.

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BLASTOSCHIZOMYCES CAPITATUS, A NEW COMBINATION

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INTRODUCTION

Blastoschizomyces pseudotrichosporon Salkin, Gordon, Samsonoff et Rieder was recently established to accommodate blastomycetes which form annelloconidia either along the hyphae, at the ends of branches, or both (Salkin, Gordon, Samsonoff, and Rieder, 1982). The conidia subsequently undergo schizolytic division and then blastoconidia formation, resulting in clumps of cells which resemble arthroconidia. Although *B. pseudotrichosporon* shared many physiologic and morphologic traits with *Trichosporon capitatum* Diddens and Lodder (Salkin et al., 1982), the formation by the former of annelloconidia, as contrasted with the reported and observed arthroconidia developed by the latter, was considered of sufficient importance to warrant the establishment of *B. pseudotrichosporon* as a new genus and species. Subsequent photomicroscopic cinematographic study of conidiogenesis in several isolates of *B. pseudotrichosporon* and the isolate designated as the "type" culture of *T. capitatum* by the Centraalbureau voor Schimmelcultures (CBS; CBS 2364) have caused us to reevaluate the taxonomy of these two organisms. We have concluded that the two taxa are conspecific and therefore that the new combination *B. capitatus* Salkin, Gordon, Samsonoff et Rieder is necessary.

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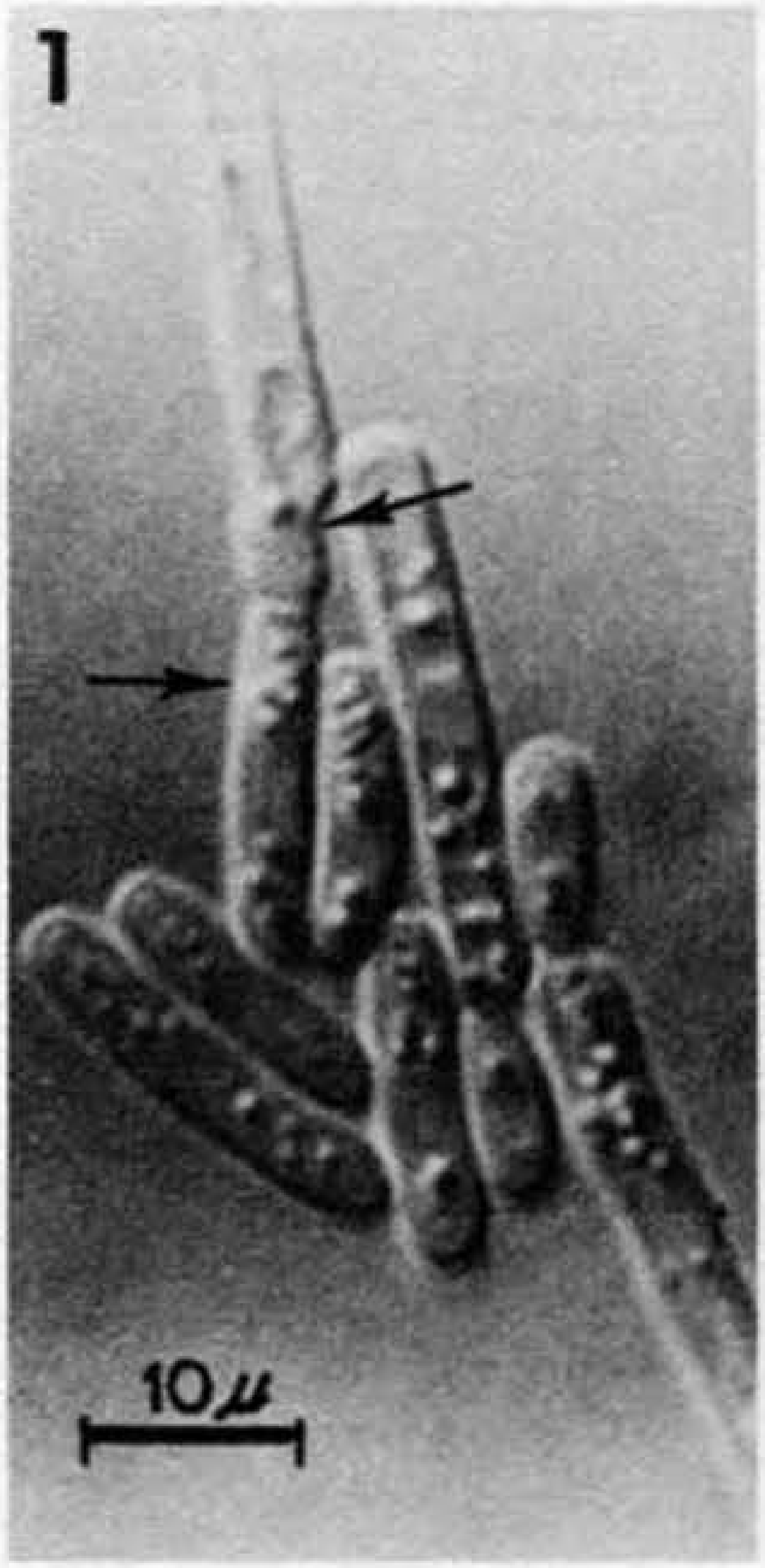

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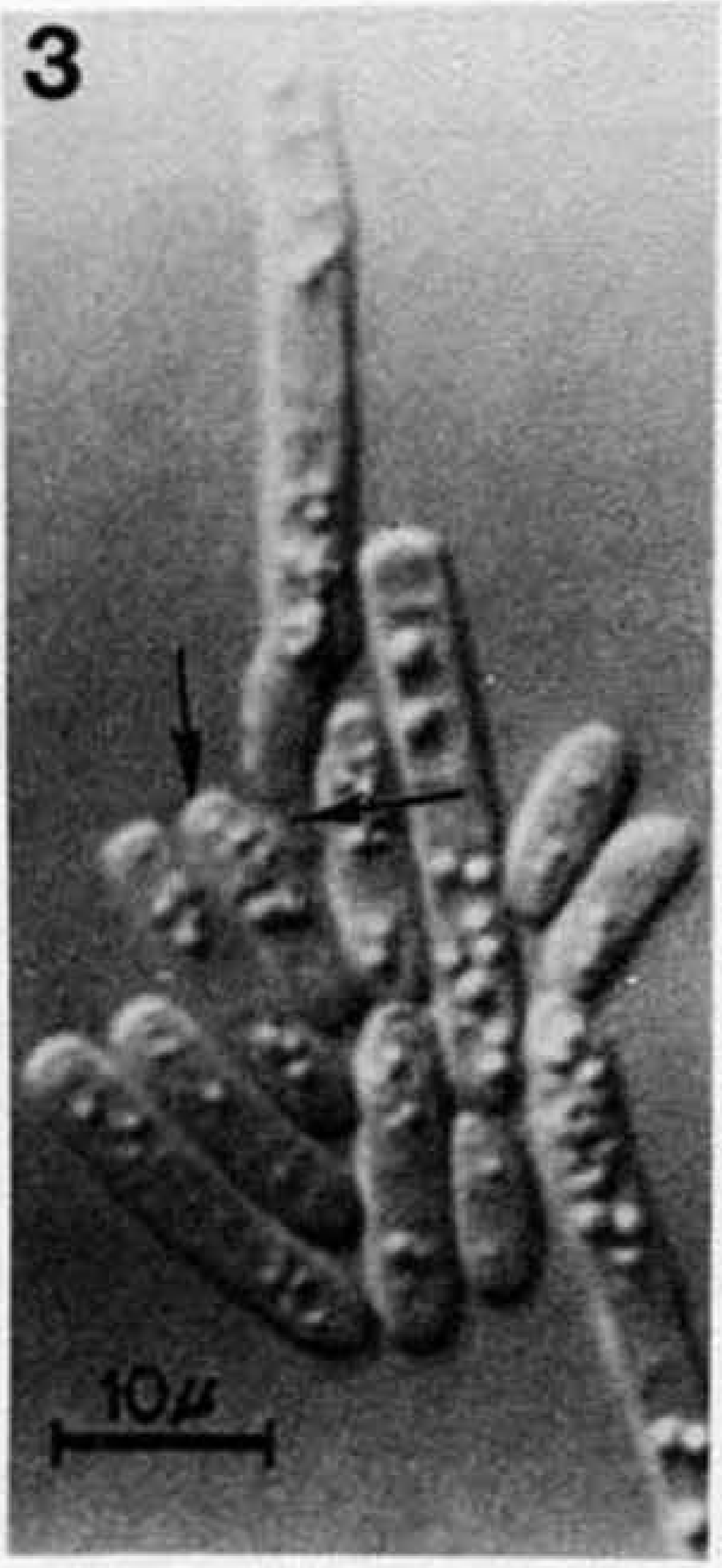

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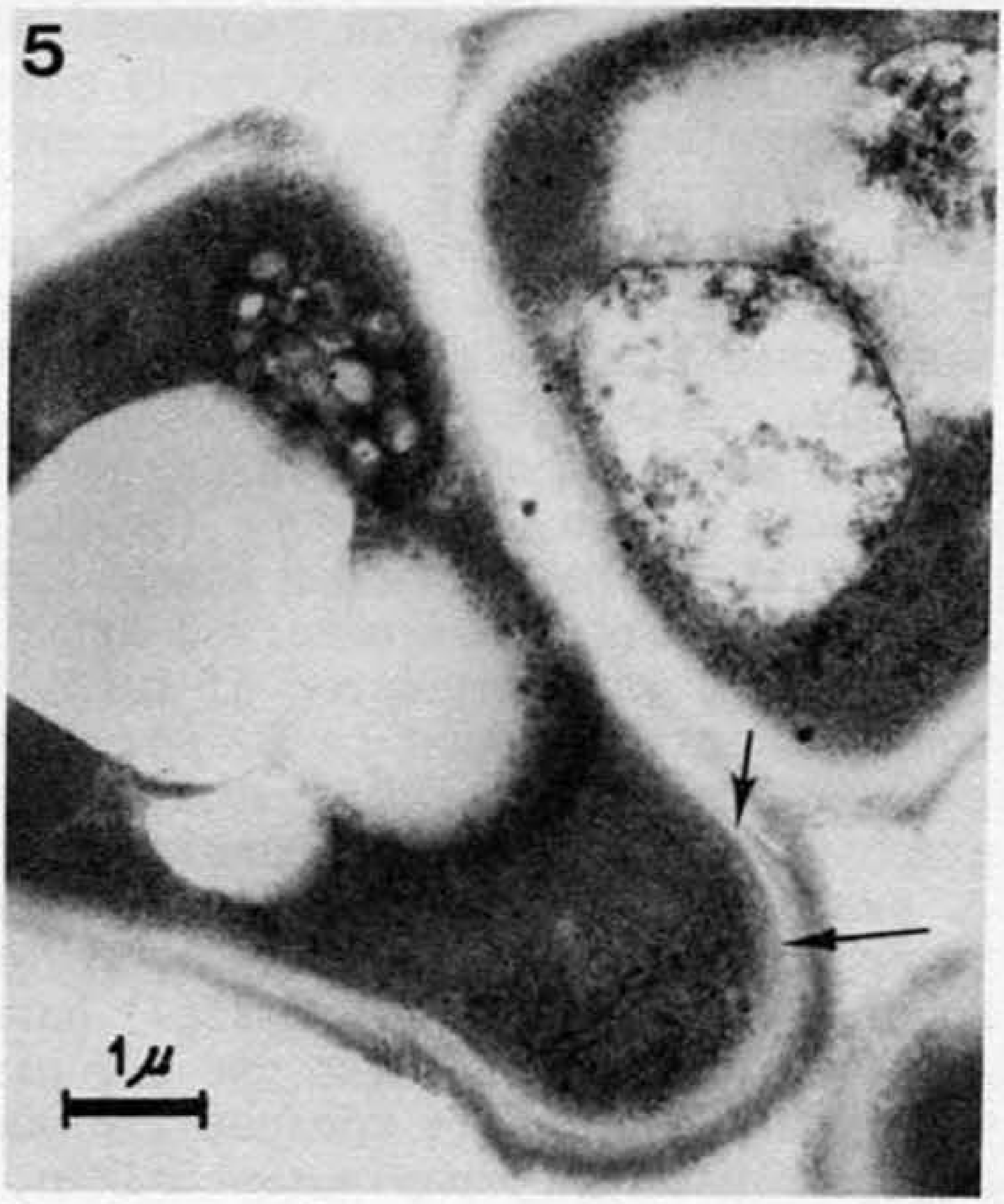

MATERIALS AND METHODS

Test organisms. Five *B. pseudotrichosporon* isolates (a subculture of the original isolate from which the holotype M46-67 was derived, M2518-82 isolated from sputum, M699-83 isolated from sputum, M1554-83 (NCMH) isolated from sputum, and Zurich-82 isolated from the mouth), and the isolate designated as the "type" culture of *T. capitatum* (CBS 2364) by the CBS were grown on Emmons' modified Sabouraud dextrose agar slants at 27C and transferred at monthly intervals to fresh medium. Inocula for all studies were obtained from slants incubated at 27C for 72 h.

Light and electron microscopic studies. The 6 isolates were examined by light microscopy, electron microscopy, or both. In order to afford continuous observation of the development of individual annellides and to provide the thin agar cultures required for electron microscopy, isolates were grown in a Coleman perfusion chamber as described previously (Salkin et al., 1982). A portion of growth from a 72-h culture was lightly cut into the surface of cornmeal agar supplemented with 1% Tween 80 coated on the lower half of the chamber. A sterile round 18-mm coverslip was then placed on the surface of the agar, and the entire chamber was assembled aseptically. Development was followed with a Nikon Photophot microscope equipped with Hoffman modulation contrast optics. Samples for electron microscopy were prepared as described by Salkin et al. (1982). Agar disks from the

Figs. 1-4. Time-lapse cinematography of annelloconidiogenesis. Fig. 1. Phase-contrast micrograph of an annelloconidium of *B. capitatus* (arrow) developing from a conidiogenous cell (arrow). Fig. 2. Annelloconidium illustrated in Fig. 1 has been pushed aside (arrow) as new annelloconidium (arrow) forms from the same annellide. Fig. 3. As a new annelloconidium (arrow) is forming from tip of the conidiogenous cell, the annelloconidium noted in Fig. 2 (arrow) has been moved aside. Fig. 4. Later stage in conidiogenesis demonstrating a clump of annelloconidia which superficially resembles a group of arthroconidia. Fig. 5. High-voltage transmission electron photomicrograph illustrating conidiogenous cell with developing conidium (arrow) and annellations (arrows).

perfusion chamber were dehydrated, flat-embedded in Epon-Araldite, serially thick (0.25-µm)- sectioned, collected on Formvar-coated grids, stained with 2.5% aqueous uranyl acetate and lead citrate, and then examined in an AEI EM7 MK II 10 high-voltage electron microscope operated at 800 Kv with an objective aperture of 20 µm.

TAXONOMY AND DISCUSSION

Blastoschizomyces capitatus (Diddens & Lodder) Salkin, Gordon, Samsonoff et Rieder, comb nov.

≡ *Trichosporon capitatum* Diddens & Lodder 1942, Die anaskosporogenen Hefen II, p. 488.

≡ *Geotrichum capitatum* (Diddens & Lodder) v. Arx 1977, Stud. Mycol. 14, p. 32.

= *Blastoschizomyces pseudotrichosporon* Salkin, Gordon, Samsonoff et Rieder 1982, Mycotaxon 14, 500.

Neotype: JHH 3699, New York State Herbarium, Albany, New York.

A permanently preserved specimen and lyophilized cultures were derived from CBS 2364 and deposited in the New York State Herbarium (NYS), Albany, New York as JHH 3699. CBS 2364, which was designated as the "type" culture, is maintained at the CBS as a living isolate.

When Diddens and Lodder described *T. capitatum* in 1942, they were not obligated under the then-existing code to deposit a permanently preserved type specimen. While no holotype for *T. capitatum* was designated at the time of the original description, living and lyophilized cultures have been maintained and designated by the CBS as the "type" (CBS 2364). Because a permanently preserved type is required under the present code (Voss, E.G., H.M. Burdet, W.G. Chaloner, V. Demoulin, P. Hiepko, J. McNeill, R.D. Meikle, D.H. Nicolson, R.C. Rollins, P.C. Silva, and W. Greuter, 1983; Article 9.5) for all new taxa, and since CBS 2364 was deposited by Diddens and Lodder at the time of their original description, we felt it should be used for the preparation of the type of *B. capitatus*. Therefore, we have prepared from it a permanently preserved specimen and depositied it as the neotype in the NYS Herbarium (JHH 3699). The neotype of *B. capitatus* is needed to serve as the type for this species.

Time-lapse cinematography revealed that CBS 2364 forms annelloconidia rather than arthroconidia as the most distinctive anamorphic form (Figs. 1-4). The morphologic features of conidiogenesis are identical to those previously described for *B. pseudotrichosporon*, as well as those observed during this study. The annellides are smooth, hyaline and develop either at the apices of branches, along the growing hyphal axis, or both. The annelloconidia are smooth, oblong with truncate bases, and accumulate in clusters at the apices of the annellides. This is the most distinctive and stable anamorph produced by the fungus and serves as the basis of its identification. Diddens and Lodder (1942) mentioned a similar accumulation of conidia in their description of *T. capitatum*: "It should be noted that these typical heads consist of accumulations of cells in clusters" (translated from German). Transmission electron microscopic studies of the conidiogenous cell revealed the percurrent proliferation typical of annellides (Fig. 5).

Although arthroconidia were observed in several cultures originally derived from CBS 2364, they were so few in number that we believe that they should be considered as a minor synanamorph. Since *T. capitatum* and *B. pseudotrichosporon* are essentially physiologically (Salkin et al., 1982) and morphologically identical, we consider them conspecific. Owing to priority, *B. capitatus* comb. nov. is the correct name for this blastomycete taxon rather than *B. pseudotrichosporon*.

It has been clearly demonstrated that *B. capitatus* cannot be retained in the genus *Trichosporon* because of its unique mode of conidiogenesis. Therefore, we do not agree with the continued placement of this taxon in *Trichosporon* as in the recent study by Kreger-van Rij, 1984. Judging from the description of *B. capitatus* (as *T. capitatum*) provided in this work, Kreger-van Rij was apparently unaware of the fact that annellidic conidiogenesis in this fungus is the mostly highly differentiated, distinctive and stable form.

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HERTELLA, A NEW LICHEN GENUS IN THE PELTIGERALES FROM THE SOUTHERN HEMISPHERE

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SUMMARY

The new genus Hertella Henssen is described to include two new species, the type species Hertella subantarctica Henssen from the Prince Edward and Kerguelen Islands and Hertella chilensis Henssen from southern Chile. On the basis of the developmental morphology of the hemiangiocarpous apothecium, the genus is placed in the Peltigerales.

Hertella has a minutely filamentous thallus derived from the morphology of the phycobionts, brown or blackish apothecia surrounded by a pale excipulary cup, amyloid octosporous asci, and unseptate colourless spores. Phycobionts are Scytonema or Tolypothrix. The hyphae extend longitudinally within or upon the gelatinous algal sheath; haustoria are formed by short side branches. The two species differ in external and internal morphology of the thallus and apothecia.

INTRODUCTION

The name Hertella is introduced for a new Southern Hemisphere lichen genus in honour of Hannes Hertel who discovered the type species, Hertella subantarctica, during a joint field trip in the Prince Edward Islands. The expedition, "S. A. Agulhas Voyage: Marion Island Relief April/May 1982", was conducted by the Research Group of the

Institute for Environmental Sciences, University of the Orange Free State, Bloemfontein, RSA.

The new lichen also has been collected by French expeditions to the Kerguelen Islands. A second species, *H. chilensis*, is described from southern Chile.

H. subantarctica is the second new cyanophilic lichen described from our material from the Prince Edward Islands, the first, *Phyllisciella marionensis* Henssen, was collected in the central part of Marion Island (Henssen & Büdel 1984). For both lichens a new genus had to be established.

According to our observations, small cyanophilic lichens are abundant at suitable sites on the islands associated with a great variety of blue-green algae. Hitherto, only four species with symbiotic blue-green algae, two of *Pannaria* and two of *Peltigera*, had been reported from the Prince Edward Islands (Lindsay 1977, Gremmen 1982).

The genus *Hertella* is of special interest as it combines the characteristics of a poorly lichenized, filamentous thallus with a hemiangiocarpous development of the apothecia corresponding to that in the order Peltigerales (treated as suborder Peltigerineae in Henssen *et al*. 1981).

METHODS

The methods described in Henssen *et al*. (1978) we are followed. Unless stated otherwise, measurements refer to microtome sections embedded in lactopheol cotton-blue (LPCB) or to air dry material as appropriate.

TAXONOMY

Hertella Henssen gen. nov.

Thallus parvus, filamentosus, gelatinosus, olivaceus. Alga symbiotica ad *Scytonema* vel *Tolypothrix* pertinens, hyphae praecipue in gelatine algarum extensae, haustoria formantia. Apothecia hemiangiocarpa, adnata, fusca vel nigricantia cum excipulo incolorato. Asci amyloidei, octospori, sporae eseptatae, incoloratae. Pycnidia adnata, conidiophora brevi-cellularia, conidia terminalia et lateralia formantia. Genus ad Peltigerales pertinens.

Typus generis: Hertella subantarctica Henssen

Thallus small, olive, filamentous, fastened by a gelatinous attachment base. Filaments less than 0.5 mm long, single or paired. Phycobionts species of Sytonema or Tolypothrix. Hyphae extening in parallel, in longitudinal sections seen to be mainly within the gelatinous sheath of the algal filaments, haustoria formed by short side branches.

Apothecia adnate, olive or brown, surrounded by a pale proper margin. Development of the apothecia hemiangiocarpous, ascogonia large-celled. Hymenium strongly gelatinous, staining dark blue in iodine, epithecium and hypothecium light brown. Excipulum proprium cupular, thick, pseudoparenchymatous. Paraphyses distinctly septate, sparsely branched in the upper part. Asci cylindrical to clavate, with amyloid caps or indistinct ring-structure, 8-spored. Spores simple, colourless, ellipsoid or slightly curved.

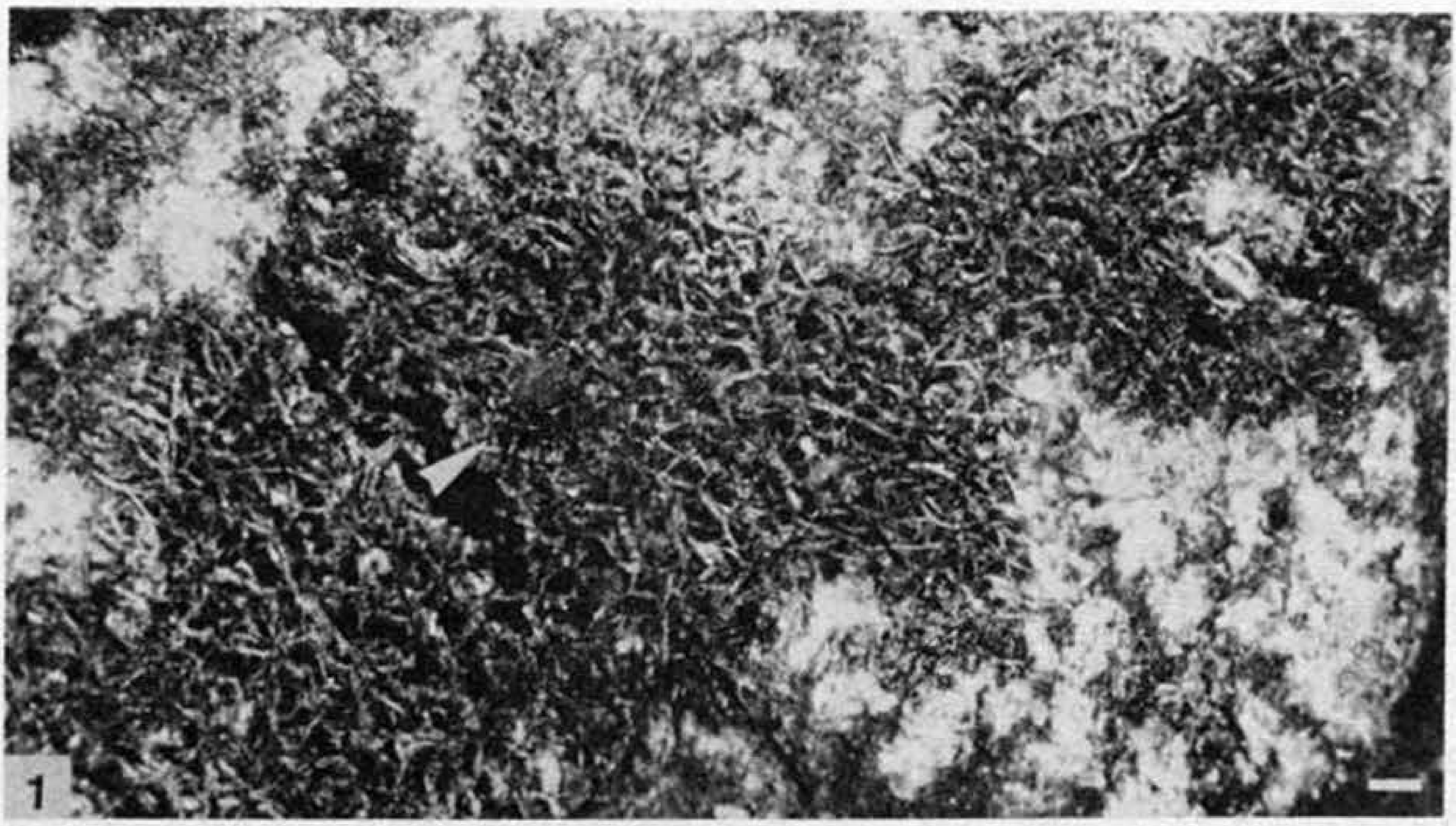
Pycnidia adnate, conidiophores with a few short cells forming rod-shaped conidia terminally and laterally.

Ecology and distribution: on shady or temporarily moist rocks in the Southern Hemisphere.

Chemistry: An unknown substance.

THALLUS. The species of Hertella are characterized by a minute filamentous thallus forming tufts or rosettes with marginally spreading lobes (Figs. 1-4). The thallus may appear almost crustaceous when the lobes are densely aggregated and glued together by associated colonies of blue-green algae.

The habit of the lobes corresponds largely to the morphology of the symbiotic algae which differ in the two lichens in the type of the false branching. The false branches of the phycobiont arise singly in H. chilensis (Figs. 8, 11) and frequently in pairs or more than two in H. subantarctica (Figs. 3, 5). The two algae differ also in the thickness of the gelatinous sheath and the position of the heterocysts. The trichomes of the symbiotic alga in H. chilensis have a rela-



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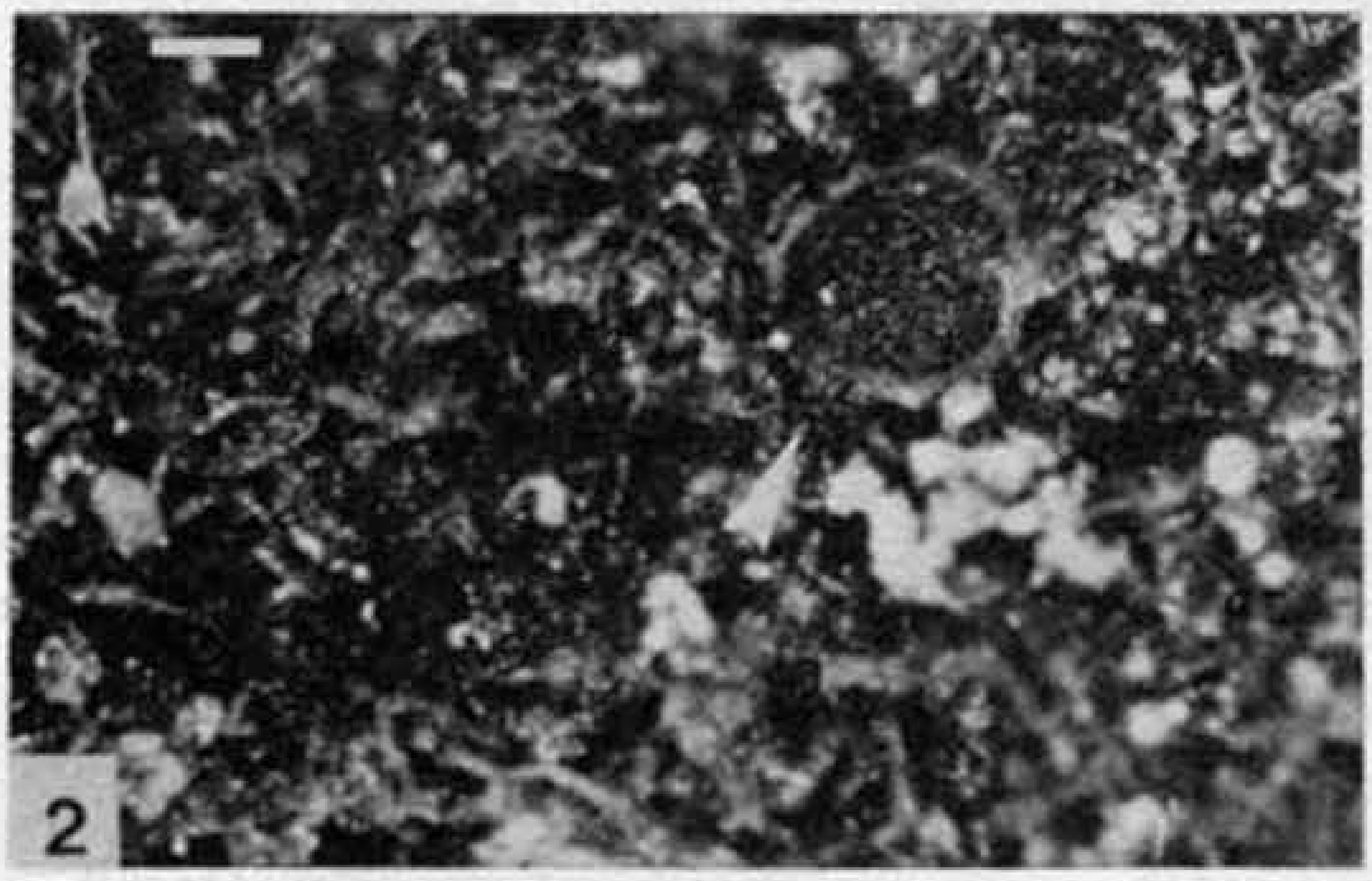

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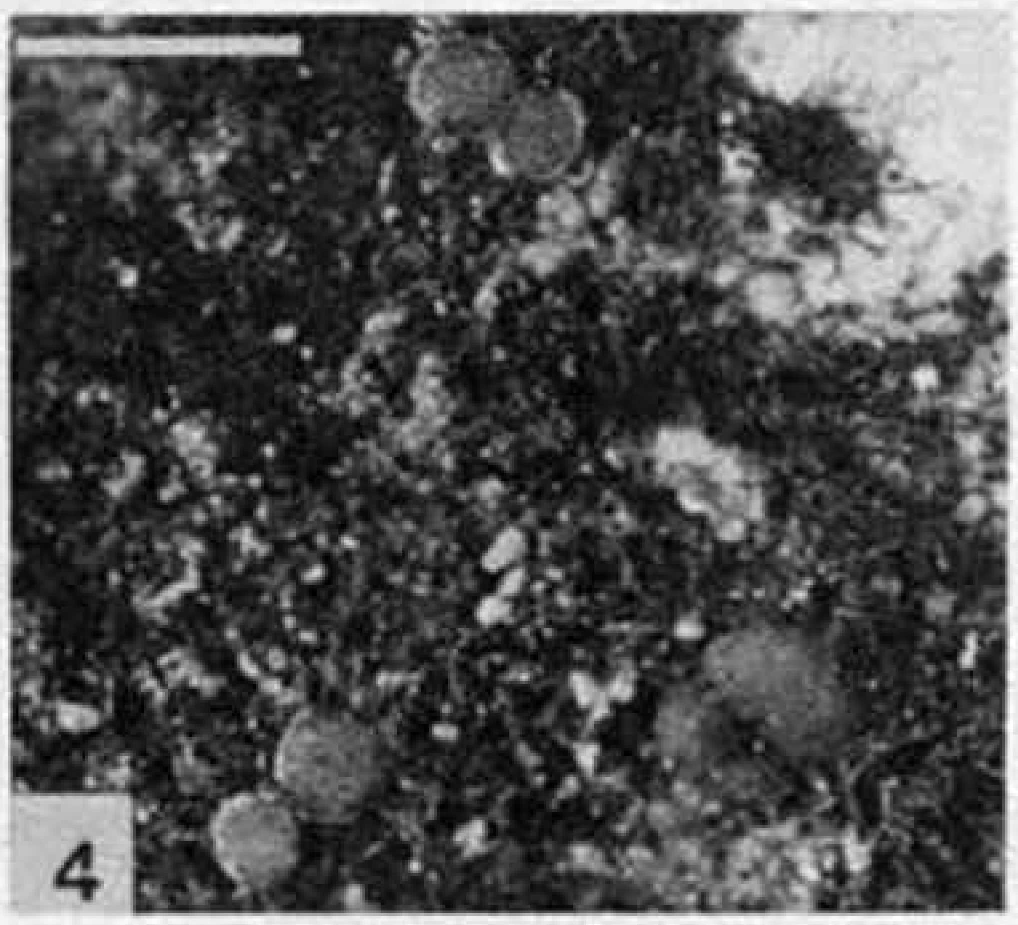

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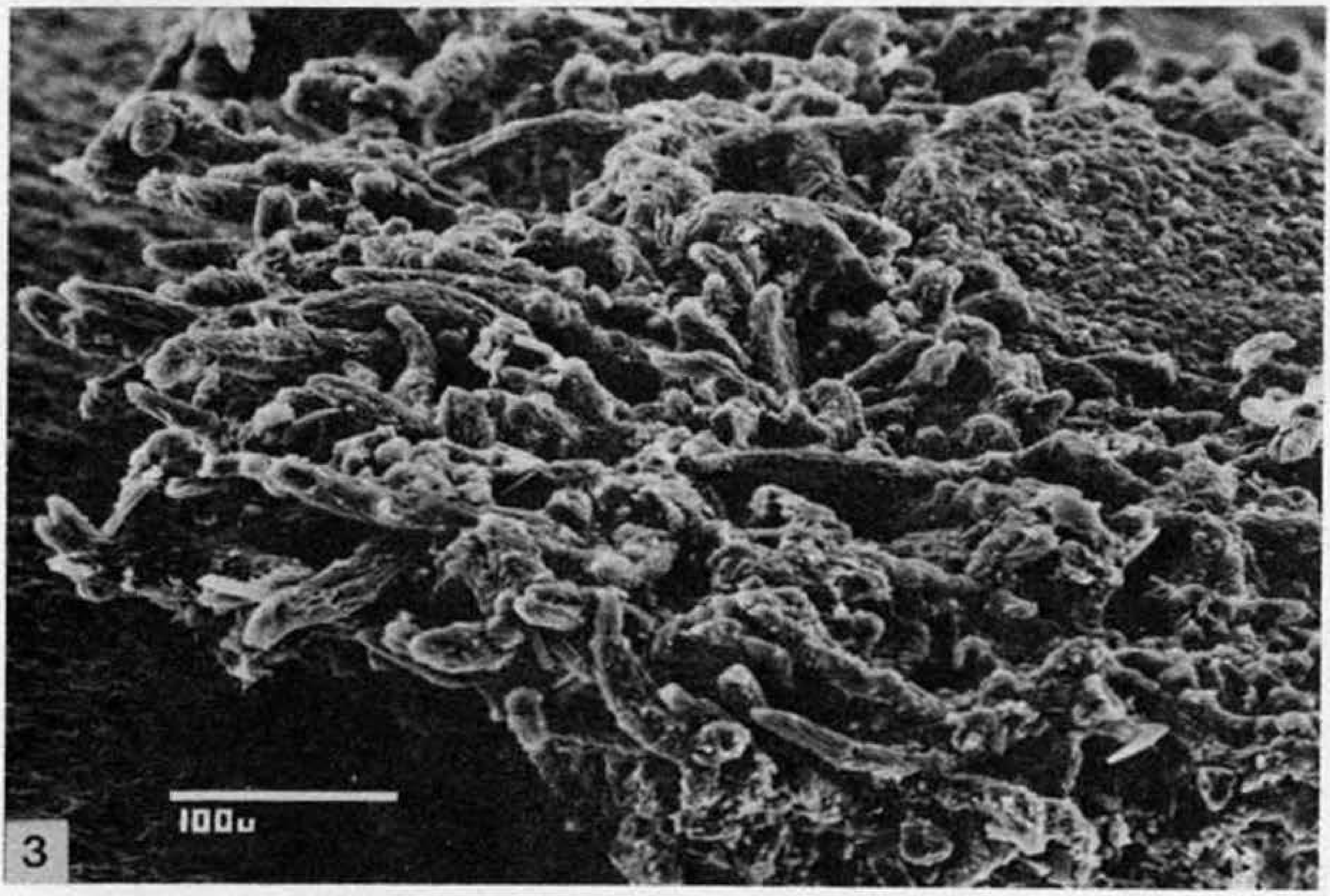

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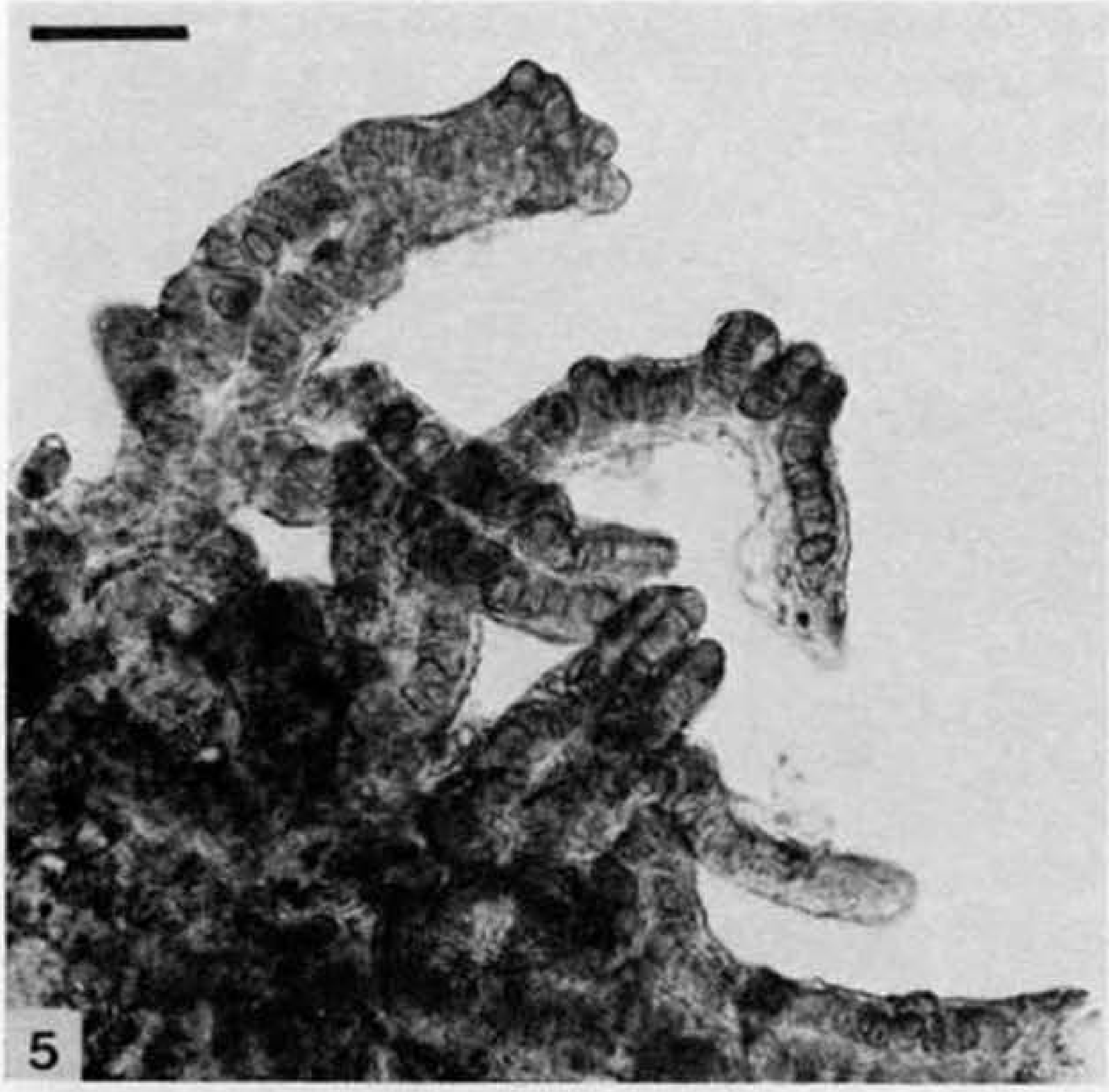
tively thin homogenous sheath and basal heterocysts, while in the phycobiont of H. subantarctica the gelatinous sheath is thicker and layered, and the heterocysts are frequently intercalary. On the basis of these characters, the phycobiont seems to be a species of Tolypothrix in H. chilensis, and one of Scytonema in H. subantarctica.

The hyphae extend parallel to one another in longitudinal sections. In H. subantarctica they are arranged mainly in several layers around the algal trichomes and are connected to each other by side branches diverging at short intervals (Figs. 6-7). In H. chilensis, one hyphal layer is usually observed which in later stages develops into an entire sheath of enlarged cells (Figs. 9-11). Haustoria form in both species from short side branches (Fig. 7, 9).

FRUCTIFICATIONS. The developmental morphology of the ascocarp corresponds to the hemiangiocarpous type of the Peltigerales (Henssen & Jahns 1973, Keuck 1977, Henssen et al. 1981). The youngest stage observed was a globose primordium of generative tissue adnate to a lobe and including relatively large ascogonial cells together with remains of trichogynes (Fig. 12). A later stage with distinctly septate paraphyses in a palisade-like layer growing into a cavity below a covering layer (Fig. 15) greatly resembles the young fruit bodies in Peltigera species, Hydrothyria venosa and Polychidium muscicola (Henssen 1963, Henssen et al. 1981). In common with the latter lichen (Henssen 1963, plate 28 b), Hertella has a well-developed pseudoparenchymatous excipulum proprium. In H. chilensis the cells of the pseudoparenchyma remain isodiametric and thin-walled (Figs. 13, 15, 17), while in H. subantarctica the cell walls become more strongly gelatinized in older

Figs 1-4. Habit photographs of Hertella species. 1-3, H. subantarctica (holotype). 1, Part of a thallus with a convex apothecium (arrow). 2, Young apothecium with a flat disc and pale proper margin (arrow). 3, Marginal part of a fertile thallus. 4, H. chilensis (holotype), part of a thallus bearing apothecia of different age. Scale 1 and 4 = 0.5 mm, 2-3 = 100 µm.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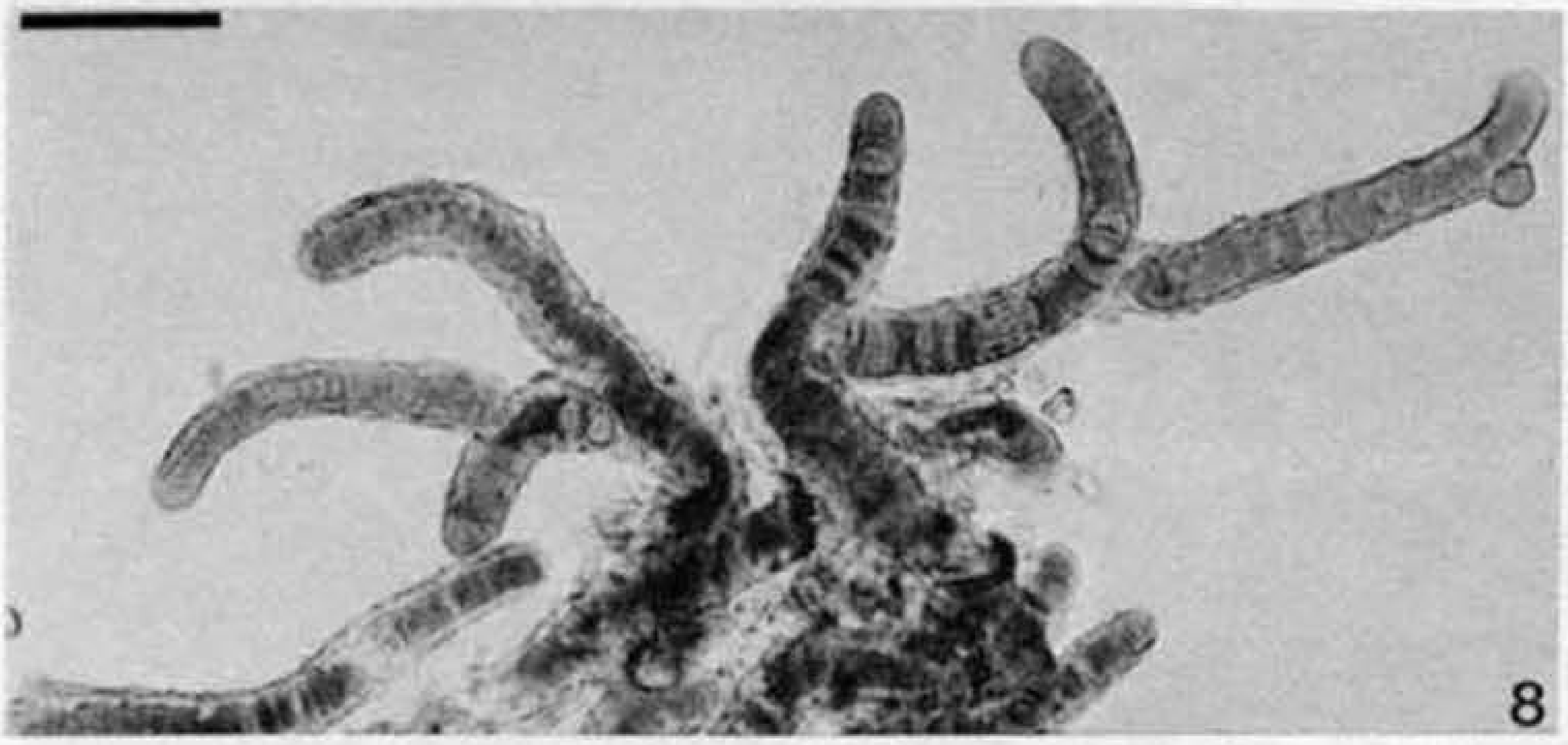
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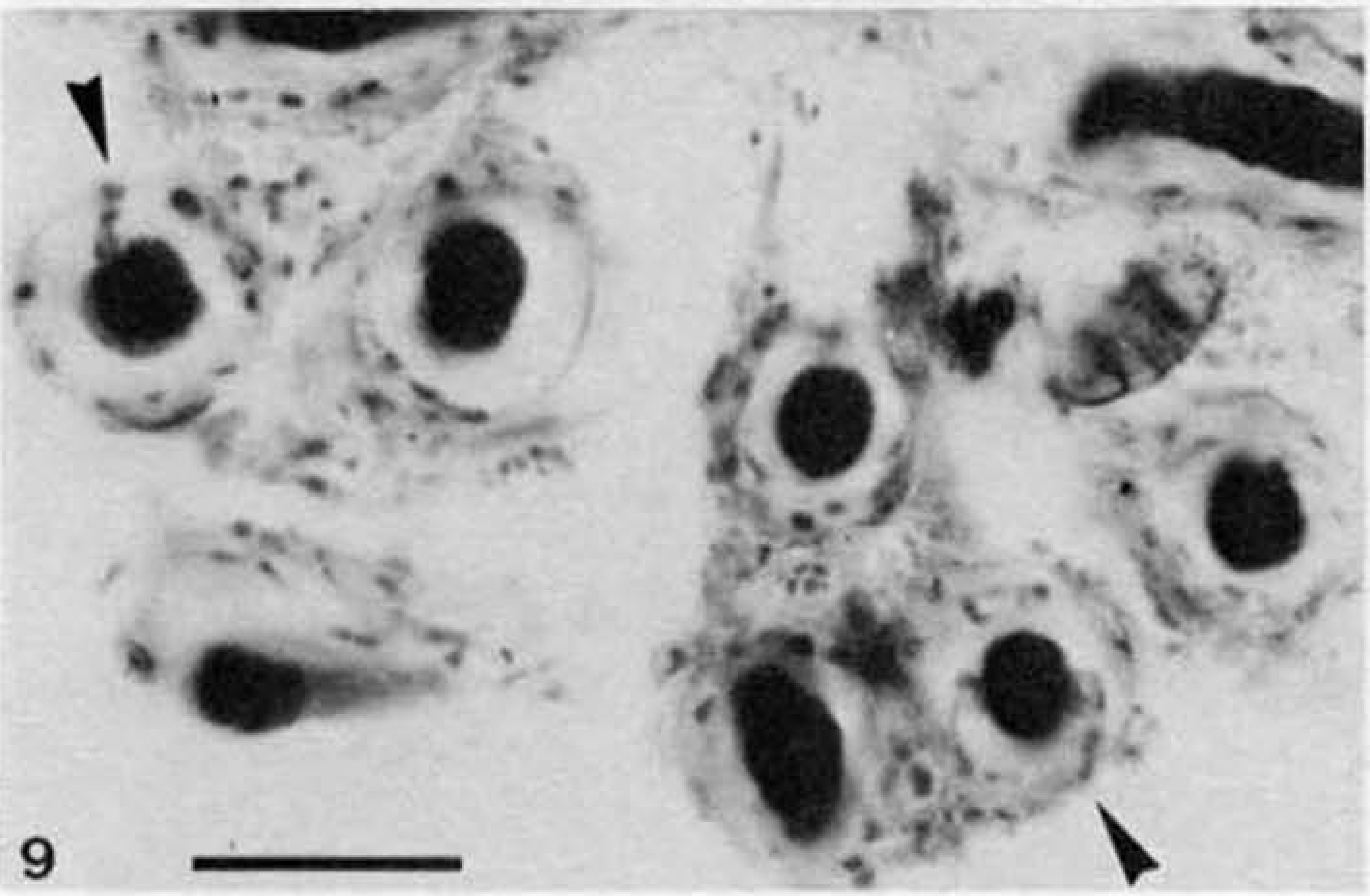
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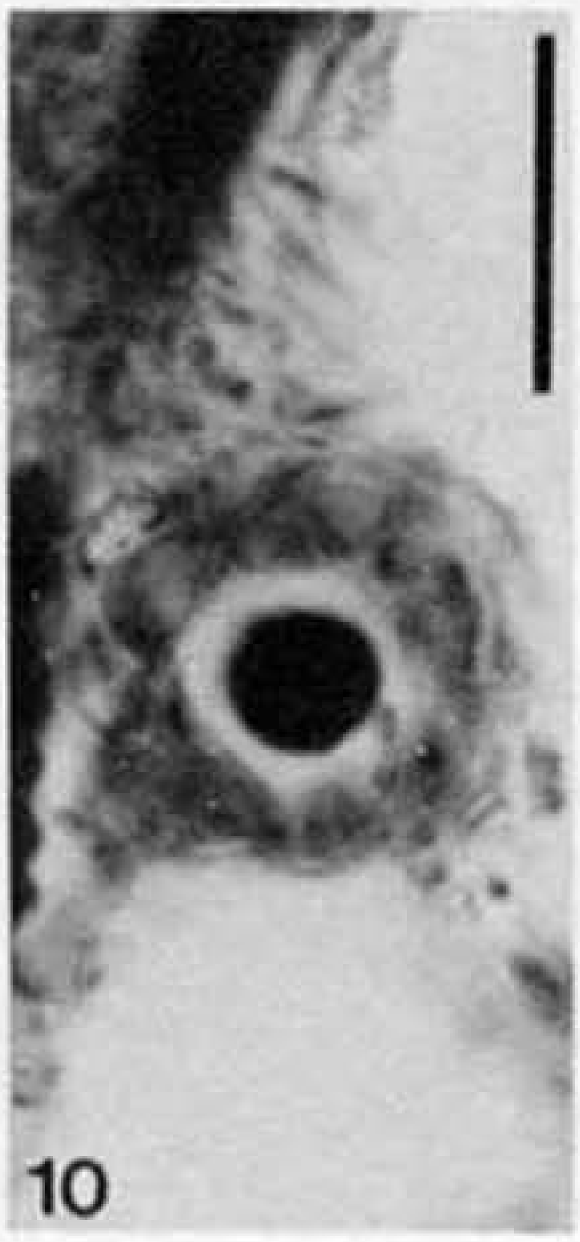
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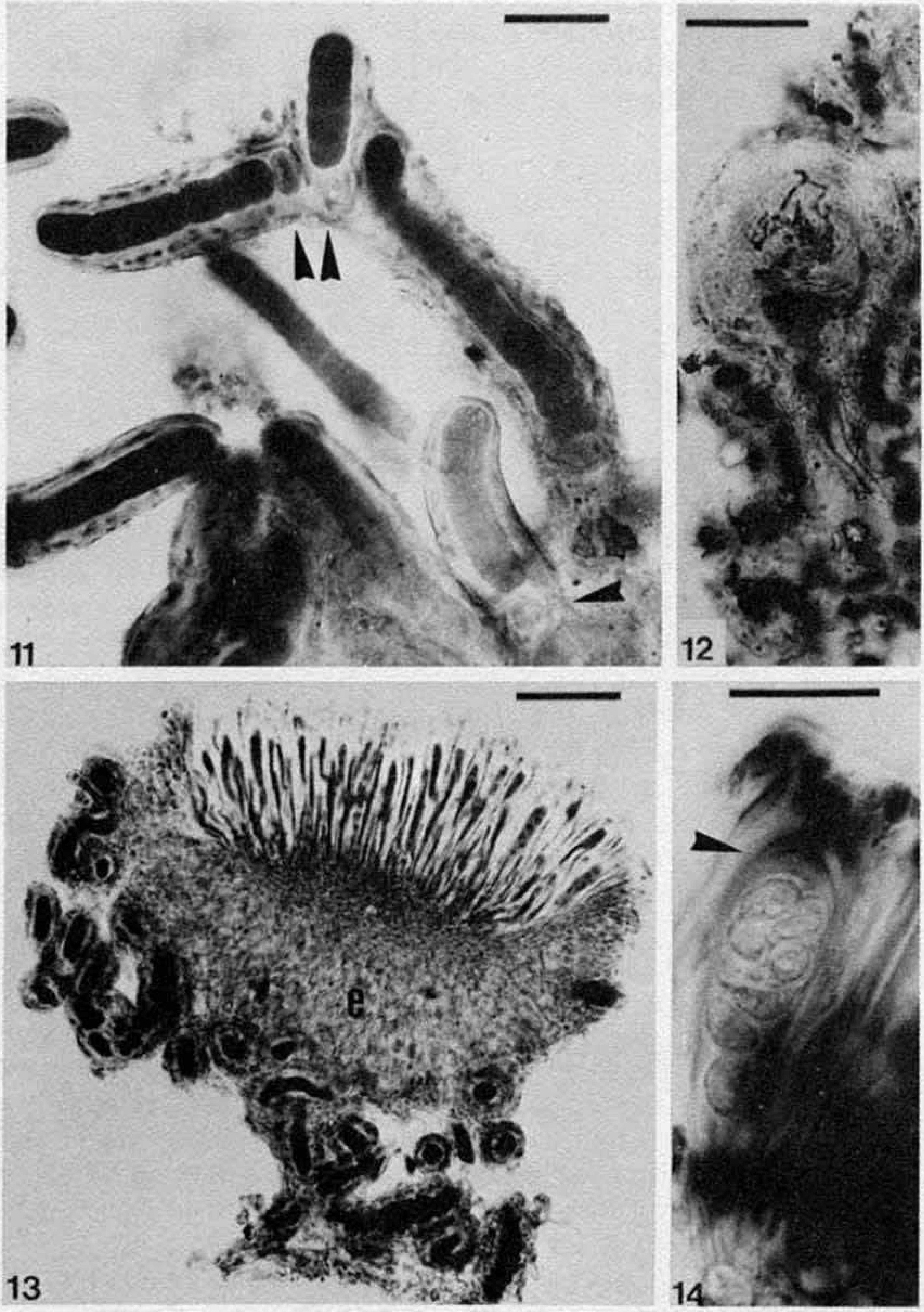
stages (Fig. 17). Hyphae develop from the marginal cells of the excipulum reinforcing the attachment of the apothecia to the adjacent lobes. When stained in iodine, amyloid caps were observed within and above the thickened ascus apex (Fig. 14) or, more rarely, as a faint ring-structure.

