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ELEMENTAL COMPOSITION OF METATRICHIA VESPARIUM SPORANGIA[1]

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SUMMARY

Fructifications of seventeen collections of *Metatrichia vesparium* (Batsch) Nann.-Brem. examined by energy dispersive x-ray spectrometry were found to contain high levels of calcium and manganese. Lower concentrations of silicon, phosphorus, sulphur, chlorine, potassium, iron and copper were less consistently present. The elemental composition of the stalk was more variable than that of the peridium. The taxonomic significance of the high levels of calcium in *M. vesparium* is discussed.

INTRODUCTION

The taxonomy of the Myxomycetes is based largely on the nature of the fructification, spore color and markings, structure of the capillitium, and presence or absence of calcareous deposits (Martin & Alexopoulos, 1969). The order Physarales contains Myxomycetes with visible deposits of lime within or on the fructification. Visible deposits in unknown chemical combinations containing calcium have been described in a few non-physaraceous genera. Small scale-like aggregations of crystalline lime are found in the base of the peridium of *Leptoderma iridescens* G. Lister, classified in the Stemonitales, and occasionally on the peridium of *Perichaena chrysosperma* (Currey) A. Lister,

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[1] Supported in part by National Science Foundation grant DMR-7504020 to R. W. Scheetz

P. corticalis (Batsch) Rost., and P. depressa Libert in the order Trichiales. A recent investigation has shown that two genera, Cribraria and Dictydium, in the order Liceales also contain calcium, in their dictydine granules (Schoknecht, 1975).

Calcium has not been demonstrated in fructifications of the two remaining orders of the Myxomycetes, the Ceratiomyxales, or the Echinosteliales. Limited information is available on the distribution of elements other than calcium in myxomycete fructifications. Schoknecht (1975) has reported the presence of phosphorus, silicon, sulphur, and chlorine in members of the Physaraceae, and traces of phosphorus in Didymium trachysporum G. Lister.

We have demonstrated the presence of calcium in fructifications of a number of non-physaraceous genera by energy dispersive x-ray spectrometry. The present report will describe our investigation of the elemental composition of fructifications of Metatrichia vesparium (Batsch) Nann.-Brem. (Trichiales).

METHODS

Mature sporangia of M. vesparium were obtained from seventeen specimens in the University of Texas Myxomycete Collection, UTMC (Table 1). Sporangia were individually mounted on aluminum stubs with metallic silver paint. Specimens were coated with carbon, and a thin film of palladium (40%) and gold (60%) in a Denton DV-502 high vacuum evaporator equipped with a tilting omni rotary shadow caster.

X-ray spectra of specific regions of specimens were obtained with a Kevex model 5100 energy dispersive x-ray spectrometer (detector resolution less than 152 eV) attached to an AMR 1000A scanning electron microscope. All x-ray data were collected with 200 sec. probes at a specimen tilt of 45. Spectra were obtained from the sporangial operculum, from the sporangial base, and from the stalk. Beam accelerating voltage was maintained at 30 Kv with a constant condenser lens setting and magnification in order to minimize discrepancies in signal. Minimum partial field settings were utilized in collecting data so that the exact area being analyzed was known. Background subtraction and peak smoothing functions were utilized to facilitate integration of elemental peaks.

Peaks representing aluminum, silver, gold, and palladium which were introduced during specimen preparation were subtracted from the spectra. Counts were recorded for each individual element as well as the total counts in the spectrum after background subtraction.

All data was normalized with respect to 125,216 counts, which was the highest figure obtained with a 200 sec. probe.

RESULTS

The overall elemental composition of the *M. vesparium* fructifications examined is shown in Table 1. The operculum and base of the sporangium had a similar elemental composition. An x-ray spectrum of the peridium prior to background subtraction is depicted in Figure 1.

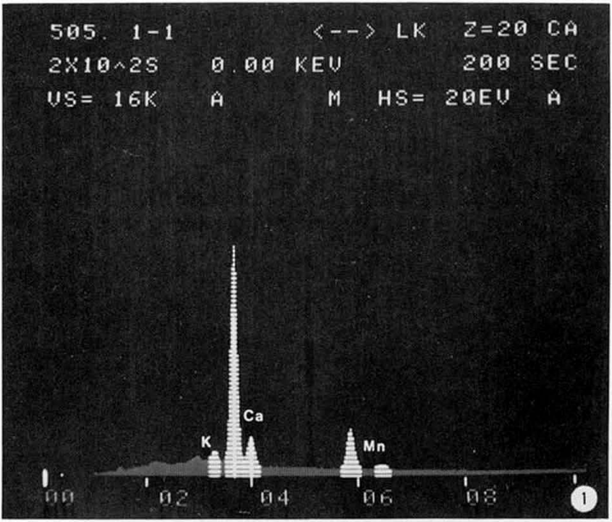


Figure 1. X-ray spectrum of the peridium of *M. vesparium* (UTMC 505) prior to background subtraction. Vertical scale 16 K.

Magnesium, silicon, phosphorus, sulphur, chlorine, potassium, and iron were sporadically present in low concentrations, usually less than 10,000 counts/200 sec.

TABLE 1

University of Texas Myxomycete collections of *M. vesparium* examined by energy dispersive x-ray spectrometry, their collection site, and overall elemental composition.

UTMC No.	Collection Site	Mg	Si	P	S	Cl	K	Ca	Mn	Fe	Cu
1822	Florida, Alachua County	-	X	-	X	X	-	X	X		
1357	Iowa, Iowa City	-	X		X	X	X	X	X	-	-
1666	Kentucky, Oldham County	X	X	-	X	X	X	X	X	X	-
2023	Kentucky, Oldham County	-	-	X	X	-	X	X	X		-
595	New Jersey, Cinnaminson	-	-			-	X	X	X	-	-
505	Texas, Big Thicket	X	-		X	-	X	X	X		-
1516	Texas, Bastrop State Park		X	X	X	-	X	X	X	X	X
2287	Texas, Big Thicket	-	-	-	-	-	X	X	X	-	-
2178	Texas, Hays County	-	X		X	-	X	X	X		X
1365	Costa Rica, Turrialba	-	X	X	X	X	X	X	X	X	
1366	Costa Rica, Univ. City		-	-	-	-	-	X			
1367	Costa Rica, Santa Ana	-	X	X	X	X	X	X	X	X	-
1386	Costa Rica, Coto 47					-	X	X	X		
363	Greece, Lailia Forest	-	-	-	-	-		X	X		
1914	Nicaragua, Indian River	-	X	-	X	X		X	X	X	-
1166	Quebec, Galt Estate	-	-	-	X	X	X	X	X		X
1096	West Indies, Dominica	-		-	-	-	X	X	X		X

X = Measurable levels; - = trace levels; blank space = not detected probe. Manganese was detected in the peridium of all but two of the collections examined. This element was generally present in higher concentrations than those listed above (Figures 2 and 3).

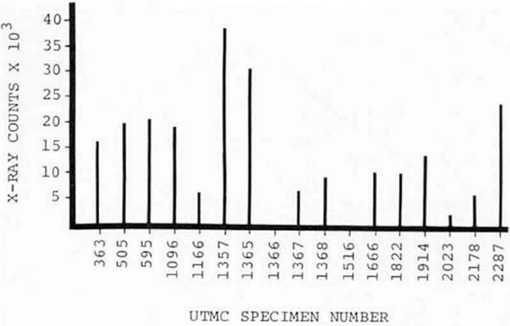


Figure 2. Normalized x-ray counts of manganese from the operculum of M. vesparium.

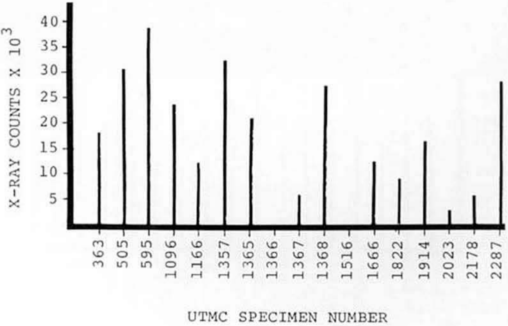


Figure 3. Normalized x-ray counts of manganese from the sporangial base of M. vesparium.

Calcium was present in every collection examined, in comparatively high concentrations. The operculum exhibited a range of 63,169 to 125,216 calcium counts/200 sec. probe, with a mean of 104,689 counts. The standard deviation was 14,038 counts (Figure 4).

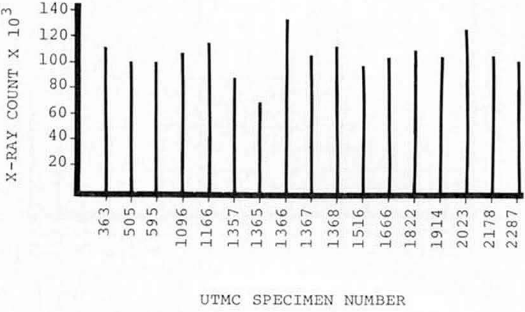


Figure 4. Normalized x-ray counts of calcium from the operculum of M. vesparium.

The base of the sporangium exhibited a range of 82,832 to 125,216 calcium counts/200 sec. probe, with a mean of 105,047 counts and a standard deviation of 12,936 counts (Figure 5).

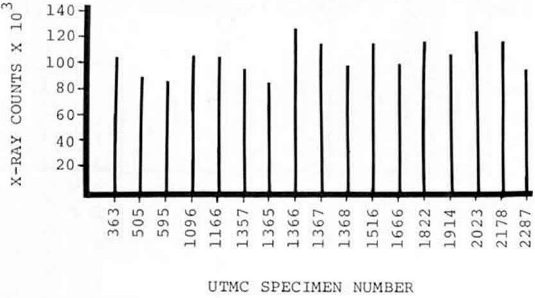


Figure 5. Normalized x-ray counts of calcium from the sporangial base of M. vesparium.

The stalk exhibited a somewhat different elemental composition than the peridium. An x-ray spectrum of this region prior to background subtraction is depicted in Figure 6.

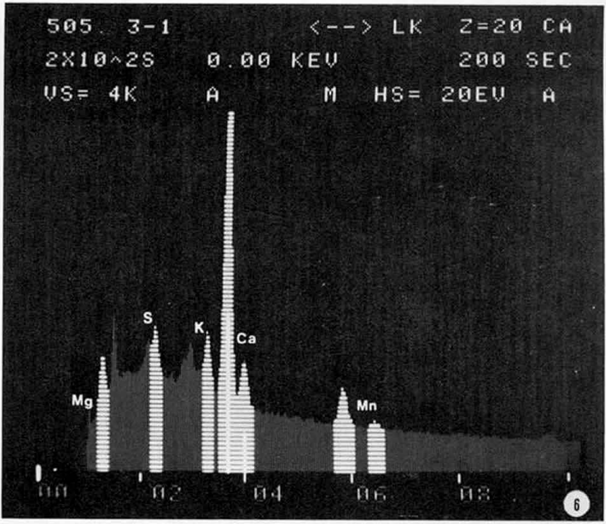
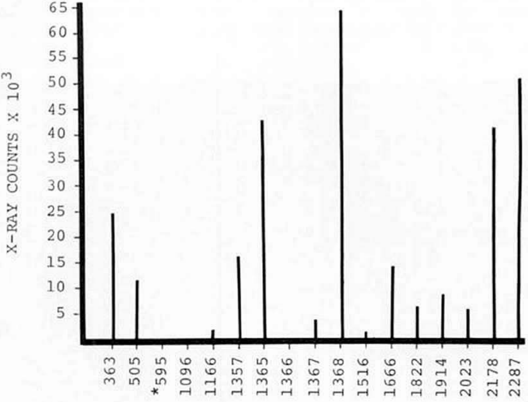


Figure 6. X-ray spectrum of the stalk of M. vesparium (UTMC 505) prior to background subtraction. Vertical scale 4 K.

Manganese, silicon, phosphorus, sulphur, chlorine, potassium, and iron were present sporadically and in low concentrations. In addition to these elements which were also present in the peridium, copper was present in the stalks of six of the collections examined.

Manganese was present in the stalk of most of the specimens examined, although in lower amounts than found in the peridium (Figure 7).