The small pycnidia include short-celled conidiphores composed of few, sometimes only two, conidiogenous cells (Fig. 16, arrow); these produce short rod-schaped conidia acrogenously or pleurogenously. The pycnidial cavity might be interpreted as a primitive *Umbilicaria*-type, type VI in the sense of Vobis (Vobis & Hawksworth 1981); type VI is known to occur in *Placynthium*, another genus of the Peltigerales (Henssen 1984).

SYSTEMATIC POSITION. On the basis of the developmental morphology of the hemiangiocarpous fruit body, *Hertella* has to be referred to the Peltigerales. As pointed out above, the young apothecium closely resembles that of *Polychidium muscicola* but in this lichen the ascus is provided with a clearly defined amyloid ring-structure of the *Peltigera*-type (Keuck 1977 Fig. 64) which does not occur in species of *Hertella*.

The new genus might be tentatively placed in the family Placynthiaceae sensu lato including the genera with small filamentous or squamulose

Figs 5-10. Habit and anatomy in *Hertella* species. 5-7, *H. subantarctica* (5, Delarue L 314, 6-7, holotype). 5, Lobes single or in pairs corresponding to the branching pattern of the *Scytonema* phycobiont (water preparation). 6, L.s. of lobe; longitudinally extending hyphae connected by perpendicular side branches (arrows) (LPCB). 7, T. s. of a pair of filaments (LPCB). 8-10, *H. chilensis* (holotype). 8, Lobes following the branching pattern of the filaments of *Tolypothrix* (water preparation). 9, T. s. of lobes, hyphal sheath in different stages of development, haustoria formed by side branches (arrows). 10, T.s. of algal filament surrounded by an entire sheath of enlarged hyphal cells (LPCB). Scale 5 = 50 µm, 6-10 = 20µm.



Figs 11-14. Anatomy in Hertella species (11-13, microtome sections, 14, squash preparation in LPCB). 11, H. chilensis (holotype), l. s. of filaments; false branches of the Tolypothrix phycobiont starting with a basal heterocyst (arrows).

thalli. The developmental morphology and ascus structure in a number of these genera is at present too incompletely known to permit a satisfactory segregation into more natural groups.

Key to the species of *Hertella*

1 Lobes frequently in pairs; apothecia olive to blackish, rarely brown, Kerguelen and Prince Edward Islands.............. *H. subantarctica*

1' Lobes always single; apothecia red-brown; Chile...........................*H. chilensis*

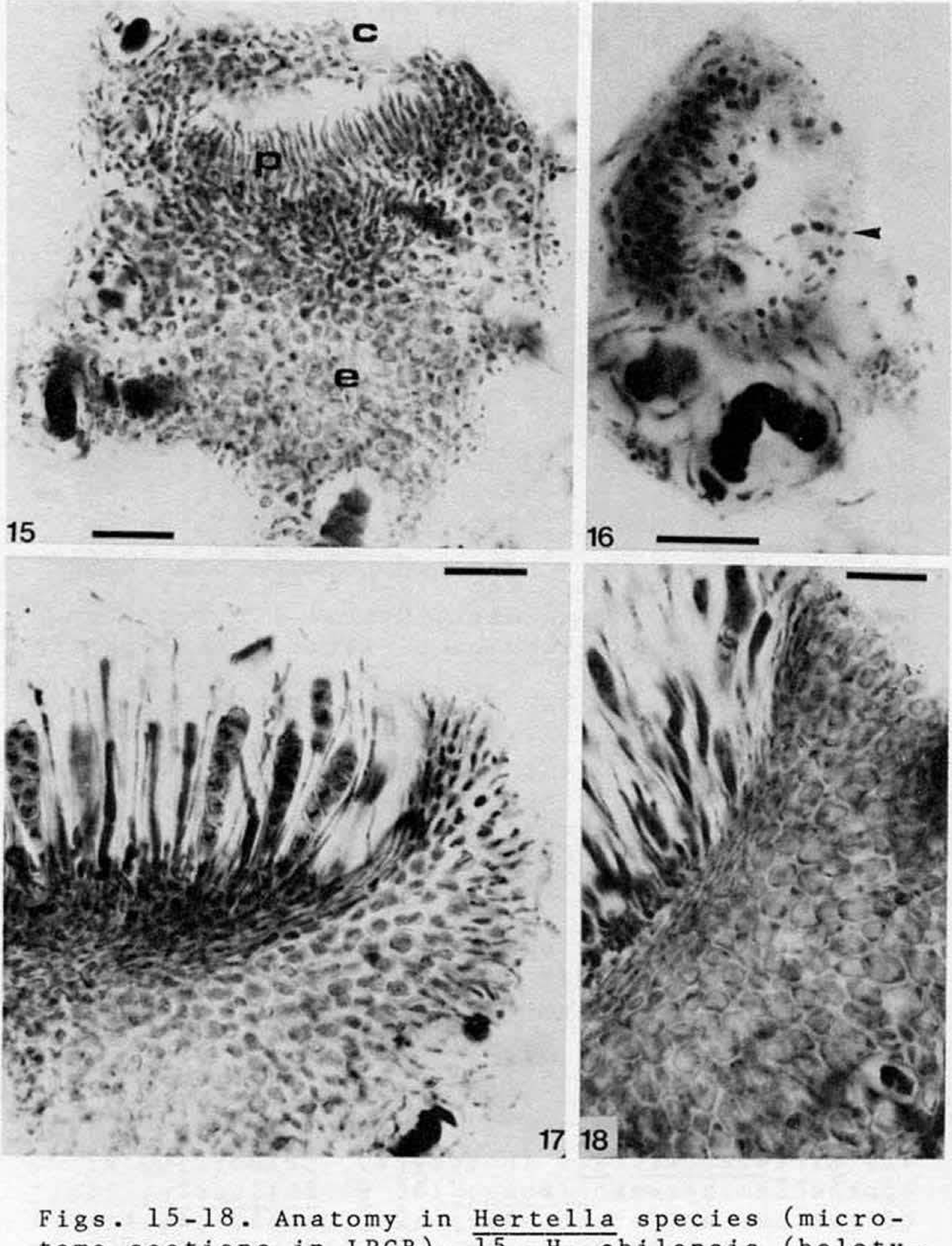
Hertella subantarctica Henssen spec. nov.

Figs. 1-3, 5-6, 12, 16, 18

DIAGNOSIS. Thallus saxicola, minutus, filamentosus, gelatinosus, olivaceus, rosulatus et 5-20 mm latus vel diffusus et saltem ad 50 mm latus, strato gelatinoso substrato affixus. Fila solitaria vel binatim, circiter 0.3-0.4 mm longa et 0.01-0.02(-0.45) mm crassa. Hyphae 1.5-2(-3) µm crassae. Alga ad *Scytonema* pertinens, ramificatio saepe binatim.

Apothecia olivacea vel nigricantia, usque ad 0.3 mm lata, discus primo planus exciPulo proprio pallido circumdatus, in statu vetusto discus convexus et excipulum proprium evanescens. Hymenium amyloideum, 50-75 µm altum, excipulum proprium 40-120 µm crassum, pseudoparenchymatum. Paraphyses 1-2 µm latae, apicem versus sparsim ramosae et 3 µm latae. Asci cylindraceo-clavati, 40-56 x 8-12 µm, octospori. Sporae eseptatae, incoloratae, ellipsoideae vel curvatae, 7-12 x 3.5-5(-6) µm. Pycnidia 55-90 µm lata, conidiophora brevicellularia, conidia terminalia et lateralia formantia, conidia bacilliformia, circiter 3 x 1µm.

12, *H. subantarctica* (holotype), primordium of apothecium between lobes. 13, *H. chilensis*, l.s. of apothecium (e, cupulary excipulum). 14, *H. subantarctica* (holotype), ascus with amyloid caps (arrow) after staining in iodine. Scale 1 and 4 = 20 µm, 2-3 = 50 µm.



Figs. 15-18. Anatomy in *Hertella* species (microtome sections in LPCB). 15, *H. chilensis* (holotype), young hemiangiocarpous apothecium (c, covering layer, e, excipulum, p, paraphyses). 16-17,

Chemistry: A new depsid was identified by HPTLC-method and u.v./v.i.s. spectroscopy. In solution C the spot was assigned to Rf class 23.

Holotypus: Prince Edward Islands, Marion Island, Coastal Plain along van den Boogaard River near Rockhopper Bay, 46°52'S, 37°51'E, on vertical or inclined plates of grey lava just above water level, 1982, Henssen 28114a (MB) (isotypus: PRE; further isotypes will be distributed in Henssen, *Lichenes cyanophili exsiccati*).

Further specimens examined. Prince Edward Islands, Marion Island, van den Boogaard River at same locality as holotype, on vertical cliff 45 cm above water level, 1982, Hertel 24212, on boulders of grey lava at the river bank further inland between Rockhopper Bay and Tafelberg, 46°53'S, 37°49'E, 1982, Henssen 28168b (MB, PRE) and 28170a (MB, PRE).- Kerguelen Island, NW-part, Lac du Nord of the glacier Gentil, in part exposed to the waves, 25 cm above water level, 1978, Delarue L 314 (MB, REN).

Thallus small, olive, filamentous or almost crustaceous, in rosettes, rings or tufts 5-12 (-20) mm diam or diffuse and at least 50 mm broad, to 1 mm high, fastened by a gelatinous attachment base. Lobes horizontal or more or less erect, 0.3-0.4 mm long, single filaments 0.01-0.02 mm, in pairs 0.45 mm thick. Phycobiont a species of *Scytonema* with false branches singly, in pairs or more than two, heterocysts intercalary or basal at the base of side branches, algal trichomes 8-12 μm broad with gelatinous sheath 18-24(-30)μm (water preparations). Hyphae 1.5-2 (-3) μm thick, in 1-3 layers longitudinally extending within (rarely upon) the gelatinous sheath of the algal trichome, longitudinal hyphae connected by side branches, haustoria enlarged cells formed by short side branches.

H. subantarctica (holotype). 16, L.s. of pycnidium; conidiophore with two conidiogenous cells producing conidia acrogenously and pleurogenously, respectively (arrow). 17, Marginal part of apothecium; excipulum cells thick-walled. 18, *H. chilensis* (holotype), marginal part of apothecium; excipulum cells thin-walled. Scale = 20 μm.

Apothecia olive or blackish (rarely brown), to 0.3 mm broad, disc at first flat and surrounded by a pale proper margin, later becoming convex and proper margin suppressed. Hymenium 50-70(-75) µm high, hymenial gelatin olive in the upper and lower part, deep blue in iodine, subhymenium reddish brown, 25-50 µm (12-20 µm in Delarue L 314). Excipulum cupular, pale, 40-45 µm broad in the upper part, 50-120 µm (80-95 µm in Delarue L 314) at the base, pseudoparenchymatous, cells 4.5-12 µm wide, in mature apothecia with roundish lumina and thick walls. Paraphyses 1-2 µm thick, enlarged to 3 µm at the tip, simple or branched in the upper part. Asci cylindrical to clavate, 40-56 x 8-12 µm (32-47 x 7-12 in L 314) µm, 8-spored, thickened apex with amyloid caps or a faint apical ring-structure. Ascospores simple, colourless (rarely slightly brown, possibly due to degeneration), ellipsoid or curved, with a central plasma bridge when young, (7-)9-11 x 3.5-6 µm.

Pycnidia adnate, olive, 55-90 µm broad, conidiophores with 2-5 rectangular conidiogenous cells, conidia rod-shaped, *c*. 3 x 1 µm.

Ecology and distribution. *H. subantarctica* is a lichen of temporarily moist faces of volcanic rocks, on river banks and lake shores and has been collected so far only in Marion and Kerguelen Islands. In Marion Island the lichen was associated with species of *Bacidia*, *Buellia*, *Catillaria*, *Caloplaca*, *Verrucaria* and two undescribed cyanophilic genera (holotype), a new species of *Zahlbrucknerella* (Henssen 28168b) or *Placopsis macrophthalma* (Hook. f. & Taylor) Nyl. (Henssen 28170a) respectively.

The epithet "*marionensis*" for the new species used in unpublished scientific reports of our expedition, was no longer appropriate when material from the Kerguelen Island became known; it was therefore replaced by "*subantarctica*".

REMARKS. The Kerguelen Island material differed slightly in the size of the excipulum proprium, subhymenium, and asci but only a few apothecia were available for study.

Hertella subantarctica greatly resembles *Spilonema paradoxum* Bornet in habit, having an olive, filamentous, minute thallus bearing adnate apothecia, but is easily distinguished by the different symbiotic alga which is *Stigonema* or *Hyphomorpha* in *Spilonema* species (Henssen 1963, 1981). Furthermore, the apothecia in *S. paradoxum* are globose from the beginning, without a proper margin, and uniformly dark in colour, and the epithecium is dark green or violet. In H. *subantarctica* the hymenium can be striated, olive in the upper and lower and colourless in the central parts. *Spilonema* belongs to the Coccocarpiaceae, an isolated lichen family (Henssen 1963, Henssen *et al*. 1981).

Hertella chilensis **Henssen spec. nov.**

Figs. 4, 8-10, 11, 13, 15, 18.

DIAGNOSIS. Thallus saxicola, minutus, filamentosus, gelatinosus, olivaceus, diffusus, 2-7 mm latus, strato gelatinoso substrato affixus. Fila solitaria, circiter 0.3-0.35 mm longa et 0.01-0.02 mm crassa. Hyphae 1-2(-5) µm crassae. Alga ad *Tolypothrix* pertinens ramis singularibus.

Apothecia rufo-fusca, usque ad 0.3 mm lata, discus primo planus et excipulo proprio pallido circumdatus, in statu vetusto discus convexus et excipulum proprium evanescens. Hymenium amyloideum, circiter 60-70 µm altum, excipulum 45-90 µm latum, parenchymatum, cellulis isodiametris. Paraphyses sparsim ramosae, 2 µm latae, apicem versus ad 3 µm incrassatae. Asci amyloidei, cylindraceo-clavati, 45-60 x 4.5-7 µm, octospori. Sporae eseptatae, incoloratae, ellipsoideae vel curvatae, 7-8.5 x 3.5-5 µm (immaturae in asco). Pycnidia 35 µm lata, conidiophora brevicellularia, conidia terminalia et lateralia formantia, conidia bacilliformia, 3-3.5 x 1 µm.

Holotypus: Chile, Prov. Llanquihue, Parque Nacional Vicente Perez Rosales, Salto de Petrohué, 1800 m s.m. 1973, Henssen, Vobis & Redon 24326b (MB).

Thallus small, olive, filamentous, diffuse, 2-7 mm broad, fastened by a gelatinous attachment base. Lobes horizontal or erect, 0.3-0.35 mm long, 0.01-0.02 mm thick. Phycobiont a species of *Tolypothrix*, false branches single with one or two basal heterocysts, trichomes 10-14 µm broad with gelatinous sheath 17-22 µm (water preparation). Hyphae in one or two layers extending within or outwards the gelatinous sheath of the algal trichome, in young stages 1-2 µm thick, in later stages cells enlarged to 5 µm and forming an entire sheath around the algal filament. Haustoria globose, formed by short side branches.

Apothecia reddish brown, to 0.3 mm broad, disc at first flat and surrounded by a pale proper margin, in later stages convex with the proper margin excluded. Hymenium 60-70 µm tall, brown in the upper part, in iodine deep blue, hypothecium 45-55 µm tall, inverse cone-shaped, light brown. Excipulum proprium cupular, pale, 45 µm broad in the upper part and 50-90 µm at the base, pseudoparenchymatous, composed of isodiametric, 4.5-9.5 µm wide cells with thin walls. Paraphyses 1.5- 2 µm thick, enlarged to 3 µm at the tip, sparsely branched in the upper part. Asci cylindrical to clavate, 47-60 x 4.5-7 µm, 8-spored, apex thick-walled with amyloid caps or a faint apical ring-structure. Ascospores simple, colourless, ellipsoid or curved, with a central plasma bridge when young, 7-8.5 x 3.5-5 µm.

Pycnidia adnate, *c.* 35 µm broad, reddish brown, conidiophores with a few short conidiogenous cells, conidia rod-shaped, *c.* 3.5 x 1 µm.

Ecology and distribution. *H. chilensis* is so far known only from the type locality, the Valdivian rainforest in southern Chile, where the lichen was growing near a waterfall on a shady granite boulder associated and in part overgrowing *Parmeliella nigrocincta* (Mont.) Müll.Arg.

Reports on the lichen flora of the Valdivian rainforest in the Vicente Perez Rosales National Park are given by Redon (1972, 1974), who emphasized corticolous species. *Hertella chilenesis* and *Parmeliella nigrocincta* both are additions to the flora of this lichen rich area.

The epithet "*chilensis*" was chosen to indicate the collecting site.

REMARKS. The two *Hertella* species are closely related. *H. chilensis* can be recognized by the consistently red-brown apothecia, while in *H. subantarctica* they are usually olive or blackish although in some thalli brown-coloured discs have also been observed. Further distinguishing characters of *H. chilensis* are the branching type of the algal filaments, with corresponding morphological differences of the lobes, the excipulum proprium composed of thin-walled isodiametric cells, and the somewhat thicker paraphyses with vacuolated cells in parts.

The type collection was too small to permit analyses for lichen substances.

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ZUSAMMENFASSUNG

Die neue Flechtengattung *Hertella* Henssen wird mit den beiden neuen Arten *H. subantarctica* Henssen und *H. chilensis* Henssen beschrieben. *H. subantarctica*, die Typusart, wurde auf den subantarktischen Prince Edward Inseln und den Kerguelen gefunden, *H. chilensis* ist nur von der Typuslokalität im südlichen Chile bekannt. Nach Struktur und Entwicklung der hemiangiocarpen Apothecien ist *Hertella* eine Gattung der *Peltigerales*, ihre Zuordnung zu der z.Zt. nicht scharf umgrenzten

Familie der *Placynthiaceae* wird vorgeschlagen.

Kennzeichnend für *Hertella* sind kleinfädige Lager mit lateral aufsitzenden, braunen oder schwärzlichen Apothecien, die von einem pseudoparenchymatischen, in jungen Stadien als heller Eigenrand hervortretendem Excipulumbecher umgeben sind.

Unterscheidungsmerkmale von habituell ähnlichen *Spilonema*-Arten sind der helle Excipulumbecher und die symbiotischen Algen: *Scytonema* oder *Tolypothrix* bei *Hertella*, *Stigenoma* oder *Hyphomorpha* bei *Spilonema*.

Die Morphologie der fädigen Loben der *Hertella*-Arten richtet sich nach dem Verzweigungstyp der symbiotischen Blaualge. Bei *H. subantarctica* mit *Scytonema* als Phycobiontem sind die Loben einzeln oder gepaart, bei *H. chilensis* mit *Tolypothrix* einzeln. Die Hyphen verlaufen parallel in Längsrichtung der Fäden innerhalb oder außerhalb der Algengallerte und können bei älteren Lagern von *H. chilensis* einen geschlossenen Mantel um die Algenfäden bilden. Haustorien werden von kurzen Seitenhyphen entwickelt.

H. subantarctica enthält ein unbeschriebenes Depsid mit dem Rf-Wert 23 in Fließmittel C, von *H. chilensis* lag nicht genügend Material für eine Analyse von Flechtenstoffen vor.

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A NEW SPECIES OF PODOSPORA FROM MARINE SEDIMENT

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SUMMARY

Podospora inquinata sp. nov. is described and illustrated from marine sediment collected in the Nagasaki Bay, Japan. This species is compared with *Podospora macropodalis*. The effect of salinity on ascospore germination and growth also was tested.

In the Sordariaceae, the genus *Podospora* has been recognized, ecologically, as one of the representatives of the coprophilous fungal community. In fact, the perithecia of this genus are easily seen on the dung of grazing animals such as cow, horse, sheep, deer, moose and rabbit. In their monographic study of *Podospora*, Mirza and Cain (1969), who recognized 64 species, included only 5 species recorded from non-coprophilous sources: *P. curvispora* (Cain) Cain and *P. inaequalis* (Cain) Cain from seeds of *Daucus carota* var. *sativa*, *P. minor* Ell. & Everh. from old stalks of *Zea mays*, *P. unicaudata* (C. Moreau & M. Moreau ex Smith) Cain from the felt lining of an ammunition box stacked in a gold mine in South Africa, and *P. vesticola* (Berk. & Br.) Mirza & Cain from the lining of an old gown, found in Batheaston, England. Records of coprophilous members from other substrates include, *P. nannopodalis* Cain reported by Gochenaur (1970) from Peruvian soil. Infrequent isolations of some coprophilous species such as *P. pauciseta* (Ces.) Trav. (= *P. anserina* (Ces. ex Rabenh.) Niessl), *P. communis* (Speg.) Niessl, *P. setosa* (Wint.) Niessl, *P. curvicolla* (Wint.) Niessl and *P. decipiens* (Wint.) Niessl from plant materials and soil also have been recorded by Lundqvist (1972). However, such isolations comprise a small percentage of their usual substrate selection.

During investigations of the microfungi in marine sediments from polluted areas of Nagasaki Bay, Japan (Ueda and Udagawa, 1983), an interesting culture of *Podospora* sp. was isolated from a sample collected in 1979. This fungus has proved to be sufficiently different from all described species of the genus to warrant its erection as a new species, as well as representing the first record of *Podospora* from marine environments (Kohlmeyer and Kohlmeyer, 1979).

The specimens studied are preserved in the Mycological Herbarium, National Institute of Hygienic Sciences, Tokyo (NHL) and the Cryptogamic Herbarium, Department of Botany, University of Toronto, Canada (TRTC). The living cultures of this species have been deposited at the American Type Culture Collection, Rockville, Maryland, U. S. A., the Centraalbureau voor Schimmelcultures, Baarn, Netherlands, and the National Institute of Hygienic Sciences, Tokyo, Japan.

Podospora inquinata Udagawa & Ueda, sp. nov. (Figs. 1-4)

Coloniae in agaro farina avenacea confecto celeriter effectae, planae, tenues, olivaceo-nigrae vel viridinigrae, perithecia numerosa producentes; reversum olivaceonigrum.

Perithecia superficialia vel immersa, dispersa vel in catervis parvis aggregata, nigra, pyriformia, 400-550 × 280-400 µm, inferne pilosa; pili dispersi, longi, flexuosi, septati, leves, olivaceo-brunnei, 1.5-2.5 µm diam; collum brevi-conicum, nigrum, 120-165 × 135-160 µm, glabrum. Peridium perithecii tenue, olivaceo-brunneum, opacum, membranaceum, ex 'textura angularis' compositum; stratum exterius ex cellulis brunneis, incrassatis, angularibus, 8-15(-18) × 6-12 µm compositum; stratum inferius ex cellulis hyalinis. Asci octospori, clavati, 160-200(-240) × 25-32 µm, superne contracti et late rotundati, sine annulo incrassato spectati, basin versus in stipitem usque 40-60(-80) µm longum attenuati, evanescentes, cum hyphis hyalinis filiformibus, septatis, 1.5-2 µm diam circumcincti. Ascosporae biseriales, primo hyalinae, deinde valde olivaceo-brunneae vel atrobrunneae, opacae, late ellipsoideae, (22.5-)25-30(-34) × (15-)18-20(-25) µm (av. 27.7 × 18.5 µm), utrinque attenuatae, poro germinali apicali, 2-2.5 µm diam instructae; appendix primaria hyalina, cylindracea, 18-24 × 6-7.5 µm; appendices gelatinosae (secundariae) hyalinae, cylindraceae vel doliiformes et obtusae, in sporae distali apice parum excentrice dispositae, 5-25(-65) × 2.5-4.5 µm, cavae, in appendice primaria proxima apice dispositae, similares sed angustiores, fugacissimae.

Holotypus: e sedimento marino isolatus est, in Sinu Nagasaki vocato, in Japonia, 11.iv.1979, legit. S. Ueda. In Herbario NHL 2945. Isotypus: TRTC 50678.

Etymology: Latin, *inquinatus* = polluted, referring to the nature of the habitat.

Colonies on oatmeal agar growing rapidly, attaining a diameter of 4.7 to 5.0 cm within 2 weeks at 23°C, plain, thin, with vegetative mycelium largely submerged, producing numerous perithecia on the agar or in the substratum, olivaceous black to greenish black (Rayner, 1970; Munsell Nos. 10.0GY/2.2/1.6 to 1.5BG/2.0/0.9); reverse olivaceous black (Rayner; Munsell No. 10.0GY/2.2/1.6). Colonies on potato-carrot agar growing slowly, thin, with surface black from perithecia scattered on the agar, violaceous black (Rayner; Munsell No. 10.0P/1.9/1.3).

Perithecia superficial to immersed, scattered to often aggregated in small clusters, black, pyriform, 400-550 × 280-400 µm, covered on the lower portion with scattered, long, flexuous, septate, smooth-walled, olivaceous brown, 1.5-2.5 µm diam, hyphal-like hairs; neck short conical, black, 120-165 × 135-160 µm, glabrous. Perithecial peridium thin, olivaceous brown, opaque, membranaceous, textura angularis; outer layer consisting of brown, thick-walled, angular cells measuring 8-15(-18) × 6-12 µm; inner layer of hyaline cells. Asci 8-spored, clavate, 160-200(-240) × 25-32 µm, contracted and broadly rounded above, with no distinct apical structure, tapering below into a long stipe reaching 40-60(-80) µm long, evanescent, surrounded by bundles of hyaline, filiform, septate hyphae measuring 1.5-2 µm diam, and often longer than the asci. Ascospores biseriate, at first hyaline, then becoming dark olivaceous brown to dark brown, opaque, broadly ellipsoidal, (22.5-)25-30(-34) × (15-)18-20(-25) µm (av. 27.7 × 18.5 µm), narrowed towards both ends, with an apical germ pore 2-2.5 µm diam; epispore thin; primary appendage hyaline, cylindrical, 18-24 × 6-7.5 µm; secondary appendages hyaline, cylindrical to doliform and obtuse, loop-like, gelatinous, the upper one slightly eccentric at the apex of spore, not covering the germ pore, 5-25(-65) µm long and 2.5-4.5 µm wide at the base, hollow, and the lower one attached to the end of the primary appendage, similar but narrower and very fugaceous. Anamorph lacking.

At 37°C, only vegetative growth is developed.

Specimen examined: ex marine sediment, Nagasaki Bay,

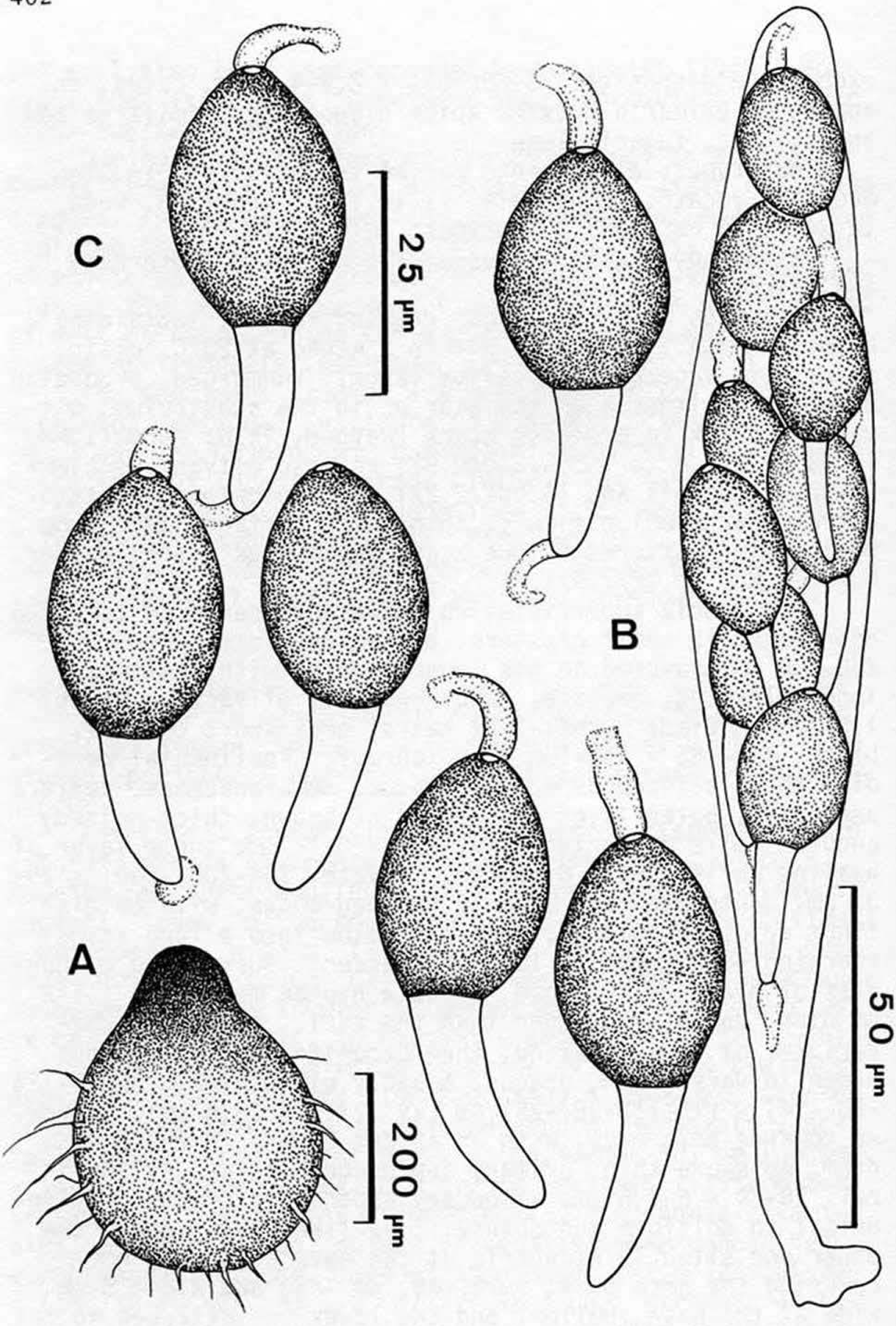
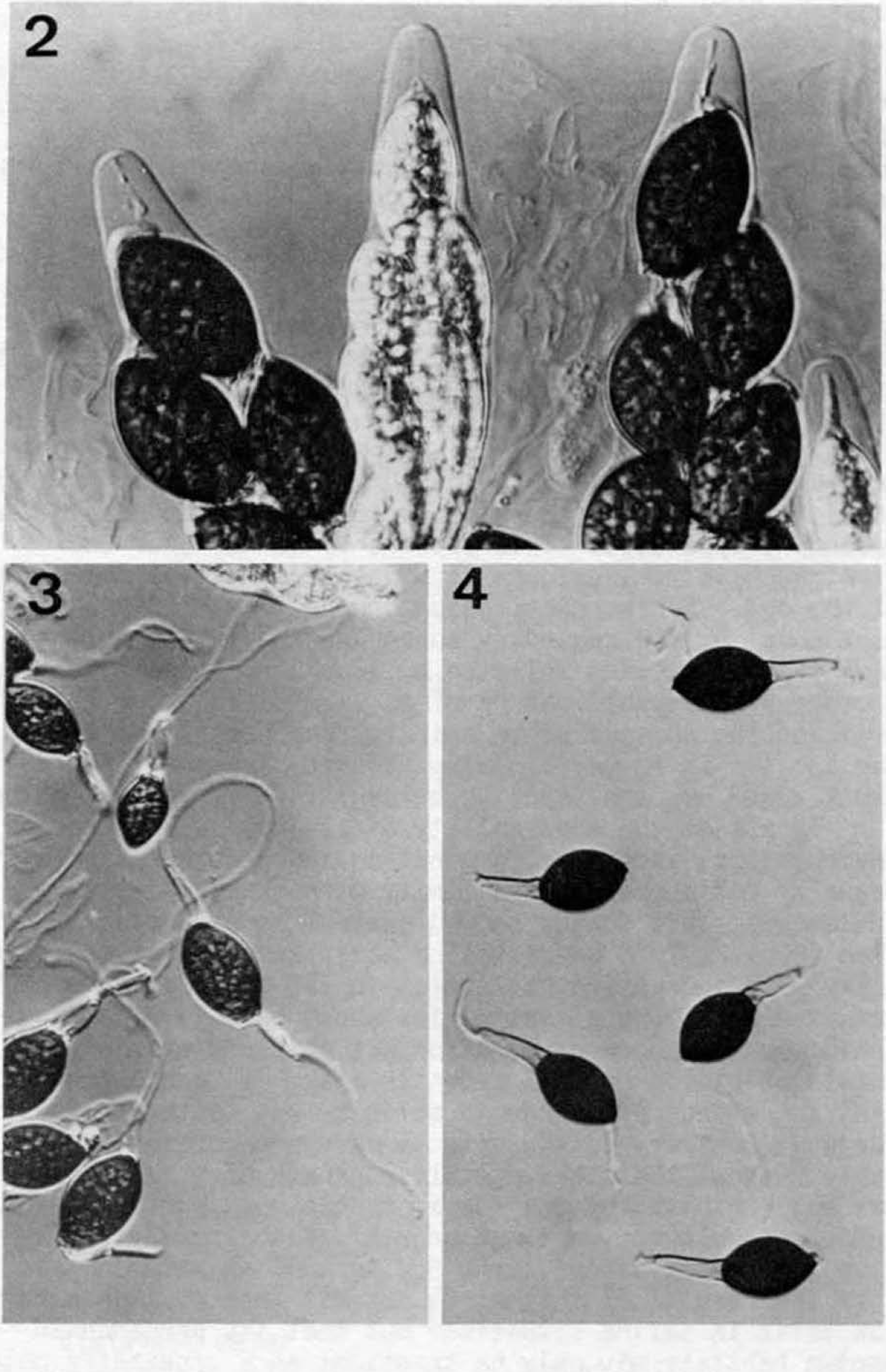


Figure 1. *Podospora inquinata*, NHL 2945.
A. Perithecium. B. Ascus. C. Ascospores.



Figures 2-4. *Podospora inquinata*, NHL 2945. 2. Apical portion of asci, indicating the absence of an apical structure. × 750. 3, 4. Ascospores. × 420.

Nagasaki City, Nagasaki Prefecture, Japan, coll. S. Ueda, 11.iv.1979, NHL 2945 (Holotype).

P. inquinata is particularly unusual among the species of *Podospora* in that it is found in a marine environment and easily grows on common culture media. On the whole *Podospora* is a genus of dung inhabiting species with a few known from soil.

This fungus is close to *P. macropodalis* Mirza & Cain (1969). The latter species, only known from a single coprophilous collection from Mexico, is distinguished by its smaller, broadly ellipsoid ascospores which have a longer and narrower primary appendage (from our examination of the type material (TRTC 39494, holotype) the spore size is 24-26 × 14-15 μm, whereas 21.5-25.5 × 15-17.5 μm is given in Mirza and Cain's description; the measurement of the primary appendage is 25-29 × 4.5-5.0 μm according to Mirza and Cain). In addition, there seems to be a difference in the secondary appendage. This appears to be narrower and straighter in *P. inquinata* although it sometimes does loop at the end. Furthermore, based on the illustrations of *P. macropodalis*, the secondary appendage appears to be whiplash in that species while in *P. inquinata* this is not so. Another significant feature of *P. inquinata* is the size of asci and the absence of an apical structure in the end of the ascus. In *P. macropodalis* the asci are smaller, 120-130 × 20-30 μm, and tapering below into a very short stipe.

To assess the adaptability of *P. inquinata* in marine environments, ascospore germination and growth responses to seawater media graded in salinity were examined. As seen in Table 1, this fungus showed maximum ascospore germination (86%) at 25°C on distilled water agar decreasing gradually with increasing salinities to 15% germination on 60% seawater agar, and at salinities above this level strong inhibition of spore germination was observed with almost total inhibition on 100% seawater agar. In another experiment the effect of change in salinity was tested on this fungus. Contrary to the effects on spore germination, Table 2 shows that the vegetative growth of *P. inquinata* was not inhibited by the seawater. In both surface and submerged cultures, optimum growth was observed at relatively high salinities, from 50% to 100% seawater.

The results of this study suggest that *P. inquinata* can exist in saline situations but that its presence in marine habitats may only be transient as a vegetative colonizer.

Table 1. Effect of varying salinities on ascospore germination of *P. inquinata* at 25°C, after 40 hr.

Seawater(%)*	Germination(%)**	Seawater(%)	Germination(%)
0	86.8	60	15.0
10	43.6	70	2.6
20	38.4	80	1.2
30	59.0	90	1.6
40	26.0	100	<0.5
50	22.0		

* Natural seawater (salinity: 33.2 $^0/_{00}$).

** Germination test : one drop of a spore suspension (10^3 spores/ml of distilled water) was placed on each agar disk containing seawater. The salinity was adjusted by distilled water.

Table 2. Growth of *P. inquinata* in seawater medium at various salinities, 25°C

Seawater(%)*	Radial growth (diam, mm)		Submerged growth (dry wt, mg)**
	at 10 days	at 25 days	at 10 days
0	5-6	10	83
10	10-11	20-30	62
20	8-10	30-38	25
30	10-11	30-35	41
40	10-12	30-45	106
50	15-16	40-55	128
60	16-17	45-50	125
70	16-20	45	101
80	20-22	50	121
90	20-22	55-60	129
100	24-25	65	139

* Medium: Seawater (natural, salinity 33.2 $^0/_{00}$) Yeast Extract Glucose Agar for radial growth and Seawater Yeast Extract Glucose Broth for submerged growth (Stevens, 1974). The salinity was adjusted by distilled water.

** Incubated by using a rotary shaker at 110 r.p.m. After incubation the mycelial mat was collected by filtration (0.45 μm membrane filter) and dried at 105°C, 2 hr.

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A NEW SPECIES OF LEPTODISCELLA

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SUMMARY

Leptodiscella chlamydospora Udagawa & Toyazaki, a new species, is described and illustrated from an isolate from house dust collected in Osaka, Japan.

The fungus described here was isolated by the junior author (N. T.) during a survey of the mycota in the domestic environment. The house dust from selected sites of 9 apartment houses in Suita City, Osaka, Japan, was sampled for fungi and allergens during November, 1983. Its isolation was made from dilution plates of the dust prepared with mycosel agar (BBL). The fungus belongs to the genus *Leptodiscella* Papendorf (1969) but is clearly distinct from the two taxa of this genus described hitherto.

Leptodiscella chlamydospora Udagawa & Toyazaki, sp. nov. (Figs. 1-6)

Coloniae in agaro 'potato-carrot' aliquanto restrictae, post 12 dies sub 23°C 24-32 mm diametro, humidae, tenues, ex mycelio submerso et mycelio aerio sparso prostrato compositae, aliquantum radiatim sulcatae, fumosae vel subolivaceo-griseae; ad centrum conidia abundanter producta sed chlamydosporae dispersae; reversum bubalinum vel fumosum vel griseo-aurantiacum.

Mycelium superficiale vel immersum, saepe sparsum, ex hyphis ramosis, septatis, laevibus, dilute olivaceo-brunneis vel brunneis, 1-3 µm diam, interdum fasciculatis compositum. Conidiophora micronemata vel semimacronemata, mononemata, brevia, haud distincta, hyalina, 5-40 × 1.5-2 (-2.5) µm, laevia, septata. Cellulae conidiogenae intercalares vel terminales, aliquantum inflatae, ca 3-5 µm diam, hyalinae vel leviter brunneae, holoblasticae, discretae vel in conidiophoris incorporatae et sympodiales, laeves, tenues, subglobosae vel irregulares, saepe aggregatae et sporodochiorum similes formantes. Conidia ex hyphis singulatim producta vel aggregata in cellulis conidiogenis, primo hyalina, aseptata, guttulata, deinde dilute brunnea et transverse 1(-3)-septata, cylindracea vel parum allantoidea, apicem rotundata, ad septum centre interdum plus minusve constricta, 8-14 × 3-5 µm, laevia, cum setula simplici, filamentosa, sublaterali, usque 2-4 µm longa, in capitulum mucosum incoloratum aggregata. Chlamydosporae terminales vel intercalares, sessiles vel stipitatae, singulares vel muriformes vel plerumque longe catenatae, ex cellulis vulgo subglobosis, 6-10 µm diam, laevibus, crassitunicatis, brunneis compositae.

Holotypus: cultura, NHL 2946, ex materia pulveratus in domo, Suita, Osaka, in Japonia, in 22.ii.1984, a Toyazaki, isolata. In collectione fungorum 'National Institute of Hygienic Sciences (NHL), Tokyo, Japan'.

Etymology: Gk. comp. *chlamyd-* = wearing a cloak and *-sporus* = -spored, referring to the appearance of chlamydospores.

Colonies on potato-carrot agar growing rather restrictedly, attaining of a diameter of 24 to 32 mm within 12 days at 23°C, wetted, thin, composed of a layer of submerged mycelium and sparse, prostrate aerial mycelium, somewhat radially furrowed, abundant conidia produced in the central area, with dark pigmentation accompanying the appearance of sparse chlamydospores, 'Smoke Grey' (Rayner, 1970) or dull green (Methuen 28D3 from Kornerup and Wanscher, 1978); reverse 'Buff' to 'Smoke Grey' (Rayner) or grayish orange (Methuen 5B3).

Mycelium superficial or immersed, often sparse, composed of branched, septate, smooth-walled, pale olivaceous brown to brown, 1-3 µm wide hyphae which are sometimes aggregated into a bundle. Conidiophores micronematous or semi-macronematous, mononematous, short, barely distinguishable from the conidiogenous cells and hyphae, hyaline, 5-40 × 1.5-2(-2.5) µm, smooth-walled, septate. Conidiogenous cells intercalary or terminal, somewhat swollen, ca 3-5 µm wide, hyaline or sometimes brownish and darker than the neighbouring cells, holoblastic, discrete or integrated and sympodial, smooth, thin-walled, subglobose or irregular,

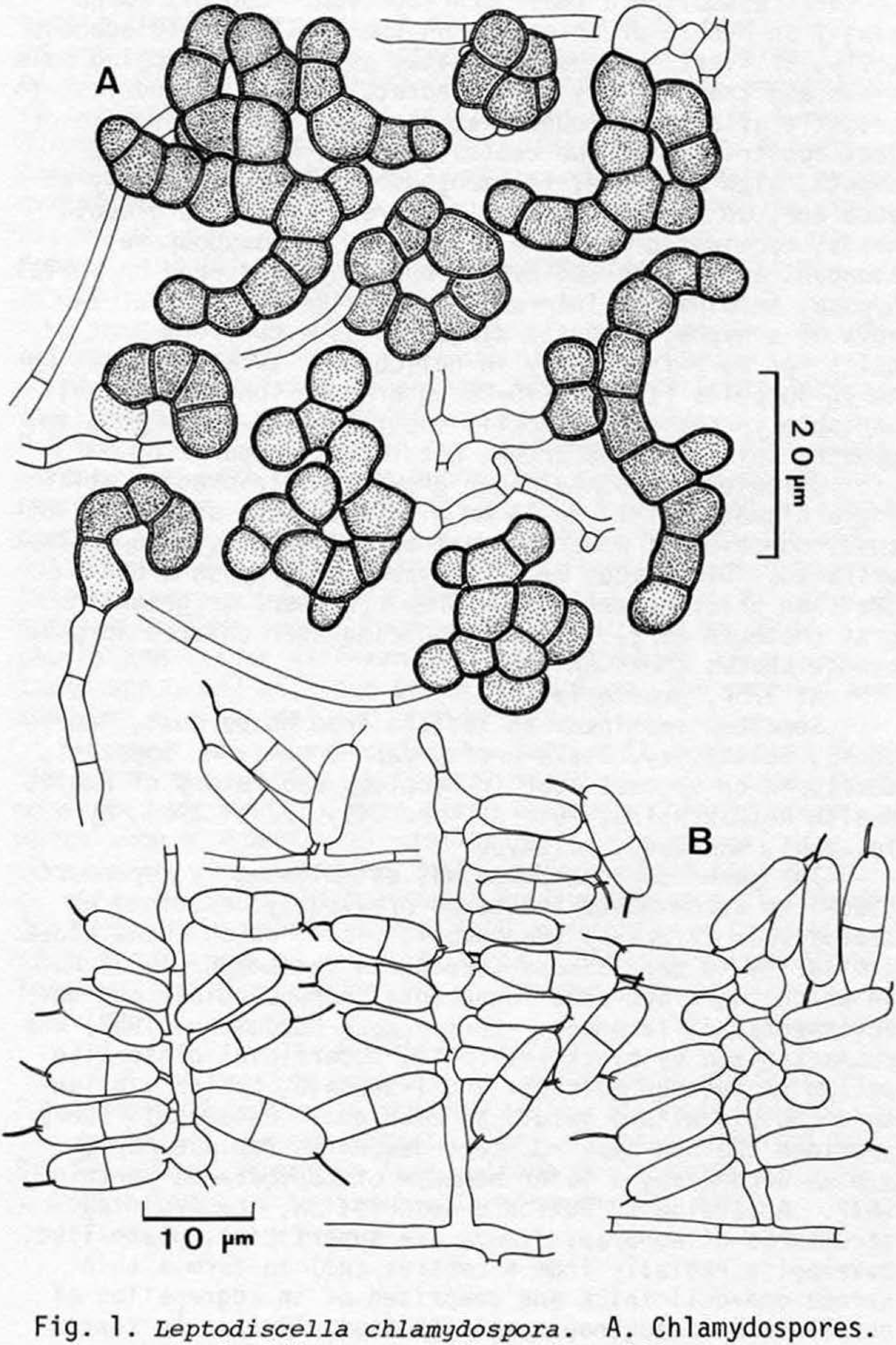

Fig. 1. *Leptodiscella chlamydospora*. A. Chlamydospores. B. Conidiogenous cells and conidia.

often aggregated and forming irregular masses of abundant conidia resembling a small sporodochium. Conidia borne singly on hyphae or in groups on the swollen conidiogenous cells, at first hyaline, aseptate, guttulate, becoming pale brown and transversely 1(-3)-septate in age, cylindrical to slightly allantoid, rounded at the apex, sometimes more or less constricted at the central septum, 8-14 × 3-5 µm, smooth, with a simple, filamentous setula sublaterally at each end, up to 2-4 µm long, gathered in hyaline gloeoid heads, germinated from the both ends. Chlamydospores abundant among immersed hyphae but also scattered on aerial hyphae, terminal or intercalary, sessile or borne at the apex of a hypha, produced singly or as a muriform knot of cells, or more frequently in helicoid or twisted chains up to 10-40 cells (totally 10-25 µm or more long); each cell variable in shape, but mostly subglobose, 6-10 µm in diam, smooth, thick-walled, brown, not readily separating.

Colonies on oatmeal agar growing restrictedly, attaining a diameter of 17 to 23 mm within 12 days at 23°C, floccose, composed of more abundant aerial growth, more or less wrinkled, 'Olivaceous Grey' (Rayner) or grayish brown (Methuen 5F3); reverse 'Iron Grey' (Rayner) or greenish gray (Methuen 29F2), with surrounding agar colored in pale orange shades (Methuen 5A3).

At 37°C, growth is nil.

Specimen examined: an isolate from house dust, Senrigaoka, Suita-city, Osaka-pref., Japan, coll. N. Toyazaki, developed on mycosel agar in Mycology Laboratory of Public Health Research Institute of Kobe City, 22.ii.1984, by N. Toyazaki, NHL 2946, holotype.

The genus *Leptodiscella* was established by Papendorf (1969) to accommodate the taxon previously described as *Leptodiscus africanus* (Papendorf, 1967), which shows close similarity to *Leptodiscus terrestris* Gerdemann (1953) but in which there are some fundamental morphological and developmental differences. *Leptodiscus* Gerdemann (1953) was characterized by black sclerotia, superficial plate-like yellow to fuscous acervuli and 1-septate, hyaline, allantoid conidia with a setula at each end. Ostazeski (1967) provided the new name *Mycoleptodiscus* to replace *Leptodiscus* Gerdemann, a later homonym of *Leptodiscus* Hertwig, 1877. According to Sutton's description, the fruiting structures of *Mycoleptodiscus* are superficial, plate-like, developing radially from a central cell to form a thin stroma one-cell thick and comprised of an aggregation of phialidic conidiogenous cells (Sutton, 1973). In *Leptodiscella*, the conidia are produced either on conidiogenous cells which are aggregated in pseudostromatic structures resembling sporodochia, or borne directly on the hyphae, either sessile or on short stalks. Conidial development is not phialidic and is apparently raduliform (Carmichael et al., 1980). The conidiogenesis and conidial morphology of *Leptodiscella* are also reminiscent of those of *Hyphodiscosia* Lodha & Chandra Reddy (1974). However, *Hyphodiscosia* is readily separated from *Leptodiscella* by the well-developed conidiophores, each with an apical swollen conidiogenous cell, on which several conidiogenous loci are formed, and the absence of pseudostromatic structures resembling sporodochia.

Leptodiscella africana, the type species, was isolated from leaf-litter and top-soil of *Acacia karroo* community, Potchefstroom, Transvaal,Republic of South Africa. Its conidia are cylindrical, medianly 1-septate, 11-17.5 × 2-3 µm(10-16 × 2.5-3 µm in our measurements for ATCC 18416 strain) and with a single,unbranched setula 6.5-13 µm long near each end. Matsushima (1975, 1981) described a second species, *Leptodiscella japonica*,isolated from forest soil, Odaigahara, Japan, and later also collected on a decayed twig of *Quercus nigra*, Tallisee, Alabama, U. S. A. The species differs from *L. africana* in that the conidiophores are rather differentiated from hyphae, like *Dactylaria* spp., and attained up to 40 µm long. The conidia are somewhat ellipsoidal and broader (12-17 × 3.5-5 µm).

Leptodiscella chlamydospora can be distinguished from the above two species by several features. The production of large, muriform or more often catenate chlamydospores, which show a superficial similarity to *Monodictys*, *Cirrenalia* and *Zalerion*-like fungi, is an unique feature of *L. chlamydospora*. With respect to the presence of chlamydospores, this species shows some similarity with some species of *Idriella* and *Dactylaria*. Other distinguishing features are shorter conidia and meager setulae.

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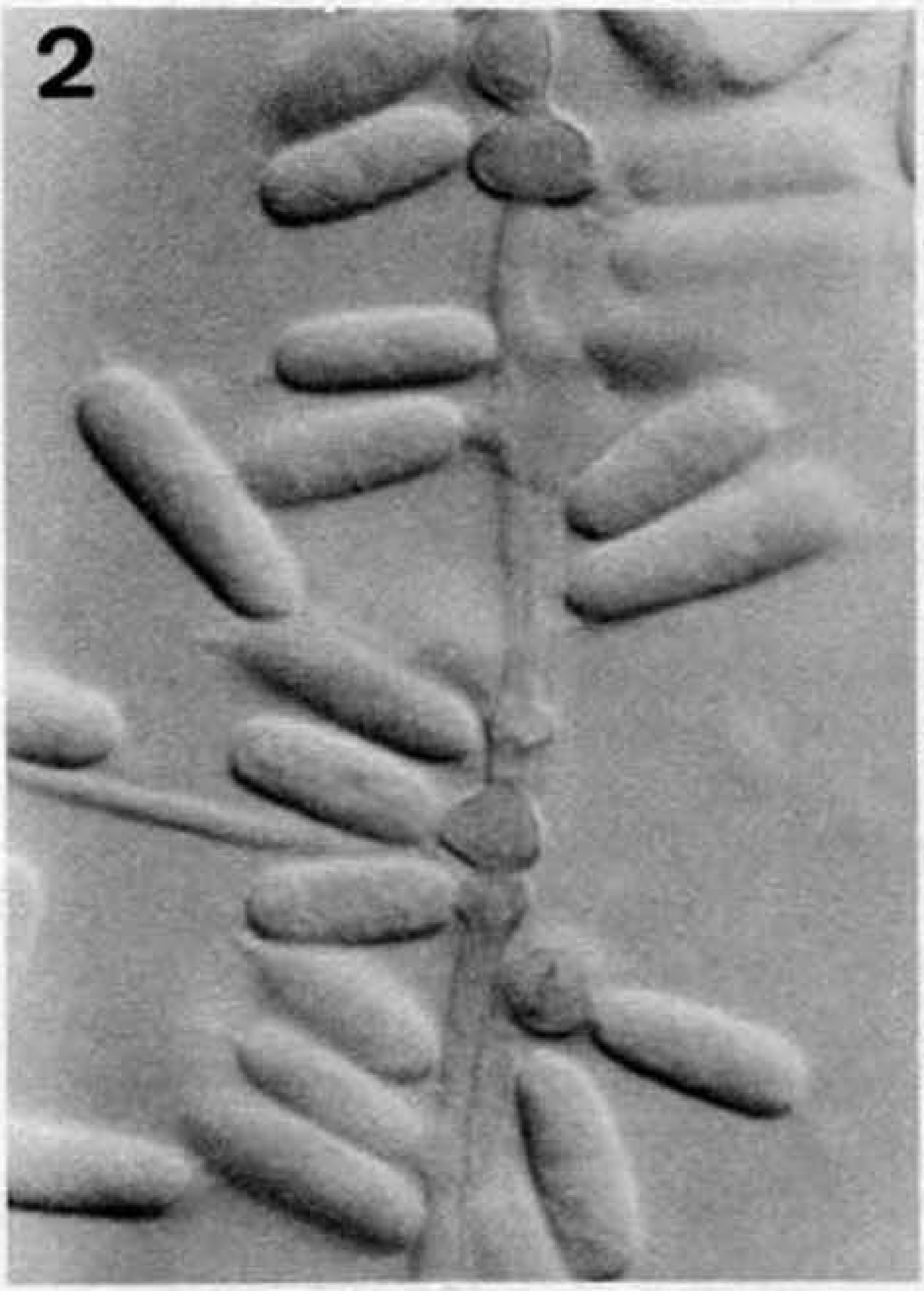
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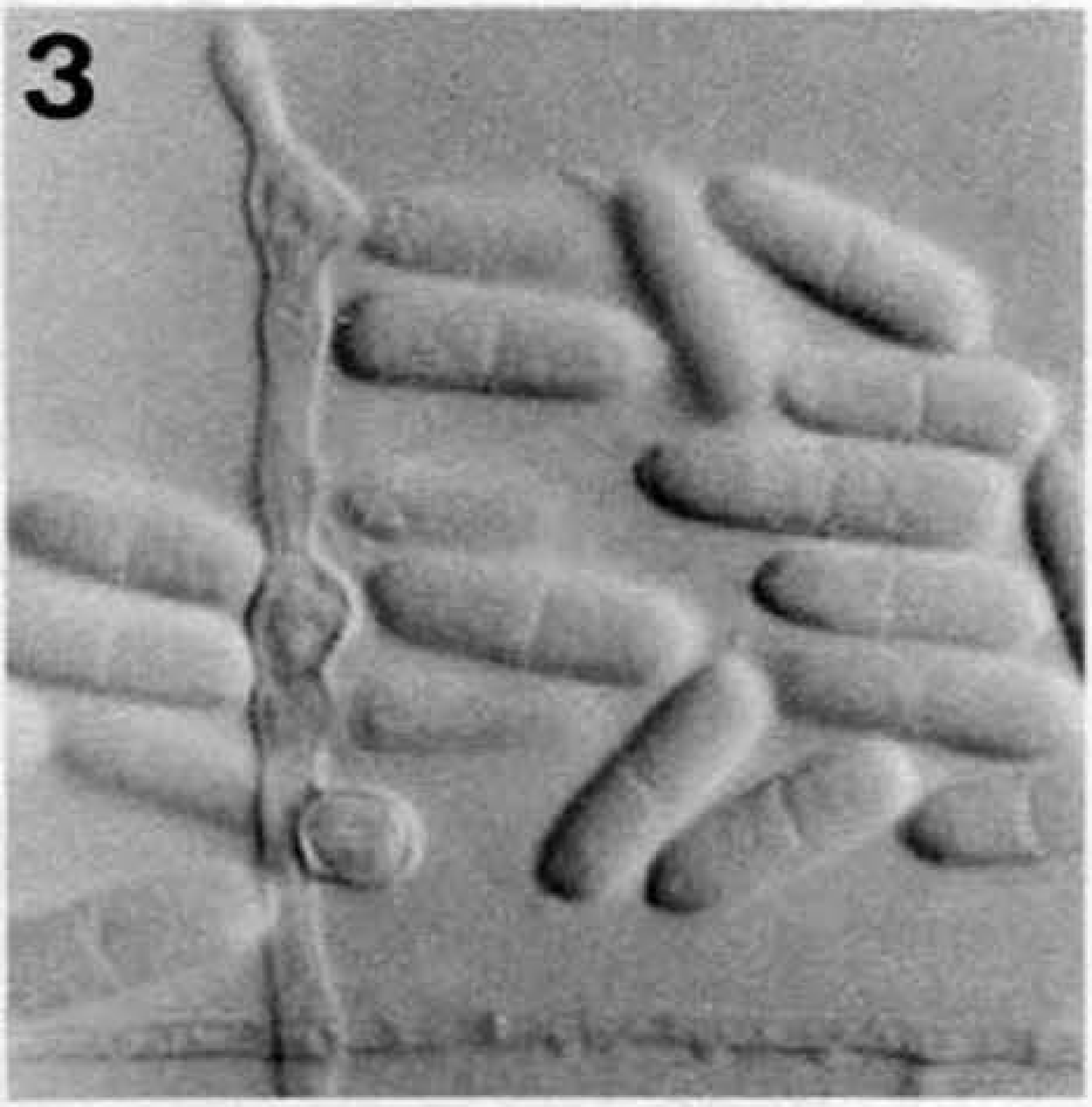
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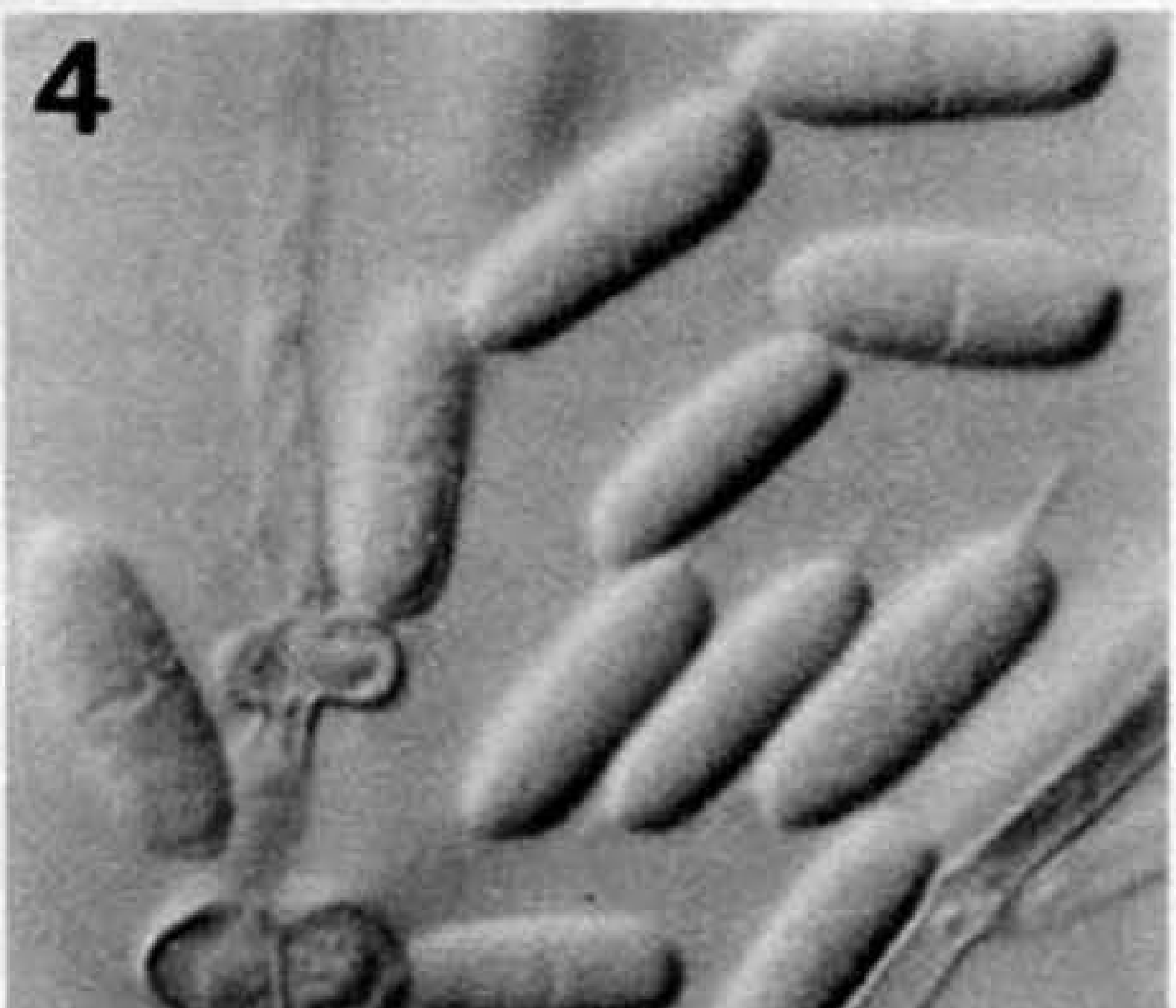
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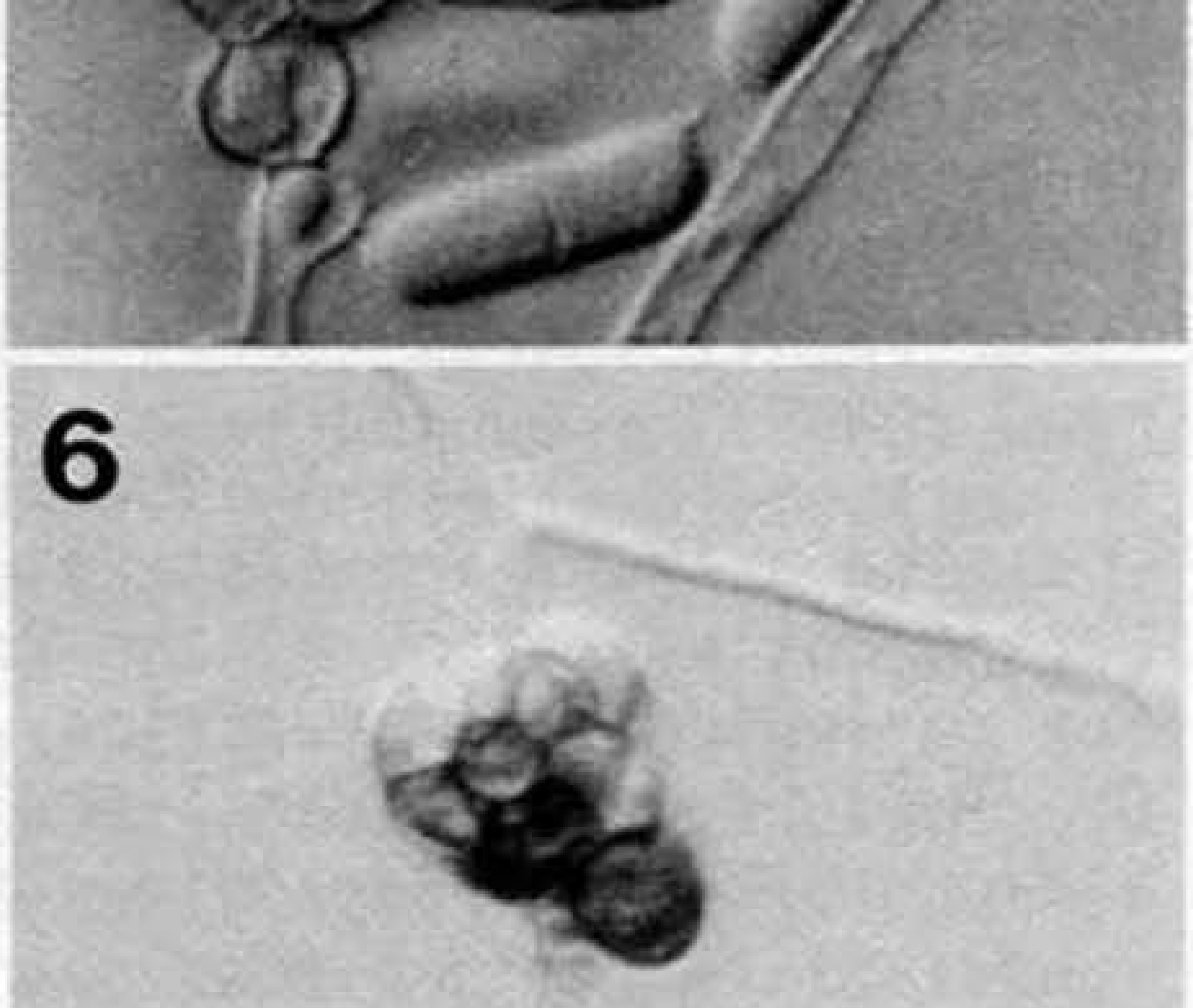
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Figs. 2-6. *Leptodiscella chlamydospora*: 2-4, conidiogenous cells and young conidia; 5, matured conidia showing some 2-septate ones; 6, chlamydospore. (Figs. 2-5, ×1300 and Fig. 6, ×850)

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ADDITIONAL SPECIES OF CRUSTODERMA

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SUMMARY

Two new combinations, Crustoderma testatum and Crustoderma sabinicum, are proposed. Basidiocarp and culture descriptions of C. testatum are included.

INTRODUCTION

In an earlier paper (Nakasone, 1984), I discussed nine species of Crustoderma. Since then I have found that two additional species, Corticium testatum Jackson et Dearden and Hyphoderma sabinicum Manjón et Moreno, belong in Crustoderma. Methods and materials are described in Nakasone and Gilbertson (1982) and Nakasone (1984).

THE TAXA

Crustoderma sabinicum (Manjón et Moreno) Nakas., comb nov.
Basionym: Hyphoderma sabinicum Manjón et Moreno, Anales Jard. Bot. Madrid 40: 12. 1983.

Specimen examined: SPAIN--G. Moreno and J. L. Manjón No. 5614, on log of Juniperus thurifera L., Tamajón, Guadalajara, 7 III 1980 (part of holotype received from Dr. J. L. Manjón, Universidad de Alcalá de Henares, Madrid).

Remarks: See Manjón and Moreno (1983) for a description and illustration of this species. Their figure clearly shows a thickening subhymenium and pedunculate basidia. These are important characters found in Crustoderma. In the holotype I examined, the basidiospores are slightly thick-walled, as in other species of Crustoderma.

Crustoderma sabinicum is very similar to C. dryinum (Berk. et Curtis) Parm. but can be distinguished by three critical characters. First, the basidiocarps of the former species are lighter in color (Pale Ochraceous Buff with white margins) than in the latter. Second, although the basidiospore size overlaps, they are slightly wider in C. sabinicum (7-9 x (3.5-)4-4.5µm) than in C. dryinum (7.5-9.5 x 3.5-4(-4.5 µm)). Third, while C. dryinum has a worldwide distribution, C. sabinicum is known only from Spain.

I also received from Dr. Manjón a paratype specimen of H. sabinicum, G. M. and J.L.M. No. 5043. This specimen, however, is not conspecific with the holotype No. 5614. Drs. J. L. Manjón and G. Moreno now believe that No. 5043 is a new species of Hyphoderma (personal communication).

Crustoderma testatum (Jackson et Dearden) Nakas., comb. nov. Fig. 1
Basionym: Corticium testatum Jackson et Dearden, Canad. J. Res., Sect. C, Bot. Sci. 27: 151. 1949.

Basidiocarp annual, effused, forming elongate, fusiform patches up to 60 x 20 mm, up to 250 µm thick, adnate; fertile area continuous, smooth, with scattered warts, ceraceous, slightly velutinous, Cartridge Buff to Pinkish Buff; margin abrupt.

Hyphal system monomitic. Subiculum thin or absent, composed of tightly agglutinated hyphae arranged parallel to substrate; subicular hyphae 3.5-7.5 µm diam, evenly or irregularly thick-walled, nodose septate, much branched. Subhymenium thickening, up to 200 µm thick, composed of agglutinated, vertically arranged thick-walled cystidia and hyphae. Dendrohyphidia lobed or branched at apex, 40-50 x 1-5 µm, hyaline, thin-walled, clamped at basal septum, smooth, arising from hymenium. Cystidia of two kinds: (a) clavate to cylindrical, 40-75 x 8-30 µm, hyaline, slightly thick- to thick-walled, clamped at basal septum, smooth, not protruding, containing nonstaining, refractive and phloxine staining, nonrefractive materials, abundant throughout subhymenium and hymenium; (b) ventricose, 60-100 x 7-10 µm, hyaline, thin-walled, clamped at basal septum,

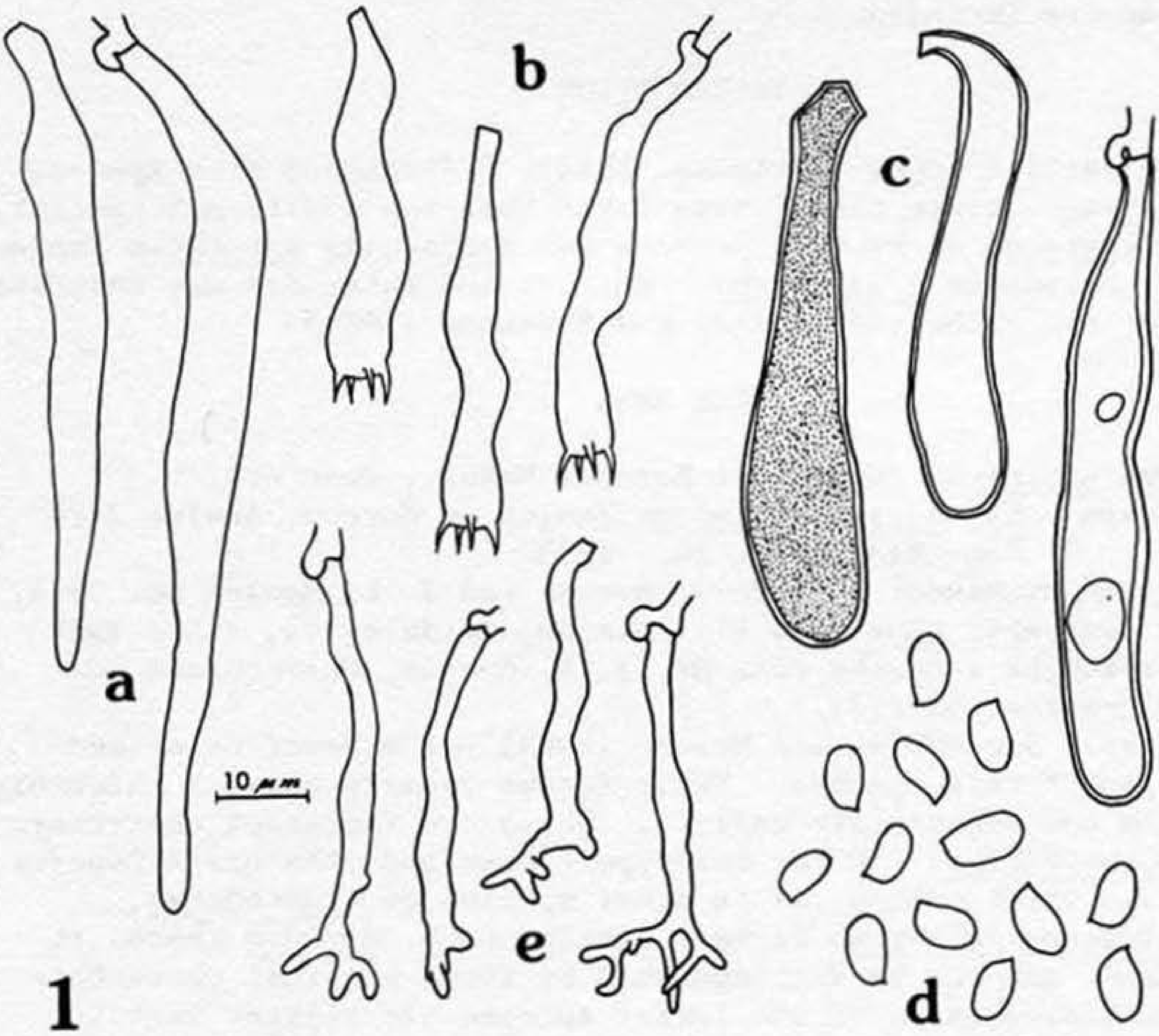

Fig. 1 (FP 133722)--a. Ventricose cystidia; b. basidia; c. clavate cystidia; d. basidiospores; e. dendrohyphidia. (ML84 5788)

smooth, protruding up to 65 µm, containing nonstaining, refractive and phloxine staining, non-refractive materials, numerous in hymenium. *Basidia* clavate, 30-50 x 5-6.5 µm, hyaline, smooth, thin-walled, clamped at basal septum, 4-sterigmate, sterigmata 4-5 µm long. *Basidiospores* ellipsoid, flattened on the adaxial side, 7-9.5 x 4-5 µm, hyaline, slightly thick-walled, smooth, negative in Melzer's reagent, acyanophilous.

Specimens examined: CANADA--BRITISH COLUMBIA: V-2627 on *Pseudotsuga taxifolia* (Lamb.) Britton, Cowichan Lake, Vancouver Island, 14 III 1947, coll. P. J. Salisbury (holotype, TRTC). U.S.A.--OREGON: FP 133722 on conifer, near Cougar Mountain, Lincoln County, 9 X 1973, coll. M. J. Larsen.

Culture description: Growth on 2% malt extract agar very slow, 55 mm diam by 6 wk, mats white, moderately thick, raised and woolly around inoculum, then becoming appressed and felty toward margin at 2 wk, by 6 wk white to Cream-Buff, moderately thick, zonate, appressed and felty around inoculum, then becoming slightly raised, short-woolly towards margins; margins even to slightly uneven, appressed; odor none at 2 wk, fruity at 6 wk; agar unchanged at 2 and 6 wk; not fruiting by 6 wk. Oxidase reactions on 0.5% gallic and tannic acid agars negative and with no growth. Microscopic characters--Advancing zone hyphae 2.5-4.5 µm diam, slightly thick-walled, nodose septate, sparingly branched. Submerged and aerial hyphae 2-5.5(-10) µm diam, slightly thick-walled at first, then becoming irregularly thick-walled, nodose septate, moderately to frequently branched. Aerial mat with numerous, yellow, refractive globules. Chlamydospores globose to limoniform, 13.5-16 x 9-12 µm, hyaline, thin-walled at first, then becoming thick-walled, intercalary, scattered in submerged and aerial mats at 2 and 6 wk.

Remarks: *Crustoderma testatum* is easily distinguished from other species in the genus because it has dendrohyphidia and two kinds of cystidia. It is associated with a brown rot of conifers in British Columbia and the Pacific Northwest region of the U.S.A.

The specimen from Oregon is well developed, and the basidiocarp description is based primarily on that specimen. I also noticed some minutely rough-walled basidiospores in the specimen. Because these spores are smaller than the smooth basidiospores, I believe that they are immature basidiospores. The holotype specimen from British Columbia, however, is poorly developed. It lacks dendrohyphidia and a distinct, thickening subhymenium. The context consists of a gelatinous matrix with scattered hyphae and thick-walled, clavate cystidia. Despite these differences, I am convinced that the two specimens represent the same species. The size and shape of the two types of cystidia, basidia and mature basidiospores of the two specimens are similar.

ADDENDUM TO: KEY TO THE SPECIES OF CRUSTODERMA

In a key to the species of *Crustoderma*, both *C. sabinicum* and *C. testatum* key out to the same place, couplet 11 (Nakasone 1984, p. 49). The key section found below incorporates the two species treated here into my earlier key.

11a. With two types of cystidia, thin-walled, ventricose and thick-walled, clavate cystidia. . . . . . *C. testatum*
11a. With one type of cystidia 11.b

11b. Basidiocarps nearly white (Pale Ochraceous-Buff); known only from Spain. *C. sabinicum*
11b. Basidiocarps not white and not limited to Spain 11.c
    11c. Rare species, known only from Austria and Fennoscandia . . . . *C. longicystidium*
    11c. Common species, widely distributed . . . . *C. dryinum*

ACKNOWLEDGMENTS

Specimens used in this study were obtained from Dr. J. C. Krug (TRTC) and Dr. J. L. Manjón, Universidad de Alcalá de Henares, Madrid. Ms. Frances F. Lombard and Dr. J. Page Lindsey reviewed this manuscript.

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STUDIES IN AGARICUS III: NEW SPECIES FROM CALIFORNIA[1]

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Abstract

Eight new species of Agaricus from California are described. They are: Agaricus sequoiae, section Agaricus subsection Agaricus; A. vinaceovirens, section Agaricus subsection Bitorques; A. fuscovelatus and A. rubronanus, section Sanguinolenti; A. arorae, section Spissicaules; and A. smithii, A. summensis, and A. perobscurus in the section Arvenses.

Beginning with the publication of Agaricus californicus Pk. in 1895, thirteen new Agaricus taxa based on material from California have to date been published. These include A. bulbosus McClatchie, A. bivelatus Pk., A. subnitens Pk., A. pattersonae Pk., A. hondensis Murr., A. abramsii Murr., A. mcmurphyi Murr., A. crocodilinus Murr., A. albolutescens Zell., A. glabrus Zell., A. lilaceps Zell., and A. placomyces Pk. var. microsporus A. H. Smith. A majority of these taxa are currently recognized as distinct. It is worth noting that of the thirteen only A. bulbosus was proposed by a collector residing in the state.

It is becoming increasingly apparent that California supports a great diversity of Agaricus species, including many new ones which may have restricted distributions. Forty-five species of Agaricus have been collected by the author in the state since 1972. Fourteen of these are undescribed, and of this group eight are described below.

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1) Portion of a thesis submitted to San Francisco State University in partial fulfillment of the requirements for the M.A. in Biology.

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Agaricus species occur in many habitats in California. One of the most significant of these is the Monterey cypress (Cupressus macrocarpa Hartw.) grove habitat, from which more than twenty-five species of Agaricus have been recorded. Other new and interesting species have come from the extensive redwood (Sequoia sempervirens (D. Don) Endl.) forests, and from the mixed evergreen forest community (Pseudotsuga and Quercus).

Materials, methods, and conventions: Formulae for the reagents mentioned below are as follows:

KOH: a 3% aqueous solution
Aniline: pure, fresh
HNO_3: concentrated
2,4-Dinitrophenylhydrazine: a saturated ethanolic solution
o-Tolidine: 0.05 g in 3.5 ml of ethanol, + 6.5 ml of distilled H_2O
alpha-Naphthol: 0.5 g in 3.5 ml of ethanol, + 6.5 ml of distilled H_2O

These reagents are applied to the pileus surface unless otherwise noted. Aniline x HNO_3, or "Schaeffer's reaction," involves streaking aniline upon the pileus surface, followed by cross-streaking HNO_3; the reaction occurs at or near the junction of the cross.

Microscopic features were generally determined from dried material mounted in KOH (3%); rarely fresh material was used. Spore measurement data were obtained as described in Kerrigan (1982). Measurements and shapes refer to spores in profile view. Shape terminology and criteria are those of Bas (1969).

The plural term "veils" refers to the two distinctly different velar layers possessed by most, if not all, species of Agaricus. The partial veil extends from the apex of the stipe, across the hymenophoral cavity, to the tramal zone at the pileus margin. The universal veil surrounds the entire sporocarp primordium and apparently also extends between the stipe and the partial veil of the immature, unexpanded sporocarp. The annulus is typically composed of both layers. See also Atkinson (1914) and Romagnesi (1977) on the veils of Agaricus.

Color terms enclosed in quotation marks are from Ridgway (1912). Spore color refers to a spore deposit on white paper; this feature has not been found to vary greatly in Agaricus. Specimens cited below are deposited in the San Francisco State University Herbarium (SFSU).

Agaricus sequoiae sp. nov. Fig. a.

Pileus 4-14 cm latus, subcylindricus vel convexus demum late convexus, laxe intertextus vel squamosus, albus;

contextus albus, immutablis; odor mitis; stipes 8-30 cm longus, 1.8-3.0 cm crassus, plerumque aequalis, e farcto cavus; vela alba, interdum ex parte flavescens; sporae (6.4-) 7.1-7.9 (-9.0-10.1) x (4.1-) 5.0-5.3 (-6.4) µm; basidia 30-40 x 7-13 µm, tetraspora; cheilocystidia nulla. Holotypus: R. W. Kerrigan 824, Mendocino Woodlands Camp, Mendocino Co., California. 20 November 1977. SFSU.

PILEUS 4-14 cm broad, convex to cylindrical, becoming very broadly convex, sometimes somewhat truncate; surface dry, fibrillose, the fibrils loosely interwoven, not tightly appressed, typically forming squamae (ca. 2-5 x 1-3 mm) with erect tips, colored white to light buff; background indistinguishable; context white, unchanging, semi-firm, to 2.5 cm thick, odor and taste mild.

LAMELLAE free, close, to 1.5 cm broad, pink to dull pink, "Fawn Color," becoming dark blackish brown, margin concolorous.

STIPE 8-30 cm long x 1.8-3.0 cm broad, equal or rarely ventricose; interior white, unchanging, stuffed-hollow, the cavity sometimes quite large; surface glabrous above, scurfy below, white, not changing immediately, but brownish, "Warm Sepia" stains sometimes developing long after handling; base deeply rooted in dense, silty soil.

VEILS white, sometimes in part becoming about "Primuline Yellow" in age, forming a scant to copious, friable, pendant or intermediate, supramedian annulus, or a series of annular bands, and/or a fringe of coarse, fibrillose squamules, often united at their tips, on the pileus margin, as well as various, often extensive remnants on the lower stipe.

SPORES (6.4-) 7.1-7.9 (-9.0-10.1) x (4.1-) 5.0-5.3 (-6.4) µm, dark brown, ellipsoid, hilar appendix rather prominent, germ pore not evident. BASIDIA 30-40 x 7-13 µm, clavate to cylindro-clavate, tetrasporic; sterigmata 3-4 µm long. CHEILOCYSTIDIA absent or basidiole-like. PILEIPELLIS of parallel or sub-parallel to interwoven, hyaline, smooth, thin-walled hyphae, cells (4.5-) 7.5-30 x 33-110 µm, cylindrical, or constricted at septae, or rarely ellipsoid.

CHEMICAL REACTIONS: KOH negative; aniline x HNO_3 negative; o-tolidine blue on basal stipe context, adjacent velar material, and pileus surface, elsewhere unchanging; alpha-naphthol pink on annulus, pileus surface, elsewhere essentially unchanging.

Solitary, gregarious, or caespitose (up to 50 per fascicle) in periodically-silted bottomlands in redwood forests. Known only from Mendocino County (possibly observed in Marin County), California. Oct. - Dec. Usually rare but occasionally almost common.

Material studied: CALIFORNIA. Mendocino Co.: R. W. Kerrigan 623, 744, 795-797, 809-813, 820-823, 824 (holotype), 825-827, 1083; K. Williams 239K77.

Observations: The unchanging color of the context, chemical reactions, and the absence of cheilocystidia place A. sequoiae in section Agaricus subsection Agaricus sensu Heinemann (1978). The unusual yellow tints that develop on the veil, as well as the typically large size, distinguish the species. Of the European species, A. chionodermus Pilát appears to most closely resemble A. sequoiae, but has larger spores. Locally, in its habitat, A. sequoiae will probably not be confused with other species, except perhaps with very pallid specimens of A. hondensis, which have a phenolic odor and turn yellow with KOH. At this point A. sequoiae appears to be restricted to those portions of the coastal redwood forest which are periodically inundated with turbid water from adjacent rivers. In the last 10 years it has been relatively abundant during only one season.

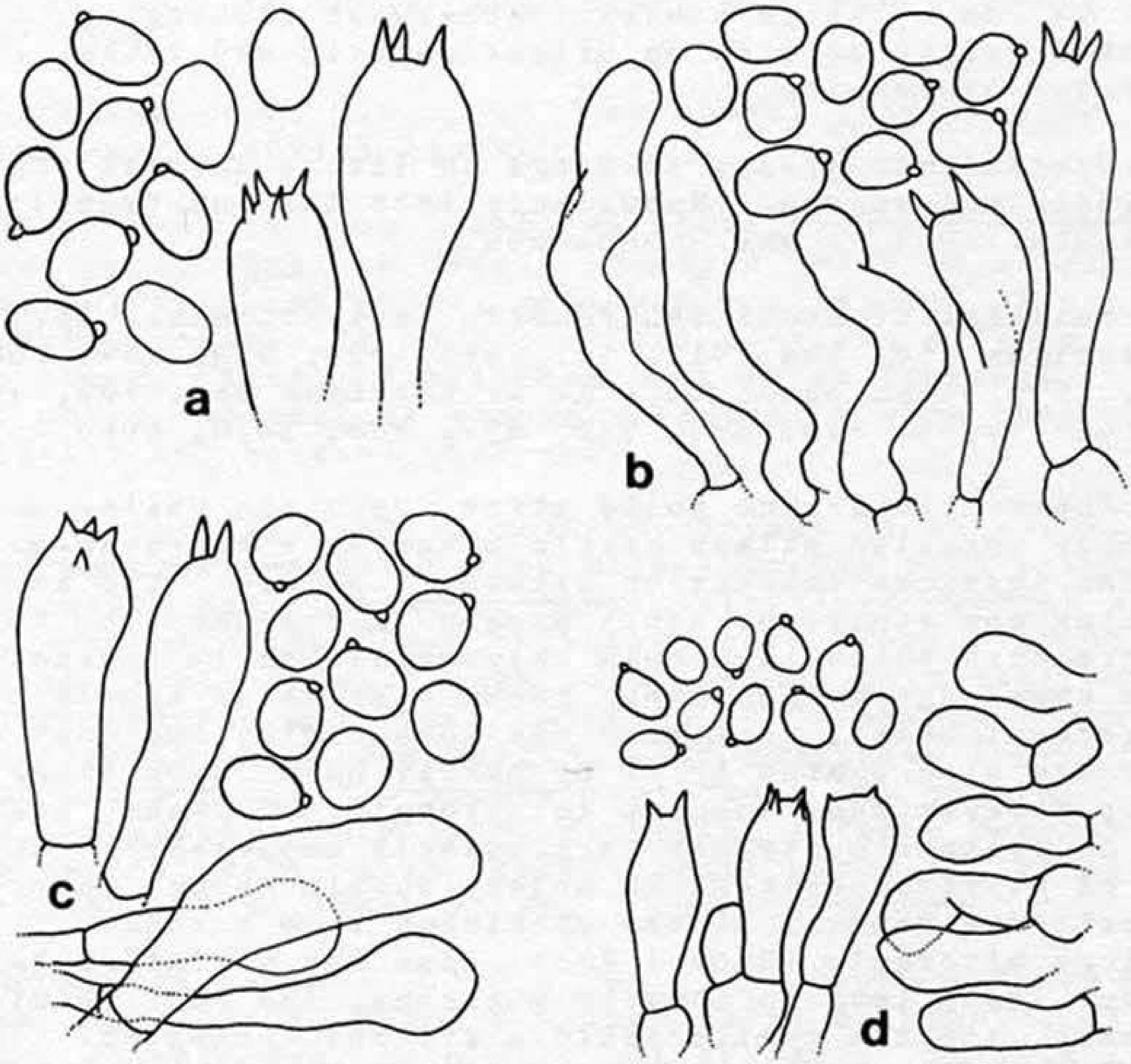
Agaricus vinaceovirens sp. nov. Fig. b.

Pileus 6-12 cm latus, convexus, margine valde involutus, demum subplanus vel depressus, laxe intertextus vel subsquamulosus, albus vel vinaceous, interdum ex parte virescens; contextus albus, immutabilis vel juxta cuticulam vinaceus, interdum virescens; odor mucido-salinus, ingratus; stipes 1.5-6 cm longus, 2-4 cm crassus, subaequalis, solidus; vela alba demum vinaceo-suffusa, peronata, saepe cupulata; sporae (5.3-) 6.2-6.7 (-7.9) x (4.1-) 4.6-5.0 (-5.6) µm; basidia 25-36 x 7.5-9 µm, tetraspora; cheilocystidia 17-39 x 6-10.5 µm, undulata vel irregularia. Holotypus: R. W. Kerrigan 730, Colma, San Mateo Co., California. 7 October 1977. SFSU.

PILEUS 6-12 cm broad, broadly convex, sometimes depressed centrally, with strongly inrolled margin, finally almost plane; surface dry, with loosely interwoven, appressed to slightly repent fibrils, towards the margin often with semi-erect, pointed squamules, colored white to light brown, "Chamois," in age usually developing vinaceous tints, especially toward the margin, occasionally greenish tints also developing, especially near the disc; context white, unchanging after exposure except after several hours a narrow band below surface becoming vinaceous, also occasionally a second band colored "Tea Green" to "Celandine Green" developing directly below surface, firm, to 2.5 cm thick, odor strong, unpleasant, musty/briny.

LAMELLAE free, close, 3-8 mm broad, pallid salmon color, or more brownish, becoming dark blackish brown, margin pallid or obscurely so.

STIPE 1.5-6 cm long x 2-4 cm above, 2-3 cm below, equal, clavate to napiform, or cuneiform; interior white,



Figs. a-d. Basidia, basidiospores, and cheilocystidia of *Agaricus* spp. a. *A. sequoiae*, Kerrigan 795 (cheilocystidia lacking). b. *A. vinaceovirens*, Kerrigan 730. c. *A. fuscovelatus* Kerrigan 784. d. *A. rubronanus*, Kerrigan 1204. All x 900.

unchanging, solid; surface glabrous where exposed (above veils), white, unchanging; base firmly rooted in substrate.

VEILS peronate, continuous from base, forming a saccate or appressed volva, with or without flaring, striate, upper limb, colored white, developing vinaceous tints above, loosely interwoven, appearing coactate.

SPORES (5.3-) 6.2-6.7 (-7.9) x (4.1-) 4.6-5.0 (-5.6) µm, dark brown, ellipsoid, hilar appendix prominent, germ pore not evident. BASIDIA 25-36 x 7.5-9 µm, clavate to cylindro-clavate, frequently predominantly trisporic, otherwise predominantly tetrasporic; sterigmata 2-4 µm long. CHEILOCYSTIDIA 17-39 x 6-10.5 µm, cylindro-clavate, usually contorted, lining the lamellar margin. PILEIPELLIS of semi-parallel to interwoven, smooth, thin-walled, hyaline hyphae, cells (3.5-) 6-9 (-12) x 30-80 (-190) µm, convoluted-cylindrical, often sharply curved.

CHEMICAL REACTIONS: KOH negative; aniline x HNO_3 negative; o-tolidine blue on surfaces and veils, sometimes blue on context near surface at pileus margin, also on basal 2-3 mm of stipe context; otherwise unchanging; alpha-naphthol bright magenta on pileus cuticle and veils, otherwise unchanging.

Gregarious, always in rings in litter or soil under *Cupressus macrocarpa*. Known only from the San Francisco Peninsula. Oct. - Mar. Uncommon.

Material studied: CALIFORNIA. San Francisco Co.: R. W. Kerrigan 660, 664, 912, 913, 925, 926, 928, 929, 1005, 1009, 1196. San Mateo Co.: R. W. Kerrigan 667, 705, 706, 730 (holotype), 895, 896, 995, 997, 998, 1010, 1040.

Observations: The solid stipe, peronate veils, and strongly inrolled pileus margin place *A. vinaceovirens* in section *Agaricus* subsection *Bitorques* Heinem. The manner in which the vinaceous tints appear is distinctive, while the greenish tones, although only occasionally present, are to my knowledge unique among known species of *Agaricus*. The general habit, contorted cheilocystidia, and odor of brine are also shared by *A. bernardii* Quel. *apud* Cooke & Quel.; however that species is strongly rufescent, and its odor is neither musty nor particularly unpleasant. The odor of *A. vinaceovirens* is objectionable enough to provoke requests for removal of the specimens from a room. *Agaricus bitorquis* (Quel.) Sacc. also has a similar habit, however the pileus is usually glabrous, the odor is mild or pleasant, and the cheilocystidia are not contorted. In addition to these distinctions, all three of the species mentioned above have substantially different spore sizes.

Agaricus fuscovelatus sp. nov. Fig. c.