UTMC SPECIMEN NUMBER

Figure 7. Normalized x-ray counts of manganese from the stalk of *M. vesparium*. *Stalk was not available for UTMC 595.

Calcium was found in the stalk of all specimens examined, usually in concentrations lower than that found in peridium (Figure 8).

The stalk exhibited a range of 14,823 to 125,216 calcium counts/200 sec. probe, with a mean of 75,367 counts and a standard deviation of 28,507 counts.

A secondary electron image of a fructification of *M. vesparium* is illustrated in Figure 9 and a concentration map of calcium in the same fructification in Figure 10. Calcium is located throughout the sporangium, with higher concentrations indicated in the peridium.

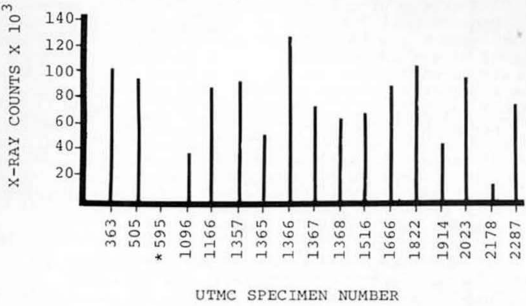
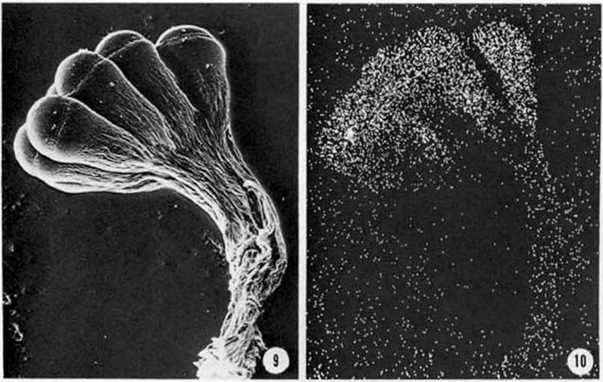


Figure 8. Normalized x-ray counts of calcium from the stalk of M. vesparium. *Stalk was not available for UTMC 595.



Figures 9-10. Figure 9. Secondary electron image of a M. vesparium fructification, X 25.
Figure 10. Concentration map showing the location of calcium within the same fructification.

DISCUSSION

High levels of calcium were consistently present in all seventeen collections of M. vesparium examined, representing widely scattered geographical locations. A one-way analysis of variance indicated a significant difference in the calcium content of the areas analyzed at the 0.05 level. Since there were unequal numbers of samples per area examined (some sporangia lacked stalks), Kramer's (1956) modification of Duncan's new multiple range test (Steel and Torrie, 1960) was performed. This test indicated a significant difference in calcium concentration at the 0.05 level between the operculum and the stalk, and also between the sporangial base and the stalk. No significant difference in calcium concentration was demonstrated between the operculum and the sporangial base.

The exact chemical form in which the calcium is present in M. vesparium is unknown. In the order Physarales, visible deposits of calcium are present in the form of calcium carbonate (Pobequin, 1954). It is not possible to identify the carbonate ion by energy dispersive x-ray spectrometry. It is unlikely that calcium is present in this chemical combination in M. vesparium since effervescence is not noted when sporangia are mounted in acid media. Neither phosphorus nor sulphur were detected consistently in all specimens. It is therefore unlikely that calcium is present as a phosphate or sulphate. It is possible that the calcium is not present as an inorganic salt, but rather that it is bound to organic anionic groups.

In view of the high levels of calcium in fructifications of M. vesparium it is incorrect to synonymously associate high concentrations of calcium exclusively with the Physarales. The concentration of calcium in M. vesparium is as high as that found in some specimens of Physarum leucopus Link examined by energy dispersive x-ray spectrometry. Preliminary readings on a limited number of other Trichiales, Oligonema flavidum (Peck) Peck and Hemitrichia calyculata (Speg.) Farr, indicate the presence of calcium at levels much lower than that found in M. vesparium.

The taxonomic significance of the high levels of calcium in M. vesparium is difficult to assess at the present time and will require similar data on numerous collections of Trichiales. Also, regardless of how much calcium is found in the so-called noncalcareous Myxomycetes, we do not believe such results should be used in radically disturbing the classification system of these organisms which has proved very workable over the last century. Whereas anyone who is interested in identifying Myxomycetes possesses a light microscope, the technique of energy dispersive x-ray spectrometry is not likely to become commonly available soon, except to persons associated with relatively large laboratories. On the other hand, the presence of calcium and other elements in significant quantities in some groups, will undoubtedly influence our phylogenetic ideas, and it is with this thought in mind that we expect to continue and expand our research efforts.

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MYCOTAXON

Vol. 5, No. 2, pp. 376-380 April-June 1977

CLASSIFICATION OF OPHIOCERAS DOLICHOSTOMUM[1]

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SUMMARY

The structure of the perithecial peridium (textura angularis) and beak (textura intricata) and the hypersaprobic habit of Ophioceras dolichostomum indicate that the genus Ophioceras is best accommodated in the family Lasiosphaeriaceae of the Sordariales. Detached asci move up the ostiole and accumulate at the tip of the beak. Sometimes the entire ascus is discharged forcibly.

INTRODUCTION

A pyrenomycete characterized by perithecia with elongated beaks and scolecosporous ascospores collected on partially submerged wood in a stream in Florida was identified as Ophioceras dolichostomum (Berk. & Curt.) Sacc. The Florida collection provided an opportunity to develop a fuller description of this species and to assess the taxonomic position of the genus Ophioceras.

DESCRIPTION OF THE FUNGUS

A search of the literature led to Ophioceras Saccardo (1883) a genus described as a scolecosporous Ceratostoma. An isotype collection of O. dolichostomum from NY was compared with the Florida collections. There seems little doubt that they are the same species. Because of the scarcity of information on O. dolichostomum in the literature, a full description of the fungus based on the isotype and the Florida collections is provided.

Ophioceras dolichostomum (Berk. & Curt.) Sacc. 1883. Syll. Fung. 2:358 (Figs. 1-8).
= Sphaeria dolichostoma Berk. & Curtis, 1869. J. Linn. Soc. London 10:388.

Perithecia immersed in wood, ca. 500 µm diam., with beak 1-5 mm long. Peridium firm, blackened except at the apex of the beak, cell layers compressed in side view, surface composed of a large celled textura angularis; beak composed of a textura intricata with hyphae

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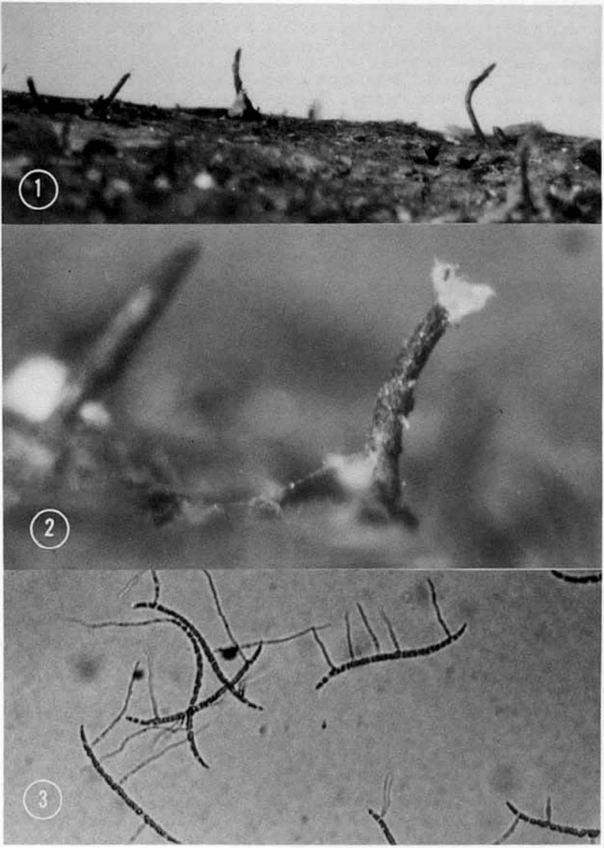
[1] *Florida Agricultural Experiment Station Journal Series No. 378.*



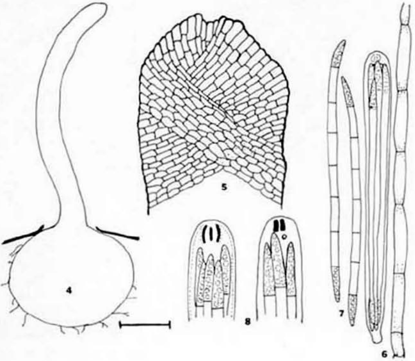
Figs. 1-3. *Ophioceras dolichostomum*. 1. Elongated perithecial beaks erumpent through wood substrate. X20. 2. Close-up of perithecial beak with a mass of asci and ascospores at the tip. X120. 3. Germinating ascospores. X150.

arranged obliquely and crossing one another in the upper regions. Asci 100-130 x 8-12 µm, unitunicate, cylindric, with a chitinoid apical annulus refractive in water, readily detached from subhymenium, in some a small nonchitinoid globule visible below the apical annulus. Paraphyses broad, tapering to tips. Ascospores 94-110 x 2-3 µm, hyaline singly, light yellowish brown in mass, filiform, 3-7 septate, occasionally with additional septa, not constriced at septa, contents of middle cells homogenous, end cells guttulate, wall thin and smooth, in a parallel fascicle in the ascus.

Hypersaprobic on wood substrata, Quercus sp. where definitely known.

Material examined: Sphaeria dolichostoma, No. 856 Fungi Cubenses Wrightiani, coll. C. Wright (isotype, NY); Devil's Millhopper, 5 mi northwest of Gainesville, Florida, K. E. Conway, 15, Sept., 1968 (FL, MASS, NY).

The perithecia develop in the wood and have greatly elongated beaks up to 5 mm (Figs. 1 & 4). The unitunicate asci become detached from the subhymenium and under moist conditions some are discharged as a unit with the ascospores from the ostiole (Figs. 2). Some asci are shot several centimeters from the ascocarp as they explode from the ostiole. Most, however, are trapped at the tip of the beak as shown in Figure 2. The ascospores are hyaline, filiform, and septate. Each cell in the mature ascospore is capable of producing a germ tube (Fig. 3); however, only four to five germ tubes are produced per ascospore. When clumps of spores in an ascus are allowed to germinate there appears to be a tendency for germination to occur from only one end of the spore rather than from the middle cells.



Figs. 4-8. Ophioceras dolichostomum. 4. Outline of Perithecium. 5. Pallid apex of beak, showing hyphal arrangement. 6. Ascus and paraphysis. 7. Ascospores. 8. Ascus apices showing chitinoid apical annulus (left) and subapical globule (right). Scale bar = 200 µm for Fig. 4; 35 µm for Fig. 5; 20 µm for Figs. 6-7; 10 µm for Fig. 8.

Single spore isolates were obtained by attaching perithecia to a lid of a petri plate of water agar and directing a beam of light up through the agar. Germinating ascospores were picked from the surface of the agar by a fine needle and plated onto potato-dextrose agar. Both single and multispored cultures have failed to produce either conidial or sexual states.

DISCUSSION

The disposition of Ophioceras in modern taxonomy poses some problems. No recent studies are helpful. Saccardo (1883) listed seven species of Ophioceras. Ophioceras dolichostomum (Berk. & Curt.) Sacc., the first-named species was designated as lectotype by von Höhnel (1911). The description of O. dolichostomum agrees with the generic diagnosis. The fungus was collected on wood in Cuba, and was described with ascospores 75-100 µm long. Clements and Shear (1931), however, designated as lectotype O. macrocarpum (Sacc.) Sacc., the fourth species in Saccardo's original listing. This latter species was described with a short beak, thus deviating from the generic diagnosis, although some species with short beaks were included in the genus by Saccardo. The illustration provided in Icon. mycol. V: pl. C72 shows an ascus with ascospores, apparently drawn from the literature, and gives no new information. Berlese's (1900) illustration is of a vaguely diaporthoid fungus. Müller (in Müller and Dennis, 1965) described Ophioceras cecropiae and referred the species to the Diaporthaceae. From the description and habit of the fungus in leaves, this specimen probably does belong in the Diaporthaceae, but is not a species of Ophioceras.