Pileus 5-9 cm latus, conico-convexus demum subplanus, appreso-squamulosus vel fibrilloso-areolatus, cinnamomeus vel obscure cinnamomeus, sub fibrillis pallide violaceo-griseus; contextus ex albo rufescens; odor mitis, suavis; stipes 6-12 cm longus, 0.8-1.5 cm crassus, deorsum 1-2 cm crassus, sub aequalis, e farcto cavus; vela pendentia, albida demum fusca; sporae (5.6-6.4-) 7.2-7.8 (-9.0) x (4.9-) 5.7-6.2 (-7.1) µm; basidia 27-30 x 9-10 µm, tetraspora; cheilocystidia 21-47 x 7.5-12 µm, cylindrica, clavata vel subsphaeropedunculata. Holotypus: R. W. Kerrigan 791, Sunset Avenue, San Francisco Co., California. 8 November 1977. SFSU.

PILEUS 5-9 cm broad, hemispherical, or compressed, becoming conico-convex, finally almost plane; surface dry, appressed-fibrillose becoming squamulose, or fibrillose-areolate, or scurfy, at first colored medium brown, about "Avellaneous," later "Buffy Brown," "Buckthorn Brown," "Cinnamon-Brown," or darker after handling or with age; background colored whitish or more often "Pale Mouse Gray" or "French Gray," producing an overall subtle violet-grey cast; context white, slowly and weakly to moderately rufescent, to 1 cm thick, odor after exposure becoming fruity/spicy.

LAMELLAE free, close, to 7 mm broad, greyish-pink becoming dark blackish brown.

STIPE 6-12 cm long x 8-15 mm above, 1-2 (-2.5) cm at broadest part, equal or rarely enlarged below or slightly ventricose; interior white, moderately rufescent throughout its length, especially in transverse section; surface smooth above, faintly fibrillose with velar fragments below, white, moderately strongly reddening when incised; base (1-1.5 cm) covered with soil.

VEILS forming a thin, pendant, apical to subapical, colored annulus dehiscing from pileus margin when pileus is approximately half-expanded, then collapsing; partial veil white, soon becoming "Drab," finally dark brown, "Carob Brown" to "Benzo Brown," especially below; universal veil primarily forming a thicker, whitish to "Cinnamon-Brown" dentate fringe on pileus margin, also sometimes leaving a ring of warts under the partial veil near the annular margin, or leaving very thin, darkening patches beneath entire partial veil, also forming small warts or, rarely, a scale-like ring on lower stipe.

SPORES (5.6-6.4-) 7.2-7.8 (-9.0) x (4.9-) 5.7-6.2 (-7.1) µm, dark brown, broadly ellipsoid to ellipsoid, hilar appendix conspicuous, germ pore not evident. BASIDIA 27-30 x 9-10 µm, clavate to ventricose, tetrasporic; sterigmata 3-5 µm long. CHEILOCYSTIDIA 21-47 x 7.5-12 µm, broadly cylindrical, clavate, or slightly sphaeropedunculate, in clusters, with basidia present on lamellar margin. PILEIPELLIS of parallel or sub-parallel to semi-interwoven, smooth, thin-walled hyphae, appearing very pale reddish brown under oil at 1000x, cells (2-) 4.5-9 x 30-105 µm, contorted.

CHEMICAL REACTIONS: KOH negative; aniline x HNO_3 negative; o-tolidine blue on surface of stipe base, pileus cuticle, elsewhere violet; alpha-naphthol purple on surface of stipe base, pileus cuticle, elsewhere orange to pinkish-orange except unchanging on basal context of stipe.

Gregarious, sometimes abundantly so, to caespitose, sometimes in arcs, usually deeply rooted in bare, compacted, often coarse-textured soils, generally under various planted conifers (<u>Cupressus</u>, <u>Abies</u>, <u>Cedrus</u>, <u>Pinus</u>). Known from central coastal California. Sept. - Jan. Rather common.

Material studied: CALIFORNIA. Marin Co.: R. W. Kerrigan 951. San Francisco Co.: R. W. Kerrigan 683, 695, 790, 791 (holotype), 849. San Mateo Co.: R. W. Kerrigan 701, 779, 945, 996, 1006. Santa Cruz Co.: R. W. Kerrigan 934, 1013, 1014. Monterey Co.: R. W. Kerrigan 976, 1031.

Observations: Agaricus fuscovelatus is similar to A. pattersonae in many respects; for example the veils of both species become brown in age, however this is much less pronounced in A. pattersonae. Of the two, A. fuscovelatus has a smaller, more slender stature, and a more conic pileus when young. The violet-grey cast of the pileus background is subtle but with experience can be used to recognize the mushroom in the field. Agaricus annae Pilát appears to be similar but has longer, narrower spores; unfortunately Pilát published no information on the veils of that species.

Agaricus rubronanus sp. nov. Fig. d.

Pileus 2-3 cm latus, conico-convexus demum subplanus, appresso-fibrillosus vel appresso-squamulosus, cinnamomeus, sub fibrillis pallidus; contextus ex albo rufescens; odor mitis; stipes 3.5 cm longus, 3-6 mm crassus, basi 8 mm crassus, aequalis vel subbulbosus, e farcto cavus; sporae (3.8-4.1-) 4.8-5.0 (-6.0-6.8) x (3.0-) 3.6-3.7 (-4.1-4.5) µm; basidia 15-22 x 6-7 µm, tetraspora; cheilocystidia 10-16 x 5-6 µm, cylindrico-clavata. Holotypus: R. W. Kerrigan 1204, Colma, San Mateo Co., California. 7 December 1981. SFSU.

PILEUS 2-3 cm broad, shape when young unknown, later convex-truncate, finally approximately plane; surface dry, appressed-fibrillose becoming appressed-squamulose, squamules small (ca. 2-3 mm), pointed, colored medium brown, "Wood Brown," or darker in age; background pallid, quickly becoming red when bruised, especially on margin; context white, quickly strongly reddening when exposed, to 4 mm thick, odor indistinct.

LAMELLAE free, close, to 4 mm broad, pinkish, bruising rose color, becoming brownish, then blackish brown, margin pallid.

STIPE 3.5 cm long x 3-6 mm broad above, to 8 mm broad at base, equal or slightly bulbous; interior white, quickly moderately to strongly rufescent when sectioned, especially above, somewhat yellowish near base, lustrous, somewhat fibrous, stuffed-hollow; surface finely striate above, fibrillose below, becoming zonate in lower half, white, rufescent where incised, becoming brownish after handling or with age; base shallowly rooted in litter.

VEILS forming a thin (ca. 1 mm), scant, pendant, supramedian, white annulus with "Wood Brown" margin, upper surface finely striate, lower surface slightly scurfy, some velar remnants also present as occasional dentate flaps on pileus margin, and as fibrils on stipe.

SPORES (3.8-4.1-) 4.8-5.0 (-6.0-6.8) x (3.0-) 3.6-3.7 (-4.1-4.5) µm, dark brown, broadly ellipsoid to ellipsoid, hilar appendix prominent, germ pore not evident. BASIDIA

15-22 x 6-7 µm, typically ventricose, tetrasporic; sterigmata 2-3 µm long. CHEILOCYSTIDIA 10-16 x 5-6 µm, cylindro-clavate, scattered, with basidia also present on lamellar margin. PILEIPELLIS of interwoven to subparallel, convoluted, branching, smooth, thin-walled hyphae, appearing light reddish-brown under oil at 1000x, cells 3-4.5 (-8) x 30-75 µm, contorted-cylindrical.

CHEMICAL REACTIONS: KOH negative.

Scattered in litter of *Cupressus macrocarpa*. Known only from San Mateo County, California. Dec. Rare.

Material studied: CALIFORNIA. San Mateo Co.: R. W. Kerrigan 1204 (holotype).

Observations: The most striking feature of *A. rubronanus* is its diminutive size. It might at first be mistaken for the more common *A. semotus* Fr., or a similar species, until the rufescence of the context is noted. *Agaricus placomyces* var. *microsporus* is another small, rufescent, very rare species which has a blackish, rather than a brown, pileus. Other small-spored species in section *Sanguinolenti* (Schaeff. & Møll.) Sing. are considerably larger. The most similar of these, *A. silvaticus* Schaeff. ex Secr. sensu Møll. (which incidentally has not been found in California), has a pileus which is 5-10 cm broad, and much larger cheilocystidia.

Agaricus arorae sp. nov. Fig. e.

Pileus 3-10 cm latus, convexus demum subplanus, undulatus, fibrilloso-squamulosus, fuscus vel olivaceus, sub fibrillis pallidus; contextus ex albo rufescens; odor mitis, suavis; stipes 5-11 cm longus, 0.7-1.2 cm crassus, deorsum 1.5-3 cm crassus, bulbosus, reliquias velorum praebens, e farcto cavus; vela alba, pendentia; sporae (4.1-) 4.5-4.7 (-5.6) x (3.0-) 3.3-3.4 (-3.8) µm; basidia 20-24 x 6 µm, tetraspora; cheilocystidia 14-25 x 6-13.5 µm, clavata, late clavata vel pyriforma. Holotypus: R. W. Kerrigan 1199, Capitola Extension, Santa Cruz Co., California. 25 November 1981. SFSU.

PILEUS 3-10 cm broad, convex, becoming broadly convex to hemispherical, finally plane, undulating; surface dry, fibrillose, later with small (ca. 2-4 x 1-2 mm) appressed fascicles of fibrils (scarcely squamules) with tips which may recurve in age, colored medium dark brown, "Sayal Brown" to "Tawny-Olive;" background color whitish, becoming sordid; context white, reddening (variably so) when cut, semi-firm, 4-7 mm thick, odor fruity/spicy upon exposure, almond-like with KOH.

LAMELLAE free, close, to 5 mm broad, when young dull pinkish, bruising more rosy color, later dull blackish brown, margin concolorous.

STIPE 5-11 cm long x 7-12 (-17) mm above, 15-30 mm at base, slender, bulbous; interior white, moderately to semi-strongly rufescent upon exposure, somewhat lustrous, stuffed-hollow; surface white, coloring as the interior when bruised, finely striate and lustrous above where not covered by extensive, thin velar zones which remain white as surface darkens, glabrous below, with 0-3 thicker, white (occasionally brown-tipped) scale-like rings; base rather deeply rooted in substrate.

VEILS forming a thin, pendant, supramedian, white annulus with blunt, entire margin, partial veil and universal veil indistinguishable, also leaving remnants on stipe as described above.

SPORES (4.1-) 4.5-4.7 (-5.6) x (3.0-) 3.3-3.4 (-3.8) µm, dark brown, ellipsoid, hilar appendix not prominent, germ pore not evident. BASIDIA 20-24 x 6 µm, clavate, tetrasporic; sterigmata 2-3 µm long. CHEILOCYSTIDIA 14-25 x 6-13.5 µm, basidiole-like or more broadly clavate, to pyriform, uncommon to common and almost continuous, with scattered basidia on lamellar margin. PILEIPELLIS primarily of interwoven, much-branching, smooth, thin-walled hyphae, appearing very light brown under oil at 1000x, cells 6-9 (-14) x 18-48 µm, cylindrical or slightly constricted at the septae.

CHEMICAL REACTIONS: KOH yellow; aniline x HNO_3 orange-red within one minute.

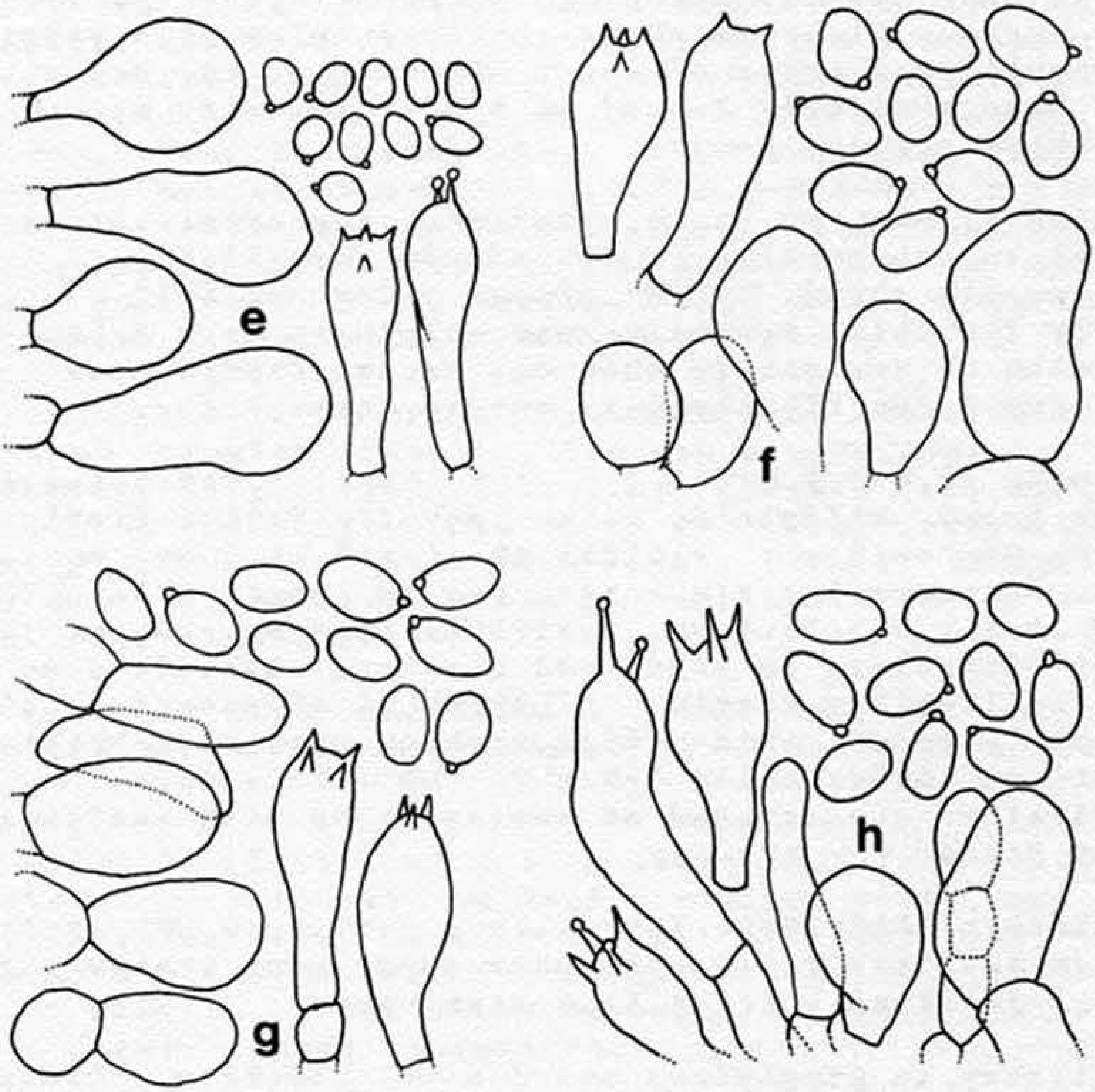
Gregarious and caespitose in deep litter of Quercus, sometimes in conjunction with other trees such as Pseudotsuga. Known only from Santa Cruz County, California. Nov. Rare.

Material studied: CALIFORNIA. Santa Cruz Co.: R. W. Kerrigan 1180, 1199 (holotype).

Observations: The brown color of the pileus, slender stature, and rufescent context are common to many species of Agaricus, such as A. fuscofibrillosus (Møll.) Møll. A. arorae differs in giving positive reactions with the KOH and aniline x HNO_3 tests. The pale velar patches on the darkening surface of the upper stipe are also distinctive. It is placed in section Spissicaules (Heinem.) Kerrigan because of the combination of chemical reactions and rufescence of the context. A. arorae is named for D. Arora, who first brought specimens of this and other interesting species to me.

Agaricus smithii sp. nov. Fig. f.

Pileus 8-13 cm latus, anguste convexus dein hemisphaericus demum planus, appresso-fibrillosus vel squamulosus, ochraceo-aurantiacus; contextus albus, immutabilis; odor amygdalinus; stipes 7-15 cm longus, 1-1.5



Figs. e-h. Basidia, basidiospores, and cheilocystidia of *Agaricus* spp. e. *A. arorae*, Kerrigan 1180, 1199. f. *A. smithii*, Thiers 24356. g. *A. summensis*, Kerrigan 661, 662. h. *A. perobscurus*, Kerrigan 643. All x 900.

cm crassus, deorsum 2-4 cm crassus, bulbosus vel abrupte bulbosus, e farcto cavus, albus demum lutescens; vela alba, pendentia; sporae (6.4-) 7.4-8.3 (-9.8) x (4.5-) 5.0-5.6 (-6.4) µm; basidia 18-24 x 9-10.5 µm, tetraspora; cheilocystidia 9-22.5 x 7.5-13.5 µm, clavata, ovoidea, vel globosa. Holotypus: H. D. Thiers 21494, Patrick's Point State Park, Humboldt Co., California. 12 November 1967. SFSU.

PILEUS 8-13 cm broad, narrowly convex becoming broadly convex, finally plane; surface dry, appressed-fibrillose becoming minutely appressed-squamulose, the squamules ca. 2-3 mm long x 1-2 mm broad, pointed, colored orangish, near "Tawny," background pallid, generally becoming yellowish-orange; context white, unchanging, to 1.5 cm thick, odor almond-like.

LAMELLAE free, close, to 1 cm broad, dull pinkish becoming greyish, finally dark blackish brown, margin pallid.

STIPE 7-15 cm long x 1-1.5 cm above, 2-4 cm at base, bulbous or more often abruptly bulbous; interior white, or yellowish near base, unchanging, stuffed-hollow, to hollow in age; surface glabrous above, covered below when young with a continuous layer of velar fibrils, white, becoming yellow; base shallowly rooted in substrate, with many yellowish mycelial strands.

VEILS forming an ample, pendant (or pendant-upturned), subapical to supramedian, white annulus; partial veil entire, smooth above, 1-2 mm thick; universal veil typically fissuring radially near margin to form a "cog-wheel" with obtuse points that may become tawny, also leaving deciduous fibrils over entire lower stipe.

SPORES (6.4-) 7.4-8.3 (-9.8) x (4.5-) 5.0-5.6 (-6.4) µm, dark brown, ellipsoid, hilar appendix rather prominent, germ pore not evident. BASIDIA 18-24 x 9-10.5 µm, mostly clavate, tetrasporic; sterigmata 2-4 µm long. CHEILOCYSTIDIA 9-22.5 x 7.5-13.5 µm, basidiole-like or globose to ovoid or irregular, in scattered clusters, basidia also present on lamellar margin. PILEIPELLIS of sub-parallel to interwoven, smooth, thin-walled hyphae, appearing hyaline under oil at 1000x, cells 4-9 x 27-100 (-175) µm, cylindrical or constricted at septae, some with swellings to 17 um broad.

CHEMICAL REACTIONS: KOH yellow; aniline x HNO_3 quickly orange to scarlet; 2,4-dinitrophenylhydrazine orange within 10 sec; o-tolidine quickly blue everywhere.

Solitary to gregarious under mixed conifers. Known from Mendocino County, California north along the coast into Oregon. Oct. - Nov. (-Jan.). Common in Humboldt County.

Material studied: CALIFORNIA. Del Norte Co.: H. D. Thiers 21342; D. Showers 20 Oct. 1972. Humboldt Co.: R. W. Kerrigan 748-751, 762, 763, 767, 772, 1118; H. D. Thiers 21342, 21372, 21494 (holotype), 24356, 24403, 30316, 40373, 41682, 43837. Mendocino Co.: R. W. Kerrigan 582, 815; H. D. Thiers 40475, 43801.

Observations: Except for the orangish pigment in the pileipellis, *A. smithii* might be mistaken in the field for the abruptly-bulbous form of *A. silvicola* (Vitt.) Pk. The much larger spores of *A. smithii* also permit separation of the above two species.

This species is named for Dr. A. H. Smith, who first (1940) called attention to the existence of this mushroom under the name *A. perrarus* Schulz., a European fungus. Most modern European authors treat *A. perrarus* as a synonym of, or a color variant of, *A. augustus* Fr. Smith, however, showed that his material was clearly different from *A. augustus*, therefore a new name is necessary for this apparently endemic species.

Agaricus summensis sp. nov. Fig. g.

Pileus 15-20 cm latus, hemisphaericus demum subplanus, undulatus, appresso-fibrillosus; fibrillae ochraceae; contextus albus, immutabilis, odor amygdalinus; stipes 11-18 cm longus, 3 cm crassus, deorsum 4.5-5 cm crassus, clavatus, e farcto cavus, albus dein lutescens; vela alba, pendentia; sporae (5.6-6.0-) 6.7-7.2 (-8.3-9.0) x (3.4-4.1-) 4.4-4.6 (-5.3) µm; basidia 19-24 x 7-8 µm, tetraspora; cheilocystidia 12-18 x 5.5-11 µm, ellipsoidea vel cylindrica. Holotypus: R. W. Kerrigan 661, Castle Rock State Park, Santa Clara Co., California. 6 March 1977. SFSU.

PILEUS 15-20 cm broad, hemispherical becoming broadly convex or somewhat truncate, finally semi-plane, undulating, margin often splitting; surface dry, appressed-fibrillose, the fibrils ca. 10 mm long, colored yellowish becoming ochraceous, near "Ochraceous-Tawny;" background color whitish; context white, unchanging, firm, to 2 cm thick, odor almond-like.

LAMELLAE free, close, to 1.5 cm broad, pallid, sometimes becoming slightly pinkish, finally dark blackish brown.

STIPE 11-18 cm long x 3 cm above, 4.5-5 cm below, clavate or occasionally bulbous; interior white, or yellowish near base, unchanging, slightly lustrous, narrowly stuffed-hollow; surface glabrous, or with scant, obscure fibrils below, white becoming buffy-yellowish; base rather deeply rooted in substrate.

VEILS forming a white, subapical to supramedian, pendant annulus, dehiscing from pileus margin late during expansion, then collapsing; upper surface (partial veil) rugose; lower surface (universal veil) breaking up via radial fissures into broad, somewhat obscure, rough-surfaced patches, also sometimes leaving scant floccules on surface of lower stipe.

SPORES (5.6-6.0-) 6.7-7.2 (-8.3-9.0) x (3.4-4.1-) 4.4-4.6 (-5.3) µm, dark brown, ellipsoid, hilar appendix not prominent, germ pore not evident. BASIDIA 19-24 x 7-8 µm, clavate, tetrasporic; sterigmata 2-4 µm long. CHEILOCYSTIDIA 12-18 x 5.5-11 µm, ellipsoid, cylindrical, or irregular, occurring in clusters, narrow hyphae oriented parallel to lamellar margin also present. PILEIPELLIS of parallel, smooth, thin-walled, hyaline hyphae, cells 2.5-6 (-10.5) x 65-180 µm, cylindrical.

CHEMICAL REACTIONS: KOH yellow; aniline x HNO_3 quickly scarlet.

Solitary or in pairs, in litter of *Pseudotsuga* (with *Quercus* present or not) and apparently also under *Sequoia*, on slopes or summits of the Coast Range in the San Francisco Bay region. (Dec.-) Jan. - Mar. Rare.

Material studied: CALIFORNIA. Marin Co.: R. W. Kerrigan 1210. Alameda Co.: R. W. Kerrigan 971. Santa Clara Co.: R. W. Kerrigan 661 (holotype), 662.

Observations: The large size, ochraceus, fibrillose pileus and spore size distinguish A. summensis. It might be mistaken in the field for a very robust specimen of A. silvicola which had discolored in age; however the tawny color of the pileus fibrils in A. summensis appears to be due to the presence of a true pigment in the hyphae of the pileipellis. The fibrils can, however, be indistinct, and the pigment may be slow to develop. The spores of A. summensis are longer than those of A. silvicola and other similar species. The European A. fissuratus (Møll.) Møll. has a very similar aspect, but has larger spores, a pastoral, maritime habitat, and apparently can discolor but lacks pigmentation in the pileus.

Agaricus perobscurus sp. nov. Fig. h.

Pileus 8-17 cm latus, hemisphaericus vel subtruncatus demum planus, appresso-fibrillosus vel squamulosus, perobscure fuscus, sub fibrillis albidus vel subaurantius; contextus albus, immutabilis; odor amygdalinus; stipes 8-13 cm longus, 1.4-2.5 cm crassus, deorsum 2.5-3.5 cm crassus, bulbosus, e farcto cavus; vela pendentia, alba, tenuia; sporae (5.3-) 6.4-7.4 (-9.0) x (3.8-4.1-) 4.3-4.7 (-6.0) µm; basidia 17-30 x 7.5-9 µm, tetraspora; cheilocystidia 9-20 x 7-15 µm, clavata, oblonga, vel subglobosa, interdum catenulata. Holotypus: H. D. Thiers 19004, Sunset Avenue, San Francisco Co., California. 24 April 1967. SFSU.

PILEUS 8-17 cm broad, at first hemispherical to convex, later often somewhat truncate with a broad disc, finally plane; surface of appressed fibrils which in age form small (ca. 3-5 mm long x 1-3 mm broad), pointed to slightly areolate, appressed-fibrillose squamules colored dark brown, "Olive-Brown" to "Clove Brown" or "Fuscous," or in age about "Sayal Brown;" background color usually predominating after expansion, at first whitish to "Pale Vinaceous-Fawn," in age becoming somewhat "Light Ochraceous-Salmon" to "Cinnamon-Buff," then surface often appearing somewhat polished; context white, unchanging, 1-2 cm thick, odor faintly to moderatly of almonds.

LAMELLAE free, close, to 1 cm broad, at first pallid, then "Pinkish Buff" or "Fawn Color," later dark blackish brown, margin pallid.

STIPE 8-13 cm long x 1.4-2.5 cm broad above, 2.5-3.5 cm at the bulbous base; interior white, unchanging or becoming somewhat yellow below, slightly lustrous, stuffed-hollow; surface glabrous above, with thin appressed-fibrillose velar zones below, white, in age often appearing smooth, polished; base shallowly rooted in well-decomposed leaf/needle litter.

VEILS forming a thin, entire, pendant, subapical to supramedian, white annulus composed mainly of partial veil, upper surface nearly smooth; universal veil present as thin marginal patches colored medium brown, "Avellaneous" to dark brown, "Fuscous" on the minutely fibrous to rimose-floccose whitish or later orangish undersurface of annulus, also leaving white to greyish, "Clay Color" velar zones on lower stipe.

SPORES (5.3-) 6.4-7.4 (-9.0) x (3.8-4.1-) 4.3-4.7 (-6.0) µm, dark brown, ellipsoid to elongate, hilar appendix not prominent, germ pore not evident. BASIDIA 17-30 x 7.5-9 µm, clavate or cylindroclavate, tetrasporic; sterigmata 3-6 µm long. CHEILOCYSTIDIA 9-20 x 7-15 µm, basidiole-like or oblong to subglobose, rarely catenulate, in scattered clusters, lamellar margin also composed of basidia and narrow hyphae oriented parallel to margin. PILEIPELLIS of parallel or sub-parallel to interwoven, smooth, thin-walled hyphae, appearing light brown under oil at 1000x, cells 6.5-9 (-12) µm x 35-80 (or more in age) µm, cylindrical or constricted at the septae.

CHEMICAL REACTIONS: KOH yellow; aniline x HNO_3 slowly or quickly orange to scarlet; 2,4-dinitrophenylhydrazine orange-red in 10 sec; o-tolidine quickly blue everywhere, becoming reddish-black on context.

Solitary to gregarious in litter/soil under various (usually planted) trees, fairly common under _Cupressus macrocarpa_, occasional under _Pinus_, _Quercus_, _Eucalyptus_, and perhaps others, in the San Francisco Bay region and possibly southern California as well. Dec. - Apr.

Material studied: CALIFORNIA. Marin Co.: R. W. Kerrigan 883. San Francisco Co.: R. W. Kerrigan 593, 643, 650, 670, 855, 920, 954; H. D. Thiers 19004 (holotype). San Mateo Co.: R. W. Kerrigan 942, 943, 967.

Observations: _Agaricus perobscurus_ may be confused with _A. augustus_ in the field; however the pileus of _A. perobscurus_ is generally darker when young, and more pallid and polished when old, than that of the latter species. The thinner annulus, more scant fibrils on the stipe, and frequently pink lamellae of _A. perobscurus_ are also good field characters which contrast with the corresponding features of _A. augustus_. The spores of the former species are much smaller than those of the latter. _Agaricus subrufescentoides_ Murr., which is perhaps only a dark form of _A. hondensis_, is another fungus with a similar aspect which is seldom encountered in California but is more common further north; unlike _A. perobscurus_ it has a negative aniline x HNO_3 reaction and a phenolic odor.

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I am deeply grateful to Dr. Harry D. Thiers for the years of patient encouragement and advice which he has so generously given to me, and additionally for his critical comments on this manuscript. I also thank Mrs. Ellen Thiers for rendering the diagnoses into Latin, and for her advice on this subject, Dr. David Farr of the National Fungus Collections for searching for prior synonyms of the above new combinations, and Dr. Clark Rogerson and Dr. Rupert Barneby of the New York Botanical Garden for suggesting the epithet "rubronanus." Finally, I am indebted to many collectors, amateur, student, and professional, who helped to bring to my attention certain of the collections and data mentioned above.

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MORE COMMENTS ON THE GENUS ACERVUS

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Several years ago, the senior author (Pfister 1975) proposed an emendation of the genus *Acervus* Kanouse and presented results of studies on the development of *A. flavidus* (Berk. & Curt. in Berk.) Pfister. At that time he had not seen living material of *A. epispartius* (Berk. & Br.) Pfister which, though described from the Americas and Asia, appeared to be only rarely collected. Recently, the junior author made a large collection of *A. epispartius* in Utica, New York, which allows further comment on the species. The following is presented by way of review.

ACERVUS Kanouse emend. Pfister (1975)
= Acervus Kanouse, Pap. Michigan Acad. Sci. 23: 149. 1938.
= Phaedropezia Le Gal, Prodr. Flore Mycol. Madagascar 4: 179. 1953.

Apothecia up to 1.5 cm in diam, at maturity plane but when young, shallow cupulate. Hymenium bright yellow to orange; outer surface of the apothecium concolorous or only slightly paler. The apothecia often occur in clusters or groups on soil and debris. The mycelium tends to bind together the substrate to form dense mats. The excipulum is composed of interwoven hyphae. The medullary excipulum is of hyphae which are widely spaced and there are occasional swollen cells. Toward the outer surface of the apothecia, the interwoven hyphae become densely interwoven and form an indistinct layer of textura angularis. The asci are small with an indistinct dehiscence mechanism; the ascospores are small, reaching a length of 13 µm in one species. The ascospores are ellipsoid with somewhat blunt ends and are in a single row within the ascus. Pfister (1972), showed that the ascospores are uninucleate. Paraphyses are simple and neither branch nor anastomose, the bright yellow to orange pigments in the paraphyses are soluble in water and alcohol.

ACERVUS EPISPARTIUS (Berk. & Br.) Pfister, Occ. Pap. Farlow Herb. 8:3. 1975.

≡ Peziza epispartia Berk. & Br., J. Linn. Soc., Bot. 14:103. 1873.
    ≡ Phialea epispartia (Berk. & Br.) Pat., Bull. Soc. Mycol. France 29:221. 1913.
    ≡ Phaedropezia epispartia (Berk. & Br.) Le Gal, Prodr. Flore Mycol. Madagascar 4:181. 1953.
= Peziza flavotingens Berk. & Br., J. Linn. Soc., Bot. 14: 104. 1873.
    ≡ Humaria flavotingens (Berk. & Br.) Sacc., Syll. Fung. 8:129. 1889.
    ≡ Phaedropezia flavotingens (Berk. & Br.) Le Gal, Bull. Jard. Bot. État 29:96. 1959.
= Peziza radiculosa Berk. & Br., J. Linn. Soc., Bot. 14:103. 1873.
    ≡ Sarcoscypha radiculosa (Berk. & Br.) Sacc., Syll. Fung. 8:155. 1889.
= Peziza microspora Berk. & Curt. in Berk., Grevillea 3:150. 1875.
    ≡ Humaria microspora (Berk. & Curt. in Berk.) Sacc., Syll. Fung. 8:131. 1889.
= Acervus aurantiacus Kanouse, Pap. Michigan Acad. Sci. 23:149. 1937 [1938].

For descriptions, see Kanouse (1937), Le Gal (1953), Korf (1963). Pfister (1975) provides a general commentary on *A. epispartius*. The features which distinguish *A. epispartius* from *A. flavidus* are the thin-walled ascospores which are 5.8 - 7.5 x 3.2 - 4µm which are regular in outline.

A. epispartius has been collected in Argentina, Ceylon, Africa, Madagascar, Malaya, Vietnam, and the United States, and, as can be seen from the synonyms, it has often been described as new. The previous other North American collections were the holotype of *Acervus aurantiacus*, on soil around roots of an elm tree in a bog, South Lyons, Michigan (MICH), on loose decaying rubbish, Philadelphia (NY), and the holotype of *Peziza microspora*, on damp,

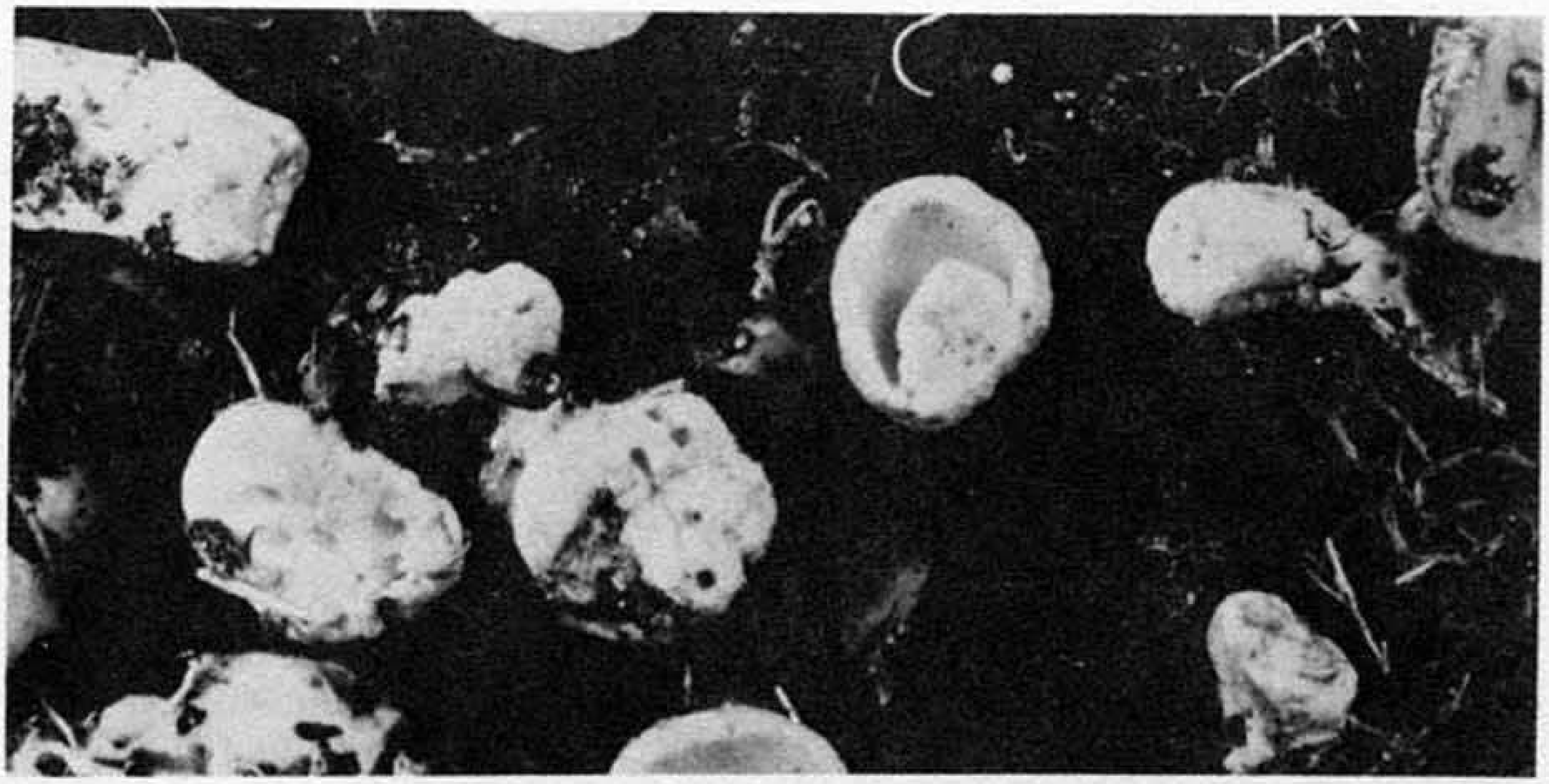

Figure 1. Photograph of ascocarp primordia at various stages of maturation; the primordium at center shows the "flap-like" covering.

rotten wood near the ground, South Carolina (K). The collection from Utica was made on a mixture of wood chips, hay and dung where it occurred in great masses (FH). Interestingly, at the same time this collection was made, another collection of *A. epispartius* was received via Richard P. Korf from Florida collected by J. W. Kimbrough. This collection was made on soil in grass under a laurel oak in Gainesville. Though a small collection, it agrees with the Utica collection in anatomical detail.

The Utica collection has allowed us to determine that the pattern of apothecial development in this species is identical to that already observed in the other species, *A. flavidus* (Pfister, 1975). Basically the ascocarps of *A. epispartius* are cleistohymenial, opening at the prohymenial stage. The developmental stages are illustrated in figure 1. The earliest primordia are somewhat flattened globular structures which show a slightly indented ring-like structure distally. As the ascocarps expand, the indented ring separates from the surrounding material and a flap of tissue is torn out and is thrown to one side. Pfister (1975) indicated that, from field notes made by E. J. H. Corner accompanying specimens at BPI, similar observations could be deduced but now we are able to substantiate the occurrance. This type of development has not been observed elsewhere in the Pezizales so far as we are aware.

In the original description of *Acervus aurantiacus* Kanouse (1937) mentioned that the apothecia arose "from a black, tough, rubbery sclerotiform base composed of thin-walled mycelium intermingled with debris." The structures have not been observed in any of the specimens examined and were not found in the collection made in Utica. Both species of *Acervus* occur on soil and loose rubble and it is possible that the holotype of *A. aurantiacus* was growing upon some substrate which was itself rubbery. The collection of *A. epispartius* from Utica was growing on debris mixed in dung--a substrate not previously recorded for these species.

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VALIDATION OF *AMANITA LONGIPES*

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Summary

Amanita longipes (fig. 1), provisionally described by Bas (1969), is described and illustrated from the Pine Barrens of New Jersey and eastern Long Island, New York. A collection is also reported from northcentral Alabama.

Introduction

Bas (1969) described *Amanita longipes* from a single specimen collected in Port Jefferson, Suffolk County, New York by Charles H. Peck in August, 1906 (NYS). The specimen studied, along with its label, were found in the same box with *Amanita limbatula* Bas. There were no field notes associated with this single specimen. Bas assumed that this specimen must have been whitish, since it was placed in the box with *Amanita limbatula*, described as being whitish.

Due to the lack of field notes and the fact that he was only able to examine one specimen, Bas described *Amanita longipes* as a provisional name.

Amanita longipes Bas in Tulloss & Jenkins, sp. nov.
Holotypus: New York, Suffolk County, Flanders, A. Norarevian 8-12-82-AN3 (NY).

Pileus albus, pallidus, canior-fuscus, vel canior-luteus super orbem ut pileus senescit, 24-81 mm in mensura diametrica; primo hemisphaericus, sed deinde qui fit late convexus cum margine incurvata, cuius summa fit fulgens, non-striatus, appendiculatus; contextus albus; materies volvica alba, densa, tenuiter pulverulenta-flocculosa, nonnumquam magna ex parte evanescens ut senescit. Interdum potest canior vel fusior in orbe fieri. Lamellae albiores; densae; angustae; anguste adnatae ad adnatas; aliquando cum linea decurrenti. Lamellae fiunt caniores et gilvae cum siccentur. Residua flocculosa veli imperfecti in margine; lamellulae copiosae-rotundatae truncatae usque ad attenuates. Stipes albus 25-142 x 5-20 mm, flocculosus, praeterea in parte

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NYS - Herbarium of the New York State Museum
NY - Herbarium of The New York Botanical Garden

superiori; facile sublatus; fastigatus adversus cacumen; dilatatus, solidus vel cum lumine firmiter farto; subradicans vel radicans, et denque cum bulbo radicali dauciformi vel anguste oblongo, 22-72 x 8.5-27 mm. Velum non perfectum, fibrosum flocculosum, et rapide evanescens. Leniter odoriferum vel sine odore. Sporae 8.4-17.5(20.3) x 4.2-7.0 (7.7) µm, amyloidei.

PILEUS: 24-81 mm diam, hemispheric at first becoming broadly convex, occasionally slightly depressed in center; white, pallid grayish-brown, or grayish buff over disk in age, surface becoming shiny; pileipellis peeling; margin nonstriate, incurved, appendiculate; context white, one specimen slightly browning where damaged, larvae tunnels not discolored, 3-10 mm thick at center; universal veil dense, finely pulverulent-flocculose, sometimes largely disappearing in age, especially over disk, white or at times grayish or brownish over disk where it infrequently comprises irregular, floccose warts that may darken on tips. LAMELLAE: close, narrow, 4.5-11 mm broad, narrowly adnate to adnate, sometimes with a decurrent line, whitish, becoming grayish-cream on drying, with white, floccose remnants of partial veil on edges; lamellulae plentiful, rounded truncate to attenuate. STIPE: white, 25-142 x 5-20 mm, tapering upwards slightly with flaring apex, floccose especially in upper portion, material easily removed, solid or with firmly stuffed central cylinder, up to 7 mm diam; context white, occasionally graying in damaged areas, no discoloration in larvae tunnels, easily breaking up into fibers; basal bulb subradicate or radicate, rarely narrowly oblong or subclavate, 22-72 x 8.5-27 mm, sometimes with brick red or rusty stains or spots, frequently flattened or doglegged; partial veil fibrous-floccose and rapidly evanescent. Having no distinct odor or, rarely, faintly odorous (as of disinfectant). No bruising of flesh noted, except in one specimen (7-30-82-C) in which handling seemed to leave a faintly pinkish bruise. Phenol spot tests were positive for tyrosinase (Marr, 1979). Other spot tests ($FeSO_4$, NH_4OH, KOH, formalin) were all negative.

PILEIPELLIS: two layers about 130 µm thick, suprapellis an ixocutis, gelatinizing, subpellis of nongelatinizing, interwoven hyphae, 1.4-4.2 µm diam; oleiferous hyphae plentiful, branching, up to 9.1 µm diam. PILEUS TRAMA: inflated cells abundant, terminal, broadly ellipsoid, up to 77 x 43 µm, to slender bacilliform, up to 180 x 30 µm; filamentous, undifferentiated hyphae 3.5-4.2 µm diam, no clamps seen. LAMELLA TRAMA: bilateral; oleiferous hyphae plentiful; inflated cells slender, up to 170 x 28 µm; filamentous, undifferentiated hyphae up to 5 µm diam. SUBHYMENIUM: inflated ramose to subcellular. BASIDIA: 45-60(70) x 9.5-14 µm, 4-spored, thin-walled, no clamps seen. UNIVERSAL VEIL: on pileus dominated by globose to broadly ellipsoid cells without apparent order, up to 78 x 71 µm, with pyriform, clavate and fusiform cells, up to 94 x 31 µm; relatively few filamentous, undifferentiated hyphae; oleiferous hyphae fairly conspicuous. PARTIAL VEIL: dominated by globose to bacilliform inflated cells, up to 85 x 30 µm; few undifferentiated, filamentous hyphae, 2.8-7.7 µm diam; oleiferous hyphae present. STIPE TRAMA: terminal cells slender, erect, narrowly clavate, up to 285 x 32 µm; oleiferous hyphae moderately abundant to abundant; no clamps seen. All tissues pale yellow in 10% KOH except as noted.

BASIDIOSPORES: (600 from 30 specimens) 8.4-17.5(20.3) x 4.2-7.0 (7.7) µm, (avg. length/specimen = (10.4)10.8-12.5(12.9) µm; avg. length (all specimens) = 11.9 µm; avg. width/specimen = 4.8-5.9 µm; avg. width (all specimens) = 5.4 µm), ($\underline{E}$ = (1.5)1.6-3.0(3.5); $\underline{E^m}$ = 1.92-2.51, avg. 2.23), amyloid, cylindric, occasionally elongate, rarely ellipsoid, occasionally constricted, may be expanded at one end; contents guttulate; apiculus sublateral; white in deposit.

Habitat and distribution: solitary to gregarious to subcaespitose in loose, sandy soil under *Quercus* spp., including *Q. ilicifolia* Wangenh. and *Q. marilandica* Muenchh. and *Pinus* spp., predominatly *P. rigida* Mill. in eastern Suffolk County, Long Island, New York and the New Jersey Pine Barrens where it has been found as early as July 8 and as late as October 2. In Alabama *A. longipes* has been found in mixed words, including *Pinus taeda* and *Quercus* spp.

Collections examined: ALABAMA - border of Shelby & Jefferson Counties, 21. viii. 84, C. Bas & D. T. Jenkins 2538(DTJ). NEW JERSEY - Burlington County, Lebanon State Forest, M. King & R. Tulloss 8-15-82-A, 9-11-83-A, members of the N.J. Myc. Assoc. 8-15-82-B; Middlesex County, Helmetta, R. Tulloss 8-12-81-F, 8-12-81-G, 7-30-82-C, 8-18-83-E, 8-18-83-G, 8-18-83-H, R. & D. Tulloss 9-3-83-F, R. & M. Tulloss 8-2-83-E, 8-2-83-F, R. & M. & D. Tulloss 9-18-82-E, R. & D. Tulloss & M. King 8-7-83-A, 8-7-83-B (SIU), A. Norarevian & D. Patterson 8-1-82 AN1, 8-1-82-AN2; Ocean County, Lakehurst, R. Tulloss 9-11-82-S; NEW YORK - Suffolk County, Flanders, A. Norarevian 8-12-82-AN1, 8-12-82-AN2(DTJ), 8-12-82-AN3(NY) Type, 8-12-82-AN6; Flanders, A. Norarevian 8-12-82-AN4; Riverhead, A. Norarevian 8-12-82-AN5.

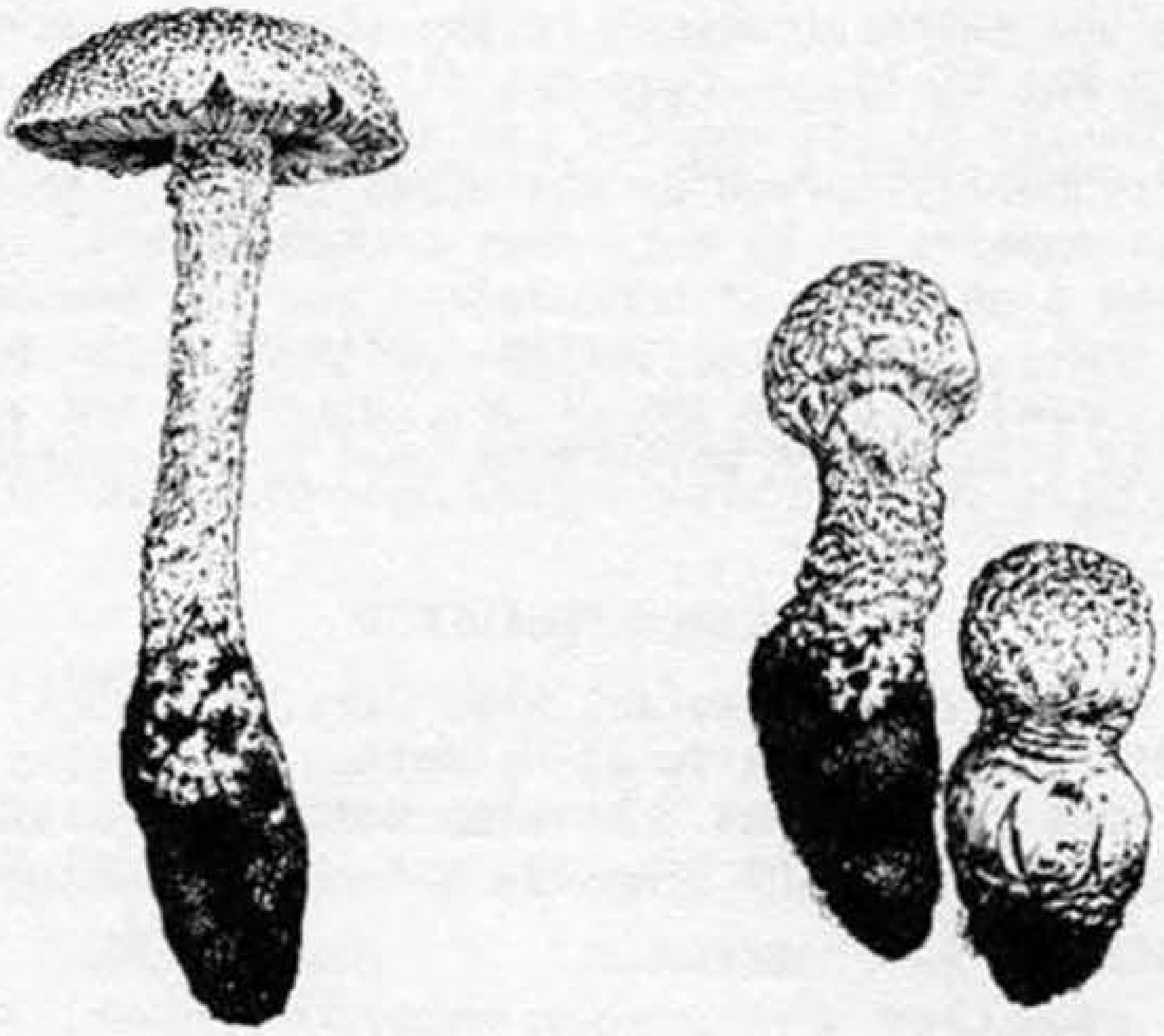

Fig. 1 *Amanita longipes* (8-2-83-F [x0.7], 8-12-81-F [x0.6], 8-15-82-B [x0.7])

DISCUSSION

Bas (1969) considers this organism to be closely related to members of stirps *Chlorinosma*, although the latter has clamps on the

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SIU - Herbarium of Southern Illinois University
DTJ - Herbarium of David T. Jenkins

basidia whereas A. *longipes* does not. He also states that there is a strong resemblance to A. *pelioma* in stirps *Cinereoconia*. *Amanita pelioma*, however, is usually slightly grayish in color and has more abundant hyphae in the volva. Because of the above mentioned differences Bas has placed this organism in stirps *Longipes*, section *Lepidella*.

Our description expands that of Bas which is based upon a dried specimen without field notes. The two descriptions agree except in two particulars: the width of the basidiospores and the basidia. In both cases the measurements in the upper range are recorded by Bas(1969).

The New York and New Jersey collections were compared by computing $\underline{E^m}$ values for 105 basidiospores from 7 Suffolk County specimens (2.22) and $\underline{E^m}$ values for 495 basidiospores from 23 New Jersey specimens (2.23). Bas measured 20 spores with an average length/breadth of 1.8, below the values for any basidiocarp we examined. One of our specimens (7-30-82-C) produced basidiospore measurements with a distribution having a median width as high as that recorded by Bas. Indeed, were Bas' range of length expanded by 0.5 μm in both upper and lower bounds and breadth expanded by 0.5 μm in its lower bound, then all 50 basidiospores measured for the collection would fall in the extended range. This observation led to examination of the effect of a similar expansion of Bas' ranges in relation to all 600 basidiospores measured. As a result, 96% fell within the extended size range. It is possible that dry Augusts in 1981-1983 may have contributed to a slight narrowing of the spores in the collections we examined.

Bas described stirps *Longipes* as the clampless analog of stirps *Chlorinosma*. In the field, A. *longipes* differs from A. *chlorinosma* (Austin) Lloyd mostly by its smaller habit and greater degree of radicating in the frequently curved or doglegged stipe. The densely floccose A. *longipes* appears to be much more common than A. *chlorinosma* in the sandy oak and pine woods of Long Island and the New Jersey Pine Barrens. Very small, deeply radicating specimens might be confused with A. *onusta* (Howe) Sacc. in the field. However, the volval material of A. *longipes* is always much paler than that of A. *onusta* and usually much more floccose.

ACKNOWLEDGEMENTS

We thank Mr. Aaron Norarevian, Glen Oaks, New York for directing R. Tulloss to the collecting site at Helmetta, New Jersey and providing all of the New York collections. We also thank Dr. Joseph Ammirati for reviewing this paper. The drawings are by Mr. Neal Macdonald, Princeton, New Jersey.

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*ETUDE DES GRANULATIONS SIDEROPHILES DU GENRE MELANOLEUCA (AGARICALES)**

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Résumé:
Les granulations sidérophiles des basides de dix espèces du genre Melanoleuca sont étudiées en microscopie photonique et électronique à transmission.

Summary:
The siderophilous granulations of basidia of ten species of the genus Melanoleuca are studied in photonic and transmission electronic microscopy.

I: INTRODUCTION

Kühner (1938) a remarqué pour la première fois la présence de granulations sidérophiles dans les basides des espèces des genres Lyophyllum et Calocybe. La structure de ces granulations -contenant des protéines basiques et capables de se lier à de nombreux ions métalliques- a été élucidée par Clémençon (1967). Par la suite, Clémençon (1978) a proposé une classification de ces granulations fondée sur leurs distributions et leurs morphologies. En 1980 Sathe et Daniel ont crée le nouveau genre Lyophyllopsis. Nous n'avons pas pu examiner l'holotype de ce genre, trop mal conservé, mais A. V. Sathe nous a indiqué qu'il s'agissait d'une espèce du genre Melanoleuca dont les basides présentaient des granulations sidérophiles.

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*Ce travail entre dans le cadre de la préparation d'une thèse de doctorat à l'Université de Lausanne.

A la lumière de ces travaux, nous poursuivons, dans un but taxonomique, l'étude de la structure et de l'ultrastructure des basides de quelques unes des espèces du genre *Melanoleuca*.

II: MATERIEL ET METHODES:

1. Matériel examiné:

No. d' herbier (LAU):	*Melanoleuca*:	appartient à la section:
HC 79-2	*decembris* Métrod	Acystidiae
JP 82-19	*subalpina* (Britz.) Bres. & Stangl	Alboflavidae
JP 82-21	*excissa* (Fr.) Singer	Grammopodiae
JP 82-41	*subpulverulenta* (Pers.) Singer	Strictipedes
JP 84-6	*rasilis* (Fr.) Singer	Grammopodiae
JP 84-7	*microcephala* (Karsten) Singer	Grammopodiae
JP 84-11	*oreina* (Fr.) Kühner & Maire	Melanoleuca
JP 84-12	*phaeopodia* (Bull.:Fr.) Murrill	Melanoleuca
JP 84-17	*arcuata* (Fr.) Singer	Cognatae
JP 84-20	*verrucipes* (Fr.) Singer	Humiles

2. Méthodes:

La méthode de préparation et de coloration du matériel observé en microscopie photonique à été décrite par Clémençon (1978). La fixation du matériel examiné en microscopie électronique à transmission est réalisée en prélevant un secteur du chapeau d'un champignon frais qui est fixé par immersion pendant 15 à 20 min. dans une solution composée en quantité égale d'une part de:

$KMnO_4$ 2%	1 g.
Tampon Cacodylat HCl 0.05 M (pH=6.9)	2.5 ml.
H_2O ad	50 ml.

et d'autre part d'une solution mouillante d'invadine-JFC (Ciba-Geigy, Bâle, Suisse) à 0.3%

Après déshydratation par passage dans différentes concentrations d'acétone (30-50-70-90 %) et finalement dans de l'oxyde de propylène, l'objet est polymérisé puis inclus dans une solution de Spurr (1969).

Les coupes sont réalisées avec un ultramicrotome Reichert Om U2, contrastées par de l'acétate d'uranyle et du citrate de plomb et observées au moyen d'un microscope électronique Hitachi HU 12 à une tension d'accélération de 75 KV.

III: RESULTATS:

Les figures 1 et 2 montrent que de nombreuses granulations sidérophiles sont présentes dans chacune des basides des espèces étudiées. Nous pouvons retrouver et identifier ces granulations sur les microphotographies électroniques des fig. 3, 4 et 5. Selon Clémençon (1978) ces granulations mesurant de 0.1 à 0.3 µm. et distribuées aussi bien à la périphérie que dans la partie centrale du cytoplasme de la cellule sont de type micro. De ce fait, et à cause de la focalisation, elles apparaissent peu distinctement sur les photos prises en microscopie photonique. Nous les avons signalées par des flèches.

IV: DISCUSSION:

Chacune des sections du genre Melanoleuca, telles qu'elles ont été résumées par Bon (1978) sont représentées dans cette étude par un specimen dont les basides contiennent des granulations sidérophiles. La création du nouveau genre Lyophyllopsis au sens de Sathe et Daniel (1980) nous semble donc inappropriée.

V: REMERCIEMENTS:

Je remercie vivement le Professeur Clémençon et le Docteur Keller qui m'ont communiqué leurs remarques et leurs suggestions ainsi que Daisy Calame et les membres du centre de microscopie électronique de l'Université de Lausanne pour leur aide technique.

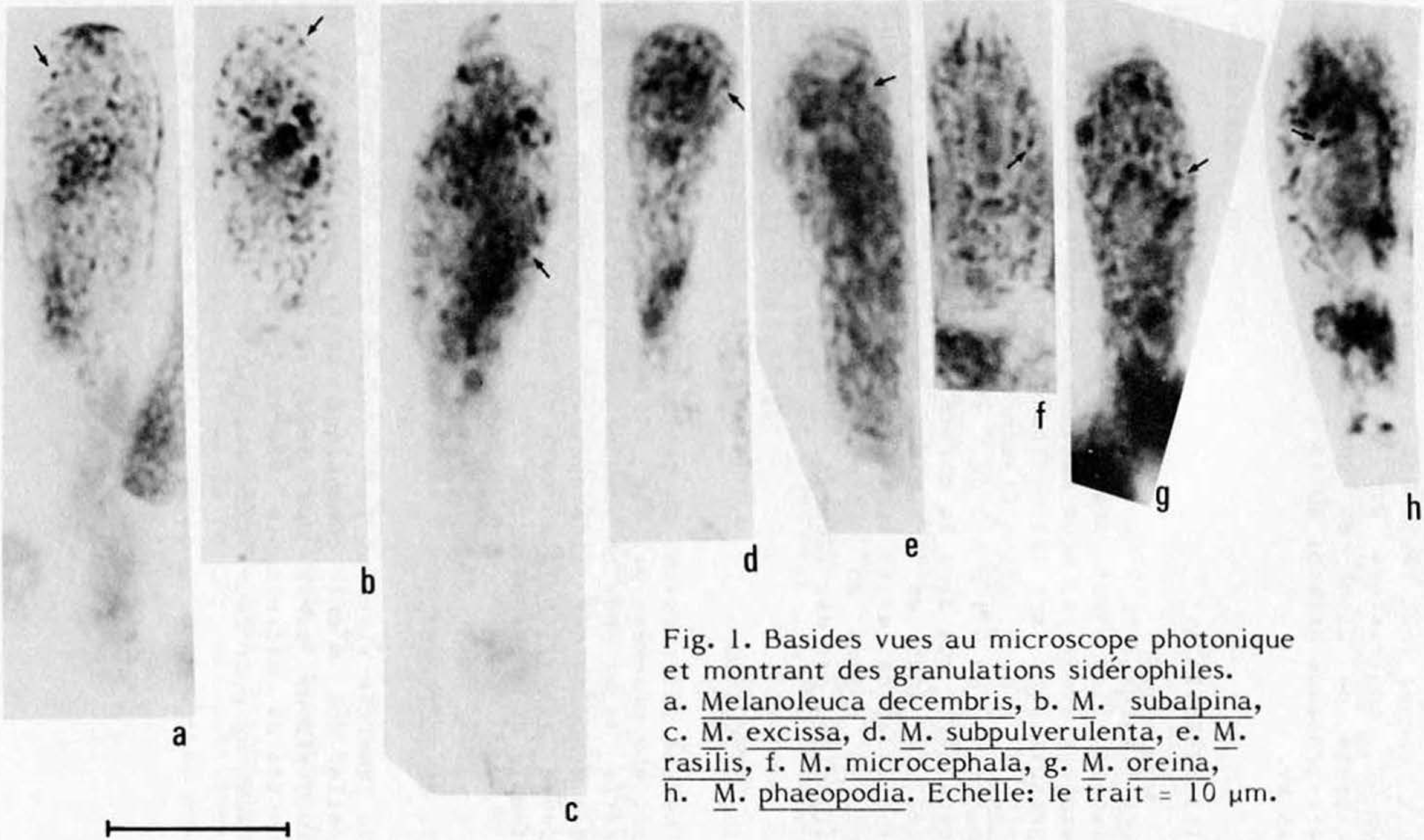

Fig. 1. Basides vues au microscope photonique et montrant des granulations sidérophiles. a. *Melanoleuca decembris*, b. *M. subalpina*, c. *M. excissa*, d. *M. subpulverulenta*, e. *M. rasilis*, f. *M. microcephala*, g. *M. oreina*, h. *M. phaeopodia*. Echelle: le trait = 10 µm.

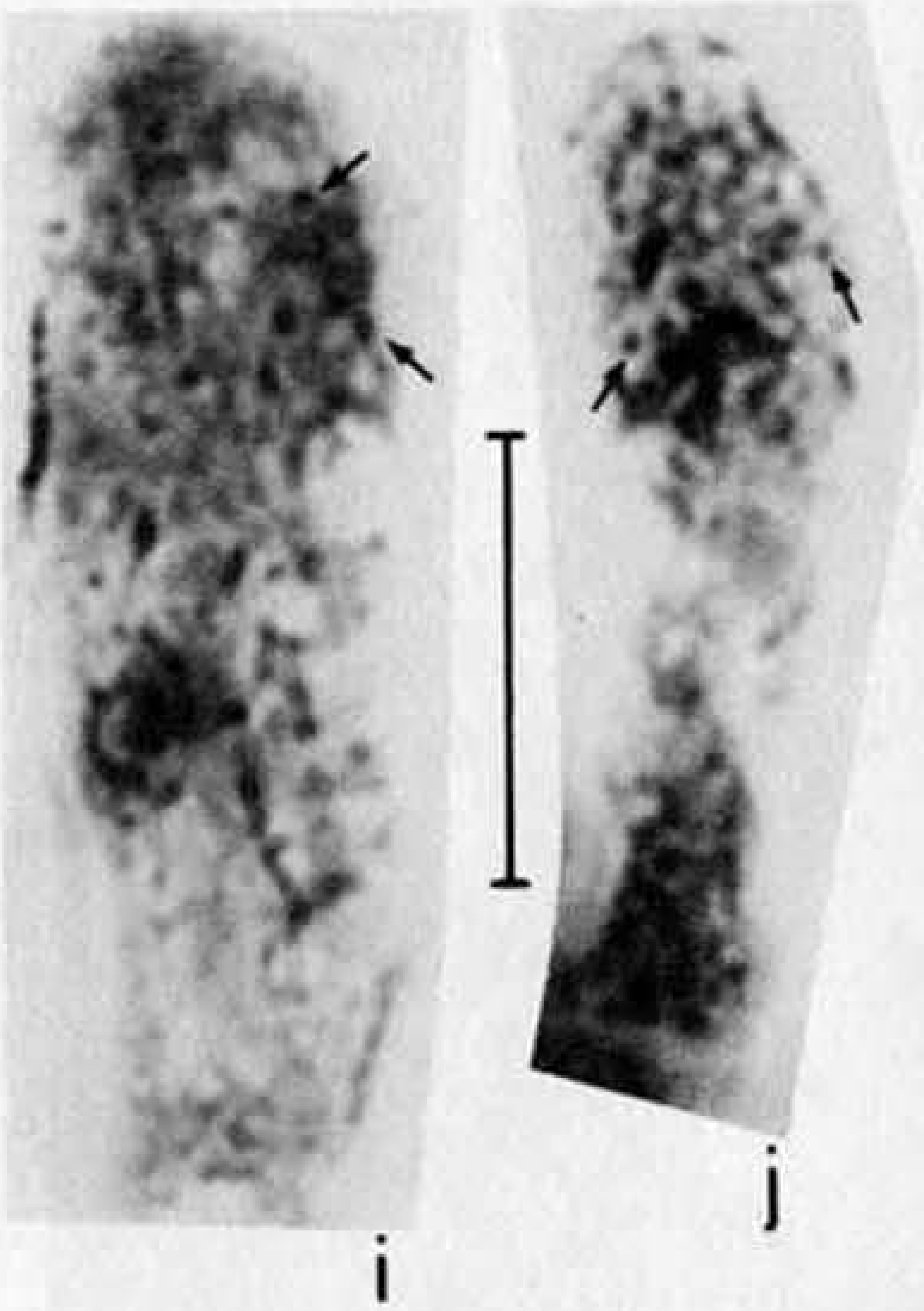

Fig. 2. Basides vues au microscope photonique et montrant des granulations sidérophiles. i. *Melanoleuca arcuata*, j. *M. verrucipes*. Echelle: le trait = 10 µm.

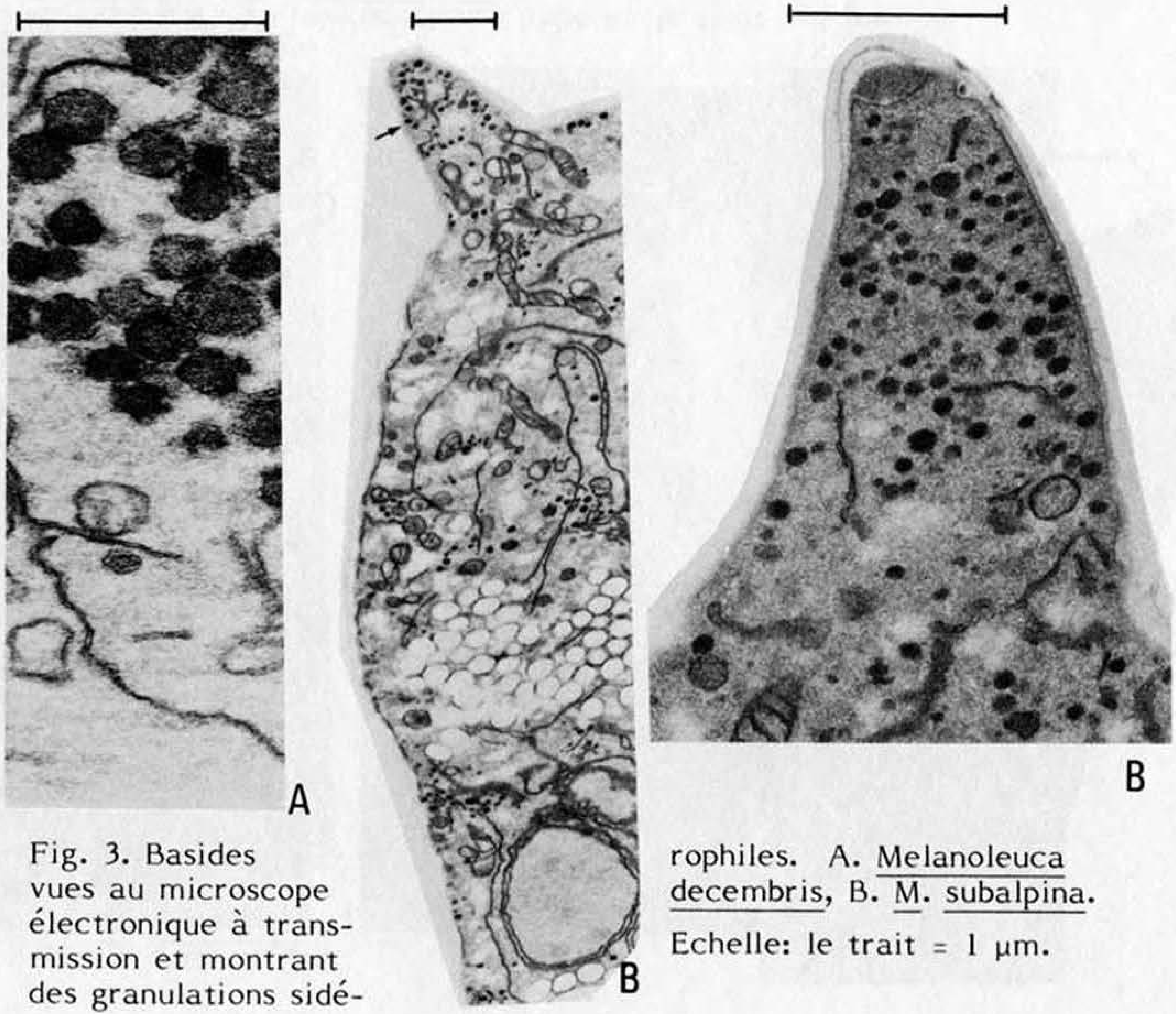

Fig. 3. Basides vues au microscope électronique à transmission et montrant des granulations sidérophiles. A. *Melanoleuca decembris*, B. *M. subalpina*. Echelle: le trait = 1 µm.

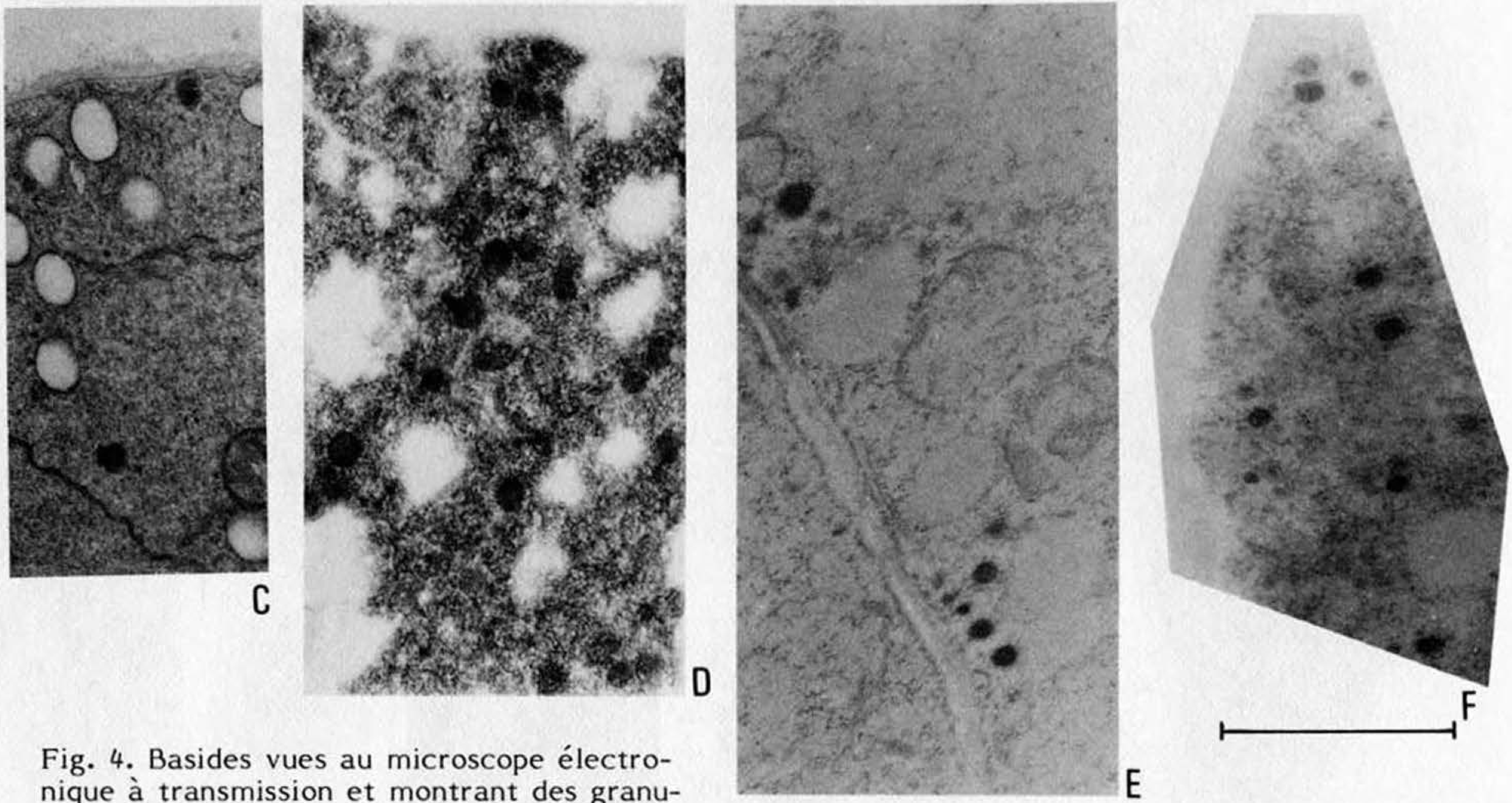

Fig. 4. Basides vues au microscope électronique à transmission et montrant des granulations sidérophiles. C. *Melanoleuca excissa*, D. *M. subpulverulenta*, E. *M. rasilis*, F. *M. microcephala*. Echelle: le trait = 1 µm.

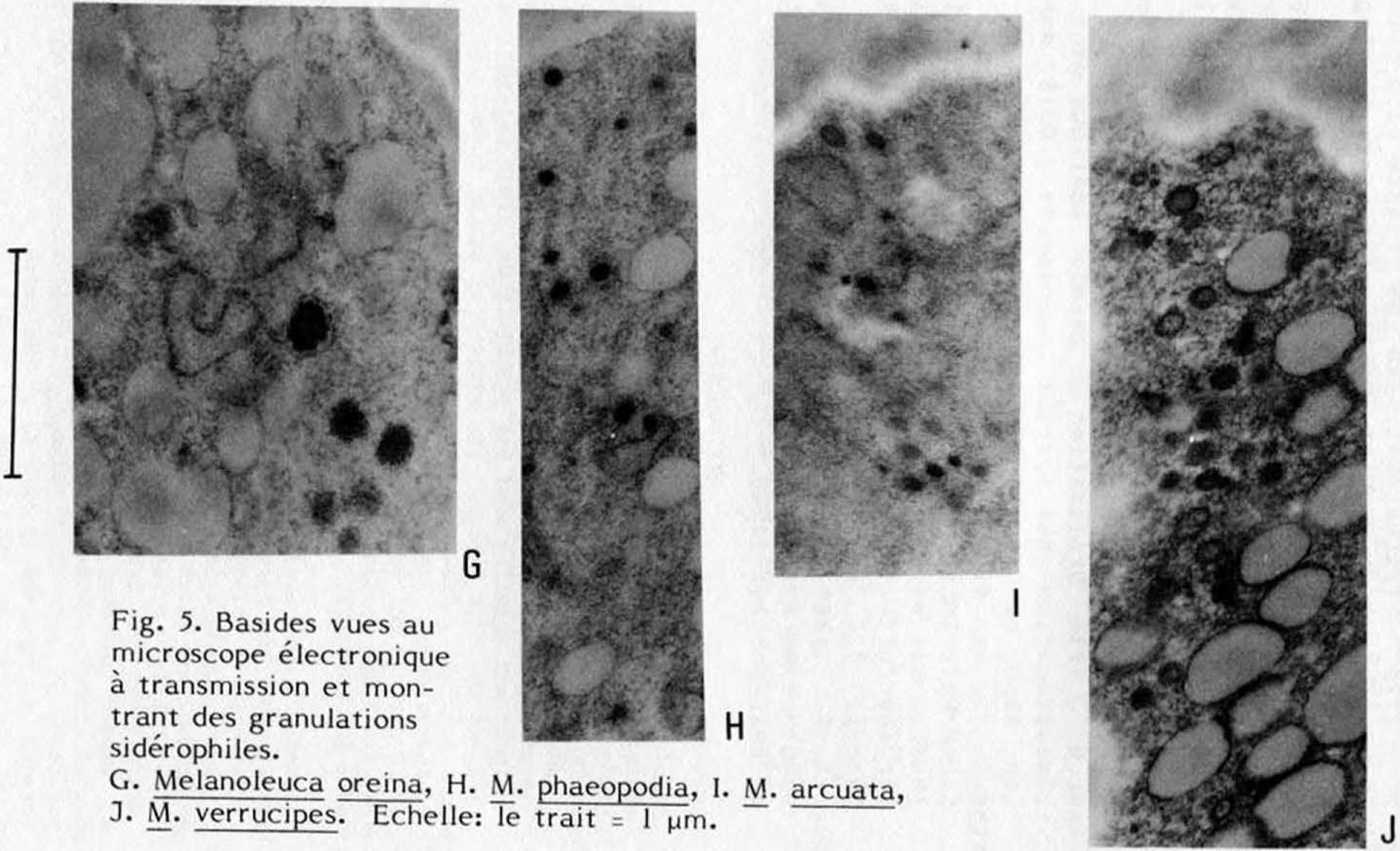

Fig. 5. Basides vues au microscope électronique à transmission et montrant des granulations sidérophiles.
G. *Melanoleuca oreina*, H. *M. phaeopodia*, I. *M. arcuata*, J. *M. verrucipes*. Echelle: le trait = 1 µm.

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REVISED LIST AND HOST INDEX OF ARIZONA RUST FUNGI[1]

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SUMMARY

Latin names of the Uredinales (plant rust fungi) are arranged alphabetically. There are 235 species and varieties belonging to 26 genera known to occur in Arizona. *Puccinia* with 123 species and *Uromyces* with 33 species exceed the other genera. Host plants include species in 255 genera of native and introduced plants. Angiosperms, especially the families Compositae, Gramineae, and Leguminosae are predominant but ferns and conifers also serve as hosts. Cotton rust (*Puccinia cacabata*) is the most important species, economically. *Frommeella duchesneae* comb. nov. is proposed.

INTRODUCTION

Arizona has a diverse flora comprised of trees, shrubs, herbs, and grasses ranging from the lower Sonoran Desert to subalpine regions. This diversity of host plants and climate supports a large number of plant rust fungi. Recorded in Arizona on native and introduced plants are 235 species and varieties belonging to 26 genera of Uredinales. The morphology and distribution of these fungi are recorded by Arthur (1934), Cummins (1971, 1978, 1979), and León Gallegos and Cummins (1981a,b). Major genera in Arizona are *Puccinia* with 123 species, *Uromyces* with 33 species, and *Gymnosporangium* with 11 species. Other genera are represented by fewer than ten species. Spore states of the fungus found on the host plants are indicated by the symbols 0, I, II, and III, that refer to spermogonia, aecia, uredinia, and telia, respectively. A first Arizona list was published by Gilbertson and McHenry in 1969.

The host plants are distributed in 55 families and 255 genera. Of these, two families, four genera, and four species are ferns (Pteridophyta); three families, seven genera, and 16 species are conifers (Gymnospermae); the remainder are flowering plants (Angiospermae). The families that support the most species of rust fungi are Compositae, Gramineae, Leguminosae, and Rosaceae. Nomenclature of host plants follows Kearney and Peebles (1960), Lehr (1978), and Lehr and Pinkava (1980, 1982). County locations are listed for each host record. An asterisk (*) indicates that the county is not known. County records are given by number as follows: 1, Apache; 2, Cochise; 3, Coconino; 4, Gila; 5, Graham; 6, Greenlee; 7, La Paz; 8, Maricopa; 9, Mohave; 10, Navajo; 11, Pima; 12, Pinal; 13, Santa Cruz; 14, Yavapai; 15, Yuma.

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[1] University of Arizona Agricultural Experiment Station Journal Article No. 4004.

Authorities for names of host plants have been omitted to conserve space.

RUST FUNGI OF ARIZONA WITH HOSTS AND DISTRIBUTION

AECIDIUM sp. 0,I on Jatropha macrorhiza var. septemfida (2).

AECIDIUM LYCII Arth. 0,I on Lycium pallidum*.

ARTHURIOMYCES PECKIANUS (Howe in Peck) Cumm. & Y. Hirat. (Gymnoconia peckiana Howe in Peck). 0,I,III on Rubus loganobaccus (14).

CHRYSOMYXA ARCTOSTAPHYLI Diet. 0,I on Picea engelmannii (3); P. pungens (3); II,III on Arctostaphylos patula (3).

C. PIROLATA Wint. II,III on Pyrola virens (2,3,11).

COLEOSPORIUM ARIZONICUM Cumm. II,III on Brickellia californica (3).

C. ASTERUM (Diet.) Syd. II,III on Solidago missouriensis (3).

C. CROWELLII Cumm. III on Pinus edulis (3,14).

C. IPOMOEAE (Schw.) Burr. 0,I on Pinus leiophylla var. chihuahuana(2).

C. JONESII (Peck) Arth. 0,I on Pinus edulis (3,14); II,III on Ribes cereum (3,11); R. inebrians (3,10,14); R. leptanthum (3); R. pinetorum (1,2,3); R. velutinum (3); R. wolfii (1).

C. VIGUIERAE Diet. & Holw. 0,I,III on Verbesina encelioides (2); Viguiera cordifolia (2); V. dentata var. dentata (2,13); V. dentata var. lancifolia (13).

CRONARTIUM ARIZONICUM Cumm. 0,I on Pinus ponderosa (2,3,5,11) II,III on Castilleja integra (3); C. laxa (3,11); C. linariaefolia (3); C. minor*; C. patriotica (2); Castilleja sp. (1,11).

C. COMANDRAE Peck. 0,I on Pinus eldarica (14,3); P. ponderosa (3,10, 14); II,III on Comandra pallida (2,3,14).

C. CONIGENUM Hedg. & Hunt. 0,I on Pinus leiophylla var. chihuahuana (3,11); II,III on Quercus arizonica (2); Q. dunnii (2); Q. emoryi (2,13); Q. grisea (2); Q. hypoleucoides (2,11); Q. oblongifolia*; Q. rugosa (2).

C. OCCIDENTALE Hedg. & Hunt. 0,I on Pinus monophylla (14); II,III on Ribes aureum (3,14); R. nigrum (10,14).

CUMMINSIELLA MIRABILISSIMA (Peck) Nannf. 0,I,II,III on Berberis repens (3,4,5,11).

C. WOOTONIANA (Arth.) Arth. II,III on Berberis fremontii (3,10,14); B. haematocarpa (15).

ENDOCRONARTIUM HARKNESSII (J.P. Moore) Y. Hirat. III on Pinus ponderosa (2).

ENDOPHYLLUM TUBERCULATUM (Ell. & Kell.) Arth. & Fromme. III on Sidalcea neomexicana (3).

FROMMEELLA DUCHESNEAE (Arth.) Yohem, Cumm., & Gilbn., comb. nov. (Kuehneola duchesneae Arth., N. Amer. Flora 7:185. 1912). II,III on Duchesnea indica (11).

GYMNOSPORANGIUM BETHELII Kern. III on Juniperus scopulorum (3).

G. CLAVIPES (Cke. & Peck) Cke. & Peck. 0,I on Pyrus communis (14).

G. CUNNINGHAMIANUM Barcl. (G. cupressi Long. & Goodd.) 0,I on Amelanchier alnifolia (3); A. utahensis (6); III on Cupressus arizonica vars. (3,4,6,14).

G. INCONSPICUUM Kern. 0,I on Amelanchier utahensis (3); III on Juniperus deppeana (2,3); J. monosperma (10); J. osteosperma (3).

G. KERNIANUM Beth. 0,I on Amelanchier utahensis*: Pyrus communis (14); III on Juniperus deppeana (2,3,4,5,11,12,13,14); J. monosperma (3,4, 13); J. osteosperma (2,3,14).

G. MULTIPORUM Kern. III on Juniperus deppeana (3); J. monosperma (3);

J. osteosperma (3).

G. NELSONII Arth. 0,I on Amelanchier utahensis (1,3); Crataegus oxyacantha (14); Cydonia oblonga (14); Pyrus communis (10); III on Juniperus deppeana (3); J. monosperma (3); J. osteosperma (3,9).

G. NIDUS-AVIS Thaxt. 0,I on Amelanchier utahensis (3); III on Juniperus scopulorum (1,3,10); Juniperus sp. (12).

G. SPECIOSUM Peck. 0,I on Fendlera rupicola (2,13); Philadelphus microphyllus (13); III on Juniperus deppeana (2,11,13,14); J. monosperma (3,13,14); J. osteosperma (3).

G. TREMELLOIDES Hartig. 0,I on Sorbus dumosa (3).

G. VAUQUELINIAE Long & Goodd. 0,I on Vauquelinia californica (12); III on Juniperus monosperma (12).

HYALOPSORA CHEILANTHIS Arth. II,III on Cheilanthes pringlei*; Notholaena sinuata (2).

H. POLYPODII (Diet.) Magn. II,III on Cystopteris fragilis (2).

MELAMPSORA ALBERTENSIS Arth. 0,I on Pseudotsuga menziesii var. glauca (1); II,III on Populus tremuloides (1,2,3,11,14).

M. EPITEA Theum. II,III on Salix bonplandiana (13); S. bebbiana (3); S. exigua (2); S. gooddingii (2,6,11,12,13); S. scouleriana (1,2,3,5,11); S. taxifolia (11); Salix sp. (14).

M. HYPERICORUM Wint. II,III on Hypericum formosum (11).

M. LINI (Ehrenb.) Lév. 0,I,II,III on Linum lewisii (3,11).

M. MONTICOLA Mains. II,III on Euphorbia brachycera (2); E. incisa (2,11); E. lurida (2); E. palmeri (1,3,4,5,11); E. robusta (3,12).

MELAMPSORELLA CARYOPHYLLACEARUM Schroet. 0,I on Abies concolor (3); A. lasiocarpa var. arizonica (3).

NYSSOPSORA CLAVELLOSA (Berk.) Arth. III on Aralia racemosa (2).

PERIDERMIUM EPHEDRAE Cke. 0,I on Ephedra nevadensis (9,14,15); E. viridis (3,9).

PERIDERMIUM FILAMENTOSUM Peck. (see also Cronartium arizonicum) 0,I on Pinus ponderosa (2,3,5,11).

PHAKOPSORA CROTONIS (Burr.) Arth. 0,I,II,III on Croton texensis (11, 13,14).

PHRAGMIDIUM MONTIVAGUM Arth. 0,I,II,III on Rosa fendleri (1,3,6,10, 14); R. neomexicana (3); R. woodsii (3).

P. OCCIDENTALE Arth. 0,I,II,III on Rubus parviflorus*.

P. PECKIANUM Arth. 0,I,II,III on Rubus neomexicanus (2,3,5,11).

P. ROSAE-CALIFORNICAE Diet. 0,I,II,III on Rosa arizonica var. granulifera (3).

P. RUBI-IDAEI (DC.) Karst. 0,I,II,III on Rubus strigosus var. arizonicus (2,3,11).

PHRAGMOPYXIS ACUMINATA (Long) Syd. 0,III on Coursetia microphylla(11).

P. DEGLUBENS (Berk. & Curt.) Diet. 0,I,II,III on Cracca edwardsii (2,13).

P. NOELII J. Baxt. 0,I,II,III on Coursetia microphylla (11).

PILEOLARIA BREVIPES Berk. & Rav. 0,I,II,III on Rhus radicans var. rydbergii (13).

P. EFFUSA Peck. 0,III on Rhus radicans var. rydbergii (2).

P. PATZCUARENSIS (Holw.) Arth. 0,I,II,III on Rhus trilobata (3).

PUCCINIA ABRUPTA Diet. & Holw. var. ABRUPTA. II,III on Viguiera annua (2,13); V. dentata var. dentata (2,5,11,13,14); V. dentata var. lancifolia (2,3,13,14); V. multiflora (11).

P. ACROPTILI Syd. II,III on Centaurea repens (11).

P. ANDROPOGONIS Schw. 0,I on Oxalis amplifolia (13); Penstemon virgatus*; II,III on Andropogon hirtiflorus (13); A. scoparius (3).

P. ANGULATA Diet. & Holw. I,II,III on Sisyrinchium longipes (5).

P. ANISACANTHI Diet. & Holw. 0,I,II,III on Anisacanthus thurberi (2, 11,13); Carlowrightia arizonica (11).

P. ANTIRRHINI Diet. & Holw. II,III on Antirrhinum majus (11).

P. ARISTIDAE Tracy var. CHAETARIAE Cumm. & Husain. 0,I on Boerhaavia sp. (13); II,III on Aristida adscensionis (13); Hilaria jamesii*.

P. ASPARAGI DC. 0,I,II,III on Asparagus officinalis (10,15).

P. ATROFUSCA (Dudl. & Thomp.) Holw. II,III on Carex douglasii (3); C. siccata (3); Carex sp. (11,13).

P. BACCHARIDIS Diet. & Holw. 0,I,II,III on Baccharis emoryi*; B. glutinosa (2,11,12,13); B. viminea (8).

P. BALSAMORHIZAE Peck. 0,I,II,III on Wyethia arizonica (3).

P. BIPORULA J. Baxt. 0,I,II,III on Salvia lemmonii (2,13).

P. BISTORTAE (Strauss) DC. II,III on Polygonum bistortoides (3).

P. BLASDALEI Diet. & Holw. 0,I,II,III on Allium macropetalum (2,5,11, 14).

P. BOUTELOUAE (Jenn.) Holw. II,III on Bouteloua curtipendula*.

P. BRACHYPODII Otth var. POAE-NEMORALIS (Otth) Cumm. & Greene. II,III on Poa pratensis (3,10).

P. CACABATA Arth. & Holw. 0,I on Gossypium barbadense (11); G. hirsutum (2,13); G. thurberi (11); II,III on Bouteloua aristidoides (2,5,11,13); B. barbata and vars. (2,11,12); B. eriopoda (2); B. hirsuta (2).

P. CALANTICARIAE J. Parm. 0,I,II,III on Viguiera cordifolia (2,13); V. dentata var. dentata (2,13).

P. CALCITRAPAE DC. var. CENTAUREAE (DC.) Cumm. 0,I,II,III on Carthamus tinctorius (8,11,15); Cirsium arizonicum (3,11); C. drummondii (1); C. nidulum (3); C. ochrocentrum (3); C. parryi (5); C. pulchellum (3,6).

P. CALIFORNICA Diet. & Holw. var. CALIFORNICA. II,III on Cirsium arizonicum (11); C. wrightii (8).

P. CALIFORNICA Diet. & Holw. var. DESERTICOLA Savile. II,III on Cirsium neomexicanum (11).

P. CALOCHORTI Peck. 0,I,II,III on Calochortus ambiguus (11); C. kennedyi (12,13); C. nuttallii (1,4).

P. CANALICULATA (Schw.) Lagh. 0,I on Ambrosia confertifolia (11); Bahia dissecta (2); Cosmos parviflora (13); Heliopsis parvifolia (13); Xanthium strumarium (10); II,III on Cyperus esculentus(2,6,14); C. fendlerianus (13); C. rusbyi (2,13).

P. CARICINA DC. II,III on Carex senta (3).

P. CHLORIDIS Speg. 0,I on Asclepias asperula ssp. capricornu (4); A. brachystephana*; A. pumila*; A. subverticillata (14); Sarcostemma cynanchoides var. hartwegii*; II,III on Bouteloua gracilis*; B. hirsuta (13); B. curtipendula (13); Chloris virgata (13).

P. CICUTAE Lasch. 0,I,II,III on Cicuta maculata (3).

P. CNICI-OLERACEI Pers. ex Desm. III on Artemisia ludoviciana (2,11); Aster commutatus (3); A. coerulescens (3); A. subulatus var. ligulatus (3).

P. COGNATA Syd. 0,I,II,III on Verbesina encelioides*; V. longifolia(2).

P. CONCINNA Arth. II,III on Eupatorium greggii (2).

P. CONFRAGA Arth. & Cumm. III on Keckiella antirrhinoides var. microphylla (4,8).

P. CONOCLINII Seym. ex Burr. 0,I,II,III on Eupatorium herbaceum (13); E. pycnocephalum (2,11,13); E. solidaginifolia*.

P. CONVOLVULI (Pers.) Cast. 0,I,II,III on Convolvulus cneorum (11).

P. CORONATA Cda. II,III on Holcus lanatus (3); Lolium perenne (12).

P. CRANDALLII Pam. & Hume. 0,I on Symphoricarpos oreophilus (2,3); II, III on Koeleria nitida (2); Poa fendleriana (2,3,11); P. longiligula

(3).

P. CRYPTANDRI Ell. & Barth. var. CRYPTANDRI. II,III on Sporobolus cryptandrus (11); S. giganteus (2).

P. CRYPTANDRI Ell. & Barth. var. LUXURIANS (Barth.) Cumm. & Greene. II,III on Sporobolus airoides (10); S. wrightii (11).

P. CYNODONTIS Lacroix ex Desm. II,III on Cynodon dactylon (2,8,11,12, 15).

P. DIETELII Sacc. & Syd. 0,I on Acalypha neomexicana (13); A. ostryaefolia (13); II,III on Chloris virgata (2,11,13).

P. DIOICAE P. Magn. 0,I on Artemisia carruthii (3); Camissonia hookeri (2,3,11); C. laciniata (11); Hieracium fendleri (5); Solidago missouriensis (3); S. sparsiflora (3); II,III on Carex praegracilis (3); C. siccata*; C. vallicola var. rusbyi*; Carex sp. (2,3,11,14).

P. DIPLACHNIS Arth. 0,I on Bouvardia glaberrima (2,11,12,13); II,III on Leptochloa dubia (2,12,13).

P. DISTORTA Holw. III on Hyptis emoryi (8,12).

P. DURANGENSIS Cumm. II,III on Piptochaetium fimbriatum (2); Stipa pringlei (2).

P. DYSSODIAE Cumm. III on Dyssodia pentachaeta (2).

P. ENCELIAE Diet. & Holw. 0,I,II,III on Tithonia thurberi (13); Viguiera annua (2,3,13,14); V. longifolia (13); V. multiflora (2,3,13, 14).

P. ESCLAVENSIS Diet. & Holw. 0,I on Mirabilis longifolia var. wrightiana (2,11,13); M. multiflora (2); II,III on Panicum bulbosum (2,11, 13); P. plenum (13); Setaria grisebachii (2); Tricachne californica (2).

P. EVADENS Hark. 0,I,II,III on Baccharis emoryi (11); B. sarothroides (2,8,11,12,13); B. thesioides*.

P. FARINACEA Long. II,III on Salvia amissa (8).

P. FRANSERIAE Syd. 0,I,II,III on Ambrosia deltoides (8,11,12,15); A. dumosa (8,15); Hymenoclea salsola var. pentalepis (8,11,14).

P. GENTIANAE (Strauss) Roeh. 0,I,II,III on Gentiana affinis (1); G. parryi (1).

P. GIBBERULOSA Schroet. III on Ranunculus cardiophyllus var. subsagitatus*.

P. GILIAE Hark. II,III on Eriastrum diffusum (8).

P. GLOBOSIPES Peck. 0,I,II,III on Lycium berlandieri var. parviflorum (11); L. californicum (11); L. exsertum (4,11,12); L. fremontii (8,11,15); L. parishii (11); L. torreyi (14).

P. GRAMINIS Pers. II,III on Koeleria nitida (11); Lolium perrene (8); Phleum pratense (1); Triticum aestivum (15).

P. GRANULISPORA Ell. & Gall. 0,I,II,III on Allium cernuum*; A. plummerae (2).

P. GRINDELIAE Peck ssp. GRINDELIAE. III on Chrysopsis foliosa (8); C. villosa (3); Ericameria laricifolia*; Gutierrezia longifolia*; G. sarothrae (13,14); G. serotina (12,14); Haplopappus junceus*; Macheranthera gracilis (13); M. pinnatifida (15).

P. GRINDELIAE ssp. RIDDELLII (Griff.) Cumm. 0,I,II,III on Baileya multiradiata (11); Psilostrophe cooperi (11); P. sparsiflora (3); P. tagetina*.

P. GUILLEMINEAE Diet. & Holw. I,II,III on Brayulina densa (2,11,12).

P. HELIANTHI Schw. 0,I,II,III on Helianthus annuus (2,3,4,11,13); H. petiolaris (15); Iva xanthifolia*.

P. HETEROSPORA Berk. & Curt. III on Abutilon californicum (11); A. incanum (11,12); A. parvulum (12); A. pringlei (11); A. sonorae (11, 13); A. thurberi (11); Herrisantia crispa (11); Sida filicaulis (2, 12, 13); S. physocalyx (11); S. spinosa var angustifolia (13).

P. HEUCHERAE (Schw.) Diet. III on Heuchera rubescens (3); H. sanguinea var. pulchra (2).

P. HIERACII (Roeh.) Mart. var. HIERACII. 0,I,II,III on Agoseris glauca (3); Hieracium fendleri (2); Stephanomeria pauciflora (3,11); Taraxacum officinale (3,10,13,14).

P. HIERACII (Roeh.) Mart. var. HARKNESSII (Vize) Cumm. 0,I,II,III on Lygodesmia grandiflora*; Rafinesquia neomexicana (11); Stephanomeria pauciflora (3,11); S. thurberi (13).

P. HYDROCOTYLES Cke. II,III on Hydrocotyle verticillata (11,14).

P. INANIPES Diet. & Holw. I,II,III on Eupatorium solidaginifolia (2).

P. INTERVENIENS Beth. II,III on Stipa speciosa (15).

P. INVELATA H.S. Jacks. 0,I,II,III on Parthenice mollis (11).

P. INVESTITA Schw. 0,I,III on Gnaphalium macounii (2,11,13).

P. IRIDIS Rab. II,III on Iris missouriensis (2,3).

P. JONESII Peck. 0,I,III on Lomatium dissectum (14); L. nevadense (9).

P. KUHNIAE Schw. var. BRICKELLIAE (Peck) Cumm. 0,I,II,III on Brickellia coulteri (2,11,12,13,14).

P. KUHNIAE Schw. var. KUHNIAE. 0,I,II,III on Brickellia amplexicaulis (13); B. betonicaefolia (13); B. chlorolepis (2,13); B. simplex (2); Kuhnia rosmarinifolia (2,13).

P. KUHNIAE Schw. var. ROBUSTA Cumm. 0,I,II,III on Brickellia lemmonii (2).

P. LEPTOCHLOAE Arth. & Fromme. 0,I on Talinum paniculatum (13); II,III on Leptochloa filiformis (13).

P. LITHOSPERMI Ell. & Kell. 0,I,II,III on Evolvulus alsinoides var. acapulcensis (2,13).

P. LOBATA Berk. & Curt. III on Althaea rosea*; Malvella lepidota (2); M. leprosa (12,15).

P. LUDOVICIANAE Fahr. 0,I,II,III on Artemisia carruthii (1); A. ludoviciana (3).

P. MALVACEARUM Bert. ex Mont. III on Althaea rosea (2,3,10,12).

P. MENTHAE Pers. 0,I,II,III on Hedeoma dentatum (11,13); H. hyssopifolium (13); H. nanum (14); H. oblongifolium (11); Mentha arvensis*; M. penardii (3,11); M. spicata (3); M. fistulosa (4); Monarda menthaefolia (2,3,5,11,14).

P. MINUSSENSIS Thuem. 0,I on Lactuca pulchella (10).

P. MONOICA Arth. 0,I on Arabis perennans (1,11); Arabis sp. (3); Sisymbrium linearifolium (11); II,III on Oryzopsis hymenoides (3).