The suggestion of diaporthaceous character, reinforced by the long-necked perithecia and readily detached asci, was examined. In Barr's (1976) interpretation of the Diaporthales, Ophioceras would be excluded for several reasons, principally the peridium structure of the perithecium and beak and the hypersaprobic habit. These features instead indicate more similarities with the fungi included in the Sordariales sensu Barr (1976) and Huang (1976). The Sordaria type of centrum development in members of Sordariales was described by Huang (1976) as pseudoparenchymatous. Paraphyses grow upward and inward from pseudoparenchyma cells and create a central cavity. The paraphyses may persist or deliquesce. Asci of the species of Sordariales may be firmly attached or readily separable from the subhymenial-cells and may be forced through the ostiolar canal as a unit. This unique phenomenon in O. dolichostomum of ascal ejection is found in only a few fungi and will be the subject of another report. The perithecial peridium, a textura angularis in face view, is composed of large pseudoparenchymatous cells. The surface layer of the beak, whether short or elongate, is a textura intricata of smaller cells, often arranged in rows and fanning out obliquely (Fig. 5) The perithecial peridium in members of the Diaporthaceae tends to be a textura epidermoidea and the beak a textura porrecta of upright parallel rows of elongated cells. Fungi included in the Diaporthaceae range from parasites to wound parasites to saprobes in recently dead host tissue. Members of the Sordariales are predominately hypersaprobic on old woody or herbaceous substrata or coprophilous, less frequently parasitic or hyperparasitic.

In the Sordariales, the family Lasiosphaeriaceae seems at present the best accommodation for Ophioceras. In this family, the apical annulus of the ascus is variable--nonreacting, chitinoid, or rarely amyloid. An apical globule is common and well developed in Lasiosphaeria, and was observed in a rather depauperate condition in O. dolichostomum (Fig. 8). Of those genera whose ascospores are filiform, Mycomedusiospora Carrol & Munk (1964), with M. flavida (Rick) Carrol & Munk, has ascospores which fragment and separate into spore parts; the perithecial peridium is soft and yellowish. In Acrospermoides Miller & Thompson (1940), with the sole species A. subulata Miller & Thompson, perithecia are subulate, the peridium is narrow but appears to be pseudobombardioid, and the very narrow asci have an only slightly developed apical annulus. The arrangement of cells of the beak peridium of O. dolichostomum is reminiscent of those in some species of Acrospermum, as described by Eriksson (1967). The position of Acrospermum is still debatable.

ACKNOWLEDGEMENTS

The authors wish to express a deep appreciation to Dr. E. S. Luttrell for his helpful comments and review of this manuscript. Appreciation is also extended to Dr. James Kimbrough for his initial guidance in this research.

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MYCOTAXON

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STUDIES IN THE GENUS CORTINARIUS, III: SECTION DERMOCYBE, NEW NORTH AMERICAN SPECIES[1]

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SUMMARY

Five new species of *Cortinarius* are described from western North America. All are in the section *Dermocybe* and are as follows: *C. aurantiobasis*, *C. humboldtensis*, *C. olivaceopictus*, *C. thiersii* and *C. zakii*.

INTRODUCTION

Cortinarius section *Dermocybe* is a diversified and widespread group; consequently a thorough classification of the North American species will require years of further study. In studies preparatory to such a treatment we have been able to clarify the concepts of previously reported species and, in addition, have published some new species and varieties (1-5).

In our investigations of *Dermocybe* we have been

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

particularly interested in the species that occur in western North America. Data collected from many years of study show that the *Dermocybe* flora of this region is especially diverse and that the number of species is large in comparison to the other areas of North America studied to date. In this paper, we have described five new species. Four of these species, *C. aurantiobasis*, *C. humboldtensis*, *C. thiersii* and *C. zakii* have been found only in western North America. The fifth species, *C. olivaceopictus*, occurs in Michigan as well as western North America.

Microscopic studies were made from freehand sections mounted in KOH (a 2.5% aqueous solution) and Melzer's reagent (KI 1.5 gr., iodine 0.5 gr., H_2O 20.0 gr., chloral hydrate 22.0 gr.). Macroscopic color reactions were tested with 2.5% KOH. Specific color designations capitalized and enclosed in parentheses are from R. Ridgway, *Color Standards and Color Nomenclature*(6). Uncapitalized color terms are regarded as useful approximations. Collections cited in 'Collections examined' are deposited in The University of Michigan Herbarium (MICH) unless otherwise indicated by the appropriate symbols from the *Index Herbariorum*.

CORTINARIUS AURANTIOBASIS Ammirati and Smith, sp. nov.

Fig. 1

Pileus 25-50 mm *latus, convexus demum planus vel subplanus, siccus, minute fibrilloso-squamosus quidem marginem versus, plerumque disco glabro et impolito, brunneo-rufus, aetate disco fusciore; contextus pallide luteo-bubalinus; odor et sapor indistincti. Lamellae adnexae, confertae, intense brunneolo-aurantiacae demum ferrugineae. Stipes* 30-50 mm *longus,* 4-6 mm *crassus, aequalis vel deorsum incrassatulus, pallide luteo-bubalinus demum pileo concolor, deorsum aurantio-brunneus fibrillosus, apice sericeo-fibrillosus. Sporae 8.5-11(-12) x 5-6 µm, ellipticae, verruculosae. Holotypus: A.H. Smith 24213 (MICH), prope Still Creek, Mt. Hood National Forest, Clackamas Co., Oregon, October 6, 1946.*

PILEUS 25-50 mm broad, convex expanding to nearly plane, sometimes subumbonate, with the margin incurved, dry, minutely fibrillose-scaly at least over the margin, disc usually glabrous and unpolished, buttons brownish rufous (Hazel) or somewhat duller, in age brownish rufous over a broad marginal area and darker (near Chestnut Brown) on the disc. Context pale buff-yellow (Cream Color) in young pilei, when moist dull yellow (Honey Yellow); odor and taste indistinctive.

LAMELLAE sharply and deeply adnexed, close, broad, edges slightly uneven, 1-2 tiers of lamellulae, color at first deep brownish orange (Amber Brown) and in age only slightly darker (near Sanford's Brown).

STIPE 30-50 mm long, 4-6 mm thick, equal or slightly enlarged below, pale buff-yellow (Cream Color) to dull buff-yellow(Chamois) at first, gradually darkening to concolorous with the pileus, frequently with orange-brown appressed fibrils over the lower two-thirds, apex silky fibrillose. Context solid, brownish yellow-orange (Raw Sienna) in the cortex.

PILEUS SURFACE of fresh basidiocarps reddish with the application of KOH.

SPORES 8.5-11 (-12) x 5-6 µm, in profile elliptic and obscurely inequilateral to somewhat inequilateral, in face view elliptic to slightly ovate, verruculose, in KOH light brownish, in Melzer's light yellowish to yellowish brown. BASIDIA 4-spored, 24-34 x 7-9 µm, clavate to more or less ventricose, thin-walled, in KOH hyaline to pale vinaceous, some containing droplets or particles of deep red to vinaceous-red pigment, in Melzer's light yellowish, some containing droplets or particles of yellow, orange or reddish orange pigment. PLEUROCYSTIDIA absent. CHEILOCYSTIDIA not well differentiated, 12-23 x 6-11 µm, clavate to broadly clavate or more or less ventricose, thin-walled, in KOH and Melzer's similar to basidia. SUBHYMENIAL HYPHAE compactly interwoven, cylindrical, 2.5-5 (-5.5) µm wide, thin-walled, in KOH and Melzer's as for the hyphae of the lamellar trama. TRAMAL HYPHAE OF LAMELLAE subparallel to slightly interwoven, cylindrical to more or less inflated, 5-20 µm wide, thin-walled, in KOH hyaline, pale vinaceous or pinkish, some containing particles of vinaceous to yellowish pigment, in Melzer's yellowish. CUTICULAR HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to slightly inflated, 4.5-18 (-25) µm wide, thin-walled, in KOH hyaline to faintly colored, pale brownish to pale vinaceous or containing a more or less concentrated red-brown to vinaceous-brown pigment, in Melzer's yellowish, yellowish brown or yellowish orange-brown; pileocystidia absent. TRAMAL HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to inflated, 6-25 µm wide, thin-walled, in KOH hyaline to pale vinaceous or pinkish, in Melzer's yellowish. CORTICAL HYPHAE OF STIPE longitudinally arranged, subparallel to slightly interwoven, cylindrical to inflated, 5-20 µm wide, thin-walled, in KOH and Melzer's as for the hyphae of the pileus trama; caulocystidia apparently absent. CORTINAL HYPHAE cylindrical, 5-9 µm wide, thin-walled, in KOH and Melzer's as for the hyphae of the stipe cortex. CLAMP CONNECTIONS of the normal type, present throughout the basidiocarp. OLEIFEROUS HYPHAE present, in KOH dingy yellowish, in Melzer's apparently not evident. INTERHYPHAL PIGMENT DEPOSITS present in the pilear trama, lamellar trama and the stipe cortex, in KOH dark red to vinaceous-red (refractive, yellow particles often present in mounts) in Melzer's yellow, yellow-orange or orange, some particles becoming blackish (amylaceous).

Gregarious in rich humus under conifers or on decayed conifer logs. Fruiting period: September to November.

Collections examined: IDAHO: Bonner Co: J.F. Ammirati 257a (SFSU): A.H. Smith 71705. OREGON: Clackamus Co. A.H. Smith 24213 (holotype, MICH), 24952, 26715; Tillamook Co.: A.H. Smith 80127. WASHINGTON: Lewis Co.: A.H. Smith 48490; Pierce Co.: A.H. Smith 40696, 40698, 40700, 48286, 48292, 48297, 48298, 48427, 48499, 48582, 48606, 48614, 48653, 48709, 48857, 48869, 49404.

The major distinctive features of *C. aurantiobasis* are its large spores, the pale buff-yellow stipe that darkens in age, the orange-brown fibrils over the lower stipe surface and the brownish rufous to reddish brown colors of the pileus surface. The orange coloration of the young lamellae appears to relate it to other Dermocybes with similarly colored young lamellae. Usually the lamellae of *C. aurantiobasis* are brownish orange to brownish orange-yellow when young but may be light orange (in Smith 24952 and 48606) and then darken to brownish orange as they mature.

In general appearance *C. aurantiobasis* is most similar to *C. zakii* and *C. subcroceofolius* Ammirati and Smith, especially when mature basidiocarps are compared. However, the large spores of *C. aurantiobasis* easily distinguish it from these species as well as other

Dermocybes with orange-colored young lamellae.

C. aurantiobasis often fruits on decayed conifer wood. It is not, however, truly a wood inhabiting species, nor is it unique in this respect. Other Dermocybes, for example *C. zakii* and *C. semisanguineus* (Fries) Gillet, also sometimes fruits on decayed conifer wood.

CORTINARIUS HUMBOLDTENSIS Ammirati and Smith, sp. nov.

Fig. 3

Pileus 30-50 mm latus, obtuse conicus demum plano-umbonatus, appresso-fibrillosus, juventute nitore olivaceo-luteo, margine pallide luteolo-bubalinus, disco pallide cinnamomeo-brunneus; contextus sordide brunneus; odor et sapor nulli; superficies pilei atroviolacea in solution kalii hydroxidi. Lamellae adnatae, confertae, olivaceo-luteae demum plus minusve ochraceae. Stipes 60-120 mm longus, apice 4-8 mm crassus, aequalis vel basi incrassatulus, sordide luteus. Sporae 7-9.2(-10) x 4.5-5.5(-6) µm, ellipticae, verruculosae. Holotypus: A.H. Smith 56392 (MICH), prope Trinidad, Humboldt Co., California, December 6, 1956.