P. MONTANENSIS Ell. II,III on Agropyron smithii (10); Sitanion hystrix (3,14);

P. MUTABILIS Ell. & Gall. 0,I,II,III on Allium acuminatum (5).

P. NEOCORONATA Greene & Cumm. II,III on Piptochaetium fimbriatum (2, 13); Stipa pringlei (2,11,13).

P. NODOSA Ell. & Hark. 0,I,II,III on Dichelostemma pulchellum (3,8,11); Triteleiopsis palmeri (15).

P. OBLIQUA Berk. & Curt. III on Asclepias erosa (11); Calotropis procera (11); Cynanchum arizonicum (13); Matelea producta*; Sarcostemma cynanchoides (2,11,12,14); S. hirtellum*.

P. OENOTHERAE Vize. 0,I,II,III on Camissonia brevipes (15); C. clavaeformis (15); Oenothera leptocarpa (11).

P. PALLIDISSIMA Speg. III on Stachys coccinea (8,11,13).

P. PELARGONII-ZONALIS Doidge. II,III on Pelargonium hortorum (11).

P. PENTSTEMONIS Peck. III on Penstemon bridgesii (3); P. linarioides (10); P. pinifolius (2); P. pseudospectabilis vars. (3,11,12).

P. POARUM Niels. 0,I on Brickellia californica (2,11); B. floribunda (2); B. grandiflora (2); B. rusbyi (11); Helenium hoopesii (1,2,5,6, 9,11); II,III on Agrostis scabra (2,11); Festuca arizonica (2,11); F. sororia (2,11); Koeleria nitida (2,11).

P. POSADENSIS Sacc. & Trott. II,III on Imperata brevifolia (3).

P. PSEUDOCYMOPTERI Holw. 0,I,II,III on Pseudocymopterus montanus (3).

P. PULVERULENTA Grev. 0,I,II,III on Gayophytum diffusum (3); G. racemosum (5); G. ramosissimum (3).

P. PUNCTATA Link. 0,I,II,III on Galium mexicanum ssp. asperrimum (2,5, 11,13); G. pilosum (5); G. triflorum (5,11).

P. PURPUREA Cke. II,III on Sorghum halapense (11,13); S. vulgare (11).

P. PYGMAEA Eriks. 0,I on Berberis repens (3); II,III on Koeleria nitida (3,8).

P. RECONDITA Rob. ex Desm. 0,I on Clematis drummondii (12); C. ligusticifolia (1,2,13); Phacelia magellanica (3); Thalictrum fendleri (2, 3,13,14); II,III on Agropyron arizonicum (2,11,13); Agropyron trachycaulum (3); Bromus anomalus (2,3); B. ciliatus (2,3); B. frondosus (2,3); Elymus triticoides*; Hordem vulgare (2); Secale cereale (2); Sitanion hystrix (2,3,11,13); Triticum aestivum (15).

P. RUFESCENS Diet. & Holw. I,III on Pedicularis centranthera (3,5,6, 14).

P. SCHEDONNARDI Kell. & Swing. 0,I on Sphaeralcea ambigua var. rosea*; S. fendleri (3); S. grossulariaefolia (2,11); S. incana (3); II,III on Lycurus phleoides (2,11,13); Muhlenbergia asperifolia (2); M. emersleyi (2,13); M. montana (3); M. porteri (3); M. repens (2); M. rigens (2); M. utilis (13).

P. SHERARDIANA Koern. III on Sphaeralcea ambigua var. rosea (9,11,12, 14); S. angustifolia var. cuspidata (11); S. emoryi (3,11); S. fendleri (3); S. laxa (11,13); S. marginata (14); S. parvifolia (3,9); Sphaeralcea sp. (1,2,6).

P. SIMILIS Ell. & Ever. II,III on Artemisia nova (3); A. tridentata(3).

P. SONORICA Cumm. var. SONORICA. II,III on Aristida hamulosa (13); A. ternipes (11,13).

P. SORGHI Schw. II,III on Zea mays (2,11).

P. SPLENDENS Vize. 0,I,II,III on Hymenoclea monogyra (11,12,14); H. salsola var. salsola (11).

P. STIPAE Arth. 0,I on Chrysopsis villosa (3); Solidago altissima (3); S. nana (3); II,III on Oryzopsis hymenoides*; Stipa comata (3).

P. STRIIFORMIS West. II,III on Triticum aestivum*.

P. SUBNITENS Diet. 0,I on Atriplex rosea (14); Cammisonia chamaenerioides*; Chenopodium album (14); C. chenopodioides (14); C. incanum (14); C. leptophyllum (14); C. morale (14); Cleome lutea*; C serrulata*; Cryptantha barbigera*; C. crassisepala (14); C. pterocarpa*; Datura meteloides (14); Draba cuneifolia (14); Eriogonum subreniforme (14); E. trichopes (14); Gilia sinuata*; Lappula redowskii (14); L. texana (14); Lepidium lasiocarpum (14); Lesquerella gordonii (14); Linanthus bigelovii*; Mirabilis multiflora (14); Nicotiana trigonophylla*; Oxybaphus comatus*; Pectocarya linearis var. ferocula*; Petunia parviflora (14); Phacelia crenulata (14); Raphanus sativus*; Rorripa nasturtium-aquaticum*; Rumex hymenosepalus (14); Salsola iberica*; Silene antirrhina*; Spinacea oleracea (14); Verbena ciliata (14); II,III on Distichlis spicata ssp. stricta (5,11,14).

P. SUBSTERILIS Ell. & Ever. var. ORYZOPSIDIS Greene & Cumm. II,III on Oryzopsis hymenoides (3).

P. SUBSTRIATA Ell. & Barth. 0,I on Physalis wrightii (2); II,III on Tricachne californica (2).

P. SUKSDORFII Ell. & Ever. III on Agoseris glauca (3).

P. TANACETI DC. var. DRACUNCULINA (Fahr.) Cumm. 0,I,II,III on

Artemisia dracunculus (2,3,5,11); A. ludoviciana (3); A. nova (3); A. tridentata (3).

P. TANACETI DC. var. TANACETI. II,III on Chrysanthemum morifolium (8).

P. TETRAMERII Seym. 0,I,II,III on Tetramerium hispidum (11,13).

P. THLASPEOS Schub. III on Arabis sp. (3); Thlaspi montanum var. fendleri (1).

P. TUMIDIPES Peck. 0,I,II,III on Lycium berlandieri var. parviflorum*; L. pallidum (2,3,9,10,11).

P. TURGIDIPES H.S. Jacks. 0,I,II,III on Viguiera deltoides var. parishii (8,11,12).

P. TUYUTENSIS Speg. I,II,III on Cressa truxillensis (8,15).

P. UNICA Holw. var. UNICA. II,III on Aristida arizonica (13); A. orcuttiana (2); A. ternipes (11,13).

P. VERSICOLOR Diet. & Holw. II,III on Heteropogon contortus (11).

P. VERTISEPTA Tracy & Gall. II,III on Salvia pinquifolia (6).

P. VEXANS Farl. 0,I on Fouquieria splendens (2,11); Idria columnaris (13); II,III on Bouteloua curtipendula (2,11,13).

P. XANTHII Schw. III on Ambrosia confertifolia (14); Xanthium strumarium (1,2,10,11,14).

P. XIMENESIAE Long. 0,I,II,III on Verbesina rothrockii (2).

P. ZEXMENIAE Diet. & Holw. 0,I,II,III on Zexmenia podocephala (2,13).

PUCCINIASTRUM AGRIMONIAE (Diet.) Tranz. II,III on Agrimonia gryposepala (3).

P. EPILOBII Otth. 0,I on Abies concolor (14); II,III on Epilobium adenocaulon (1,3,11); E. californicum (2); E. halleanum (3).

P. GUTTATUM (Schroet.) Hylan., Joerst. & Nannf. II,III on Galium triflorum (5).

P. PYROLAE Arth. II,III on Pyrola picta (3).

RAVENELIA ARIZONICA Ell. & Ever. II,III on Prosopis glandulosa (2); P. velutina (2,11).

R. EPIPHYLLA (Schw.) Diet. 0,I,II,III on Tephrosia tenella (13).

R. FRAGRANS Long var. EVERNIA (Syd.) J. Baxt. II,III on Mimosa biuncifera (2,11,13); M. dysocarpa (2,13); M. grahamii (11,13); M. laxiflora (11).

R. FRAGRANS Long var. FRAGRANS. II,III on Mimosa biuncifera (2,11,13); M. dysocarpa (2,13); M. grahamii (13).

R. INDIGOFERAE Tranz. 0,I,II,III on Indigofera sphaerocarpa (13).

R. MESILLANA Ell. & Barth. 0,I,II,III on Cassia covesii (11).

R. PRINGLEI Cumm. 0,I,II,III on Acacia greggii var. arizonica (2,3,4,5,9,11,12,13,14).

R. SPINULOSA Diet. & Holw. var. PAPILLIFERA (Syd.) Cumm. & J. Baxt. 0,I,II,III on Cassia lindheimeriana (2).

R. TEXENSIS Diet. var. TEXENSIS. II,III on Acacia angustissima (2,11,13); Calliandra eriophylla (13); C. humilis (2,11,13,14); C. humilis var. reticulata (2,3,11,13); Desmanthus cooleyi (13).

R. THORNBERIANA Long. II,III on Acacia constricta var. constricta (2,4,11,13); A. constricta var. paucispina (11).

TRANZSCHELIA COHAESA (Long) Arth. 0,I,III on Anemone tuberosa (11,12,13).

T. PRUNI-SPINOSAE (Pers.) Diet. II,III on Prunus serotina ssp. virens (13); P. virginiana (12).

T. THALICTRI (Chev.) Diet. III on Thalictrum fendleri (1,3).

UREDINOPSIS PTERIDIS Diet. & Holw. II,III on Pteridium aquilinum var. pubescens (3,5,11).

UREDO CUPRESSICOLA R.S. Pete. II on Cupressus arizonica (2).

U. MEXICANA (Arth.) Cumm. II on Rhus choriophylla (2,13).

U. PHORADENDRI H.S. Jacks. II on Phoradendron juniperinum (3).

U. SPIROSTACHYDIS Arth. II on Allenrolfea occidentalis (15).

UROMYCES AEMULUS Arth. 0,I,II,III on Allium gooddingii (11).

U. APPENDICULATUS (Pers.) Unger. 0,I,II,III on Phaseolus atropurpureus (11); P. vulgaris (2).

U. BELOPERONES G.F. Laund. 0,I,II,III on Beloperone californica(8,15).

U. BETAE (Pers.) Tul. II on Beta vulgaris (8,15).

U. COLORADENSIS Ell. & Ever. 0,I,II,III on Vicia americana*.

U. COMPACTUS Peck. 0,I,II,III on Aster spinosus (2).

U. DACTYLIDIS Otth. II,III on Alopecurus aequalis (14); A. geniculatus (3).

U. EPICAMPIS Diet. & Holw. II,III on Muhlenbergia rigens (2).

U. ERAGROSTIDIS Tracy. 0,I on Anthericum torreyi (2,13); II,III on Eragrostis intermedia (2,11,13); E. lehmanniana (2).

U. EUPHORBIAE Cke. & Peck. 0,I,II,III on Euphorbia albomarginata (3); E. capitellata (14); E. chamaesula (6); E. dentata var. cuphusperma (4,13); E. fendleri (10); E. florida (13); E. glyptosperma (3); E. hirta (13); E. palmeri (4,13); E. plummerae (13); E. polycarpa (11); E. prostrata (2,4,11); E. serpyllifolia (4).

U. GIGANTEA Speg. 0,I,II,III on Suaeda torreyana (8).

U. GLYCYRRHIZAE Magn. 0,I,II,III on Glycyrrhiza lepidota (10,14).

U. GRAMINICOLA Burr. II,III on Panicum sp.*.

U. HEDYSARI-PANICULATI (Schw.) Farl. II,III on Desmodium sp. (13).

U. HYALINUS Peck. 0,I,III on Sophora sericea (2,3,10,11); S. stenophylla (10).

U. INDIGOFERAE Diet. & Holw. II,III on Indigofera sphaerocarpa (13).

U. INTRICATUS Cke. 0,I,II,III on Eriogonum deflexum (9); E. fasciculatum var. polifolium (3,8); E. racemosum (3,4,10); E. wrightii (2,11, 12,13).

U. JUNCI (Desm.) Tul. II,III on Juncus xiphioides (3).

U. JUNCI-EFFUSI Syd. II,III on Juncus ensiformis (2); J. xiphioides (3).

U. LIMONII (DC.) Lév. 0,I,II,III on Limonium californicum (4).

U. LUPINI Berk. & Curt. 0,I,II,III on Lupinus blumeri (2); L. palmeri (11).

U. MEXICANUS Diet. & Holw. II,III on Desmodium neomexicanum (2,13); D. procumbens var. exiguum (2,13); D. rosei (11).

U. MINOR Schroet. I,III on Trifolium subcaulescens (9).

U. OAXACANUM Diet. & Holw. II,III on Cnidioscolus angustidens (13).

U OCCIDENTALIS Diet. 0,I on Euphorbia chamaesula (1,6); E. incisa(3); E. robusta*; II,III on Lupinus argenteus (1,2,3); Lupinus sp. (3,5).

U. PSORALEAE Peck. 0,I,II,III on Psoralea lanceolata (3,10,14); P. tenuifolia var. bigelovii (4).

U. PUNCTATUS Schroet. II,III on Astragalus allochrous (11); A. arizonicus*; A. bigelovii (2); A. crotalariae*; A. gilensis (10); A. hosackiae*; A. lentiginosus (8); A. thurberi (2); A. wootonii*; Astragalus sp. (3).

U. SHEARIANUS Arth. 0,I,III on Atriplex polycarpa (11).

U. SILPHII (Burr.) Arth. II,III on Juncus interior (3).

U. STRIATUS Schroet. II,III on Medicago sativa (2,5,10,11,15).

U. SUKSDORFII Diet. & Holw. I,II,III on Silene scouleri (3).

U. TRANZSCHELII Syd. III on Euphorbia lurida (12); E. palmeri (4); E. robusta (3).

U. VICIAE-FABAE (Pers.) Schroet. 0,I,II,III on Lathyrus arizonicus (3,11); L. eucosmus (3); L. leucanthus var. laetivirens (3); V. americana (3,11); V. pulchella (3,11).

U. VIGNAE Barcl. 0,I,II,III on Vigna sinensis (2).

UROPYXIS AMORPHAE (Curt.) Schroet. 0,I,II,III on Amorpha californica (2,3,11,13); A. fruticosa var. occidentalis (2,4,5,10,11).

U. DALEAE (Diet. & Holw.) Magn. var. DALEAE II,III on Dalea albiflora (2); D. formosa (2); D. parryi (2).

U. DALEAE (Diet. & Holw.) Schroet. var. EYSENHARDTIAE (Diet. & Holw.) J.W. Baxt. II,III on Eysenhardtia polystachya (2,13).

U. HOLWAYI (Arth.) Arth. III on Eysenhardtia polystachya (11,13).

U. PETALOSTEMONIS (Farl.) De-T. 0,I,II,III on Petalostemum candidum (1,10).

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  Puccinia vexans
IMPERATA BRVIFOLIA
  Puccinia posadensis
INDIGOFERA SPHAEROCARPA
  Ravenelia indigoferae
  Uromyces indigoferae
IRIS MISSOURIENSIS
  Puccinia iridis
IVA XANTHIFOLIA
  Puccinia helianthi
JATROPHA MACRORHIZA var. SEPTEMFIDA
  Aecidium sp.
JUNCUS ENSIFOLIUM var. BRUNNESCENS
  Uromyces junci-effusi
J. INTERIOR
  Uromyces silphii
J. XIPHIOIDES
  Uromyces junci
  Uromyces junci-effusi
JUNIPERUS DEPPEANA
  Gymnosporangium inconspicuum
  Gymnosporangium kernianum
  Gymnosporangium multiporum
  Gymnosporangium nelsonii
  Gymnosporangium speciosum
J. MONOSPERMA
  Gymnosporangium inconspicuum
  Gymnosporangium kernianum
  Gymnosporangium multiporum
  Gymnosporangium nelsonii
  Gymnosporangium speciosum
  Gymnosporangium vauqueliniae
J. OSTEOSPERMA
  Gymnosporangium inconspicuum
  Gymnosporangium kernianum
  Gymnosporangium multiporum
  Gymnosporangium nelsonii
  Gymnosporangium speciosum
J. SCOPULORUM
  Gymnosporangium bethelii
  Gymnosporangium nidus-avis
KECKIELLA ANTIRRHINOIDES ssp. MICROPHYLLA
  Puccinia confraga

- KOELERIA NITIDA
  - Puccinia crandallii
  - Puccinia graminis
  - Puccinia poarum
  - Puccinia pygmaea
- LACTUCA PULCHELLA
  - Puccinia minussensis
- LAPPULA REDOWSKII, L. TEXANA
  - Puccinia subnitens
- LATHYRUS ARIZONICUS, L. EUCOSMOS, L. LEUCANTHUS var. LAETIVIRENS
  - Uromyces viciae-fabae
- LEPIDIUM LASIOCARPUM var. LASIOCARPUM
  - Puccinia subnitens
- LEPTOCHLOA DUBIA
  - Puccinia diplachnis
- L. FILIFORMIS
  - Puccinia leptochloae
- LESQUERELLA GORDONII
  - Puccinia subnitens
- LIMONIUM CALIFORNICUM
  - Uromyces limonii
- LINANTHUS BIGELOVII
  - Puccinia subnitens
- LINUM LEWISII
  - Melampsora lini
- LOLIUM PERRENE
  - Puccinia coronata
  - Puccinia graminis
- LOMATIUM DISSECTUM var. MULTIFIDUM
  - Puccinia jonesii
- LUPINUS ARGENTEUS
  - Uromyces occidentalis
- L. BLUMERI, L. PALMERI
  - Uromyces lupini
- LYCIUM BERLANDIERI var. PARVIFLORUM
  - Puccinia globosipes
  - Puccinia tumidipes
- L. CALIFORNICUM, L. EXSERTUM, L. FREMONTII
  - Puccinia globosipes
- L. PALLIDUM
  - Aecidium lycii
  - Puccinia tumidipes
- L. PARISHII
  - Puccinia globosipes
- LYCURUS PHLEOIDES
  - Puccinia schedonnardi
- LYGODESMIA GRANDIFLORA
  - Puccinia hieracii var. harknessii
- MACHERANTHERA GRACILIS, M. PINNATIFIDA
  - Puccinia grindeliae ssp. grindeliae
- MALVELLA LEPIDOTA, M. LEPROSA
  - Puccinia lobata
- MATELEA PRODUCTA
  - Puccinia obliqua
- MEDICAGO SATIVA
  - Uromyces striatus
- MENTHA ARVENSIS var. VILLOSA, M. PENARDII, M. SPICATA
  - Puccinia menthae
- MIMOSA BIUNCIFERA, M. DYSOCARPA, M. GRAHAMI, M. LAXIFLORA
  - Ravenelia fragrans
- MIRABILIS MULTIFLORA
  - Puccinia esclavensis
  - Puccinia subnitens
- M. LONGIFLORA var. WRIGHTIANA
  - Puccinia esclavensis
- MONARDA FISTULOSA, M. MENTHAEFOLIA
  - Puccinia menthae
- MUHLENBERGIA ASPERIFOLIA, M. EMERSLEYI, M. MONTANA, M. PORTERI, M. REPENS
  - Puccinia schedonnardi
- M. RIGENS
  - Puccinia schedonnardi
  - Uromyces epicampis
- M. UTILIS
  - Puccinia schedonnardi
- NICOTIANA TRIGONOPHYLLA
  - Puccinia subnitens
- NOTHOLAENA SINUATA
  - Hyalopsora cheilanthes
- OENOTHERA LEPTOCARPA, O. CALIFORNICA var. ARIZONICA
  - Puccinia oenotherae
- ORYZOPSIS HYMENOIDES
  - Puccinia monoica
  - Puccinia stipae
  - Puccinia substerilis var. oryzopsidis
- OXALIS AMPLIFOLIA
  - Puccinia andropogonis
- OXYBAPHUS COMATUS
  - Puccinia subnitens
- PANICUM sp.
  - Uromyces graminicola
- P. BULBOSUM, P. PLENUM
  - Puccinia esclavensis
- PARTHENICE MOLLIS
  - Puccinia invelata
- PECTOCARYA LINEARIS var. FEROCULA
  - Puccinia subnitens
- PEDICULARIS CENTRANTHERA
  - Puccinia rufescens
- PELARGONIUM HORTORUM
  - Puccinia pelargonii-zonalis

PENSTEMON BRIDGESII, P. LINARIOIDES
P. PINIFOLIA, P. PSEUDOSPECTABILIS
  Puccinia pentstemonis
P. VIRGATUS
  Puccinia andropogonis
PETALOSTEMUM OCCIDENTALE
  Uropyxis petalostemonis
PETUNIA PARVIFOLIA
  Puccinia subnitens
PHACELIA CRENULATA
  Puccinia subnitens
P. MAGELLANICA
  Puccinia recondita
PHASEOLUS ATROPURPUREUS,
P. VULGARIS
  Uromyces appendiculatus
PHILADELPHUS MICROPHYLLUS
  Gymnosporangium speciosum
PHLEUM PRATENSE
  Puccinia graminis
PHORADENDRON JUNIPERINUM
  Uredo phoradendri
PHYSALIS WRIGHTII
  Puccinia substriata
PICEA ENGELMANNII, P. PUNGENS
  Chrysomyxa arctostaphyli
PINUS EDULIS
  Coleosporium crowellii
  Coleosporium jonesii
P. ELDARICA
  Cronartium comandrae
P. LEIOPHYLLA var. CHIHUAHUANA
  Coleosporium ipomoeae
  Cronartium conigenum
P. MONOPHYLLA
  Cronartium occidentale
P. PONDEROSA
  Cronartium arizonicum
  Cronartium comandrae
  Endocronartium harknessii
PIPTOCHAETIUM FIMBRIATUM
  Puccinia durangensis
  Puccinia neocoronata
POA FENDLERIANA, P. LONGILIGULA
  Puccinia crandallii
P. PRATENSIS
  Puccinia brachypodii var. poae-nemoralis
POLYGONUM BISTORTOIDES
  Puccinia bistortae
POPULUS TREMULOIDES
  Melampsora albertensis
PROSOPIS GLANDULOSA, P. VELUTINA
  Ravenelia arizonica
PRUNUS SEROTINA ssp. VIRENS
  Tranzschelia pruni-spinosae
PRUNUS VIRGINIANA
  Tranzschelia pruni-spinosae
PSEUDOCYMOPTERUS MONTANUS
  Puccinia pseudocymopteri
PSEUDOTSUGA MENZIESII var. GLAUCA
  Melampsora albertensis
PSILOSTROPHE COOPERI,
P. SPARSIFLORA, P. TAGETINA
  Puccinia grindelii ssp. riddellii
PSORALEA LANCEOLATA,
P. TENUIFLORA var. BIGELOVII
  Uromyces psoraleae
PTERIDIUM AQUILINUM var. PUBESCENS
  Uredinopsis pteridis
PYROLA PICTA
  Pucciniastrum pyrolae
P. VIRENS
  Chrysomyxa pirolata
PYRUS COMMUNIS
  Gymnosporangium clavipes
  Gymnosporangium kernianum
  Gymnosporangium nelsonii
QUERCUS ARIZONICA, Q. DUNNII,
Q. EMORYI, Q. GRISEA,
Q. HYPOLEUCOIDES, Q. OBLONGIFOLIA,
Q. RUGOSA
  Cronartium conigenum
RAFINESQUIA NEOMEXICANA
  Puccinia hieracii var. harknessii
RANUNCULUS CARDIOPHYLLUS
  Puccinia gibberulosa
RAPHANUS SATIVUS
  Puccinia subnitens
RHUS CHORIOPHYLLA
  Uredo mexicana
R. RADICANS var. RYDBERGII
  Pileolaria brevipes
  Pileolaria effusa
R. TRILOBATA
  Pileolaria patzcuarensis
RIBES AUREUM
  Cronartium occidentale
R. CEREUM, R. INEBRIANS,
R. LEPTANTHUM
  Coleosporium jonesii
R. NIGRUM
  Cronartium occidentale
R. PINETORUM, R. VELUTINUM,
R. WOLFII
  Coleosporium jonesii
RORIPPA NASTURTIUM-AQUATICUM
  Puccinia subnitens
ROSA ARIZONICA var. GRANULIFERA
  Phragmidium californicum

ROSA FENDLERI, R. NEOMEXICANA,
R. WOODSII
  Phragmidium montivagum
RUBUS LOGANOBACCUS
  Arthuriomyces peckianus
R. NEOMEXICANUS
  Phragmidium peckianum
R. PARVIFLORUS var. PARVIFLORUS
  Phragmidium occidentale
R. STRIGOSUS var. ARIZONICUS
  Phragmidium rubi-idaei
RUMEX HYMENOSEPALUS
  Puccinia subnitens
SALIX BEBBIANA, S, BONPLANDIANA,
S. EXIGUA, S. GOODDINGII
S. SCOULERIANA, S. TAXIFOLIA
  Melampsora epitea
SALSOLA IBERICA
  Puccinia subnitens
SALVIA AMISSA
  Puccinia farinacea
S. LEMMONII
  Puccinia biporula
S. PINGUIFOLIA
  Puccinia vertisepta
SARCOSTEMMA CYNANCHOIDES
  Puccinia obliqua
S. CYNANCHOIDES var. HARTWEGII
  Puccinia chloridis
  Puccinia obliqua
S. HIRTELLUM
  Puccinia obliqua
SECALE CEREALE
  Puccinia recondita
SETARIA GRISEBACHII
  Puccinia esclavensis
SIDA PHYSOCALYX, S. FILICAULIS,
S. SPINOSA var. ANGUSTIFOLIA
  Puccinia heterospora
SIDALCEA NEOMEXICANA
  Endophyllum tuberculatum
SILENE ANTIRRHINA
  Puccinia subnitens
S. SCOULERI
  Uromyces suksdorfii
SISYMBRIUM LINEARIFOLIUM
  Puccinia monoica
SISYRINCHIUM LONGIPES
  Puccinia angulata
SITANION HYSTRIX
  Puccinia montanensis
  Puccinia recondita
SOLIDAGO ALTISSIMA
  Puccinia stipae
S. MISSOURIENSIS
  Coleosporium asterum
  Puccinia dioicae
SOLIDAGO NANA
  Puccinia stipae
S. SPARSIFLORA
  Puccinia dioicae
SOPHORA SERICEA, S. STENOPHYLLA
  Uromyces hyalinus
SORBUS DUMOSA
  Gymnosporangium tremelloides
SORGHUM HALAPENSE, S. VULGARE
  Puccinia purpurea
SPHAERALCEA AMBIGUA var. ROSEA
  Puccinia schedonnardi
  Puccinia sherardiana
S. ANGUSTIFOLIA var. CUSPIDATA,
S. EMORYI
  Puccinia sherardiana
S. FENDLERI
  Puccinia schedonnardi
  Puccinia sherardiana
S. GROSSULARIAEFOLIA, S. INCANA
  Puccinia schedonnardi
S. LAXA, S. MARGINATA,
S. PARVIFOLIA
  Puccinia sherardiana
SPINACEA OLERACEA
  Puccinia subnitens
SPOROBOLUS AIROIDES, S. CRYPTANDRUS
S. GIGANTEUS, S. WRIGHTII
  Puccinia cryptandri
STACHYS COCCINEA
  Puccinia pallidissima
STEPHANOMERIA PAUCIFLORA,
S. THURBERI
  Puccinia hieracii
STIPA COMATA
  Puccinia stipae
S. LETTERMANNII
  Puccinia substerilis var. substerilis
S. PRINGLEI
  Puccinia durangensis
  Puccinia neocoronata
S. SPECIOSA
  Puccinia interveniens
SUAEDA TORREYANA
  Uromyces giganteus
SYMPHORICARPOS OREOPHILUS
  Puccinia crandallii
TALINUM PANICULATUM
  Puccinia leptochloae
TARAXACUM OFFICINALE
  Puccinia hieracii var. hieracii
TEPHROSIA TENELLA
  Ravenelia epiphylla
TETRAMERIUM HISPIDUM
  Puccinia tetramerii

THALICTRUM FENDLERI
  Puccinia recondita
  Tranzschelia thalictri
THLASPI MONTANUM var. FENDLERI
  Puccinia thlaspeos
TITHONIA THURBERI
  Puccinia enceliae
TRICACHNE CALIFORNICA
  Puccinia esclavensis
  Puccinia substriata
TRIFOLIUM SUBCAULESCENS
  Uromyces minor
TRITELEIOPSIS PALMERI
  Puccinia nodosa
TRITICUM AESTIVUM
  Puccinia graminis
  Puccinia recondita
  Puccinia striiformis
VAUQUELINIA CALIFORNICA
  Gymnosporangium vauqueliniae
VERBENA CILIATA
  Puccinia subnitens
VERBESINA ENCELIOIDES
  Coleosporium viguierae
  Puccinia cognata
V. LONGIFOLIA
  Puccinia cognata
V. ROTHROCKII
  Puccinia ximenesiae
VICIA AMERICANA var. AMERICANA
  Uromyces coloradensis
  Uromyces viciae-fabae
VICIA AMERICANA var. LINEARIS,
V. PULCHELLA
  Uromyces viciae-fabae
VIGNA SINENSIS
  Uromyces vignae
VIGUIERA ANNUA
  Puccinia abrupta
  Puccinia enceliae
V. CORDIFOLIA
  Coleosporium viguierae
  Puccinia calanticariae
V. DELTOIDEA var. PARISHII
  Puccinia turgidipes
V. DENTATA var. DENTATA
  Coleosporium viguierae
  Puccinia abrupta var. abrupta
  Puccinia calanticariae
V. DENTATA var. LANCIFOLIA
  Coleosporium viguierae
  Puccinia abrupta var. abrupta
V. LONGIFOLIA, V. MULTIFLORA
  Puccinia abrupta var. abrupta
  Puccinia enceliae
WYETHIA ARIZONICA
  Puccinia balsamorhizae
XANTHIUM STRUMARIUM
  Puccinia canaliculata
ZEA MAYS
  Puccinia sorghi
ZEXMENIA PODOCEPHALA
  Puccinia zexmeniae

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ADDITIONS TO *MARASMIUS* SECTION *GLOBULARES*

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Marasmius albogriseus is re-described based on recent collections from southern California, and *Collybia fimicola* is verified as its later synonym. *Marasmius decipiens* is described as a new species in section *Globulares*. The colored, extremely long, narrow, and slightly curved spores serve to distinguish it from others in the section.

Since the synopsis of *Marasmius* section *Globulares* for the United States (Halling, 1983b), additional information on members of this section has come to our attention. First of all, fresh material of *Marasmius albogriseus* (Pk.) Sing. has been collected recently in southern California near the type locality. The collections differ slightly from the type specimen in that the caulocystidia are more polymorphous and are not thick-walled. Furthermore, these recent collections were found to be indistinguishable from the type and other origianl collections of *Collybia fimicola* Earle, thus substantiating the synonymy given by Singer (1976). Earlier, Halling (1983b) refrained from accepting this synonymy because additional Californian specimens were not available. Because these recent collections of *M. albogriseus* from southern California represent the only known ones from the area since the species was originally described, we provide the following updated description. Color terms (*e.g.* 5C4) are from Kornerup and Wanscher (1967).

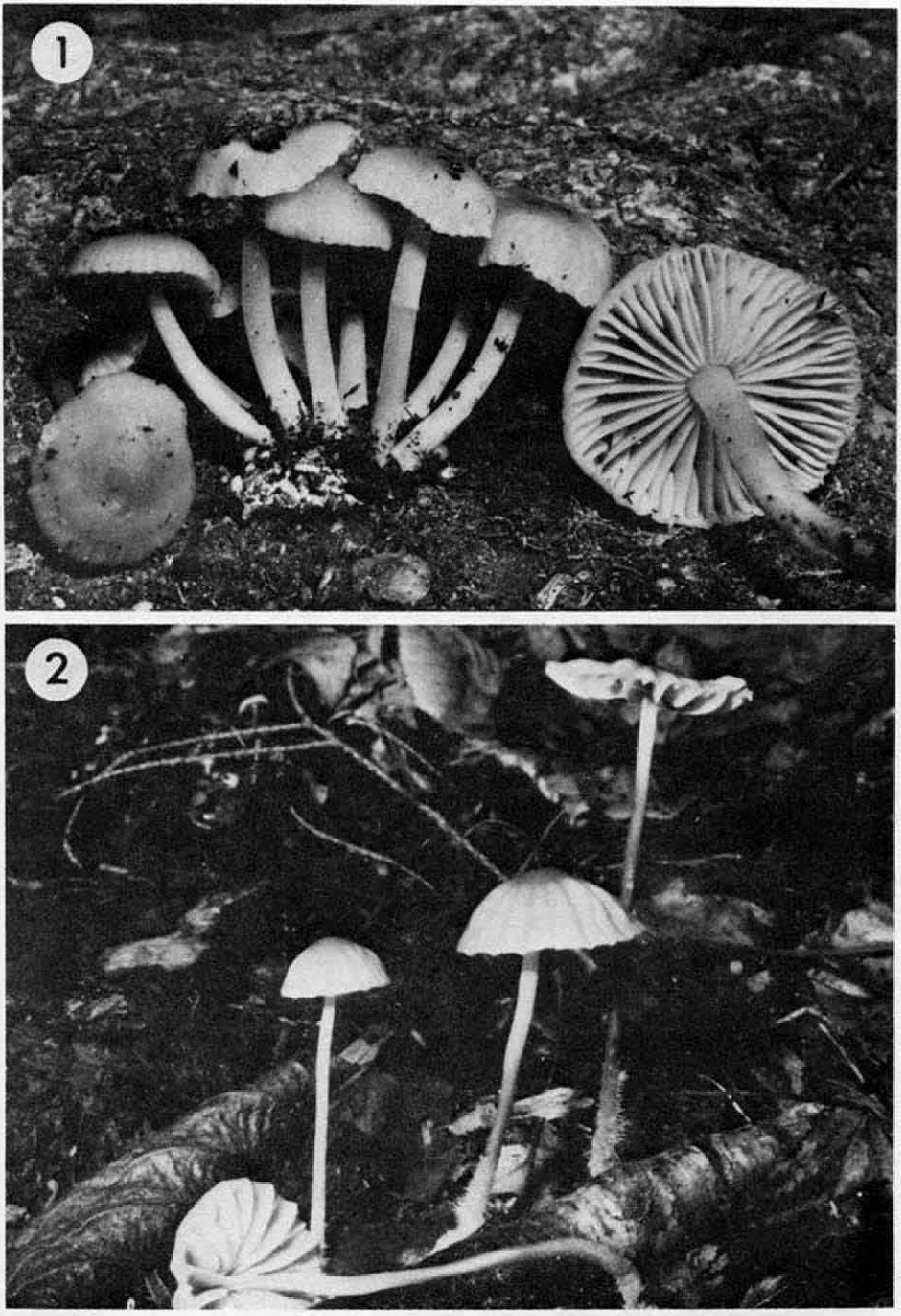
MARASMIUS ALBOGRISEUS (Pk.) Sing., Ann. Mycol. 41: 130. 1943. Figs. 1,9,10.

Collybia albogrisea Pk., Bull. Torrey Bot. Club 22: 199. 1895. *Gymnopus albogriseus* (Pk.) Murr., N. Amer. Fl. 9: 368. 1916. TYPE: United States. California: Los Angeles Co., Pasadena. 10 Jan 1895, *A. J. McClatchie 814* (Holotype: NYS!; Isotype: NY!).

Collybia fimicola Earle, Bull. New York Bot. Gard. 3: 298. 1905. TYPE: United States. California: Santa Clara Co., near Stanford University. 30 Nov 1901, *C. F. Baker's Pacific Slope Fungi no. 153* (Holotype: NY!; Isotype: FH!).

Pileus 15-35 mm broad, broadly conic to convex to broadly convex to plane, subumbonate or uneven in outline from mutual pressure; margin even and translucent-striate when young, becoming plicate-striate to sulcate, irregular or scalloped with age, remaining smooth on the disc; surface glabrous, moist to lubricous when wet but not viscid, hygrophanous, grayish brown (5C4; 5D4) on the disc, paler at the margin, tending toward a pale grayish yellow (4B4; 4B3) overall with age. *Context* pliant, up to 5 mm thick, grayish white. *Odor* mild; *taste* mild or none. *Lamellae* narrowly adnexed to broadly adnexed or nearly free, moderately distant to subdistant, very broad (up to 6 mm), ventricose, thick, minutely intervenose in larger, mature individuals, white to yellowish white (3A2; 4A2) when young, becoming grayish yellow (near 4B3; 4B2) when old or wet; edges even and entire. *Lamellulae* in 1-2 series. *Stipe* 20-50(-70) mm long, 2-6 mm broad, terete to compressed, seldom cleft, equal or tapered downward, rarely slightly enlarged at the base, tough-fibrous, non-insititious, strict or sometimes curved at base, hollow, translucent above, shiny; apex glabrous or minutely pruinose (under a lens), glabrescent, whitish to grayish pallid when young, remaining so in age; base pubescent to tomentose or strigose, the tomentum often well-developed, amber yellow (4B6) at first, becoming brownish orange (6C7) with age, concolorous within.

Basidiospores white in deposit, 6.6-8.1(-9) X 3.6-4.5 (-5.4) µm, broadly ellipsoid, amygdaliform to lacrymoid, inequilateral and adaxially flattened in profile, smooth,



Figs. 1,2. Habit photographs of (1) *Marasmius albogriseus* (Halling 3773). (2) *Marasmius decipiens* (Holotype). Both approx. X 1.5.

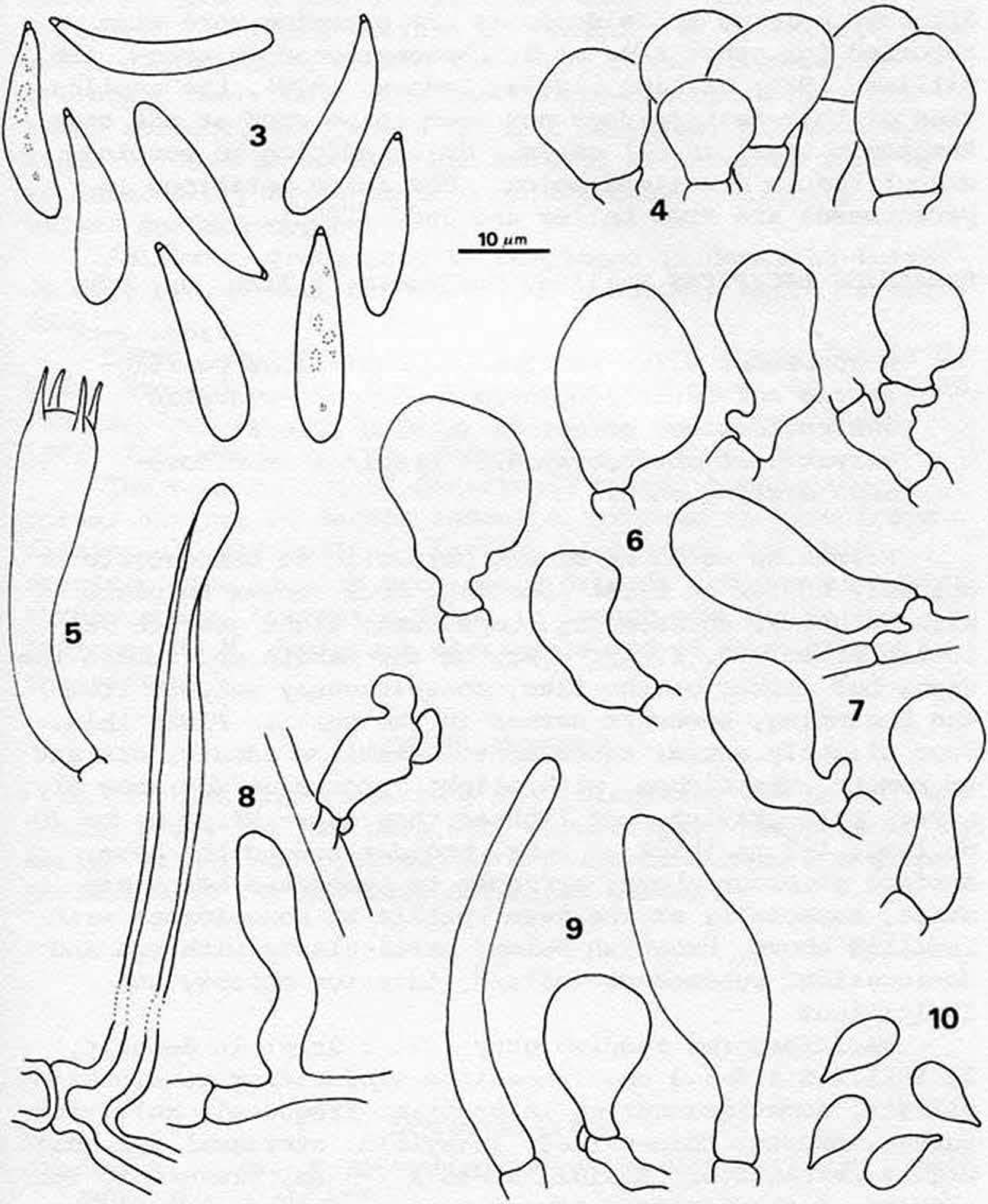
thin-walled, hyaline, inamyloid, typically uniguttulate. *Basidia* 18-26.6(-36) X 6-7.2(-8) µm, clavate, hyaline 1-, 2-, or 4-sterigmate. *Hymenial cystidia* absent. *Tramal hyphae* interwoven, dextrinoid, sometimes inflated, usually hyaline or pale yellowish in KOH, occasionally with oleiferous elements in the stipe and pileus, 3-18 µm in diam; walls up to 1.2 µm thick. *Clamp connections* present. *Pileus surface* composed of smooth endcells, embedded in a thin, gelatinous matrix, forming a hymeniform layer up to 25 µm thick; elements 12-25 X 3.6-9(-13) µm, cylindric, clavate to subacuminate, broadly clavate or sphaeropedunculate; walls thin, hyaline or pale yellow to ochraceous, inamyloid or weakly dextrinoid. *Caulocystidia* abundant, sometimes scattered in clusters, repent to erect, weakly dextrinoid, thin-walled, very rarely thick-walled, hyaline to pale yellowish, 11-33 X (3.6-)6-9 µm, typically broadly clavate, elongate-clavate, strangulate, fusoid-ventricose to sphaeropedunculate, or narrowly cylindric and irregular in outline (this latter especially at the base of stipe).

Gregarious to cespitose on soil, often among wood chips in disturbed soil, near *Quercus* sp., *Purshia* sp., *Pinus* sp., *Cupressus forbesii* Jeps., and *Olea* sp. Locally abundant in southern California from December through March.

Additional material examined: United States. California: Los Angeles Co., La Cañada. Descanso Gardens, 28 Dec 1983, *Halling 3773*; 20 Dec 1984, *Halling 3998* (NY, SFSU). Claremont, Rancho Santa Ana Botanical Garden, 30 Dec 1977, *G. Wright 815* (SFSU). Santa Clara Co., Stanford University, 19 Jan 1907, *Patterson #6*, 31 Jan 1907, *Patterson #16* (both NY). San Diego Co., Lake Henshaw, San Luis Rey Campground, 10 Mar 1970, *Thiers 25080* (SFSU).

Marasmius albogriseus is keyed out together with *M. oreades* (Bolt.:Fr.) Fr. because both lack hymenial cystidia (Halling, 1983b). However, *M. albogriseus* differs from *M. oreades* in having a pale grayish brown rather than a light yellowish brown pileus. Furthermore, the spores of *M. oreades* are longer (7-10 versus 5-7 µm), and the stipe tomentum is sparser than that of *M. albogriseus*. The caulocystidia of *M. albogriseus* are also quite polymorphous when compared to the nearly uniform, cylindric to clavate elements found in *M. oreades*.

Another taxon, collected over the past several years in North Carolina, appears to be undescribed. The plicate pileus and remote lamellae might lead one to look for this species in section *Sicci* with *M. pulcherripes* Pk. and *M. siccus* (Schw.) Fr., but broom cells are entirely lacking.



Figs. 3-10. Microscopic features of *Marasmius albogriseus* and *M. decipiens*. 3-8. *M. decipiens*. 3. Basidiospores. 4. Elements of pileus surface. 5. Basidium. 6,7. Cheilocystidia. 8. Caulocystidia. 9-10. *M. albogriseus*. 9. Caulocystidia. 10. Basidiospores.

There is a superficial resemblance to *M. wynnei* Berk. & Br. (Dähncke & Dähncke, 1982), a European member of section *Globulares*, but the latter species does not produce elongate curved spores over 20 µm long that are colored in deposit. Although colored spore deposits are becoming more widely reported for other taxa of Tricholomataceae (Bigelow, 1982; Gilliam, 1976; Halling, 1983a; Lennox, 1979), the application of this feature does not seem to be used at the same taxonomic level in all cases. This addition to section *Globulares* is described below. The color notations in parentheses are from Kelley and Judd (1955).

MARASMIUS DECIPIENS Halling, Desjardin, & Tish *sp. nov.*

Figs. 2-8.

A speciebus aliis sectionis Globularibus basidiosporis coloratis longissimis elongato-clavatis subfusiformibus aliquando de visu laterali curvatis et cheilocystidiis brevibus sacciformibus distinguenda.

Pileus up to 25 mm broad, parabolic to campanulate or obtusely convex at first, becoming more convex to plane with maturity; surface dry. canescent, light grayish yellowish brown (79. l. gy. y Br) on the margin and toward the disc, but darker on the disc, conspicuously sulcate from the beginning, somewhat darker in the sulci. *Flesh* thin. *Odor* slightly acrid; *taste* none. *Lamellae* adnate, distant to remote, ventricose, with slight intervenations when dry, a very pale grayish, but lighter than cap. *Stipe* up to 70 mm long, 1-2 mm thick at apex, broader toward the base; surface glabrous above, strigose to pubescent below midstipe, especially at the base, pallid to concolorous with lamellae above, brownish below, particularly with age and desiccation, pubescence whitish; interior hollow; not insititious.

Basidiospores reddish gray (22. r Gray) in deposit, 22.5-25.2 X 4.5-6.3 µm, lanceolate-subfusiform to elongate-clavate, sometimes curved in profile, frequently multi-guttulate, smooth, thin-walled, inamyloid, sterigmal appendage highly refractive. *Basidia* 31-45 X 7-9 µm, clavate to subclavate, 4-sterigmate. *Pleurocystidia* absent. *Cheilocystidia* very short, saccate and subglobose to broadly clavate or sphaeropedunculate, rarely with diverticulate excrescence, otherwise smooth, thin-walled, (6.3-)7.2-11.7(-22.5) µm, soon collapsing on lamellar edge and very inconspicuous. *Tramal hyphae* interwoven, dextrinoid, smooth, thin-walled, 3.6-10 µm in diam. *Clamp connections* present. *Pileus* *surface* composed of thin-walled, smooth, pyriform, turbinate to sphaeropedunculate elements, (4.5-)9-12.6(-18) µm broad, forming a hymeniform layer. *Caulocystidia* short and scattered at apex to mid-stipe, these usually thin-walled, cylindric, globose, clavate or irregularly cylindric; long and densely packed toward the base, these filamentous-cylindric near their tips and knotty-contorted near the stipe surface, with walls up to 2 µm thick; all caulocystidia 2.7-5.4 µm in diam and arising as recurved tips or as intercalary branches from golden-brown, slightly thick-walled surface hyphae.

Solitary, gregarious to cespitose in decaying leaves (mostly *Quercus* and *Rhododendron*). Western North Carolina. June.

TYPE: United States. North Carolina, Transylvania Co.: Cedar Mountain, near Brevard, Sherwood Forest, 19 Jun 1980, *Tish 1602-F* (Holotype: NY). Paratype: as above, 2 Jun 1982, *Tish 9503*; 25 Jun 1984, *Tish s.n.* (both NY).

The combination of dextrinoid tramal hyphae and a pileus surface of smooth endcells arranged in hymeniform fashion clearly indicate section *Globulares* for this species. The reddish gray spore deposit and the elongate, curved spores exceeding 20 µm in length are the unique features of *M. decipiens* distinguishing it from others in the section.

ACKNOWLEDGMENTS

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NEW COMBINATIONS IN THE PLEOMASSARIACEAE AND THE MASSARINACEAE

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SUMMARY

Six new combinations are made for species once named in *Trematosphaeria* but referable to the Pleomassariaceae or the Massarinaceae: *Asteromassaria berberidicola, A. daphnes, Splanchnonema britzelmayriana, Massarina piskorzii, M. indigoferae*, and *M. mori*.

During the course of studies on species named in *Trematosphaeria* (Boise, 1984) I discovered six species that unlike *T. pertusa* (Pers.: Fr.) Fuckel, the generic type, possessed the characteristics of the Pleosporales and furthermore the characteristics of either the Pleomassariaceae or Massarinaceae. New combinations are made for these species in the genera *Asteromassaria, Splanchnonema*, and *Massarina*.

All of the species described here exhibit the cellular type of pseudoparaphyses and bipolar ascospore symmetry that are indicative of species in the Pleosporales, as it is delimited by Barr (1979, 1983). To recognize species in the Pleomassariaceae, I followed the general criteria outlined in Barr's treatment of North American species (1982) and for the Massarinaceae I used Barr's keys for families in the Loculoascomycetes (1979) along with the studies of Bose (1961) and Holm (1957). In addition, I consulted Eriksson's work (1981) and found the descriptions of asci of particular help in separating the families.

Like other species in the Pleomassariaceae, *Asteromassaria berberidicola, A. daphnes* and *Splanchnonema* *britzelmayriana* produce sphaeroid, broadly papillate ascomata that are immersed, later erumpent, from woody substrates. Their asci are cylindric-clavate and most noteably have endotunicae that are at least twice as thick as the ectotunicae. *Asteromassaria* and *Splanchnonema* are phragmosporous members of the family that can be separated by the shape of the ascospores, which are ellipsoid-fusoid or oblong in *Asteromassaria* and obovoid in *Splanchnonema;* also, the ascospore wall tends to be thicker in species of *Asteromassaria*.

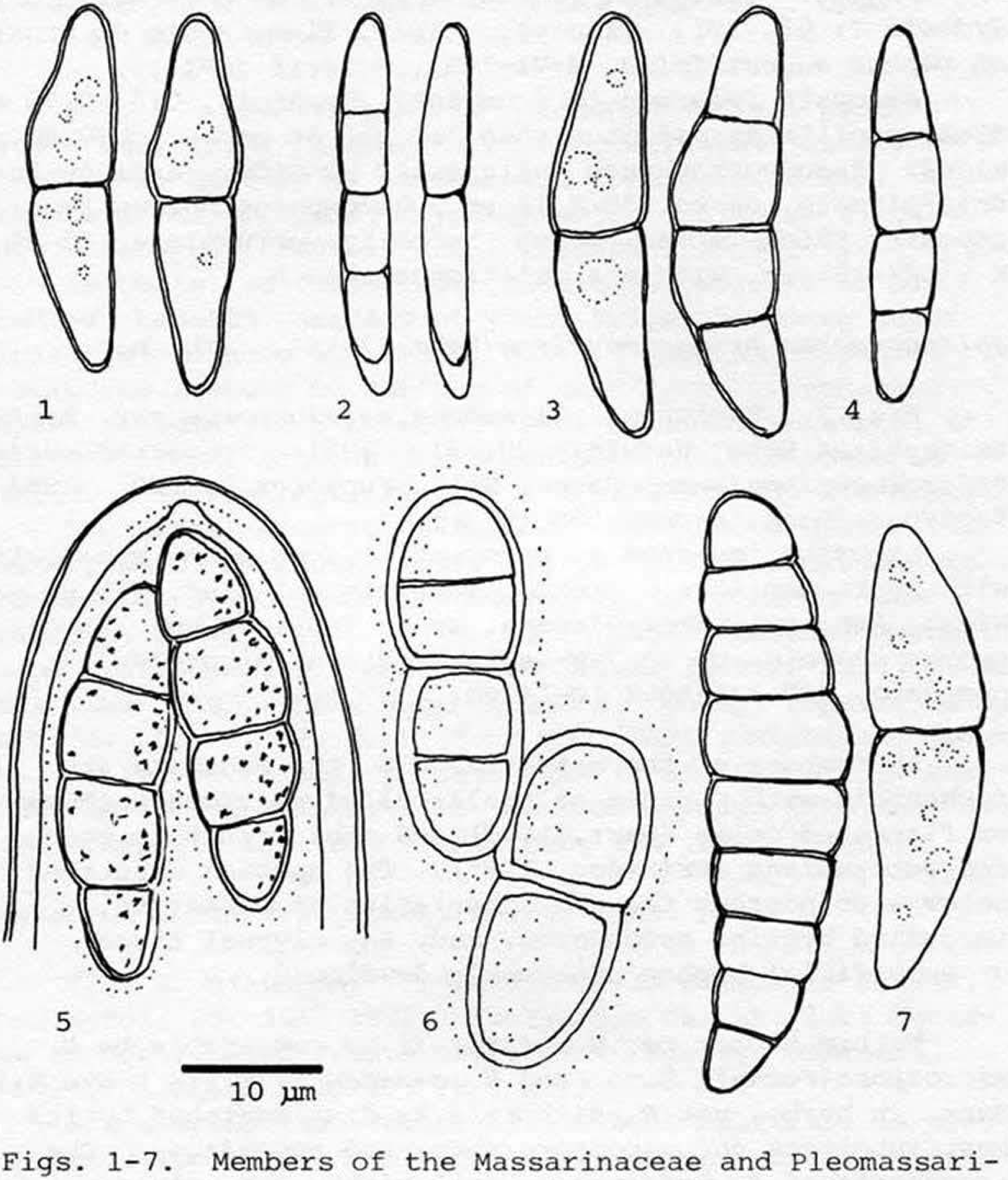
Asteromassaria berberidicola and *A. daphnes* can be separated by the shape of their ascospores, and perhaps geographic distribution. Ascospore dimensions in both species fall within the lower extreme described for *A. macrospora*(Desm.) v.Höhnel (Barr, 1982), however, ascomata in *A. macrospora* are larger and the ascospores are smooth or foveolate. *Asteromassaria olivaceohirta*(Schw.) Barr is regarded as a synonym of yet another species named in *Trematosphaeria, viz., T. epileuca*(Berk. & Curt.)Shoemaker & LeClair (Barr, 1982; Boise, 1984). *Splanchnonema britzelmayriana* is comparable with *S. sporadicum*(Ellis & Everh.) Barr. However, in *S. sporadicum* the ascospores are smaller and verruculose.

Asteromassaria berberidicola(Otth) Boise, comb. nov.

Fig. 5. Basionym: *Cladosphaeria berberidicola* Otth, Mittheil. Naturf. Ges. Bern 1870: 105. 1871. *Massaria berberidicola*(Otth) Jacz., Bull. Herb. Boissier 2: 673. 1894. *Trematosphaeria berberidicola*(Otth) Shoemaker & LeClair, Canad. J. Bot. 53: 1975. Type: (n.v.).

Ascomata sphaeroid, *ca.* 0.5 mm diam, papillate, immersed to erumpent. Pseudoparaphyses cellular, 1.5-2 µm wide. Asci cylindric-clavate, up to 110 X 28 µm, endotunicae thick. Ascospores ellipsoid-fusoid, 1-3-sepatate, thick-walled, brown with end cells lighter brown or hyaline becoming verruculose, (26-)28-35(-38) X 9-14 µm within a gelatinous sheath.

Material examined: Rehm, Ascom. 1866, on *Berberis*(NY) Canada, Manitoba, Winnipeg, Manitoba Agricultural College, on *Salix*, 6-XII-1925, G. R. Bisby 2596 ex herb. Dearness 553 (as *Trematosphaeria pertusa*, DAOM 182892).



Figs. 1-7. Members of the Massarinaceae and Pleomassariaceae. 1. Ascospores of *Massarina corticola*. 2. Ascospores of *M. piskorzii*. 3. Ascospores of *M. indigoferae*. 4. Ascospore of *M. mori*. 5. Ascus apex and ascospores of *Asteromassaria berberidicola*. 6. Ascospores of *A. daphnes*. 7. Ascospores of *Splanchnonema britzelmayriana*.

Asteromassaria daphnes (Petrak) Boise, comb. nov.

Fig. 6. Basionym: *Trematosphaeria daphnes* Petrak, Sydowia 7: 65. 1953. Isotype: Iran, Ilam, Route de Gharb, on *Daphne angustifolia*, 4-VI-1951, Scharif (BPI!).

Ascomata immersed to erumpent, sphaeroid, 0.35-0.75 mm diam, papillate; peridium thin (10 µm) at base, to 30 µm at sides. Pseudoparaphyses cellular, 2 µm wide. Asci cylindric-clavate, up to 230 X 19 µm. Ascospores oblong 1-3-septate, thick-walled, brown, becoming verruculose, 23-32 X 9-12(-18) µm, within a gelatinous sheath.

Splanchnonema britzelmayriana(Rehm) Boise, comb. nov.

Fig. 7. Basionym: *Melanomma megalosporum* var. *britzelmayriana* Rehm, Hedwigia 20: 51. 1881. *Trematosphaeria britzelmayriana*(Rehm) Sacc., Syll. Fungorum 2: 120. 1883. Isotype: Rehm, Ascom. 588 (NY!).

Ascomata immersed to erumpent, 0.4 mm diam, sphaeroid with short papillae. Pseudoparaphyses cellular, 2-3 µm wide. Asci cylindric-clavate, up to 160 X 30 µm. Ascospores obovoid, up to 7-8-septate, brown, minutely punctate, (27-)36-56 X 10-14 µm.

In members of the Massarinaceae, the ascomata are ±sphaeroid with peridia of small-celled pseudoparenchyma or flattened cells (Barr, 1979) and asci with thin endo- and ectotunicae (Eriksson, 1981). The species described below also possess the characteristics of *Massarina*, including hyaline ascospores, and, any clypeal tissue or superficial hyphae are weakly developed.

Within *Massarina*, *M. piskorzii* is comparable to *M. microspora*(Fuckel) Sacc. and *M. canadensis*(Ellis & Everh.) Barr, in herb., yet *M. piskorzii* is distinguished by its host substrate and ascospore shape and appendages. The ascospores of *M. indigoferae* fall within the extremes described for *M. corticola*, but the average values are larger. The ascomata of the two species differ in that those in *M. corticola* have well developed papillae, and in *M. indigoferae* the papillae are not apparent, if not absent. The distinctive type locality and substrate for *M. indigoferae* give me further reservation about treating the name in synonymy with *M. corticola*. Likewise, I retain *M. mori* as a separate species although it too has ascospores that fall within the extreme size range described for *M. corticola*. *Massarina mori* can be separated from *M. corticola* by the difference in ascospore shapes.

Massarina corticola(Fuckel) L. Holm, Symb. Bot. Upsal. 14: 147. 1957.

Fig. 1. *Trematosphaeria corticola* Fuckel, Symb. Mycol. 162. 1870. *Zignoella corticola*(Fuckel) Sacc., Michelia 1: 346. 1878. *Melomastia corticola*(Fuckel) Schröter, In: F. Cohn, Kryptogamenfl. Schlesien 2: 321. 1894. Isotype: Fuckel, Fungi rhenani 2528 (FH!).

Ascomata, at first immersed within periderm of old stems or beneath periderm of young twigs, becoming superficial, globose to sphaeroid, 0.2-0.5 mm diam, papillae protruding through to surface of substrate. Pseudoparaphyses cellular, 1-3 µm wide. Asci cylindric-clavate, up to 125 X 17 µm, ecto- and endotunicae thin. Ascospores fusoid, 1-(3-)septate, hyaline, (22-)25-32(-37) X 4-8 µm.

Additional material examined: Sine loc., Herb. Fuckel, Herb. Barbey-Boissier 622 (FH); Herb. Persoon 910-269-164 (as *S. pertusa*, L); Switzerland, Fribourg, on *Fraxinus*, 21-VIII-1976, M. E. Barr (MASS); Canada, Quebec, Gaspé Prov. Park, Mt. Albert, on *Ledum*, 22-VIII-1957, M. E. Barr 2262 (MASS); USA, Massachusetts, Conway, Baptist Hill, on *Tilia*, 20-V-1967, M. E. Barr 933 (MASS); Michigan, Emmet Co., Gill+Elder Roads, on *Sambucus*, 11-IX-1969, M. E. Barr 5524d (MASS); New York, 1 mi. west of Saranac Lake, on tree stump, 11-IX-1965, D. Malloch, 494 (DAOM 136383).

Massarina piskorzii(Petrak) Boise, comb. nov.

Fig. 2. Basionym: *Trematosphaeria piskorzii* Petrak, Ann. Mycol. 25: 366. 1927. Isotypes: Petrak Flora Bohemiae et Moraviae exsiccata 2298, on *Phragmites communis*, V-1926, J. Piskorz (BPI!, FH!, NY!).

Discoloring the surface of the host substrate in grey patches (0.5-1.0 mm diam), dotted by the protruding papillae of ascomata clustered beneath the epidermis within a loose weft of hyphae. Ascomata globose, 0.25-0.5 mm diam, peridium thin (15 µm). Pseudoparaphyses cellular, 1.5-2.5 µm wide. Asci cylindric-clavate, up to 120 X 12 µm. Ascospores narrow oblong, 1-3-septate, with short basal appendages, hyaline to clear gold, 20-32 X 4-6 µm.

Massarina indigoferae(Müller & Ahmad) Boise, comb. nov.

Fig. 3. Basionym: *Trematosphaeria indigoferae* Müller & Ahmad, Biologia(Lahore) 4: 25-32. 1958. Holotype:

Pakistan, Kagan Valley, Shogran, on dead branches of *Indigofera geradina* Wall, 28-VII-1956, S. Ahmad 14078 (ZT!).

Ascomata immersed beneath periderm, becoming superficial, globose to sphaeroid, 0.35-0.5 mm diam. Pseudoparaphyses cellular 1.5-2.0 µm wide. Asci cylindric-clavate, up to 130 X 18 µm, ecto- and endotunicae thin. Ascospores fusoid, 1-3-septate, hyaline, (33-)35-39(-42) X 7-9 µm.

Massarina mori (Fabre) Boise, comb. nov.

Fig. 4. Basionym: *Trematosphaeria mori* Fabre, Ann. Sci. Nat. Bot. Sér. 6. 15: 53. 1883. Holotype: France, Vaucluse, Sérignan, on decorticated wood of *Morus alba*, I-1882, J.H.Fabre (L'Harmas!).

Ascomata immersed to erumpent, subglobose, 0.5 mm diam with minute papillae. Pseudoparaphyses cellular, 2 µm wide. Asci cylindric-clavate, up to 120 X 12 µm. Ascospores ellipsoid-fusoid, 1-3-septate, hyaline, becoming golden, 25-33 X 4-5 µm.

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SOME NEW SPECIES AND NEW RECORDS OF DISCOMYCETES IN CHINA

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SUMMARY

Seven new species of Discomycetes are recorded from China: **Arachnopeziza subnuda**, **Coccomyces mucronatus** (also reported here from Indonesia), **Coccomyces sichuanensis**, **Gyromitra sichuanensis**, **Lambertella rubi**, **Psilachnum microallantosporum**, and **Trichophaea geoporoides**. Attention is drawn to eight probable new species in **Calycellina**, **Coprotus**, **Geopora**, **Hymenoscyphus**, **Moellerodiscus**, **Pachyella**, and **Plectania** (in sect. **Plectania** and in sect. **Sphaerosporae**). Forty-two species and infraspecific taxa previously described are reported for the first time from China, including **Lachnum flavidulum**, **L. tenuissimum**, and **Hymenoscyphus scutula** var. **solani**, all new combinations. **Otidea purpurea**, **Lachnum javanicum**, and **Lanzia serotina** are proposed as new combinations for the previously reported **Acetabula purpurea**, **Erinella javanica**, and **Helotium serotinum**. Two species previously reported from China, **Mollisia viridulo-mellea** and **Erinella sinensis**, are reported here as later synonyms of **Chlorosplenium chlora** and **Lachnum abnormis**, respectively. The reports of **Orbilia sinuosa** from China are based on a specimen of **Bisporella discedens**. One extralimital species (from Switzerland), **Calycellina triseptata**, is transferred as **Parachnopeziza triseptata**.

Early records of the Discomycetes of China date back to the end of the 19th century. Later, some pathogenic cup-fungi, as well as a few larger saprophytic species, were reported (Tai, **1979**), particularly in such genera as **Sclerotinia**, **Morchella**, and **Mitrula**. Though many specimens were collected after 1930, most of the taxonomic work was done by only a few mycologists, e.g., Ou (**1936**), Tai (**1944**), and Teng (**1939**, **1964**). A total of 78 genera and 290 species and varieties of Discomycetes were listed in Tai's (**1979**) Sylloge Fungorum Sinicorum. More records have been added recently (Liou and Chen, **1977a**, **b**; Zang, **1979**; Wang and Zang, **1983**; Korf and Zhuang, **1984**). Seven new species, eight probable new species, and forty-two new records for China are reported here.

As part of a study of the fungal flora of China we have collected over 200 Discomycete specimens in Beijing and in Sichuan Province in the summers of 1981 (R.P.K.) and 1982 and 1983 (W.-y. Z.). Beijing is in the northern part of China, and was dry in those periods. Sichuan lies in southwest China, and the places where we collected are temperate, with a mild climate, high humidity, and altitudes ranging from 750 to 1200 meters. In order to clarify some misapplied names, some of the Chinese collections, primarily from the 1930's, which had been transferred to the Cornell University Plant Pathology Herbarium (CUP) during World War II were reexamined. The studies reported here are thus based primarily on our own collections (in CUP-CH and HMAS) and those at Cornell (CUP-CH), and several additional collections kindly sent to us by Professor Mu Zang, from Kunming (HKAS).

The species reported here are presented in four lists, in general following the classifications by Korf (**1972**, **1973**): (**1**) new or provisional new species, (**2**) old species and infraspecific taxa new to the Chinese flora, (**3**) some species previously recorded from China for which name changes are necessary, and (**4**) taxa previously recorded from China, but new to Sichuan Province. Herbarium accession numbers in CUP, HKAS, and HMAS are provided, with full data for new taxa.

NEW OR PROVISIONAL NEW SPECIES

1. ARACHNOPEZIZA SUBNUDA Korf & Zhuang, **sp. nov.**

Fig. 1

A. ***nudae*** *similis sed sporae semper ferme 1-septatae modo, fusoideae vel leviter curvatae vel latere uno com-*

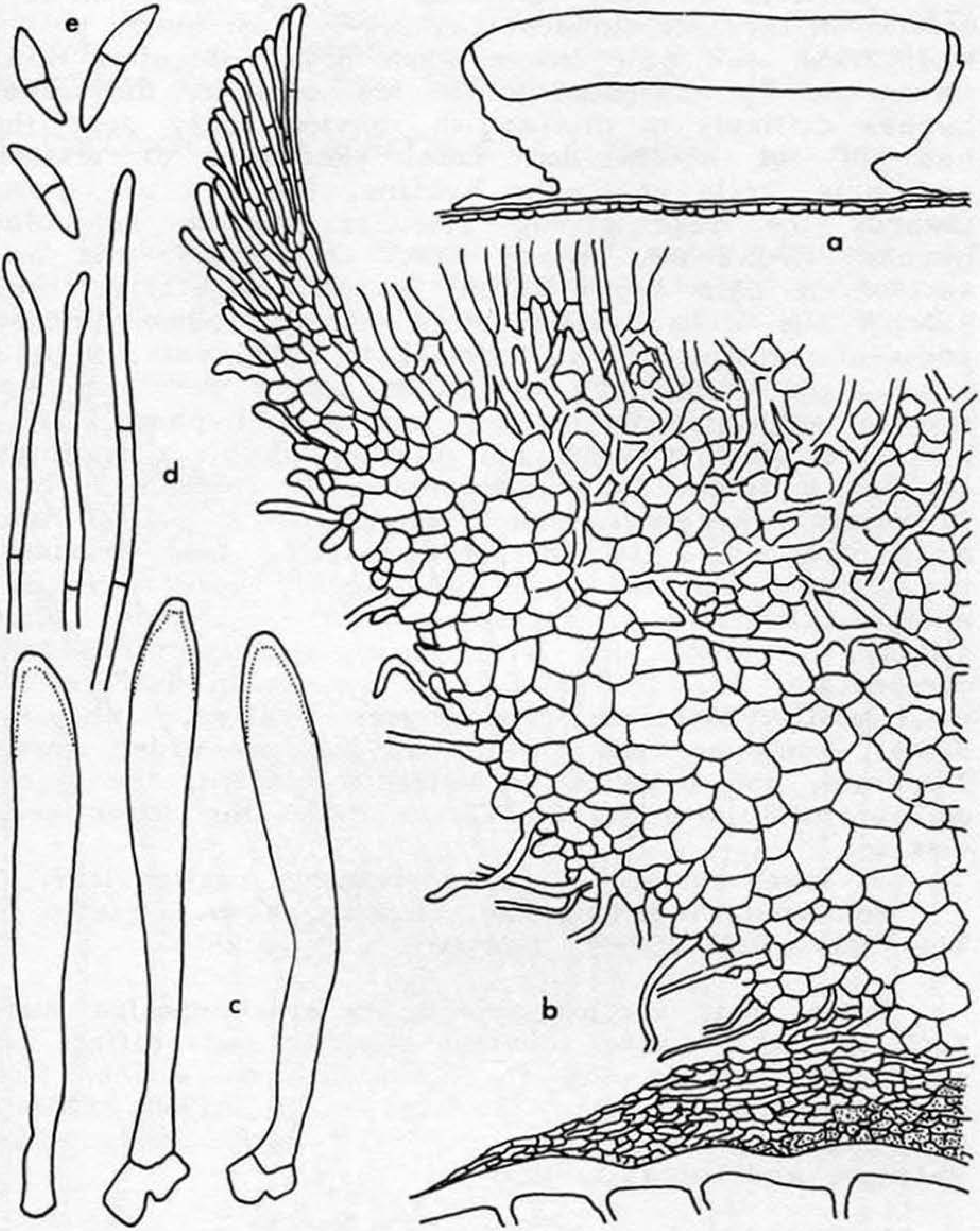


FIG. 1. **Arachnopeziza subnuda** (holotype). **a**, shape of apothecium, x 100; **b**, structure of apothecium, x 650; **c**, asci; **d**, paraphysis apices; **e**, ascospores. **c-e**, x 1000.

planatae, breviores angustioresque, 11.7-16.8 x 2.2-3.3 µm. pili similiter rara sed angustiores, 9-20 x 1.5-2.2 µm, in foliis defluxis reperta.

Apothecia discoid, scattered or gregarious, broadly sessile on the leaf surface, ca. 0.4-0.5 mm diam, yellow when fresh and pale brown when dry. **Subiculum** thin, white, closely appressed to the leaf surface, individual hyphae difficult to distinguish, obvious only near the base of the apothecium. **Ectal excipulum** of textura angularis, cells at flanks hyaline, 5.5-10.0 µm diam, towards the base giving rise to hyaline subicular hyphae 1.5-2.2 µm broad; basal cells above the leaf surface of pale brown-walled textura angularis, cells 3.0-4.5 µm diam. **Hairs** often absent, when present non-septate, apically cylindrical to subclavate, 9-20 x 1.5-2.2 µm. **Medullary excipulum** poorly developed, of textura angularis to textura intricata, hyphae 1.5-3.0 µm wide. **Subhymenium** not distinguishable. **Hymenium** ca. 70 µm thick. **Asci** inoperculate, J+ (pore wall blue in Melzer's Reagent), subclavate, 59-70 x 7.1-8.0 µm, mean 63.4 x 7.4 µm, 8-spored, arising from croziers, the ultimate cell of which only rarely fuses with the antepenultimate cell. **Ascospores** hyaline, fusoid, often slightly curved or with one surface flattened, one-septate, 11.7-16.8 x 2.2-3.3 µm, mean 14.8 x 2.7 µm, mostly biseriate. **Paraphyses** hyaline, subcylindrical, more or less rigid, ca. 2.2 µm wide, mostly 2-septate, golden-yellow in Melzer's Reagent, the apical cell staining strongly in Cotton Blue, the lower cells less so.

On lower surface of an undetermined, fallen leaf.

Holotype: Qingchengshan, Sichuan, W.-y. Zhuang, 6. VII. 1983 (HMAS 45091). **Isotype:** (CUP-CH 2510).

Notes: This species approaches **Arachnopeziza nuda** Korf in not having obvious hairs, but differs in microscopic details and its occurrence on a leaf from other described species (Batista et al., **1960**; Batista and Bezerra, **1961**; Dennis, **1961**; Korf, **1952**, **1959**; Malençon and Bertault, **1958**.)

2. CALYCELLINA (sp. nov.?)

We are unable to name a species with 3-septate ascospores collected by the senior author in Sichuan on a fern rachis (CUP-CH 2434). With some hesitation we refer this to **Calycellina** (see Lowen and Dumont, **1984**). We have examined the type specimen on deposit at ZT of **C. triseptata** Raschle (**1978**), described from Switzerland on fern rachises, but that is quite different and is clearly a member of the Arachnopezizoideae (Korf, **1978**).

It is transferred here as **PARACHNOPEZIZA TRISEPTATA** (Raschle) Korf, **comb. nov.**, (basionym: **Calycellina triseptata** Raschle, Nova Hedwigia **30**: 667. 1978.)

3. **COCCOMYCES MUCRONATUS** Korf & Zhuang, **sp. nov.**

Fig. 2

Ab ***Coccomycetis*** *speciebus aliis polygonalibus vel subcircularibus forma paraphysium non-septatarum in gelatinam agglutinatarum et epithecium 20-25 µm crassum*

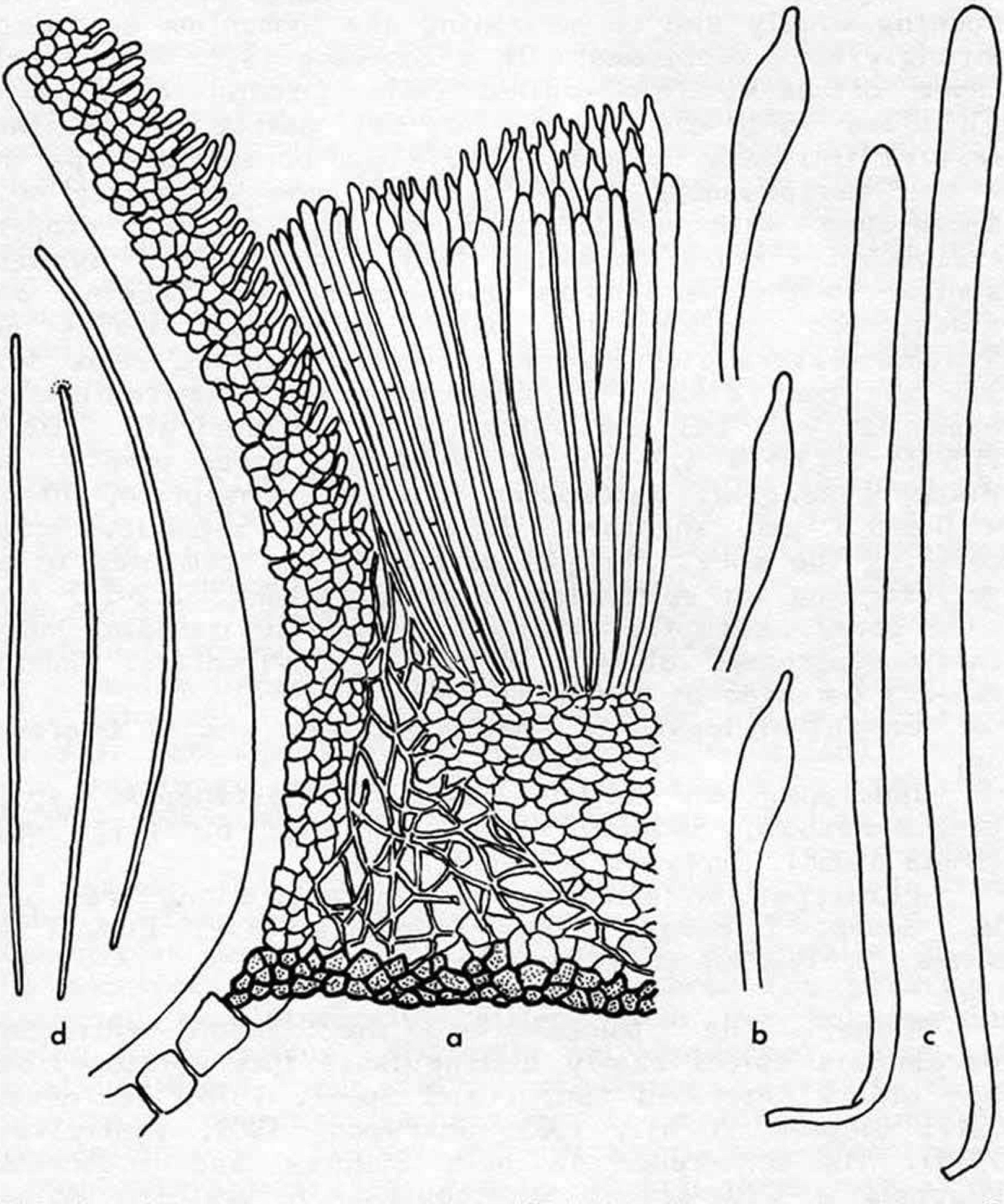


FIG. 2. **Coccomyces mucronatus** (holotype). **a**, structure of apothecium, x 400; **b**, paraphysis apices; **c**, asci; **d**, ascospores. **b-d**, x 1000.

formantium facile distinguendus, paraphysibus singulis superne ad 4.5-6.0 µm abrupte incrassatis et subfusoideo-ventricosis, ad apicem mucrone subcylindrico 1.6-2.0 µm lato praeditis.

Ascostromata produced separately on the leaf, epiphyllous (holotype) or hypophyllous (paratype), intraepidermal, polygonal to subcircular, 1.0-1.5 mm diam when dry, opening by 5-8 teeth to expose the lemon-yellow hymenium, the hymenium remaining luteus and exposed after drying, on rehydration the teeth opening widely and on sectioning the hymenium becoming strongly convex. **Stroma** with a covering layer and basal layer of dark, thick-walled cells forming a textura globulosa 15-20 µm thick, internal matrix of hyaline textura intricata, hyphae 1.1-1.5 µm broad, perhaps in a gel; **periphysoids** short, hyaline, one- or few-celled. **Apothecium** with a hyaline or light-colored proper exciple of textura porrecta, 15-35 µm wide, of hyphae similar to the paraphyses but septate and lacking an apical prolongation; the basal apothecial tissues of hyaline textura globulosa to textura angularis, cells ca. 3.5-7.5 µm diam; subhymenium not differentiated; hymenium ca. 155 µm thick. **Asci** cylindrical, (102-) 110-117 (-130) x 4.3-5.0 µm, 8-spored, ascus pore J- in Melzer's Reagent. **Ascospores** filiform, nonseptate, 70-84 x 0.6-0.8 µm, sheathed, some with a refractive cap covering the apex. **Paraphyses** nonseptate, cemented in a gel, forming an epithecium 20-25 µm thick, 2.2-2.7 µm wide below, abruptly enlarged to 4.5-6.0 µm and subfusoid-ventricose above, with a subcylindrical mucro 1.6-2.0 µm wide at the apex.

On fallen leaves of **Castanopsis** sp. and of **Quercus** sp.

Holotype: On fallen leaf of **Castanopsis** sp., Qingchengshan, Sichuan, W.-y. Zhuang, 6. VII. 1983 (HMAS 45058). **Isotype:** (CUP-CH 2484).

Paratype: On fallen leaf of **Quercus**, Along trail up Mt. Gedeh, Tjibodas, Java, Indonesia, K.P. Dumont & Nurta, 5. I. 1967 (CUP-SA 3030).

Notes: The mucro on the fusoid-ventricose paraphysis apices easily distinguishes this species from any others described (Butin and Speer, **1978**; Dearness, **1917**; DiCosmo et al., **1983**; Sherwood, **1980**; Vasilyeva, **1979**). Its occurrence in both Sichuan and Indonesia suggests a wide-spread distribution in southern Asia, where it should be sought on Fagaceae.

4. COCCOMYCES SICHUANENSIS Korf & Zhuang, **sp. nov.**

Fig. 3

Ab ***Coccomycetis*** *speciebus aliis triangularibus vel tetragonis (e.g.,* ***C. delta*** *et* ***C. spegazzini****) ascis et ascosporis brevioribus angustioribusque et paraphysibus plerumque trifurcatis septatis filiformibus apice aliquantum tumentibus distinguendus.*

Ascostromata scattered in discolored areas of the leaf bounded with a black line, epiphyllous, subepidermal or possibly intraepidermal, triangular to tetragonous, exposing the greenish-gray hymenium when dry, 0.3-0.4 mm diam. **Stroma** with a covering layer and basal layer of dark, thick-walled cells, 10-20 (-24) µm thick, epidermal cells in covering layer often filled with dark fungal cells so that the stroma may appear to be subcuticular, with an internal matrix of compressed, hyaline textura angularis 12-15 µm thick. **Apothecium** lacking a proper exciple; hymenium hyaline, ca. 120 µm thick; subhymenium 9-12 µm thick, bounded below by a thin layer one or two cells thick of brown-walled hyphae running parallel to the leaf surface, below which is the stromal matrix. **Asci** cylindrical, 80-100 x 5.0-5.5 µm, 8-spored, ascus pore J- in Melzer's Reagent. **Ascospores** filiform, nonseptate, 65-80 x 0.8 µm, sheathed. **Paraphyses** filiform, septate, mostly trifurcately branched, somewhat swollen at the apices.

On the upper surface of a fallen leaf of ? **Ficus** sp.

Holotype: Qingchengshang, Sichuan, W.-y. Zhuang, 7. VII. 1983 (HMAS 45059). **Isotype:** (CUP-CH 2485).

Paratype: Qingchengshang, Sichuan, W.-y. Zhuang, 7. VII. 1983 (HMAS 45060). **Isoparatype:** (CUP-CH 2486).

Notes: This species is easily distinguished from other triangular to tetragonous species such as **Coccomyces delta** (Kunze) Sacc. and C. **spegazzinii** Sacc. by ascospore and paraphysis characters. The paratype, collected simultaneously, differs from the holotype in being hypophyllous, distinctly intraepidermal, somewhat smaller (0.2-0.3 mm diam), remaining closed (with a preformed opening mechanism) at maturity, and in possession of simple or occasionally dichotomous paraphysis apices (Fig. 3 e-g). Though these may eventually prove to be distinct taxa, we treat them both as conspecific for the time being.

5. COPROTUS (n. sp.?)

A collection on cow dung from Kiangsu (CUP-CH 257) identified as **Ascophanus granulatus** (Bull. : Fr.) Speg. appears to be a new species, not identifiable in the treatment by Kimbrough et al. (1972).

6. GEOPORA (n. sp.?)

We have been unable to place a species name on three collections (HMAS 45047, 45048, 45049) on soil made by the junior author at the Summer Palace, Beijing. These may represent one or more new species, but without the desperately needed monograph of **Geopora** we cannot go further.

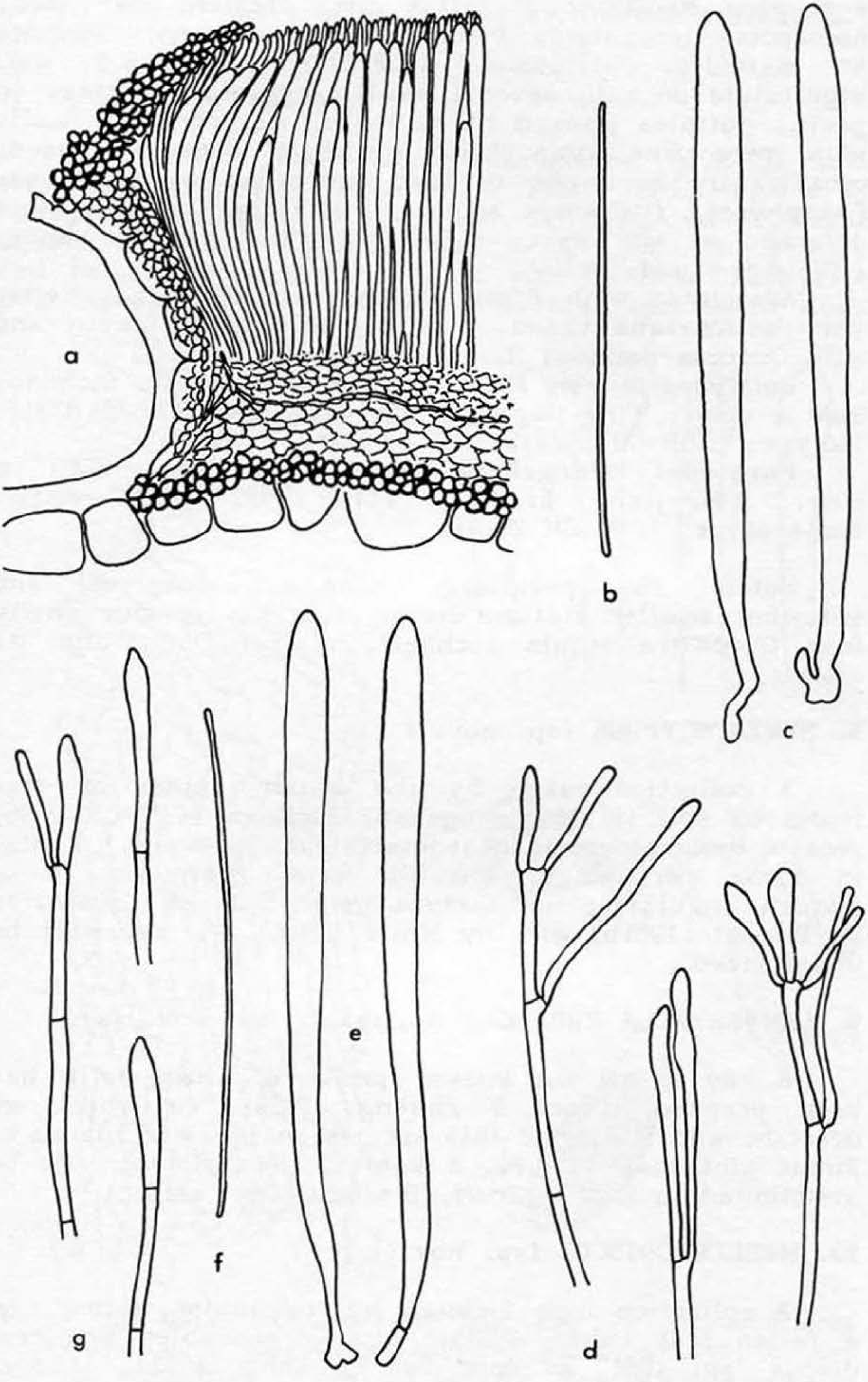
7. GYROMITRA SICHUANENSIS Korf & Zhuang, sp. nov.

Fig. 4

Ascocarpia morphologia grossa eis ***G. infulae*** *similia, sed ascosporae biguttulatae (vel harum juventute guttulis pluribus irregularibus, maturitate velatis) 16.8-20.2 x 7.0-8.3 µm notis obsitae subtilissimis aliquando tam ordinatis ut aggregationes cristoideas forment.*

Ascocarp up to 6.5 cm diam when dry, hymenium dark sienna to umber, lower surface of pileus straw-colored, pileus lobed to saddle-shaped with free, often overlapping margins; stipe cylindrical, straw-colored, up to 3.5 cm high and 1.0 cm broad when dry. **Ectal excipulum** of textura intricata, hyphae hyaline, somewhat perpendicular to the outer surface of the pileus, fairly thick-walled and slightly refractive. **Medullary excipulum** of textura intricata, hyphae variable in diam, ectal and medullary excipula almost indistinguishable except near the margin. **Subhymenium** not sharply differentiated, though hyphae are more cyanophilic. **Asci** 8-spored, cylindrical, apex J- in Melzer's

FIG. 3. **Coccomyces sichuanensis. a-d,** holotype; **e-g,** paratype. **a,** structure of apothecium, x 400; **b,** ascospore; **c,** asci; **d,** paraphysis apices; **e,** asci; **f,** ascospore; **g,** paraphysis apices. **b-g,** x 1000.


a
b
c
d
e
f
g

Reagent, 180-190 x 11.7-14.5 µm, croziers not seen. **Ascospores** irregularly biseriate when young, uniseriate at maturity, ellipsoid, 16.8-20.2 x 7.0-8.3 µm, biguttulate or with several small, irregular guttules in youth, guttules masked at maturity, mature spore walls with very fine cyanophilic markings densely placed, occasionally arranged to form crest-like aggregations. **Paraphyses** filiform, septate, slightly swollen and deformed at the apex, 4.5-6.5 µm wide at the apex, 4.0-5.8 µm wide below.

Associated with **Picea likiangensis** (Franch.) Pritz. var. **balfouriana** (Rehd. & Wils.) Hillier ex Slavin and with **Quercus pannosa** Hand.-Mazz.

Holotype: Wugen Mts., Xiangchen County, Sichuan, 3600 m elev., Xing-jiang Li, 12. VIII. 1981 (HKAS 8331). **Isotype:** (CUP-CH 2522).

Paratype: Xiangcheng County, Sichuan, 3500 m elev., Xing-jiang Li, 12. VIII. 1981 (HKAS 8605). **Isoparatype:** (CUP-CH 2523).

Notes: The peculiarly marked ascospores and somewhat smaller stature distinguish this species easily from **Gyromitra infula** (Schaeff. : Fr.) Quél. and its allies.

8. HYMENOSCYPHUS (sp. nov.?)

A collection taken by the senior author on tree fruits on soil in Qingchengshan, Sichuan (CUP-CH 2396) recalls **Hymenoscyphus dearnessii** (Ell. & Everh.) Kuntze in spore morphology, but the ectal excipulum is of textura angularis, not textura prismatica as illustrated by Dumont (**1981b**) and by White (**1944**). It may well be undescribed.

9. LAMBERTELLA RUBI Korf & Zhuang, sp. nov. ined.

A key to all the known species of **Lambertella** has been prepared (Korf & Zhuang, **1985**), in which we describe and illustrate this species on the leaf blades of **Rubus pinfaensis** H. Lév. & Vaniot. The holotype will be distributed in Korf & Gruff, Discomycetes Exsiccati.

10. MOELLERODISCUS (sp. nov.?)

A collection from Sichuan by the junior author, on a fallen leaf (HMAS 45083), closely resembles **Moellerodiscus** "sp. 1881" as described by Kohn (**1982**). It does not fit any of the species treated by Dumont (**1976a**, b), or Kohn (**1982**).

11. PACHYELLA (sp. nov.?)

A collection from Yen-hsien, Hainan (CUP-CH 322) served as the basis for Teng's (**1934**, **1939**) reports of **Psilopezia aquatica** (DC.) Rehm. We consulted Professor Donald H. Pfister, Farlow Herbarium, on its identity and he indicates that it is a species near **Pachyella punctispora** Pfister. It differs from that species in much

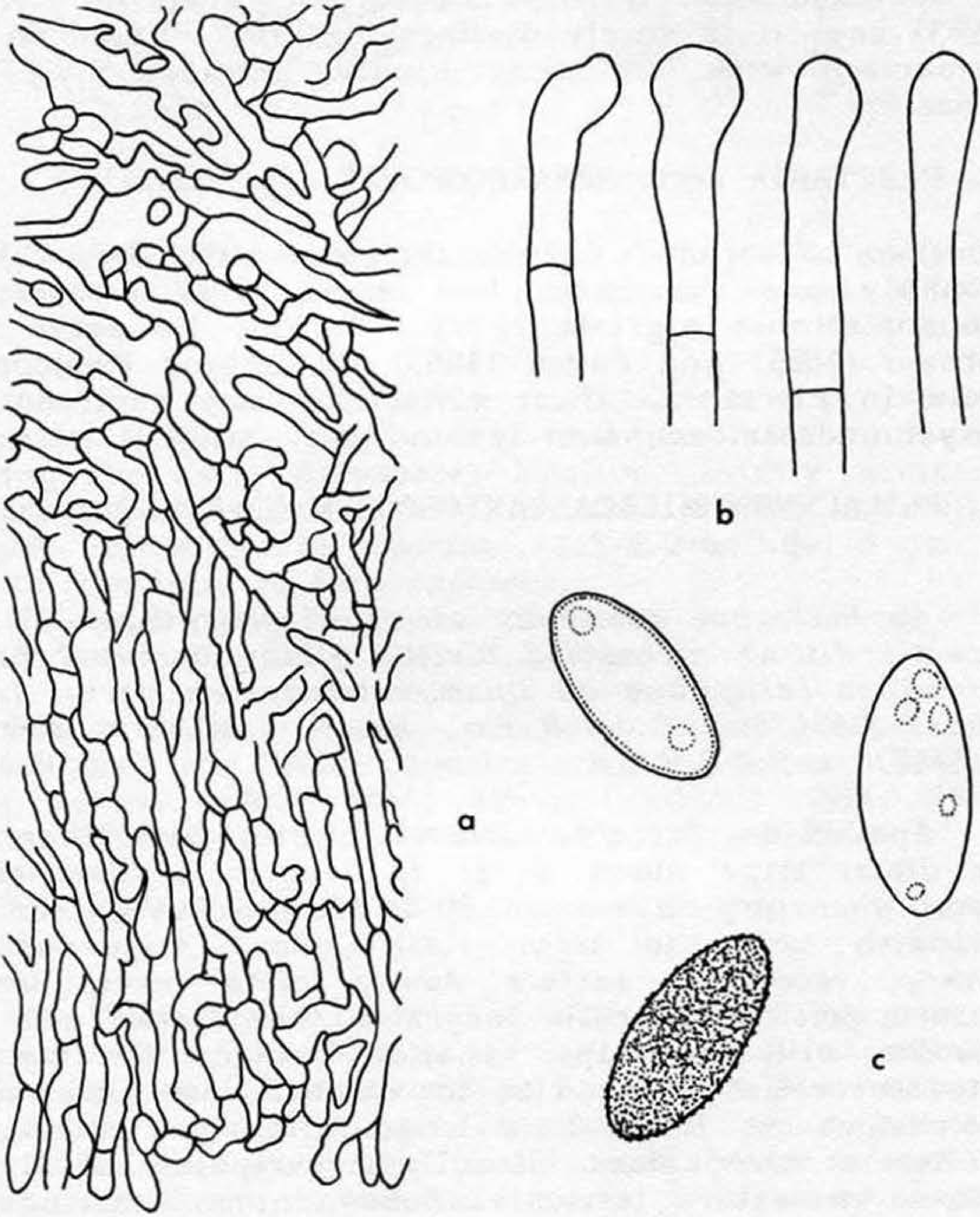


FIG. 4. **Gyromitra sichuanensis** (holotype). **a**, structure of the excipulum, x 400; **b**, paraphysis apices, x 1000; **c**, two immature ascospores in optical section, one mature ascospore in surface view, x 1500.

smaller apothecia (dry 2.8 mm vs 10 mm), slightly smaller spores, and slightly larger markings, and also does not seem to fit any of the other species described by Pfister (1973, 1976a) or Pfister and Candoussau (1981).

12. PLECTANIA sect. PLECTANIA (sp. nov.?)

An old collection from Yunnan (CUP-CH 938) identified as **Bulgaria melastoma** (Sow.) Seav. is clearly a species of **Plectania** sect. **Plectania.** Though it keys to **P. mexicana** (Ell. & Holw. in Holw.) Paden in Paden's (1983) key, it is surely distinct from that, based on our comparison with specimens kindly provided by Prof. Paden.

13. PLECTANIA sect. SPHAEROSPORAE (sp. nov.?)

Two collections, CUP-CH 1611 and 1662, from Sikang probably are the basis for Teng's (1939) report of **Pseudoplectania nigrella** (Pers.) Fuckel. We agree with Karsten (1885) and Paden (1983) in merging **Pseudoplectania** in **Plectania.** These collections may represent an as yet undescribed Asian taxon.

14. PSILACHNUM MICROALLANTOSPORUM Korf & Zhuang, sp. nov. Fig. 5

*Ab **Psilachni** speciebus aliis in rhachidibus filicum repertis differt ascosporis leviter allantoideis vel bacilliformibus (aliquibus ad unam extremitatem parum latioribus) 3.5-4.0 x 0.8-1.0 µm, in ascis minutis 8-sporis 23.5-28.0 x 3.0-3.7 µm.*

Apothecium discoid, short-stipitate, less than 0.5 mm diam, stipe about equal in length to diameter of disc, when dry hymenium and receptacle concolorous, yellowish beige to light flesh color, stipe usually darker, receptacle surface downy. **Ectal excipulum** of textura prismatica, cells largest at the flanks near the junction with the stipe, smaller towards the margin, outermost cells giving rise to smooth, hair-like hyphal protrusions ca. 7.5-14.0 µm long, cylindrical or slightly swollen at the apices. **Medullary excipulum** of tightly interwoven textura intricata. **Subhymenium** indistinguishable from the medullary excipulum. **Hymenium** ca. 27 µm thick. **Asci** clavate, inoperculate, J+ (pore wall blue in Melzer's Reagent), 8-spored, 23.5-28.0 x 3.0-3.7 µm. **Pa-**

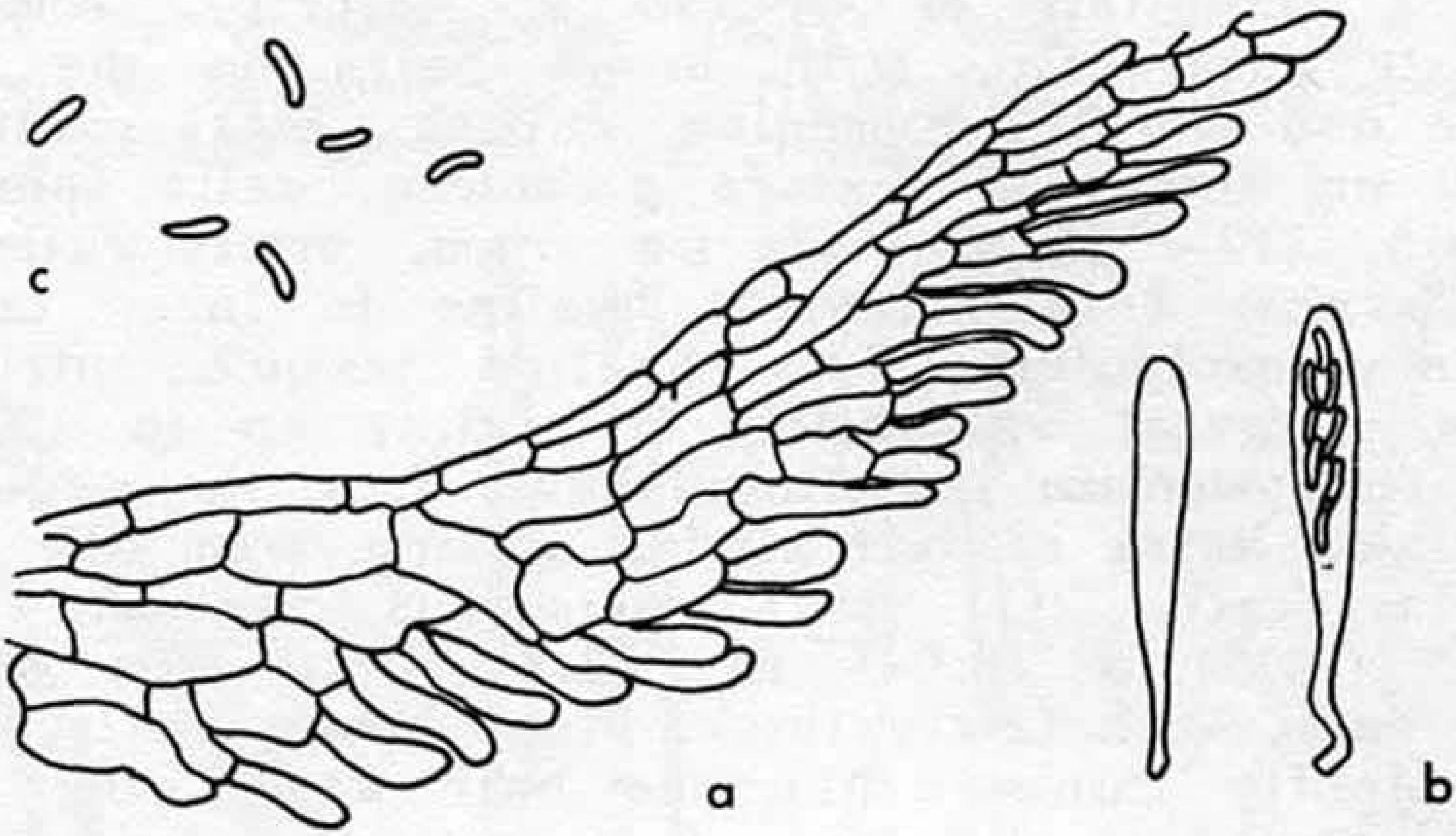


FIG. 5. **Psilachnum microallantosporum** (holotype). **a**, structure of ectal excipulum; **b**, asci; **c**, ascospores. All x 1000.

raphyses filiform, simple, ca. 1.0 µm wide, not exceeding the asci. **Ascospores** hyaline, faintly allantoid to rod-shaped, some slightly broader at one end, nonseptate, uniseriate to biseriate, 3.5-4.0 x 0.8-1.0 µm.