PILEUS 30-50 mm broad, obtusely conic becoming plano-umbonate, with the margin incurved and becoming decurved, appressed fibrillose, with an olive-yellow (Honey Yellow) sheen when young, margin light yellow-buff (Ochraceous Buff), disc pale brown (pale Cinnamon Brown). Context dingy brown (near Snuff Brown); odor and taste none.

LAMELLAE adnate, close, broad, at first olive-yellow (Honey Yellow), finally more or less ocher yellow.

STIPE 60-120 mm long, 4-8 mm thick at the apex, equal or base slightly enlarged, fibrillose, dingy yellow to the base, with a covering of brownish fibrils, base pale yellowish. Context dingy brownish in cortex, darker in the base.

PILEUS SURFACE of fresh basidiocarps quickly dark inky violet then slowly purple-brown with the application of KOH.

SPORES 7-9.2(-10) x 4.5-5.5(-6) µm, in profile elliptic and obscurely inequilateral to somewhat inequilateral, in face view elliptic to ovate, verruculose, in KOH light brown to light fulvous, in Melzer's yellowish to yellowish brown. BASIDIA 4-spored, 21-30 x 7.5-9.5 µm, clavate to broadly clavate or occasionally more or less ventricose, thin-walled, in KOH hyaline to pale vinaceous, sometimes containing droplets and colorless granules or particles of red to vinaceous-red pigment, in Melzer's pale yellow to dingy yellow, sometimes containing particles of yellow pigment. PLEUROCYSTIDIA absent. CHEILOCYSTIDIA apparently absent. SUBHYMENIAL HYPHAE compactly interwoven, cylindrical, 2-6 µm wide, thin-walled, in KOH and Melzer's as for the hyphae of the lamellar trama. TRAMAL HYPHAE OF LAMELLAE subparallel to slightly interwoven, cylindrical to more or less inflated, 6-25 µm wide, thin-walled, in KOH hyaline or containing a pale reddish pigment, sometimes containing droplets and colorless particles, in Melzer's pale yellow to dull yellow. CUTICULAR HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to more or less inflated, 5-20 µm wide, thin-walled, in KOH hyaline, pale brown or pale purplish, some containing particles of deep purple to bluish purple pigment, in Melzer's dull yellowish; pileocystidia absent. TRAMAL HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to inflated, 6-25 µm wide, thin-walled, in KOH and Melzer's as for the hyphae of the lamellae trama. CORTICAL HYPHAE OF STIPE longitudinally arranged, subparallel to more or less interwoven, cylindrical to more or less inflated, 6-25 µm wide, thin-walled, in KOH hyaline, pale vinaceous to pinkish red or containing a concentrated red pigment, in Melzer's yellowish and sometimes containing colorless droplets; caulocystidia apparently absent. CORTINAL HYPHAE cylindrical, 2-8 µm wide, thin-walled, in KOH hyaline to pinkish or containing a concentrated vinaceous pigment, in Melzer's pale yellow or containing a more or less concentrated orangish pigment. CLAMP CONNECTIONS of the normal type, present throughout the basidiocarp. OLEIFEROUS HYPHAE present, in KOH grayish to brownish or slightly vinaceous, in Melzer's yellowish. INTERHYPHAL PIGMENT DEPOSITS present in the pilear trama, lamellar trama and the stipe cortex, in KOH yellow, orange, red or vinaceous red, in Melzer's yellow, orange or slightly reddish (sometimes shaded brownish).

Gregarious under *Pinus*. Fruiting period: December.

Collections examined: CALIFORNIA: Humboldt Co.: A.H. Smith 56392 (holotype, MICH), 56592.

C. humboldtensis is easily separated from other yellow-olive species of *Dermocybe* by the inky-violet KOH reaction of the pileus surface of fresh basidiocarps. All similarly colored species studied to date give a reddish, dark brown or dark olive reaction when KOH is applied to the pileus surface of fresh basidiocarps. The color reaction in *C. humboldtensis* is due to the purplish or bluish purple pigment and particles present in the hyphae of the pileus cuticle. A similar reaction is present in the hyphae of the pileus cuticle of *C. semisanguineus* but this species typically has deep red lamellae and a more strongly yellow-brown pileus and stipe.

CORTINARIUS OLIVACEOPICTUS Ammirati and Smith, sp. nov.

Fig. 5

Pileus 20-40 mm latus, ex obtuso plano-umbonatus, minute fibrillosus, subhygrophanus, disco rufobrunneus, margine olivaceo-brunneus; contextus ex olivaceo pallescens; odor indistinctus, sapor mitis vel subamarus. Lamellae adnexae, confertae, obscure luteolo-olivaceae demum ferrugineo-olivaceae. Stipes 40-70 mm longus, 8-13 mm crassus, aequalis, olivaceus, basi olivaceo-bubalinus, apicum versus fibrillis brunneo-aurantiacis zonatus. Sporae 6.5-8(-8.5) x 3.5-4.6(-5-6) µm, ellipticae, verruculosae. Holotypus: A.H. Smith 79016 (MICH), prope Van Duzer Corridor, Tillamook Co., Oregon, October 13, 1970.

PILEUS 20-40 mm broad, obtuse expanding to plano-umbonate, minutely fibrillose, subhygrophanous, disc reddish brown (Tawny) to more reddish, margin olive-brown (Tawny-Olive), fading to olive-brown (Tawny-Olive) overall at times. Context dark olive when moist, paler faded; odor slight, taste mild or slightly bitter.

LAMELLAE adnexed, close, broad, color at first dark yellowish olive, more rusty in age but olive tones remaining evident.

STIPE 40-70 mm long, 8-13 mm thick, equal, apex silky, color olive overall to base, olive-buff on the base, with belts or patches of deep brownish orange (Burnt Orange) fibrils near the apex. Context olive above, olive-fuscous in base.

PILEUS surface of fresh basidiocarps reddish with the application of KOH.

SPORES 6.5-8(-8.5) x 3.5-4.6(-5-6) µm, in profile elliptic and obscurely inequilateral to somewhat inequilateral, in face view elliptic to ovate, verruculose, in KOH light brown, in Melzer's brownish to brownish yellow. BASIDIA 4-spored, 26-34 x 6.2-8 µm, clavate to narrowly clavate, thin-walled, in KOH hyaline, pale yellowish or pale brownish, often containing colorless to yellowish particles or droplets, in Melzer's yellowish to yellowish brown, some containing particles of yellowish pigment or large droplets. PLEUROCYSTIDIA absent. CHEILOCYSTIDIA apparently absent. SUBHYMENIAL HYPHAE compactly interwoven, cylindrical, 2.5-5.5 µm wide, thin-walled, in KOH and Melzer's as for the hyphae of the lamellar trama. TRAMAL HYPHAE OF LAMELLAE subparallel to slightly interwoven, cylindrical to more or less inflated, 5-25 µm wide, thin-walled, in KOH hyaline to pale brownish, in Melzer's yellowish to yellowish brown, some containing particles of yellowish pigment. CUTICULAR HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to inflated, 6-26 µm wide, thin-walled, in KOH nearly hyaline to pale brownish or containing a more or less concentrated brownish orange, dull orange or reddish pigment or similarly colored particles, in Melzer's yellowish, yellowish brown or yellowish orange-brown; pileocystidia absent. TRAMAL HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to inflated, 6-30 µm wide, thin-walled, in KOH and Melzer's as for the hyphae of the lamellar trama. CORTICAL HYPHAE OF STIPE longitudinally arranged, subparallel to more or less interwoven, cylindrical to more or less inflated, 5-20 µm wide, thin-walled, in KOH hyaline, pale brownish or faintly vinaceous, in Melzer's yellowish; caulocystidia apparently absent. CORTINAL HYPHAE cylindrical, 3.5-8 µm wide, thin-walled, in KOH and Melzer's as for the hyphae of the stipe cortex. CLAMP CONNECTIONS of the normal type or, on some of the basal mycelium, of the medallion type, present throughout the basidiocarp. OLEIFEROUS HYPHAE present, in KOH pallid grayish to pale yellowish, in Melzer's yellowish to yellowish orange. INTERHYPHAL PIGMENT DEPOSITS present as small deposits in the pilear trama, lamellar trama and stipe cortex, in KOH yellow, in Melzer's dull yellowish to yellowish brown.

Gregarious to scattered in conifer or mixed woods. Fruiting period: September to October (western North America) or July (eastern North America).

Collections examined: MICHIGAN: Emmet Co.: A.H. Smith 32818. OREGON: Benton Co.: J.F. Ammirati 5981; Clackamas Co.: A.H. Smith 20158, 24609, 24610; Tillamook

Co.: A.H. Smith 79016 (holotype, MICH), 79203, 79278.
WASHINGTON: Pierce Co. A.H. Smith 47561.

C. olivaceopictus is one of several Dermocybes with strong yellowish olive to olive colors. In general appearance it is similar to *C. humboldtensis* but it can be separated from the latter by its smaller spores, the ferruginous to reddish orange fibrils or fibrillose zones on the stipe and the reddish, rather than dark inky violet, reaction of the pileus surface of fresh basidiocarps with KOH. *C. tubarius* Ammirati and Smith and *C. huronensis* var. *olivaceus* Ammirati and Smith are easily separated from *C. olivaceopictus* by their larger spores.

CORTINARIUS THIERSII Ammirati and Smith, sp. nov.

Fig. 2

Pileus *15-50 mm latus, obtuse convexus demum plano-convexus, umbonatus vel subdepressus, glaber vel sericeus vel appresso-fibrillosus, primo lamellis immaturis concolor demum ochraceo-brunneus vel cinnamomeo-brunneus; contextus solidus, usque 2 mm crassus, superficie pilei concolor vel pallidior; odor et sapor raphanini.* *Lamellae* *confertae vel subdissitae, luteolo-bubalinae dein pallide ochraceo-luteae vel pallide ochraceo-bubalinae demum fulvo-tinctae.* *Stipes* *30-50 mm longus, 4-10 mm crassus, aequalis vel basi incrassatulus, siccus, appresso-fibrillosus, pallide viridi-luteus demum pallide luteo-bubalinus vel subochraceo-bubalinus, interdum plus brunneus vel brunneo-olivaceus.* *Cortina* *luteola, evanescens.* *Sporae* *7.7-10(-12) x 4.7-5.8 (-6.2) µm, ellipticae, verruculosae. Holotypus: H.D. Thiers 12633 (SFSU), prope Pinecrest Campground, Tuolumne Co., California, June 14, 1965.*

PILEUS 15-50 mm broad, obtusely convex when young, becoming plano-convex, umbonate to shallowly depressed, in age often irregular in outline, margin incurved becoming decurved, smooth to silky or appressed fibrillose, never scaly but often lacerated or torn in age, when young more or less concolorous with the young lamellae or yellow brown (Buckthorn Brown) to olive-brown (Dresden Brown), in age becoming ochraceous brown (Ochraceous-Tawny) to deep brown (Cinnamon Brown), in some slightly darker on the disc or the margin more pallid. Context solid, up to 2 mm thick, more or less concolorous with the surface or slightly paler;

odor and taste raphanoid.

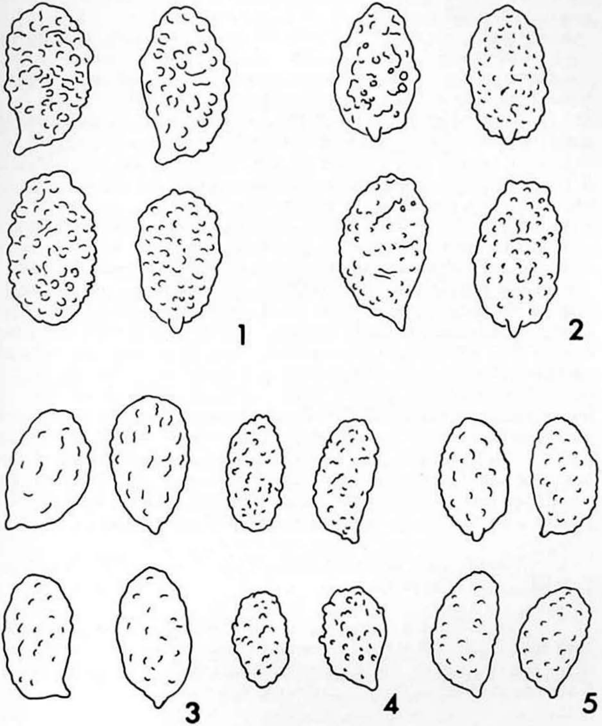
LAMELLAE shallowly to deeply notched, close to subdistant, thin, some slightly ventricose, edges even to eroded, several tiers of lamellulae, when very young light yellowish buff (Warm Buff) becoming light ochraceous yellow to light ochraceous buff (Yellow Ocher, Antimony Yellow, Ochraceous Buff) finally with a fulvous (Ochraceous-Tawny) cast, edges concolorous with the faces.

STIPE 30-50 mm long, 4-10 mm thick, equal or the base slightly enlarged, dry, appressed fibrillose becoming more or less fibrillose scaly from handling, color light greenish yellow (Chalcedony Yellow) when young, becoming light yellowish buff (Warm Buff) to light ochraceous buff (Ochraceous Buff) or some in age sordid or more brownish to brownish olive (Ochraceous-Tawny to Dresden Brown). Context stuffed becoming hollow, more or less concolorous with the surface.

CORTINA yellowish, not leaving a noticeable annulus on the stipe.

PILEUS SURFACE of fresh basidiocarps not tested with KOH; pileus surface of dried basidiocarps vinaceous-red with the application of KOH.

SPORES 7.7-10(-12) x 4.7-5.8(6.2) µm, in profile elliptic and obscurely inequilateral to somewhat inequilateral, in face view elliptic to broadly elliptic or slightly ovate, verruculose, in KOH light brownish to light fulvous (Ochraceous-Tawny), in Melzer's yellowish to yellowish brown. BASIDIA 4-spored, 29-34 x 7.5-9.5 µm, broadly clavate to clavate or more or less ventricose, thin-walled, in KOH hyaline to pale vinaceous, some containing colorless to yellowish granules and droplets or particles and masses of purplish red, red, reddish orange, orange or yellowish pigment, in Melzer's pale yellow or containing particles of reddish, orange or yellowish pigment. PLEUROCYSTIDIA absent. CHEILOCYSTIDIA not well differentiated, 14-18 x 6-9.5 µm, clavate to broadly clavate, thin-walled, in KOH and Melzer's as for the basidia but fewer containing particles of pigment. SUBHYMENIAL HYPHAE compactly interwoven, cylindrical, 2.5-6(-6.5) µm wide, thin-walled, in KOH and Melzer's as for the hyphae of the lamellar trama. TRAMAL HYPHAE OF LAMELLAE subparallel to slightly interwoven, cylindrical to more or less inflated, 5-26 µm wide, thin-walled, in KOH hyaline to pale vinaceous or containing a more or less concentrated vinaceous to yellowish pigment, in Melzer's yellowish. CUTICULAR HYPHAE OF PILEUS interwoven, more or less radially arranged,



FIGS. 1-5 Basidiospores (x1800). 1. *Cortinarius aurantiobasis*. 2. *Cortinarius thiersii*. 3. *Cortinarius humboldtensis*. 4. *Cortinarius zakii*. 5. *Cortinarius olivaceopictus*.

cylindrical to more or less inflated, 5-25 µm wide, thin-walled, in KOH hyaline, pale vinaceous to pale brown or containing a more or less concentrated reddish, vinaceous or brownish vinaceous pigment, some slightly encrusted, in Melzer's yellowish, yellowish brown or yellowish orange-brown; pileocystidia absent. TRAMAL HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to inflated, 6-30(-40) µm wide, thin-walled, in KOH and Melzer's as for the hyphae of the lamellar trama. CORTICAL HYPHAE OF STIPE longitudinally arranged, subparallel to more or less interwoven, cylindrical to more or less inflated, 6-25 µm wide, thin-walled, in KOH hyaline, pale pinkish to pale reddish or containing a more or less concentrated reddish vinaceous to vinaceous pigment or red-vinaceous particles, in Melzer's yellowish or yellowish orange to dull orange, some containing granules; caulocystidia apparently absent. CORTINAL HYPHAE cylindrical, 3.5-7 µm wide, thin-walled, in KOH as for the hyphae of the stipe cortex, in Melzer's yellowish. CLAMP CONNECTIONS of the normal type, present throughout the basidiocarp. OLEIFEROUS HYPHAE present, in KOH vinaceous to brownish vinaceous, in Melzer's yellowish to yellowish brown. INTERHYPHAL PIGMENT DEPOSITS present in the pilear cuticle and trama, the lamellar trama and the stipe cortex, in KOH purplish red, red, orange or ochraceous-orange to yellow, in Melzer's reddish orange to yellowish.

Caespitose to gregarious under conifers. Fruiting period: June to August.

Collections examined: CALIFORNIA: Amador Co: J.F. Ammirati 182 (SFSU); G. Breckon 413 (SFSU), 422 (SFSU); H.D. Thiers 12633 (holotype, SFSU). IDAHO: Custer Co.: A.H. Smith 65655.

C. thiersii is a common species in the higher mountains of California and should be expected in the higher coniferous forests throughout western North America.

The large spores together with the general coloration of the basidiocarps distinguishes it from other species of *Dermocybe* with yellowish lamellae. The pilei are yellowish buff at first and then become brownish to brownish olive and finally more or less cinnamon brown. The lamellae are yellowish buff at first and become ochraceous to brownish or rusty brown in age. The stipe surface is greenish yellow at first and becomes somewhat sordid to brownish below in age or from handling. In some collections the pileus context is somewhat greenish yellow, usually it is similar in color to the pileus surface.

The large spores of *C. thiersii* (spores 7.7-10(-12) x 4.7-5.8(-6.2) µm) indicate some affinity with other large-spored Dermocybes, such as *C. huronensis* and *C. chrysolitus* Kauffman (spores 8.5-11(-12) x 5-6.2 µm), that occur in the coniferous forests of eastern North America. However, more information on the distribution and ecology of these species is needed before their relationship with *C. thiersii* can be determined.

C. thiersii is named for Professor H.D. Thiers, San Franscisco State University, who first collected it from California.

CORTINARIUS ZAKII Ammirati and Smith, sp. nov.

Fig. 4

Pileus 15-45 mm latus, e convexo late obtusus, umbonatus vel subumbonatus, siccus, appresso-fibrillosus, ad marginem primo olivaceo-brunneus deinde subfulvus demum rufobrunneus vel valde rufobrunneus, disco concolor vel fuscior; contextus dilute brunneus; odor et sapor plus minusve raphanini. Lamellae confertae, primo sordide aurantiacae, brunneo-suffusae, deinde pallide brunneo-aurantiacae demum ferrugineo-aurantiacae, aetate interdum maculis rufobrunneis. Stipes 40-75 mm longus, apice 4-10 mm crassus, aequalis vel basi incrassatulus, appresso-fibrillosus, apice luteolus vel luteus, deorsum ochraceus, brunneo-ochraceus vel pallide aurantio-ochraceus et fibrillis brunneis vel vinaceo-brunneis tectus. Sporae (6-)6.5-8 x 4-4.5(-5) µm, ellipticae, verruculosae. Holotypus: J.F. Ammirati, Jr. 6175 (MICH), prope Mary's Peak, Benton Co., Oregon, November 16, 1971.

PILEUS 15-45 mm broad, convex becoming broadly obtuse, umbonate to subumbonate, with the margin incurved to slightly decurved, dry, appressed fibrillose becoming minutely fibrillose-scaly on the margin in age, margin at first olive-brown (Tawny-Olive) or browner, sometimes with slight ochraceous to olivaceous (Old Gold) tones, becoming light fulvous (Ochraceous-Tawny) to reddish brown (Tawny) or deep red-brown (Warm Sepia), sometimes with a streaked appearance, disc more or less concolorous with the margin or slightly darker reddish brown when mature, sometimes the surface with a light olive-yellow (Honey Yellow) sheen overall. Context watery brown, faintly olive or more or less concolorous with surface when moist, when faded pale yellow to light buff or with an orange-buff cast; odor and taste more or less raphanoid.

LAMELLAE close to crowded, adnexed to emarginate, broad, not strongly ventricose, edges uneven, at first dull orange (near deep Zinc Orange) with slight brownish tones, becoming rusty orange (Orange Rufous) to brownish rusty-orange, when older sometimes with reddish brown spots.

STIPE 40-75 mm long, apex 4-10 mm thick, equal or the base slightly enlarged, appressed fibrillose, apex light yellow (Amber Yellow) or slightly deeper yellow (Pinard Yellow) but not strongly orange-yellow, below ochraceous, dingy to brownish ochraceous or slightly dull orange-ochraceous beneath a more or less continuous covering of dull brown to vinaceous brown (Natal Brown) fibrils, base dingy ochraceous to brownish. Context stuffed to hollow, cortex in apex at first yellow but soon sordid and developing watery brown to watery orange-brown tones, lower cortex watery brown to brownish orange and in the base olive-brown to watery olive, pith yellowish to pale dull buff or more sordid or shaded with colors of the cortex, in cavity vinaceous-brown (Natal Brown) in places.

PILEUS SURFACE of fresh basidiocarps reddish with the application of KOH.

SPORES (6-)6.5-8(-9) x 4-4.5(-5) µm, in profile elliptic and obscurely inequilateral to somewhat inequilateral, in face view ovate to elliptic, verruculose, in KOH pale to light brown, in Melzer's pale brown to light yellow-brown. BASIDIA 4-spored, 22-30 x 5.5-7 µm, clavate to narrowly clavate, thin-walled, in KOH hyaline to pale greenish yellow, sometimes containing droplets or more or less filled with concentrated greenish yellow pigment or greenish yellow particles, in Melzer's pale yellow or more or less filled with concentrated yellowish pigment or yellowish particles. PLEUROCYSTIDIA absent. CHEILOCYSTIDIA apparently absent. SUBHYMENIAL HYPHAE compactly interwoven, cylindrical, 2-6 µm wide, thin walled, in KOH and Melzer's as for the hyphae of the lamellar trama. TRAMAL HYPHAE OF LAMELLAE subparallel to slightly interwoven, cylindrical to inflated, 7-28 µm wide, thin-walled, in KOH hyaline to pale greenish yellow or more or less filled with concentrated yellow-green pigment or yellow particles, in Melzer's pale yellow or more or less filled with concentrated yellow-brown pigment or yellow, yellow-brown, dull orange-brown or reddish orange-brown particles. CUTICULAR HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to somewhat inflated, 7-20 µm wide, thin-walled (up to 1.5 µm thick), in KOH hyaline to brownish ochraceous or filled with a concentrated red-vinaceous, brownish vinaceous or brownish pigment, sometimes encrusted, in Melzer's pale yellow, brownish yellow or more ochraceous; pileocystidia absent. TRAMAL HYPHAE OF PILEUS interwoven, more or less radially arranged, cylindrical to inflated, 7-30 µm wide, thin-walled, in KOH hyaline to pale yellow or more ochraceous in the upper trama, in Melzer's pale dull yellow to light ochraceous. CORTICAL HYPHAE OF STIPE longitudinally arranged, subparallel to more or less interwoven, cylindrical to slightly inflated, 7-20 µm wide, thin-walled, in KOH hyaline to pale dull greenish yellow or filled with concentrated greenish yellow pigment or containing yellowish particles, in Melzer's pale yellow, sometimes containing yellowish particles (some of these may be amylaceous); caulocystidia apparently absent. CORTINAL HYPHAE cylindrical, 3-8 µm wide, thin-walled, in KOH hyaline to pale greenish yellow, in Melzer's pale yellowish. CLAMP CONNECTIONS of the normal type, present throughout the basidiocarp. OLEIFEROUS HYPHAE present, in KOH slightly colored to yellowish, in Melzer's yellow to olive-yellow. INTERHYPHAL PIGMENT DEPOSITS present in the pilear trama, lamellar trama and the stipe cortex, in KOH yellow to greenish yellow or dull yellow on standing, in Melzer's yellow, orange or reddish orange (some amylaceous).

Gregarious to caespitose in humus or rotten wood in stands of *Pseudotsuga menziesii* (Mirb.)Franco. Fruiting period: November.