On the base of fern rachises.

Holotype: Qingchengshan, Sichuan, R.-y. Zheng & R. P. Korf, 19. IX. 1981 (CUP-CH 2430).

Notes: The spore shape distinguishes this **Psilachnum** from other species of the genus (Bøhler, 1974; Dennis, 1962, 1963, 1964; Graddon, 1974, 1977; Müller, 1967; Raitviir, 1970; Svrček, 1977, 1979).

15. TRICHOPHAEA GEOPOROIDES Korf & Zhuang, **sp. nov.** Fig. 6

Ab ***Trichophaeae*** *speciebus aliis differt margine et lateribus setis laevibus et ad apicem pustulae excipularis saepe confertis praeditis, basi pilis plus minusve cylindricis saepe flexuosis longitudinem secus granulis incrustatis sed ad apicem et ad imam basem plerumque laevibus praedita, atque ascosporis ellipsoideis biguttulatis 18.3-22.7 x 8.8-12.0 µm non bullas ab nomine DeBary appellatas formantibus, in hoc charactere speciebus generis* ***Geoporae*** *similis.*

Apothecia ca. 4-6 mm diam, at first concave, becoming scutellate or discoid at maturity, somewhat pustulate externally, with brown hairs on the lower surface and margin; hymenium whitish. **Ectal excipulum** 100-150 µm thick, of textura globulosa, cells spherical to ovoid, (12-) 25-38 (-47) µm diam, brown-walled in the outermost 2 to 5 layers, hyaline in inner layers. **Medullary excipulum** of a hyaline textura intricata, hyphae of great variability in width, up to 150 µm thick. **Subhymenium** indistinguishable from the medullary excipulum. **Hairs** of two kinds, arising from the ectal excipular cells: (1) stiff, setaceous, smooth, (55-) 200-270 (-338) x (8.0-) 10.0-12.5 (-15.0) µm at the widest part, with fairly thick, light brown walls, septa only slightly thinner than the hair walls, the hairs often clustered at the apex of an excipular pustule and produced at the margin and flanks, and (2) often flexuous, more or less cylindrical, granularly encrusted along their length except at the very base and often also smooth at the apex, 213-750 x 5.0-8.0 µm, thinner-walled, light brown-walled, septa very thin, these hairs produced mainly at the base where they enmesh soil particles, fewer on the flanks where interspersed with setaceous hairs. **Asci** operculate, cylindrical, (170-) 200-225 (-250) x 13-15 µm, J- (apex not blue in Melzer's Reagent). **Ascospores** ellipsoid, appearing smooth-walled, with a strongly cyanophilic inner wall layer, eventually with small, very faint, cyanophilic markings at the limit of resolution under oil immersion, usually biguttulate in youth, sometimes with more than 2 guttules, often with a single, irregular guttule at maturity, 18.3-22.7 x 8.8-12.0 µm, thin-walled, not forming de Bary bubbles. **Paraphyses** filiform, 2.8-3.2 µm wide, about as long as the asci, slightly swollen or deformed at the apices, septate.

On soil.

Holotype: Summer Palace, Beijing, W. Tang & W.-y. Zhuang, 30. VIII. 1982 (HMAS 45044). **Isotype:** (CUP-CH 2471).

Notes: This species is is some ways intermediate between **Trichophaea** and **Geopora**. The smooth-walled setaceous hairs at the margin and flanks would be typical of **Trichophaea**, but no de Bary bubbles form in the ascospores. Granularly roughened basal hairs enmeshing soil particles fit **Geopora**, but no species we know also has smooth-walled, setaceous hairs. Rather than erect a new genus for this fungus, we describe it in **Trichophaea** until cultural studies demonstrate it cannot be accommodated there. None of the species treated by Kanouse (1958), Pfister (1982), and others we have searched combine such characters.

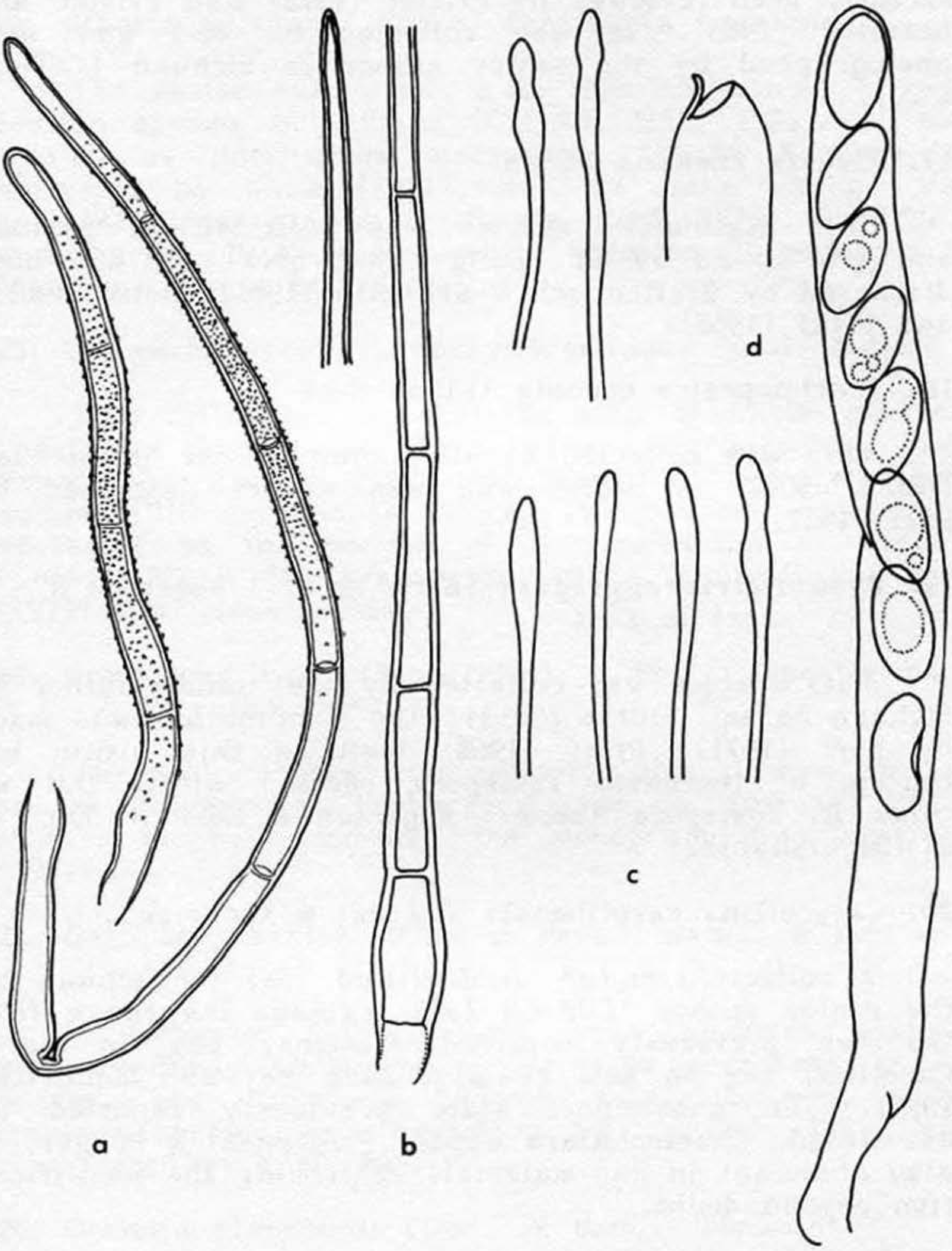


FIG. 6. **Trichophaea geoporoides** (holotype). **a**, granulate basal hairs; **b**, basal and apical part of seta; **c**, paraphysis apices; **d**, ascus apex showing operculum, and ascus containing ascospores. All x 650.

16. **Acervus epispartius** (Berk. & Br.) Pfister

The distribution of this interesting fungus has recently been reviewed by Pfister (1975) and Pfister and Bessette (1985). It was collected on soil and also photographed by the senior author in Sichuan (CUP-CH 2320).

17. **Aleuria rhenana** Fuckel

This distinctive species was collected in Sichuan and sent to us by Dr. Zang (HKAS 8644). It has been discussed by Breitenbach & Kränzlin (1981), Heim (1961), and Rifai (1968).

18. **Arachnopeziza cornuta** (Ellis) Korf

This was collected by the junior author in Sichuan (HMAS 45062) on wood, and was earlier described by Korf (1952).

19. **Byssonectria aggregata** (Berk. & Br.) Rogerson & Korf in Korf

This species was collected by the junior author in Sichuan on soil (HMAS 45053). The combination was made by Korf (1971). Rifai (1968) included this within his concept of **Inermisia fusispora** (Berk.) Rifai, but we think **B. fusispora** (Berk.) Rogerson & Korf in Korf is distinguishable.

20. **Calycellina carolinensis** Nag Raj & Kendrick

A collection on an unidentified leaf in Sichuan by the senior author (CUP-CH 2383) extends the range from the two previously reported stations, one in North Carolina, one in New Zealand (Nag Raj and Kendrick, 1975). The anamorphic state previously reported as associated, **Chaetochalara aspera** Pirozynski & Hodges, is also abundant in our material, confirming the identification beyond doubt.

21. **Calycellina** cfr. **minuta** Thind & Sharma

One of the senior author's collections on fern pinnae from Sichuan (CUP-CH 2429) we have tentatively identified as this species, originally described from India. We have not seen the type specimen of Thind and Sharma's (1980) species, nor apparently have Lowen and Dumont (1984).

22. **Ciboria peckiana** (Cooke) Korf forma **peckiana**

The senior author has made two collections of this common species in Sichuan (CUP-CH 2332, 2374). It was treated as **Rutstroemia macrospora** (Peck) Kanouse in Wehmeyer by White (1941), but the name change was necessary when placed in **Ciboria** (Korf, 1971). Arendholz and Sharma (1984) have recently reported **C. peckiana** f. **gigaspora** (Korf) Korf from India.

23. **Claussenomyces** cfr. **dacrymycetoideus** Ouell. & Korf

This collection, on a living twig of **Larix gmelinii** Ledeb. ex Gordon was collected in Daxinganling, Neimenggu by Jian-yu Yun, and identified by the senior author while he was in Beijing. We can no longer find apothecia on the portion of the collection at Cornell (CUP-CH 2293). This was described by Ouellette and Korf (1979) from Macaronesia.

24. **Crocicreas cyathoideum** (Bull. : Fr.) Carpenter var. **cyathoideum**

The junior author has collected this common species on an unidentified herbaceous stem in Sichuan (HMAS 45064). We have followed the monograph by Carpenter (1981).

25. **Galiella javanica** (Rehm in Henn.) Nannf. & Korf in Korf

A collection (CUP-CH 630) from Tan-hsien, Hainan was originally identified as **Bulgaria melastoma** (Sow.) Seaver, but proves to be this fairly common, Asian tropical species well described by Le Gal (1953) and transferred by Korf (1957).

26. **Greletia planchonis** (Dun. ex Boud.) Donadini

The junior author collected this species on soil in Sichuan (HMAS 45038). It has been placed in various genera, including **Plicaria.** We accept **Greletia** as distinct from **Marcelleina** (= **Pulparia** sensu Korf, et al., non sensu Karsten). For treatments see Boudier (1905–1911), Donadini (1976, 1979), Korf (1971), and Rifai (1968).

27. **Hymenoscyphus eburneus** (Rob.) Phill.

The senior author's collection from Sichuan on basal culms of living clumps of a large grass (CUP-CH 2349) fits the description in Dennis (1956) well.

28. **Hymenoscyphus sclerogenus** (Berk. & Curt. in Berk.) Dennis

Two collections by the junior author from Sichuan, on stems of **Rubus** and on a herbaceous stem (HMAS 45092, 45093) are referable to this common tropical species as interpreted by Dennis (1962), by Dumont (1981a, 1981b), and Dumont and Carpenter (1982).

29. **HYMENOSCYPHUS SCUTULA** (Pers. : Fr.) Phill. var. **SOLANI** (Karst.) Korf & Zhuang, **comb. nov.**

Basionym: **Helotium scutula** (Pers. : Fr.) Karst. [var.] *** **solani** Karst., Not. Sällsk. Fauna Fl. Fenn. Förh. **11**: 234. 1870.

Collected in Sichuan by the senior author on unidentified stems and on stems of **Polygonum cuspidatum** Sieb. & Zucc. (CUP-CH 2388, 2413). The treatment in Dennis (1956) is followed here.

30. **Jafneadelphus ferrugineus** (Phill. in Cooke) Rifai subsp. **imaii** (Korf) Rifai

Both of us collected this subspecies on soil in Sichuan, thus extending its known distribution from Japan (CUP-CH 2333, 2372, 2403, HMAS 45039, 45040, and probably several other collections which are not mature). A submonographic study of this genus is in preparation in our laboratory. For our purposes here, we follow the treatment by Rifai (1968). This taxon was given species rank originally, in **Jafnea** (Korf, 1960).

31. **Lachnum ciliare** (Schrad. : Fr.) Rehm

The senior author collected this on a leaf blade in Sichuan (CUP-CH 2437). Dennis (1949) has a good description.

32. **LACHNUM FLAVIDULUM** (Rehm) Haines, **comb. nov.**, var. **FLAVIDULUM**

Basionym: **Dasyscyphus flavidulus** Rehm ('Dasyscypha flavidula'), Ann. Mycol. 7: 542. 1909.

Previously reported from the Neotropics, Hawaii, New Guinea and New Zealand as **Dasyscyphus varians** Rehm var. **varians** (Haines, 1980), an earlier taxonomic synonym. Since **Lachnum** is now the generic name of choice, the more recent epithet must be adopted to avoid homonymy. We have both collected this common species in Sichuan, on twigs, rachises of **Dicranopteris dichotoma** (Thunb.) Bernh. and unidentified fern rachises (CUP-CH 2414, 2417; HMAS 45063).

33. **Lachnum pygmaeum** (Fr. : Fr.) Bresadola

The junior author's collection from Sichuan is, as is typical of the species, on a root (HMAS 45073). Good descriptions are to be found in Dennis (1949) and White (1942).

34. **LACHNUM TENUISSIMUM** (Quél.) Korf & Zhuang, **comb. nov.**

Basionym: **Peziza tenuissima** Quél., Grevillea 8: 38. 1879.

Two collections on grasses were made by the senior author in Sichuan (CUP-CH 2331, 2340). This was treated in **Dasyscyphus** by Breitenbach and Kränzlin (1981), Dennis (1963) and Raitviir (1970), but is much better known under the name of **D. pudicellus** (Quél.) Sacc. (Dennis, 1949; Luijt-Verheij, 1973).

35. **Lambertella buchwaldii** Tewari & Singh

The junior author's collection on rootlets in Sichuan (HMAS 45080) fits the original description (Tewari and Singh, 1972) fairly well, but we find no mature, brown ascospores in the Chinese specimen, and the margin is not crenate.

36. **Lambertella copticola** Korf & Tewari in Tewari

The senior author's two collections on stromatized leaves from Sichuan differ: in CUP-CH 2360 the inner ectal excipulum and medullary excipulum do not turn blue in Melzer's Reagent, while in CUP-CH 2369 both react strongly. In microscopic features both collections fit **L. copticola** closely, and we are not placing much weight on this character. Dumont (1971) has a good description.

37. **Lambertella corni-maris** Höhnel

The collection by the senior author on the husk of a (tree?) fruit in Sichuan (CUP-CH 2371) seems to match this species well, as delimited by Dumont (1971).

38. **Lambertella zeylanica** Dumont

We are referring three specimens collected by the senior author in Sichuan to this name, though only CUP-CH 2327 on a leaf blade fits well. In CUP-CH 2424 and 2425 from the same area, on obvious line stromata on leaves, the hairs instead of being narrowed and thread-like, are swollen apically with a rounded apex. It is possible they represent a different taxon.

39. **Melastiza rubra** (Batra) Maas Geesteranus

Two collections, CUP-CH 2288 and 2289 (a specimen planned for issue in Discomycetes Exsiccati), were taken on soil along a path in the Beijing area by the senior author. Maas Geesteranus (1967) has a good description.

40. **Micropyxis geoglossi** (Ell. & Everh.) Seeler

This parasite on the hymenium of **Trichoglossum walteri** (Berk.) Durand was collected by the senior author in Sichuan (CUP-CH 2408). For descriptions and comments, see Pfister (1976b) and Seeler (1943).

41. **Nanoscypha pulchra** Denison

The senior author's collection (CUP-CH 2394) on decaying leaves of **Cupressus** in Sichuan extends distribution from Costa Rica, Central America (Denison, 1972).

42. **Orbilia auricolor** (Bloxam ex Berk.) Sacc.

This very characteristic species (Dennis, 1978) was picked up by both of us in Sichuan on a rotted stump and on wood (CUP-CH 2313, HMAS 45087).

43. **Orbilia xanthostigma** (Fr. : Fr.) Fr.

We are using this name in the sense of Svrček (1954) for two collections made on wood in Sichuan by the junior author (HMAS 45084, 45085).

44. **Peziza atrospora** Fuckel

A collection by the junior author on soil in Beijing (HMAS 45033) fits the description and treatment by Maas Geesteranus (1969).

45. **Peziza michelii** (Boud.) Dennis

A collection on soil from Sichuan by the junior author (HMAS 45034) fits the concepts of Dennis (1960), Donadini (1981), and Le Gal (1941).

46. **Peziza subumbrina** Boud. in Cooke

A Sichuan collection on soil taken by the junior author (HMAS 45035) agrees with the treatments by Donadini (1981) and Le Gal (1941).

47. **Peziza succosella** (Le Gal & Romagnesi) Moser

The junior author collected this species on soil in Sichuan (HMAS 45036). Compare Donadini (1981) and Le Gal (1941).

48. **Peziza** cfr. **thozetii** Berk.

There is clearly some confusion about the identity of specimens classified near **P. thozetii** (see Hirsch, 1984; Moravec, 1984; Rifai, 1968), and we cannot reach any definitive name for our material, collected by the senior author on duff of **Chamaecyparis** in Sichuan (CUP-CH 2391).

49. **Pseudopithyella minuscula** (Boud. & Torrend) Seaver

Two collections on leaves of **Biota orientalis** (L.) Endl. (a new substrate) in Beijing by the junior author (HMAS 44074, 44075) extend the range of this easily recognized species with its peculiar ascus apices, well described and illustrated by Seaver (1928, 1942).

50. **Psilachnum** cfr. **chrysostigmum** (Fr. : Fr) Raitviir

A collection on a fern rachis in Sichuan by the senior author (CUP-CH 2419) has smaller spores than described by Bøhler (1974) or by Raitviir (1970).

51. **Scutellinia minutella** Svrček & Moravec

Collected by the junior author in Sichuan on soil (HMAS 45050). See Svrček and Moravec (1969).

52. **Scutellinia subcervorum** Svrček

Another soil collection by the junior author in Sichuan (HMAS 45052). Compare Kullman (1982) and Svrček (1971),

53. **Scutellinia subhirtella** Svrček

A third soil-inhabiting species from Sichuan, collected by the junior author (HMAS 45051). The treatments by Kullman (1982) and Svrček (1971) are useful.

54. **Stictis hydrangeae** Schw.

The collection by the senior author on an unidentified twig in Sichuan (CUP-CH 2379) appears to fit the description by Sherwood (1977), and represents a range extension beyond North America and Europe.

55. **Stictis radiata** Pers.

A collection from Sichuan on an unidentified twig made by the junior author (HMAS 45056) fits the treatments in Johnston (1983) and Sherwood (1977).

56. **Trichoglossum walteri** (Berk.) Durand

This species was collected commonly in Sichuan on soil by the senior author (CUP-CH 2343, 2365, 2397, 2399, 2404, 2407, 2408, 2409). It is somewhat surprizing that it has not been reported before from China (Maas Geesteranus, 1965; Mains, 1954; Tai, 1944), but it may have been reported under some other epithet. Ascocarps parasitized by **Micropyxis geoglossi** were also found (see No. 40 above).

57. **Trichophaea woolhopeia** (Cooke & Phill.) Boud.

The junior author collected this on soil in Sichuan (HAMS 45045). We accept the treatments by Boudier (1905–1911) and Pfister (1982), and place in synonymy **T. bullata** Kanouse (1958).

58. **Unguiculariopsis hysterigena** (Berk. & Br.) Korf

Two collections, both from Ling-shui, Hainan, were found on old collections of **Rhytidhysteron rufulum** (Spreng. : Fr.) Speg. [CUP-CH 259, 857, both as **Tryblidiella rufula** (Spreng.) Sacc.], overlooked by the collectors when collecting the host fungus. The species was originally described from Ceylon (Berkeley and Broome, 1873), and was transferred to **Unguiculariopsis** by Korf (1971). This material clearly matches the type specimen, and represents a major extension of range.

PREVIOUSLY REPORTED SPECIES
FOR WHICH NEW NAMES ARE REQUIRED

59. **Bisporella discedens** (Karst.) Carpenter

Ou (1936) and Teng (1939) reported a collection from Chekiang (CUP-CH 939) as **Orbilia sinuosa** Penz. & Sacc., but our examination of the specimen shows it is clearly the fungus that Carpenter (1975) calls **B. discedens.** The **Cystodendron** anamorph described by Carpenter is present in this material, and the asci are far too large for this to be Penzig and Saccardo's species. Since this collection appears to be the only report of **O. sinuosa** from China, that species should apparently be struck from the records of Chinese fungi. Whether **B. discedens** can really be distinguished from the very common **B. sulfurina** (Quél.) Carp. in Korf & Carpenter (1974) is still open to question, but if not, the Quélet epithet would have priority.

60. **Chlorosplenium chlora** (Schw. : Fr.) Curtis in Sprague

Judging by Teng's identifications (CUP-CH 19, 48, 2169) as cited in Teng (1934) and one of his later collections (CUP-CH 2167), his various reports in the Chinese literature of the occurrence of **Mollisia viridulomellea** Penz. & Sacc. are based on specimens better referred to C. **chlora** as delimited by Dixon (1974). The species appears to be widespread in Asia. Neither Dixon (1974, 1975) nor we have examined Penzig and Saccardo's type specimen to see if it is a later synonym of C. **chlora** or some other fungus. **M. viridulo-mellea** should be struck from the Chinese flora lists as either a later synonym or a misidentification.

61. **Lachnum abnormis** (Mont.) Haines & Dumont

We have examined the isotype specimen of **Erinella sinensis** Teng (CUP-CH 253) and have also consulted with Dr. John Haines, New York State Museum, who agrees with us that Teng's species is a new, later synonym of Montagne's species. The name **E. sinensis** as reported by Teng (1934, 1939) should be dropped from the Chinese flora, and replaced with **L. abnormis** as delimited by Haines and Dumont (1984). We have a number of collections from Sichuan (CUP-CH 2370, HMAS 45065-45072).

62. **LACHNUM JAVANICUM** (Henn. & Nym. in P. Henn.) Haines, Korf, & Zhuang, **comb. nov.**

Basionym: **Erinella javanica** Henn. & Nym. in P. Henn., Monsunia 1: 32. 1899.

Dr. Haines has confirmed our identification of an old collection from Ling-shui, Hainan on wood (CUP-CH 1285) as **E. javanica**, but the necessity to abandon **Erinella** and to adopt **Lachnum** instead requires this name change. It fits Saccardo's (1902) description well.

63. **LANZIA SEROTINA** (Pers. : Fr.) Korf & Zhuang, **comb. nov.**

Basionym: **Peziza serotina** Pers., Syn. Method. Fung. p. 661. 1801; : Fr., Syst. Mycol. 2: 119. 1822.

The senior author has collected this species extensively in Sichuan (CUP-CH 2355, 2366, 2368, 2373, 2378). It has been reported from China as **Helotium serotinum** (Pers. : Fr.) Fr. (Tai, 1979). An important paper on this species is by Dumont and Carpenter (1982), but despite their familiarity with the Sclerotiniacae and with **Lanzia**, they have referred the species to **Hymenoscyphus**, as **H. serotinus** (Pers. : Fr.) Phill. We find the structure of the apothecium to be as they and other authors illustrate, but that not infrequently a very evident stroma is to be found in the host tissue. We conclude that the fungus must be removed from **Hymenoscyphus** and placed in the Sclerotiniaceae. We believe that the recently transferred **Lanzia vacini** (Velen.) Spooner in Kirk & Spooner (**1984**) is merely a collection of **L. serotina** in which Spooner correctly noted the stroma, and that Velenovský's species is probably a later synonym of Persoon's, though we have not examined the Velenovský type.

64. OTIDEA PURPUREA (Zang) Korf & Zhuang, **comb. nov.**

Basionym: **Acetabula purpurea** Zang, Acta Bot. Yunnanica 1: 101. 1979.

The biguttulate ascospores, apically hooked paraphyses (not noted in the original description), and ectal excipulum of textura angularis, coupled with the slightly unequal-sided apothecia, leave no doubt that this species must be referred to **Otidea**, not to **Acetabula** (= **Helvella**). We have examined the type specimen (HKAS 5670) from Xizang (Tibet), kindly communicated by Professor Zang. It appears to be quite distinct from any other species of **Otidea** yet described. The original figure (Zang, **1979**) has been republished in Wang and Zang (**1983**).

PREVIOUSLY REPORTED SPECIES FROM CHINA
NEW TO SICHUAN PROVINCE

65. **Geoglossum umbratile** Sacc.

The senior author's collections (CUP-CH 2402, 2432) show this also to be present in Sichuan.

66. **Lachnum** cfr. **nudipes** (Fuckel) Nannf.

The senior author's collection on a (herbaceous?) stem from Sichuan (CUP-CH 2421) differs from typical material in paraphyses that do not exceed the asci as much as usual, in somewhat shorter ascospores, and in the absence of crystals at the tips of hairs, so often present in **L. nudipes.** We only provisionally identify it, following the treatments of Dennis (**1949**), Liou and Chen (**1977a**), Luijt-Verheij (**1973**), and Raitviir (**1970**).

67. **Lachnum virgineum** (Batsch : Fr.) Karst.

This widespread species is represented by many Sichuan collections (CUP-CH 2310, 2311, 2334, 2336, 2353, 2354, 2363, 2381, 2439; HMAS 45074-45077). In much of the literature this species is placed in **Dasyscypha** or **Dasyscyphus.**

68. **Lanzia rufo-cornea** (Berk. & Br.) Dumont

In much of the literature this common tropical species is referred to as **Helotium subserotinum** P. Henn. & Nym. in Henn., but as Dumont (1980) has shown, the Berkeley and Broome epithet has priority, and this name should replace that in the Chinese floras. We have both collected this discomycete in Sichuan, and these collections extend the distribution to that province (CUP-CH 2303, 2314, 2319, 2328, 2345, 2359, 2386; HMAS 45081).

69. **Leotia lubrica** (Scop. : Fr.) Pers.

The senior author's collections (CUP-CH 2344, 2406) extend the distribution of this exceptionally common fungus to Sichuan.

70. **Trichoglossum hirsutum** (Pers. : Fr.) Boud.

A collection (CUP-CH 2398) by the senior author adds Sichuan to the known distribution of this common species.

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REVUE DES LIVRES

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FUNGI PATHOGENIC FOR HUMANS AND ANIMALS, PART A. BIOLOGY, éd. par D.H. HOWARD et L.F. HOWARD, Mycology Series (P.A. Lemke, éd.) vol. 3A, xiv + 652 p., ill., 4° (18x25 cm), relié cartonné. 1983. Marcel Dekker Inc. Publ., 270 Madison Ave, New York, NY 10016, USA. Prix: US $ 225.-

Cet ouvrage en 3 volumes dont deux sont parus, est conçu d'un point de vue large et approfondi à la fois, de telle manière que le chercheur comme l'étudiant y trouvera la mise à jour de ses connaissances sur les champignons médicalement importants sous tous leurs aspects tant mycologiques que médicaux.

Le premier volume couvre les récentes acquisitions en matière de systématique de classification et de nomenclature des champignons pathogènes, grâce à la contribution de spécialistes de chaque groupe. Dans les mucorales sont passées en revue principalement *Rhizopus, Absidia, Rhizomucor, Mucor* et quelques autres. Des entomophtorales, on retient *Basidiobolus* et *Conidiobolus*. Parmi les Ascomycètes traités, citons les *Ajellomyces, Emmonsialla(Histoplasma), Eurotium, Emericella, Neosartorya, Microascus (Scopulariopsis), Pithoascus, Petriellidium (Allescheria), Leptosphaeria* et *Pierdraia*. Les dermatophytes, traités par D.H. Howard lui-même, sont groupés en pathogènes et en saprophytiques. Lorsqu'il est connu, c'est le nom de téléomorphe qui est utilisé. Treize genres d'hyphomycètes dématiés potentiellement pathogènes sont encore décrits et illustrés, en particulier les *Cladosporium,* les *Exophiala,* les *Ochroconis,* les *Rhinocladiella* et d'autres. Il est utile que soient ainsi mises à jour la taxonomie et la nomenclature des champignons pathogènes sur lesquelles trop de confusion a longtemps subsisté.

Après un chapitre sur l'ultrastructure de la cellule, un intéressant chapitre, par P.J. Szaniszlo, sur le dimorphisme, montre bien que la diversité des formes selon les conditions de vie parasitaire ou saprophytes dépend bien de celles-ci. Les formes ne sont pas considérées comme des synanamorphes ni dénommées. Au contraire, les mécanismes biochimiques de passage de l'une à l'autre sont largement étudiés. G.T. Coole illustre ensuite la conidiogénèse et la sporangiosporogénèse des hyphomycètes et mucorales. Après un petit chapitre sur la germination des conidies, la cinétique des transports d'ions et de métabolites vers ou de la cellule ouvre la porte à l'étude de la pharmacodynamie.

FUNGI PATHOGENIC FOR HUMANS AND ANIMALS, PART B. PATHOGENICITY AND DETECTION (1), éd. par D.H. HOWARD et L.F. HOWARD, Mycology Series (P.A. Lemke, éd.) vol. 3B, xiv + 544 p., ill., 4° (18x25 cm), relié cartonné. 1983. Marcel Dekker Inc. Publ. 270 Madison Ave, New York, NY 10016, USA. Prix: US $ 190.-

Cette seconde partie de l'ouvrage concerne à la fois les mécanismes de pathogénèse et la réaction immunitaire à l'infection, les moyens de détection et de diagnose et enfin l'action des médicaments. A cela s'ajoutent deux chapitres sur les champignons toxiques.

Les mécanismes de pathogénèse sont traités par voie d'exemples: la paracoccidioidomycose, la lobomycose, la coccidioidomycose, l'histoplasme, la sporotrichose, la candidose, la cryptococcose. Sont étudiées ensuite l'immunité cellulaire CMI, sa mise en évidence dans les mycoses et sa disparition, et la réponse immunitaire par anticorps. D.W.R. Mackenzie donne alors un long chapitre sur la diagnose sérologique des mycoses par l'étude des antigènes et des anticorps tandis que M. Huppert revoit l'usage d'antigènes et P.F. Lehmann détermine les métabolites fongiques dans le corps, y compris les antigènes, en vue du diagnostic. Ces chapitres constituent un des centres d'intérêt du livre, mais les deux derniers chapitres sur les champignons toxiques d'une part et les mycotoxines présentes dans les denrées alimentaires retiendront une large audience. Là, c'est la nature chimique des substances toxiques qui constitue la trame de ces chapitres. Par les mycotoxicoses trop souvent fatales que ces substances provoquent, il est heureux qu'elles aient été revues dans cet ouvrage surtout destiné aux gens du domaine médical.

THE GENERA OF MYXOMYCETES par G.W. MARTIN, C.J. ALEXOPOULOS et M.L. FARR. xii + 562 p., 41 planches couleurs, 8° (18x25cm), relié toilé, 1983. University of Iowa Press, Iowa City, Iowa 522 42, USA. Prix: US $ 35.-

Ce livre est un complément de mise à jour du livre de Martin et Alexopoulos *THE MYXOMYCETES*, paru aux mêmes éditions en 1969. Dr. Farr a, en effet, pu réunir une somme abondante d'informations nouvelles, surtout d'intérêt taxonomique, mais aussi d'intérêt général, sur la physiologie et la culture in vitro des myxomycetes.

Que ce soit au sujet des clés d'identification, des familles et des genres, elle ajoute des commentaires d'ordre morphologique, taxonomique, écologique, floristique, insistant sur les connaissances nouvelles acquises depuis 20 ans, représentés par une longue bibliographie. L'ouvrage est édité dans le style de l'ouvrage principal et reprend les 41 planches originales.

CBS LIST OF CULTURES. 1983. 30th edition, anonymous, xii + 423 p., 8°, broché, 1983. Centraalbureau voor Schimmelcultures, P.O. Box 273, 3740 AG, BAARN, The Netherlands. Price: Hfl. 35.- (microfiche edition: Hfl.10.-).

These 30th edition of the catalogue of the CBS Culture Collection has been extended with approximately 3.000 cultures and now lists a total of 28.000 strains. That includes 21.500 filamentous fungi, 5.000 yeasts and 1.500 actinomycetes. About 3.500 of these are type strains. Data on source, isolation date, depositor's name, mating type and known biochemical properties are given for each strain. The nomenclature of the fungi has been revised in accordance with the Sydney Internatioanl Code of Botanical Nomenclature.

AUSTRALIAN NATIONAL REFERENCE LABORATORY IN MEDICAL MYCOLOGY. LIST OF CULTURES, JANUARY 1984. 42 p., Din. 1984. Royal North Shore Hospital, St Leonards, N.S.W. 2065, Australia.

This is the catalogue of the AMMRL Fungus Culture Collection founded by Dr. Shirley Campbell at Sydney in 1949. It mainly comprises filamentous fungi, including a large number of dermatophytes, yeasts and actinomycetes. Short data on source, locality and depositor are given for each strain.

MUSHROOM, THE JOURNAL OF WILD MUSHROOMING, par Don H. COOMBS et Maggie ROGERS, éditeurs, publié 4 fois par an, 50 p. par fascicule, 4°, vol. 1, n°1, Automne 1983. Publ. Mushroom Ltd. Box 3156, University Station, Moscow, ID 83 843, USA. Prix de souscription: personnelle US $ 12.- l'an, institution US $ 16.- l'an. Réduction pour souscription pluriannuelle.

Au premier regard, ce périodique témoigne de l'enthousiasme actif et sérieux de ses éditeurs fondateurs. Il s'adresse à tous mycologues amateurs ou professionnels intéressés de loin ou de près à la récolte et à la culture des champignons jusqu'à la dégustation. Edités par des mycologues passionnés, ces textes ont bonne allure et restent très accessibles. Vous y trouverez des descriptions précises et illustrées d'espèces, des commentaires sur l'identification des espèces, des biographies de mycologues réputés, des informations détaillées sur les publications et les réunions, des conseils de tous genres, même culinaires et encore, fort heureusement, de l'humour. Il faut croire que ce périodique aura aussi son succès en Europe comme il semble l'avoir déjà aux U.S.A.

AGARIC FLORA OF THE LESSER ANTILLES, par David N. PEGLER, Kew Bulletin Additional Series, vol. 9, iv + 670 p., 129 fig. 27 planches coul. h.t., 8°, broché, 1983. Her Majesty's Stationery Office, 49 High Holborn, London WC IV 6HB.

Depuis que Patouillard eut décrit dans sa "Famille des Agaricacées" 127 espèces des Îles Guadeloupe et Martinique, rien ne fut décrit à nouveau. Encouragé par les excellentes récoltes de Jean-Pierre Fiard, un mycologue de la Martinique, l'auteur a, avec ce dernier, pu réunir sur la décade passée les matériaux de la flore des Petites Antilles, Martinique, Guadeloupe, Dominique, Marie Galante, Montserrat, Antigue, Ste Lucie, St Vincent, Grenade et les Barbades. Pour l'identification, l'auteur dut avoir recours à l'étude de nombreux types de la flore d'Amérique centrale, septentrionale et méridionale, dans les collections de Patouillard, de Murrill, de Berkeley et Curtis, de Massee et encore de Dennis. Cette flore, ici couverte, est très riche, préservée grâce aux forêts d'altitude encore vierges. 457 espèces appartenant à 106 genres d'agaricales sont ici décrites avec le plus grand soin. Pas de genre nouveau, mais *Inophilus* (Romagn.) Pegler est proposé. 70 espèces nouvelles et 39 nouvelles combinaisons sont proposées. Parmi elles citons 8 espèces d'*Agaricus*, 3 d'*Amanita*, 9 d'*Inocybe*, 6 de *Lepiota* et 6 d'*Hygrocybe*. Le système de classification suivi est celui de Singer, à part les touches personnelles de l'auteur dans les familles des Entolomatacées et Polyporacées. Il faut apprécier la précision qu'ont mis l'auteur et son collaborateur, J.P. Fiard, à la rédaction et l'illustration de ces descriptions. Les détails microscopiques de chaque taxon sont soigneusement qualifiés et mesurés. Les dessins sont fins et très parlants. Les 212 photos couleurs de carpophores sont très bonnes mais elles eurent, à mon avis, gagné de ne pas être imprimées encadrées de noir. On s'imagine aisément l'intense travail que demande une telle flore et c'est heureux que des mycologues puissent avoir le temps de l'entreprendre.

THE GENUS LENTINUS, A WORLD MONOGRAPH, par David N. PLEGER, Kew Bulletin Additional Series, vol. 10, iv + 282 p., 65 fig., broché, 1983. Her Majesty's Stationery Office, 49 High Holborn, London WCIV 6HB. Prix: £ 15.-

Qui s'intéresse au Shiitake, le champignon japonnais, s'intéresse à cette monographie du genre *Lentinus* mais pour ne pas y trouver l'espèce classiquement dénommée *Lentinus edodes* car en 1975, l'auteur l'avait retirée de ce genre pour la classer comme *Lentinula edodes*(Berk.) Pegler en raison de son système hyphal monomitique.

Cette monographie n'en garde pas moins toute sa valeur. Des 514 taxa classés dans *Lentinus* Fries, l'auteur garde 63 espèces réparties en 15 sections. Moins fréquents dans nos régions tempérées, les *Lentinus* représentent un élément dominant de la flore fongique des forêts tropicales. Souvent récoltés mais aussi souvent difficiles à déterminer du fait de leur grande variabilité et de leur anatomie complexe. "Indeed, some *Lentinus* species are said to have the most complicated structure of all fungi" nous dit l'auteur. Cela n'a pas empêché l'auteur de proposer une monographie complète. Proche d'*Agaricus*, le genre *Lentinus* fut créé par Fries avec 20 espèces dès l'origine et, pour un certain nombre, tropicales. Sieurin, Lloyd, Petch, Pilat contribuèrent à la connaissance de ce genre. Singer y appliqua son système de classification basé sur les systèmes d'hyphes et déclassa le genre des Agaricales pour le classer dans les Polyporacées parce que monomitique. Cependant, Pegler avec Kühner devait montrer la situation de transition du genre par l'existence de systèmes dimitique et trimitique et classa le genre dans les Pleurotacées. A l'inverse de Corner qui retient le genre *Panus* pour ses hyphes squeletiques, en opposition à *Lentinus* qui possède des hyphes ligatives, Pegler réduit le genre *Panus* à l'état de section de *Lentinus*, comprenant 9 espèces. Chaque espèce est illustrée d'un fin dessin de pleine page représentant le carpophore, le système hyphal, les basides, les cystides et les spores. Toutes les descriptions sont augmentées de commentaires sur l'étude des types, les critères taxonomiques, l'analyse critique de la littérature et l'écologie de l'espèce. Il va sans dire que cette monographie sera appréciée pour sa qualité.

FUNGI OF THE INDIAN SUBCONTINENT. A COLLECTION OF PAPERS, par J. CRAMER éd., Bibliotheca Mycologica vol. 91, vi + 684 p., ill., 8° (14x22cm), relié toilé, 1983. J. Cramer, AR Gautner Verlag, FL-9490 Vaduz, Lichtenstein. Prix: DM 200.- (subscr. 160.-).

Cet assemblage de 48 contributions de mycologues indiens, dû apparement à l'initiative de J. Cramer, porte sur la mycoflore de l'Inde et des pays limitrophes et couvre tous les groupes de champignons. Une contribution porte sur les Mixomycètes, une autre sur *Dictyuchus* et une et une autre sur des Saprolégnales, deux sur *Absidia* et *Mucor* (Zygomycètes). Dix-huit traitent d'Ascomycètes. A côté de *Chaetomium, Podospora, Lophodermium,* 15 contributions ont trait aux Discomycètes, écrites par M.P. Sharma, R. Sharma, K.S. Thind, S.C. Kaushal. *Daedalae, Calvatiella, Polyporus, Inocybe, Russula* sont parmi les Basidiomycètes décrits. Quelques articles portent aussi sur des Hyphomycètes, en particulier les espèces thermophiles. Une douzaine de contributions s'intéressent plus particulièrement à l'écologie des champignons dans le milieu aquatique de marais, dans les sols alcalins, dans les mangroves, et à la symbiose mycorhizienne. Vingt-six nouvelles espèces sont proposées dans les genres suivants: *Russula* (3), *Lactarius* (1), *Calvatiella* (1), *Scutellinia* (2), *Lambertella* (1), *Dasyscyphus* (1), *Sclerotinia* (1), *Mollerodiscus* (2), *Poculum* (1), *Cordierites* (1), *Lanzia* (2), *Leptoxyphinum* (1), *Candida* (1), *Phaeroramularia* (2), *Mucor* (1), *Blastocladia* (1) et *Dictyuchus* (1). Onze combinaisons nouvelles sont proposées.

THE GASTEROMYCETES OF CHINA, par BO LIU, Beihefte zur Nova Hedwigia, vol. 76, 240 p., 62 fig. b.n. et coul., 8°, relié toilé, 1984. J. Cramer, AR Gantner Verlag, FL-9490 Vaduz, Lichtenstein. Prix: DM 120.- (souscription: DM 96.-).

Depuis 20 ans, l'Auteur récolte et étudie les gastéromycètes de tous les coins de la Chine. Ce groupe de champignons est particulièrement recherché en Chine pour ses espèces comestibles ou à propriétés médicinales, technologiques, mycorhiziennes et biodégradantes. Cent quarante-trois espèces appartenant à 40 genres sont décrites et un certain nombre illustrées par des photographies blanc-noir et couleurs. L'auteur couvre successivement les Phallales, les Lycoperdales, les Hymenogastrales, les Nidulariales, les Sclerodermatales et les Tulostomatales. Nombreuses sont les espèces exclusivement asiatiques décrites par l'auteur et d'autres mycologues chinois durant les dix dernières années. Les descriptions sont soignées et accompagnées d'une synonymie, de la mention d'habitat et de celle de la distribution géographique limitée au niveau de la province chinoise. Parmi l'illustration, neuf aquarelles représentent 4 espèces de Clathraceae et 5 espèces de Phallaceae. Ce livre est un heureux témoignage de l'activité mycologique en plein essor de nos collègues chinois. Il sera certainement apprécié.

BIOLOGICAL RECLAMATION AND LAND UTILIZATION OF URBAN WASTES, par F. ZUCCONI, M. DE BERTOLDI et S. COPPOLA, 764 p.ill., 8°, broché, 1983. F. Zucconi, Istituto di Coltivazioni Arboree, Università degli Studi di Napoli, 80055 Portici, Napoli, Italia.

These Proceedings of the International Symposium on Biological Reclamation and Land Utilization of Urban Wastes, Napoli, 11-14 October 1983, may appear to fall out of the scope of Systematic Mycology but worth a mention. Composting is the domestication of the natural turnover of brute organic matters, in which fungi, particularly thermophilic fungi, play a large role. Through 47 papers, the full process and all aspects of composting will be discovered.

CBS COURSE OF MYCOLOGY, 2d Edition, 1980, par W. GAMS et al., 110 p., ill., 8° (17x24cm), broché, 1980. Centraalbureau voor

Schimmelcultures, Baarn, Nederland.

Le cours de Mycologie pratiqué au CBS est une introduction théorique et pratique à la mycologie systématique et à l'identification des champignons. Ce syllabus est essentiellement le support de séances de démonstration où l'usage des cultures pures de champignons préservées en collection est un matériel d'étude essentiel à l'identification des Zygomycètes, Ascomycètes et Deuteromycètes. Le matériel naturel, cependant, est utilisé dans l'identification des Basidiomycètes, des Myxomycètes et de quelques Ascomycètes et champignons aquatiques. L'insistance est donnée sur les techniques de cultures, de description, de dessin et l'usage de la littérature. Le texte est d'ailleurs présenté avec d'abondants dessins et schémas et suivi d'une longue sélection de littérature mycologique.

AUTHOR INDEX, VOLUME TWENTY-TWO

INDEX TO FUNGOUS AND LICHEN TAXA, VOLUME TWENTY-TWO

This index includes genera, infrageneric taxa, species, and infraspecific taxa. New taxa are underlined, as are the pages on which they are published. There is one new family, **MYCOTYPHACEAE**. The paper on Arizona rust fungi is itself an index, and its entries in the larger genera are not repeated here, but marked "see 451-468."

REVIEWERS, VOLUME TWENTY-TWO

The Co-Editors express their appreciation to the following individuals who have reviewed prior to acceptance for publication one or more of the papers appearing in this volume.

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ERRATA, VOLUME TWENTY

page	319,	line 9	*for*	1982).	*read*	1892).
		line 31	*for*	1963,	*read*	1933,
	323,	line 18	*for*	1982.	*read*	1892.

ERRATA, VOLUME TWENTY-TWO

page	164	line 50	for	*Pyrrohoderma*	read	*Pyrrhoderma*
	275	line 14	*for*	P.	*read*	Phaeosaccardinula

MYCOTAXON PUBLICATION DATES
VOLUME 21 AND VOLUME 22(1)

Volume 21 (October-December 1984)	November 30, 1984
Volume 22(1) (January-March 1985)	February 8, 1985

PUBLICATION DATE OF MYCOTAXON CUMULATIVE INDEX FOR VOLUMES I-XX (1974-1984)

MYCOTAXON's first cumulative index, to volumes 1-20, by Richard P. Korf and Susan C. Gruff, was originally scheduled for publication in November or December, 1984. It was offered at a prepublication price of $10.00 for orders received before 1 October 1984, to allow us to decide on the size of the press run. Delays in publication, primarily a result of problems in the computer program specially designed for the book, have resulted in a number of those who prepaid at the prepublication price wondering whether their copy had gone astray. We are pleased to announce that the book was finally published on February 8, 1985. Since this book will perhaps receive even more use than individual volumes of MYCOTAXON, we have used sewn signatures in producing the volume, rather than the perfect binding the journal has been using.

There are three separate indices included: 1) Articles arranged by authors, with cross references to junior authors; 2) Books Reviewed, arranged by authors, with cross references to junior authors; 3) A complete Taxon Index arranged by genera, infrageneric taxa, species, and infraspecific taxa, with all new names clearly identified; new suprageneric names are also indexed.

Subscribers are reminded that the Index is not part of their regular subscription. Ordering information for libraries and individuals is:

KORF, RICHARD P. & SUSAN C. GRUFF. 1985. **Mycotaxon Cumulative Index for Volumes I-XX (1974-1984).** 232 pp., softbound. $17.50, postpaid. Published Feb. 1985 (First Edition).

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