Collections examined: OREGON: Benton Co.: J.F. Ammirati 5984, 6170, 6171, 6172, 6173, 6174, 6175 (holotype, MICH); Polk Co.: A.H. Smith 79721.

The small spores and orange-colored lamellae of *C. zakii* indicate some affinity with *C. malicorius* Fries and *C. croceofolius* Peck. However, *C. zakii* has somewhat larger spores than these species and the color of the young lamellae is usually deep orange rather than yellow-orange or light orange. In addition, the stipe of *C. zakii* is coated with dull brown to vinaceous-brown fibrils while in *C. malicorius* and *C. croceofolius* the fibrils on the stipe are yellow-orange to orange or reddish orange. Also, the flesh of the pileus and stipe of *C. zakii* is usually more brownish to orange tinted than in these species.

C. zakii is named for Dr. B. Zak of the Pacific Northwest Forest and Range Experiment Station, Corvallis, Oregon, who has worked on the mycorrhizae formed by this species (7-8). His studies show that *C. zakii* forms ectendomycorrhizae with *Arbutus menziesii* Pursh and ectomycorrhizae with *Pseudotsuga menziesii* and *Abies grandis* (Dougl.) Lindl.

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NOMENCLATURAL CHANGES AND NEW SPECIES IN THE UREDINALES[1]

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SUMMARY

New species are: *Coleosporium arizonicum* on *Brickellia* in Arizona; *C. durangense* on *Eupatorium*, *C. incompletum* on *Stevia*, *C. longisporum* on *Carphochaete*, and *C. pereziae* on *Perezia*, *Uredo mexicensis* on *Leucaena* in Mexico; *Puccinia dyssodiae* on *Dyssodia* in Arizona and Mexico. New names are: *Coleosporium pacificum* (*C. madiae* Cooke nom. illegit.); *Puccinia ocellifera* (*P. biocellata* Vest., *P. plucheae* Arth. nom. illegit.) New status or new combinations are: *Puccinia arachidis* Speg. var. *offuscata* (*P. offuscata* Arth.), *P. calcitrapae* DC. var. *bardanae* (*P. bardanae* (Wallr.) Corda), *P. calcitrapae* var. *centaureae* (*P. centaureae* DC.), *P. cascadensis* (*P. albulensis* Magn. ssp. *cascadensis* Savile), *P. concinna* Arth. var. *duranii* (*P. duranii* Hennen, Leon-Gall. & Cumm.), *P. hieracii* (Roehl.) Mart. var. *harknessii* (*P. harknessii* Vize), *P. hieracii* var. *stephanomeriae* (*P. stephanomeriae* Syd.), *P. invelata* H. S. Jack. var. *echinulata* (*P. cognata* Syd. var. *echinulata* J. Parm.), *P. kuhniae* Schw. var. *brickelliae* (*P. brickelliae* Peck), *P. tanaceti* DC. var. *dracunculina* (*P. dracunculina* Fahr.) *P. variabilis* Grev. var. *insperata* (*P. insperata* H. S. Jack.), *P. variabilis* var. *lapsanae* (*P. lapsanae* Fckl.), *Uromyces appendiculatus* (Pers.) Unger var. *punctiformis* (*U. punctiformis* Syd.), *U. purus* (*Argomycetella pura* Syd., *Maravalia pura* (Syd.) Mains). *U. trifolii-repentis* Liro var. *fallens* (*Nigredo fallens* Arth.)

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[1] University of Arizona Agricultural Experiment Station Journal Article No. 2705.

COLEOSPORIUM ARIZONICUM Cumm. sp. nov.
Coleosporium aridum H. S. Jack. in Arthur Bull. Torrey Bot. Club 51:52. 1924. (Illegit. based on uredinia).

Spermogoniis et aeciis ignotis. Urediniis (*Uredo arida* Cumm. Mycologia 48:607. 1956) hypophyllis, conspicuis, saepe concentricis, primo aurantiacis tum pallide flavidis; sporis (18-)21-26(-29) x (17-)20-24 µm, variabilis sed pro parte maxima late ellipsoideis vel late obovoideis, membrana 2.5 µm crassa (cum verrucae), uniformiter verrucosa, fere hyalina. Basidiosoris hypophyllis, obscure aurantiacis, stratum exterius gelatinosum (5-)10-15 µm crassum in sicco corneus, ex basidiis 2-4 catenulatim compositis; basidiis (40-)45-60(-65) x (17-)19-23(-26) µm, cylindricis, statim germinantibus, basidiosporis 15-20 x 12-16 µm, late obovoideis.

Holotype: on *Brickellia californica* Torr. & Gray, Oak Creek Canyon N of Sedona, Arizona, Cummins 57-72 (PUR 56550); isotypes Solheim & Cummins Mycofl. Saximont. Exsic. No. 902. Also in California on the same host.

The urediniospore inner wall is 1 µm thick. This is adorned externally with flat topped, rod like "verrucae" about 1.5 µm high which may be discrete or merged in short irregular ridges.

COLEOSPORIUM DURANGENSE Cumm. sp. nov.

Spermogoniis, aeciis et urediniis ignotis. Basidiosoris hypophyllis, primo aurantiacis tum melleis, stratum exterius gelatinosum (8-)10-14 µm crassum in sicco corneus, ex basidiis 3 vel 4 catenulatim compositis; basidiis 60-75 (-80) x 18-22(-24) µm, plerumque cylindraceis, basidiosporis (18-)20-22(-24) x (15-)16-18(-20) µm, late obovoideis vel late ellipsoideis.

Holotype: on *Eupatorium calaminthaefolium* H.B.K., Mex hgw 40, km 1015, W of Durango, Dgo., Mexico, 25 Nov. 1963, Cummins 63-577 (PUR 62369). Not known otherwise.

Neither uredinia nor urediniospores adhering to gelatinized basidiosori could be found. The basidia are longer than those of *C. arizonicum* but basidial size is variable in *Coleosporium*. If the urediniospores, when found, correspond to those of *C. arizonicum* the species may need to be merged. Both occur associated with ponderosa pine.

COLEOSPORIUM INCOMPLETUM Cumm. sp. nov.

Spermogoniis ignotis, verisimiliter nullis. Aeciis hypophyllis, sparsis vel aggregatis, peridium brevis, inconspicuis, cellulis peridii plus minusve quadratis 20-35 µm longis, verrucosis, sporis (21-)23-30(-33) x (16-)18-22 (-24) µm, pro parte maxima ellipsoideis vel oblongo-ellipsoideis, membrana 3-3.5 µm crassa (cum verrucae), plus minusve unilateraliter verrucosis, hyalinis. Urediniis ignotis, verisimiliter nullis. Basidiosoris hypophyllis, aurantiacis, stratum gelatinosum exterius 18-25 µm crassus in sicco corneus, 1 vel 2 basidiis altus noncatenatus; basidiis (50-)58-66(-70) x 17-22(-26) µm, plerumque cylindraceis, basidiosporis 18-20 x 16-18 µm ovalis vel obovoideis.

Holotype: on *Stevia berlandieri* A. Gray, Mex hgw 40, near Espinosa del Diablo, Durango, Mexico near the border with Sinaloa, 29 Nov. 1971, Cummins 71-544 (PUR 64124). Not known otherwise.

This autoecious and apparently demicyclic species differs from *C. reichei* Diet. especially in the short inconspicuous peridium which, in *C. reichei*, is about 1 mm long and conspicuously peridermioid. The basidiospores of *C. reichei* are not known.

COLEOSPORIUM LONGISPORUM Cumm. sp. nov.
Aecidium carphochaetes Syd. Ann. Mycol. 1:20. 1903.

Spermogoniis et aeciis ignotis. Urediniis hypophyllis auranticis vel flavidis; sporis (23-)27-38(-44) x (16-)18-24(-27) µm, oblongo-ellipsoideis, ellipsoideis vel late ellipsoideis, membrana 3-4.5 µm crassa (cum verrucae), unilateraliter verrucosa, hyalina. Basidiosoris hypophyllis, aurantiacis, stratum gelatinosum exterius plus minusve 20 µm crassus in sicco corneus, 1 basidium altus; basidiis (55-)60-70(-80) x (16-)18-22 µm, cylindraceis, basidiosporis (20-)24-28(-30) x 11-14 µm, oblongo-ellipsoideis vel leniter allantoideis.

Holotype: on *Carphochaete grahamii* A. Gray, Mex hgw 40, km 1016 W of Durango, Dgo., Mexico, 26 Nov. 1963, Cummins 63-581 (PUR 62353).

Arthur (1924) treated Sydow's species as a synonym of *Coleosporium steviae* Arth. recognizing that it was not an aecial stage. The "verrucae" of the urediniospore wall are rod like or ridge like, 2-3 µm high, and with flat tops. They may merge variously on the coarsely sculptured side of the spore but decrease to become finely rugose or pseudoreticulate on the opposite side. New basidia may push up between the older ones but they are not catenulate.

COLEOSPORIUM PACIFICUM Cumm. nom. nov.
Coleosporium madiae Cooke Grevillea 7:102. 1879 (Illegit.: based on uredinia).
Stichopsora madiae Syd. Ann. Mycol. 2:30. 1904.

The first description of telia, albeit sketchy, is that of Sydow: "An einigen Blättern waren bereits junge Teleutolagern entwickelt. Es scheint, als ob auch bei dieser Art die Teleutosporen nicht einzeln, sondern reihenweise entstehen, ..." Arthur (1907) provided a more detailed description of telia, but under *Coleosporium madiae* Cooke. Cummins and Stevenson (1956) used *C. madiae* (Syd.) Arth., citing the N. Amer. Flora. *C. pacificum* is proposed because *C. madiae*, under whatever authorship, is a later homonym of *C. madiae* Cooke.

The type is that cited by Sydow for *Stichopsora madiae*: on *Madia sativa* Molina from California, collected by E. B. Copeland (S).

COLEOSPORIUM PEREZIAE Cumm. sp. nov.

Spermogoniis et aeciis ignotis. Urediniis hypophyllis, sparsis, primo aurantiacis tum pallide flavidis; sporis (18-)21-26(-29) x (17-)20-24 µm, plerumque oblongo-ellipsoideis vel late ellipsoideis, membrana 2.5-3 µm crassa (cum verrucae) plus minusve uniformiter verrucosa. Basidiosoris hypophyllis, obscure aurantiacis, stratum exterius gelatinosum 15 µm vel minus crassum in sicco corneus, ex basidiis 3 vel plus catenulatim compositis; basidiis 44-70 x 17-23 µm, cylindricis, basidiosporis 16-18 x 14-16 µm, obovoideis vel plus minusve napiformis.

Holotype: on *Perezia thurberi* A. Gray, Mex hgw 45 near km 177 S of Durango, Dgo., Mexico, 19 Oct. 1971, Cummins 71-209 (PUR 65365). Also known on *P. reticulata* (Lag.) A. Gray, *P. rigida* (DC.) A. Gray in Durango and on *P. wrightii* A. Gray in Nuevo Leon.

These are the first records of a species of *Coleosporium* on the tribe Mutisieae of the Compositae. This species is one of a few that have truly catenulate basidia; in most others the new basidia may crowd up among the older and collapsed ones to give a pseudocatenulate appearance.

PUCCINIA ARACHIDIS Speg. var. *OFFUSCATA* (Arth.) Cumm. stat. nov.

Puccinia offuscata Arth. Bull. Torrey Bot. Club 47: 469. 1920.

P. offuscata on species of *Zornia* differs from *P. arachidis* in having 2-4, commonly 3, germ pores in the urediniospores and somewhat paler teliospores. There are no significant size differences. The aecial stage is not known for either. The holotype of *P. offuscata* is C. F. Baker No. 2143 (PUR 36786) on *Zornia diphylla* (L.) Pers. from Herradura, Cuba.

Species of *Puccinia* are rare on legumes. Recognizing this, Savile (1971) suggested that *P. arachidis* and *P. offuscata* "... probably belong elsewhere" but without deciding where. The discovery of spermogonia and aecia will be needed to decide the matter.

PUCCINIA CALCITRAPAE DC. var. *BARDANAE* (Wallr.) Cumm. comb. nov.

Puccinia inquinans bardanae Wallr. Fl. Crypt. Germ. 2: 219. 1833.
Puccinia bardanae (Wallr.) Corda Icones Fung. 4:17. 1840.

This variety has uniformly echinulate urediniospores whereas var. *centaureae* has urediniospores with a smooth zone just above the hilum. The significance of this difference is open to question. I have not seen the type.

PUCCINIA CALCITRAPAE DC. var. *CENTAUREAE* (DC.) Cumm. stat. nov.

Puccinia centaureae DC. Flore Fr. 5:59. 1815.
Puccinia carthami Corda Icones Fung. 4:15. 1840.
Puccinia laschii Lager. Tromsoe Mus. Aarsh. 17:63. 1895.
Puccinia irrequisita H.S. Jack. in Arthur Bull. Torrey Bot. Club 48:32. 1921.

The variety occurs in North America on *Carthamus* *tinctorius* L. *Centaurea americana* Nutt., *C. nigra* L. and species of *Cirsium*. The holotype is on *Centaurea*, environs de Mende, Prost (G).

Savile (1970) recognized the above listed entities as species and added *P. laschii* var. *xerophylla* Savile. But these fungi have the principal characters in common i.e., uredinoid aecia, teliospores with small verrucae, depressed pores with slight or no umbonate caps, fragile pedicels and similar sizes, and urediniospores with 3 equatorial pores with slight or no "caps", a smooth zone basally and a wall conspicuously thicker at the hilum than elsewhere.

PUCCINIA CASCADENSIS (Savile) Cumm. stat. nov.
Puccinia albulensis Magn. ssp. *cascadensis* Savile Can. J. Bot. 46:632. 1968.

P. albulensis is characterized by systemic infections, whereas ssp. *cascadensis* produces only local infections, and the teliospores are morphologically distinct. To consider the two fungi as belonging to a single species exceeds credibility, hence the elevation of ssp. *cascadensis* to specific rank.

PUCCINIA CONCINNA Arth. var. *DURANII* (Hennen, Leon-Gall. & Cumm.) Cumm. stat. nov.
Puccinia duranii Hennen, Leon-Gall. & Cumm. Southw. Nat. 16:367. 1972.

This fungus has dimorphic teliospores, the large ones mostly 40-48 x 27-29 µm and the small ones mostly 29-35 x 21-25 µm. The teliospores of *P. concinna* var. *concinna* are mostly 40-52 x 25-32 µm. The wall is minutely rugose or rugose reticulate in both and there is no appreciable difference in the urediniospores. Aecia are not known. *Eupatorium greggii* Gray is the host of both. The holotype of var. *duranii* is Hennen No. 69-152 (PUR 63275) from south of Hidalgo del Parral, Dgo., Mexico.

PUCCINIA DYSSODIAE Cumm. sp. nov.

Spermogoniis, aeciis et urediniis nullis. Teliis sparsis vel aggregatis, amphigenis et caulicolis, plus minusve erumpentibus, compactis, atro-brunneis, paraphysibus brunneis aggregatis paucis sed soris non-loculatis, stratum sporogenus castaneo-brunneus; sporis (39-)44-60(-65) x (17-)18-23(-25) µm, variabiles sed pro parte maxima elongato-clavatis vel oblongo-ellipsoideis, ad apicem late rotundis vel plus minusve obtusis, membrana ad latere (1.5-)2-2.5(-3) µm crassa apicem versus plerumque 2.5-4 µm crassa vel ad apicem (5-)7-9(-11) µm, castaneo-brunnea, levis, pedicello usque ad 50 µm plerumque 35-40 µm longo persistenti, brunneolo.

Holotype: on *Dyssodia pentachaeta* (DC.) B. L. Rob., 3 miles N of Portal, Arizona, 14 Sept. 1961, Cummins 61-173 (PUR 59039). Also known from one collection in Nuevo Leon State, Mexico on *D. greggii* (Gray) B. L. Rob.

Dyssodia is a genus of the tribe Helenieae of the Compositae. The fungus was reported as *Puccinia grindeliae* Peck by Hennen, Leon-Gallegos and Cummins (1972) but differs markedly in having groups of stromatic paraphyses and teliospores with relatively short pedicels.

PUCCINIA HIERACII (Roehl.) Mart. var. *HARKNESSII* (Vize) Cumm. stat. nov.
Puccinia harknessii Vize Grevillea 7:11. 1878.

This variety differs from *hieracii* var. *hieracii* principally in having the teliospore wall 2-2.5(-3) µm thick and teliospore pedicels that reach 110 µm long and tend to be persistent. These differences may reflect the arid regions in which the fungus occurs on species of *Lygodesmia*, *Malacothrix*, and *Rafinesquia*.

There being no original material in K, I designate the following neotype: Harkness No. 742 (PUR 34727; isotype NYS) on *Lygodesmia spinosa* Nutt., Mt. Rosa, Nevada, 7000 ft. This is in accord with the listing of "*P. Harknessii* n. sp. Vize" in Harkness and Moore (1880).

PUCCINIA HIERACII (Roehl.) Mart. var. *STEPHANOMERIAE* (P. Syd. & H. Syd.) Cumm. stat. nov.
Puccinia stephanomeriae P. Syd. & H. Syd. Monogr. Ured. 1:157. 1902.
Puccinia harknessii major Arth. Manual Rusts U.S. and Canada. p. 353. 1934 (Illegit.; trinomial).

This variety is similar to var. *harknessii* but the urediniospores mostly are 30-36 x 25-30 µm vs 23-26 x 19-24 µm and the teliospores are mostly 35-46 x 23-28 µm vs 33-40 x 21-25 µm. The pedicel is semipersistent. The holotype is on *Stephanomeria cichoriacea* Gray, Pasadena, California, McClatchie (S).

PUCCINIA INVELATA H. S. Jack. var. *ECHINULATA* (J. Parm.) Cumm. comb. nov.

Puccinia cognata P. Syd. & H. Syd. var. *echinulata* J. Parm. Can. J. Bot. 45:2287. 1967.

It is my opinion that var. *echinulata* is related to *P. invelata* rather than to *P. cognata* and that *P. cognata* var. *fraseri* J. Parm. and *P. parthenices* H. S. Jack. are synonymous with *P. invelata* var. *invelata*. The holotype of var. *echinulata* is on *Verbesina turbacensis* H.B.K., Zunil, Guatemala, Standley No. 83189 (PUR 49983).

PUCCINIA KUHNIAE Schw. var. *BRICKELLIAE* (Peck) Cumm. stat. nov.

Puccinia brickelliae Peck Bull. Torrey Bot. Club 12: 34-35. 1885.

This variety differs from other varieties of *P. kuhniae* in having the pore of the lower teliospore cell always next to the septum. The teliospores vary in shape and size, the pedicels vary but may be at least 200 µm long and sometimes have sterile branches.

The holotype in NYS bear these data: on *Brickellia*, Bowie, Arizona, M. E. Jones No. 541 but the published record reads "On living leaves of Brickellia. Arizona. September. M. E. Jones". The host unquestionably is *B. coulteri* Gray. Robinson (1917) cites a Jones specimen from Bowie, but without other data.

PUCCINIA OCELLIFERA Cumm. nom. nov.

Puccinia biocellata Vest. Micromycetes rar. sel. Nos. 1267, 1368. 1908 (Illegit.; perfect state not described).

Puccinia plucheae Arth. Bull. Torrey Bot. Club 49:194. 1922 (Illegit.; perfect state not described).

Dicaeoma plucheae Arth. & H. S. Jack. N. Amer. Fl. 7: 793. 1926 (Illegit.; telia described but the name a later homonym if used in *Puccinia*).

Puccinia biocellata Vest. ex Cumm. Mycologia 48:606. 1956 (Illegit.; telia described but the name a later homonym).

All descriptions of telia and teliospores are based on Vestergren's specimens. The type, designated by Cummins (loc. cit.), stands: on *Pluchea fastigiata* Griseb., Quinta near Laguna de la Brea, Prov. Jujuy, Argentina, June 13, 1901, Vestergren (Microm. rar. sel. No. 1368; holotype in the BPI bound set).

PUCCINIA TANACETI DC. var. *DRACUNCULINA* (Fahr.) Cumm. stat. nov.

Puccinia dracunculina Fahr. Ann. Mycol. 39:181. 1941.

Variety *dracunculina* differs from var. *tanaceti* mainly because the urediniospores are 17-20 µm wide vs 22-28 µm. The host plant is *Artemisia dracunculus* L. (*A. glaucus* Pall., *A. dracunculoides* Pursh). Fahrendorf did not designate a type, hence I have selected, from specimens cited by him, the following lectotype: on *A. dracunculoides*, Boulder, Colorado, Bartholomew and Bethel (PUR 37727; isotypes Barth. F. Columb. No. 2753).

P. tanaceti var. *tanaceti* is represented in North America by *Puccinia chrysanthemi* Roze, which I consider to be synonymous.

PUCCINIA VARIABILIS Grev. var. *INSPERATA* (H. S. Jack.) Cumm. stat. nov.

Puccinia insperata H. S. Jack. Brooklyn Bot. Gard. Mem. 1:253. 1918.

The holotype is on *Prenanthes alata* (Hook.) Griseb., Hood River Valley, Oregon, Jackson No. 3265 (PUR 34812).

This variety and var. *lapsanae* differ from variety *variabilis* because the urediniospores have 2, rarely 3, pores, whereas var. *variabilis* has 3, rarely 2, pores. Variety *insperata* has teliospores mostly 26-33 x 17-21 µm; those of var. *lapsanae* are mostly 26-29 x 19-23 µm. The three varieties are similar morphologically in all spore stages and are of northern distribution.

PUCCINIA VARIABILIS Grev. var. *LAPSANAE* (Fckl.) Cumm. stat. nov.

Puccinia lapsanae Fckl. Jahr. Nass. Ver. Nat. 15:13. 1860.

The holotype is on *Lapsana communis* L., near Oestrich in Nassau, Germany (G). The American host plant is the same.

UROMYCES APPENDICULATUS (Pers.) Unger var. *PUNCTIFORMIS* (P. Syd.) Cumm. stat. nov.
Uromyces punctiformis P. Syd., Sydow Uredineae No. 1513. 1901.

Variety *punctiformis* differs from var. *appendiculatus* because most teliospores are 35-40 x 28-31 µm vs 28-33 x 22-27 µm and the teliospore pedicel is thick walled. The holotype on *Ramarizella strobiliformis* (B. L. Rob.) Rose (*Vigna* s.), Guadalajara, Jal., Mexico, Holway (S; isotypes Sydow Ured. No. 1513) is the only record.

UROMYCES PURUS (H. Syd.) Cumm. comb. nov.
Argomycetella pura H. Syd. Ann. Mycol. 23:313. 1925.
Maravalia pura (H. Syd.) Mains Bull. Torrey Bot. Club 66:178. 1939.

The type of the genus *Maravalia* is *M. pallida* Arth. & Thaxt. on *Pithecellobium latifolium* (L.) Bernh. and only telia are known. *U. purus* and *U. pressus* Arth. & Holw. (*M. pressa* (Arth. & Holw.) Mains have the kind of spermogonia and uredinoid aecia that occur in many species of *Uromyces*. Both parasitize species of *Vernonia*. I believe that they belong in *Uromyces*.

UROMYCES TRIFOLII-REPENTIS Liro var. *FALLENS* (Arth.) Cumm. comb. nov.
Nigredo fallens Arth. N. Amer. Fl. 7:254. 1912.

This variety is generally similar to var. *trifolii-repentis* except the pores of the urediniospores often are 3 or 4, vs 2 or 3, or usually 3 or 4 more or less equatorial and 1 in or near the apex. I am designating as neotype: on *Trifolium pratense* L., Emporia, Kansas, 3 Nov. 1903, J. E. Bartholomew (PUR 15322; isotypes Barth. N. Amer. Ured. No. 685).

UREDO MEXICENSIS Cumm. sp. nov.

Soris subcuticularibus amphigenis, frequenter circinatem aggregatis, interdum nervicolis, paraphysibus peripherales capitatis, brunneis, capitulum (10-)14-20(-25) µm latus, membrana ad apicem 2-3.5(-4) µm crassa deorsum 1.5 µm crassa; sporis (20-)23-29(-33) x (11-)13-17(-19) µm, pro parte maxima obovoideis, membrana ad apicem 2.5-4(-5) um crassa deorsum 1.5-2.5(-3) µm crassa, uniformiter echinulata, echinulae inter se 1.5-2.5(-3) µm, poris germinationis (3)4-6, equatorialibus.

Holotype: on *Leucaena macrocarpa* Rose, Mex hgw 40, km 280 east of Malpica, Sin., Mexico, 1 Dec. 1971, Cummins No. 71-568 (PUR). There are three other collections from coastal areas of Colima and Jalisco states of Mexico.

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MYCOTAXON

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THE OCCURRENCE OF AMYLOID PLUGS IN THE ASCI OF ASCOTRICHA ERINACEA[1]

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SUMMARY

Ascotricha erinacea has been isolated and cultured, for the first time, from elephant dung collected in Kenya and Tanzania. The disposition of A. erinacea within the Xylariaceae on account of the amyloid apical plug in the ascus tip and the Dicyma conidial state is proposed. A revised description and illustrations are provided.

INTRODUCTION

The genus Ascotricha was erected by Berkeley (1838) for a single species A. chartarum Berk., which was found on paper. Cooke(1871) and Saccardo(1882) accepted the genus as distinct from Chaetomium Kunze ex Fr. Ascotricha was treated by Winter(1887) in the family Chaetomiaceae along with Chaetomium and Chaetomidium(Zopf)Sacc. Clements and Shear(1931) followed Winter's concept of the genus, but placed it in the family Sphaeriaceae. For a complete review of the history and taxonomic concept of the genus Ascotricha see Hawksworth(1971).

The species of Ascotricha are cosmopolitan in distribution and grow well on any cellulose-rich substrate. This report represents a new and interesting record from Kenya and Tanzania. The material and methods followed in this study are the same as described earlier by Khan and Cain(1972). A. erinacea Zambett has been isolated in pure culture on Weitzman and Silva-Hutner's medium(1967) and deposited with the Plant Research Institute, Ottawa(DAOM 142684), American Type Culture Collection(ATCC 24707), Centraalbureau voor Schimmelcultures(CBS 535.73), and Commonwealth Mycological Institute(IMI 174497).

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TAXONOMY

Ascotricha erinacea Zambett. , Bull. Soc. Bot. Fr. 102: 225. 1955. Figs. 1-12.

Colonies on Weitzman and Silva-Hutner's medium attaining a diameter of 5 cm. in 4 weeks at 28°C, slow growing, dark olivaceous, velvety to felty, margin lighter in colour, smooth to wavy, reverse dark grey. Perithecia pyriform, occasionally subglobose, 70 - 150μ diam. , olivaceous to dark brown by transmitted light, nearly black by reflected light; neck distinct and short, ostiolate, with conidiophores arising from it and adjacent areas; peridium membranaceous to semicoriaceous, dark brown to black, thick-walled, textura epidermoidea in surface view, 2-4 cells thick in cross-section. Asci 8-spored, cylindrical, thin-walled, persistent, 70 - 85 x 11 - 14μ, rounded at the apex, ending abruptly in a short stipe; apical plug staining blue with Melzer's reagent(Iodine-positive). Ascospores one-celled, ellipsoidal, 11 - 16 x 6.5 - 9μ, uniseriate, hyaline at first, then becoming olivaceous to light brown, finally dark brown to opaque at maturity, with a distinct longitudinal germ slit, forcibly discharged onto the cover of a Petri dish. Conidiophores arising independently from the substrate mycelium and the outer peridial cells around the perithecial neck, dichotomously or sympodially branched, 2.5 - 6.0μ diam., thick-walled, dark brown, with sharp pointed terminal ends. Conidia(Sympodulospores) ellipsoidal, ovoid or subglobose, 4.5 - 7 x 3 - 4.5μ, smooth, hyaline, arising as blown out ends at the apex of simple or branched conidiophores.

HOLOTYPE: on paper, Bibliothèque Nationale, Paris, France, sine dato, Nicot, herb. Zambettakis 1012(PC).

SPECIMENS EXAMINED: KENYA: Mt. Kenya, Kamweti, 0°23'S, 37°20'E, elev. 6800 ft, elephant dung, 11 July 1966, Cain, Griffin and Krug, TRTC 66.327c. TANZANIA: Ngurdoto Crater, 3°15'S, 36°55'E, elev. 3000 ft, elephant dung, 10 August 1966, Cain, Griffin and Krug, TRTC 66.1093m.

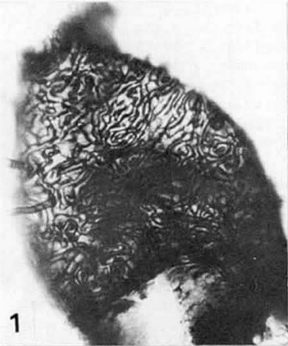
DISCUSSION

When the asci of A. erinacea were stained with Melzer's reagent each was found to contain a distinct amyloid apical plug which previously has never been reported in any species of Ascotricha. Moreover, the conidiophores arising from the neck region superficially resemble the terminal hairs found in the genus Chaetomium. These conidiophores are straight, pointed, dichotomously or sympodially branched and do not hold the ascospores in a cirrhus, as they are shot out forcibly by the ejection of the amyloid apical plug. The ascospores always have a longitudinal germ slit.

This is a very slow growing species compared with the species of Chaetomium which usually take 10 to 15 days to cover a 9 cm. Petri dish culture. All of these characteristic features of A. erinacea as exemplified in the specimens from Kenya and Tanzania clearly indicate that this species does not belong in the Chaetomiaceae, but should be placed in the Xylariaceae. The ornamentation on the terminal hairs in ninety two species of Chaetomium and representatives of similar genera has been examined under scanning electron microscopy by Hawksworth and Wells(1973). They report a similar ornamentation on the terminal hairs of Chaetomium, Achaetomiella von Arx, Chaetomidium, and Thielavia Zopf; but no ornamentation on the hairs in Ascotricha, Farrowia D. Hawksw. (as Chaetoceratostoma Turc. & Maffei), Coniochaeta(Sacc.)Massee, Kernia Nieuwl., and Lophotrichus Benjamin. Thus, at least, on the basis of the nature of the surface of terminal hairs, these two groups of genera are quite different phylogenetically. These observations on the terminal hairs support our conclusion that Ascotricha should be placed in the Xylariaceae.

In order to confirm our observations for other species of the genus, herbarium(TRTC) material of A. amphitricha (Corda)Hughes and A. chartarum was examined. Since the asci are usually very evanescent it was not surprising to observe that all collections in our herbarium lacked asci. Likewise attempts to germinate the ascospores from this material, even when subjected to heat and chemical treatments, were not successful. Consequently, it was not possible to confirm the presence of amyloid apical structures in these taxa. When cultures become available for these as well as the other remaining species, the asci should be re-examined to determine the presence or absence of amyloid apical plugs. However, whether the asci have these structures or are evanescent is not considered significant at the generic level.

Ascotricha is distinguished from Chaetomium on the basis of the distinct neck on the perithecia,the amyloid plug in the asci, and the prominent germ slit in the ascospores. Hawksworth(1971) has emphasized a number of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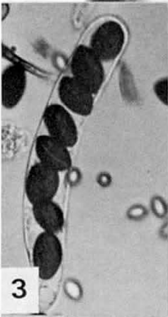
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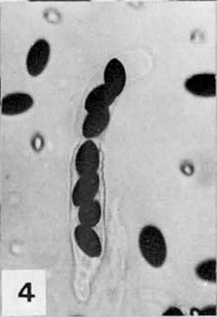
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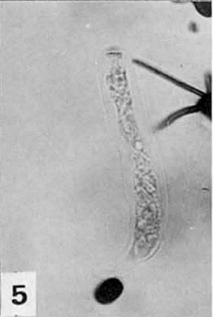
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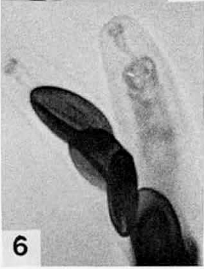
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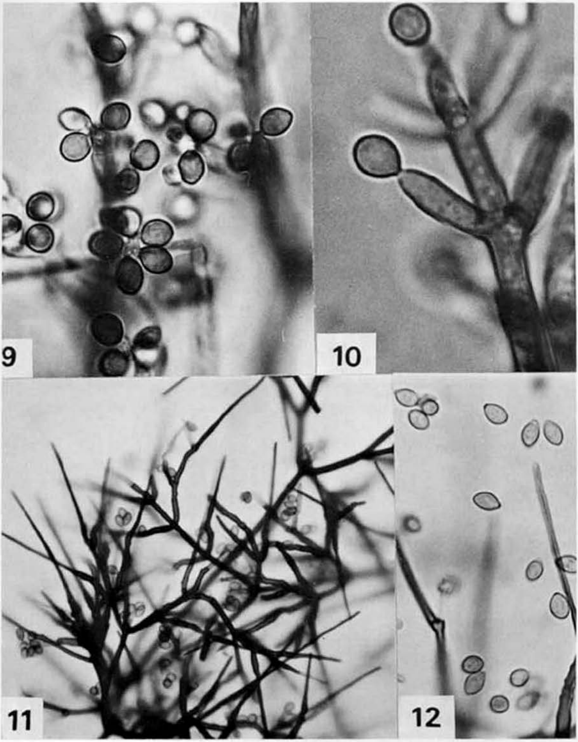

Figs. 1-12. Ascotricha erinacea. 1. Perithecium in surface view, x365. 2. Perithecium with conidiophores, x365. 3-4. Asci, x585. 5. Young ascus, x585. 6-8. Apical amyloid plugs after staining with Melzer's reagent, x1245. 9. Conidiophores and conidia, x1355. 10. Conidium arising at the apex of branched conidiophore, x1465. 11. Conidiophores showing the typical branching, x365. 12. Conidiophores and conidia, x805.

additional characters including the shape and colour of the ascospores as well as the kind, ornamentation and shape of the terminal hairs. The conidial state for species of Ascotricha belongs to Dicyma Boul. , while in Chaetomium it is never reported as such. Where known, it is usually referred to Botryotrichum Sacc. & March.

Such features as the vestiture of the perithecium, presence or absence of the apical structures, the evanescent nature of the ascus, presence of paraphyses, the spore size and pigmentation, and the number of germ pores do not appear to be reliable above the generic, or in some instances the specific level. Consequently, the inclusion of Chaetomium in a separate family Chaetomiaceae would seem to be open to question since there is no valid reason for excluding it from the Sordariaceae.

ACKNOWLEDGEMENTS

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SOME INSIGHTS INTO THE MYCOLOGICAL WORK OF JOHN JACOB DILLEN

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Summary

Attention is drawn to the mycological contribution of Dillenius in his "Catalogus," and to other reliquiae at the University of Oxford Herbarium and library.

In early 18th century, few botanical authors gave attention to cryptogamic plants. Tournefort had lately expounded on the concept of genus, and his idea had gained some acceptance. In the small town of Gisse, Germany, John Jacob Dillen (1684-1747, wrote under his Latinized name, Dillenius) wrote a local flora of the plants in the neighborhood of the town, arranging the plants by the month, or perhaps more accurately, the season of the year in which each was most easily identified. Although the higher plants were included and emphasized, Dillen devoted substantial space to the cryptogams - the fungi, mosses, and ferns. As will be developed below, his interest in the fungi was more than passing, and for the first time, Tournefort's few genera of fungi were split and expanded (cf. Druce & Vines, 1907) (see Table I). Because the genera of Dillen were more easily discerned, Micheli (1729) used almost all of Dillen's names, and Linnaeus (1735, as 1830) had both Dillen's generic names and those several of Micheli from which to choose. In some instances, Linnaeus's choice (viz. his choice of *Hydna* to wholly replace *Erinaceus* Dillen) was to be both ironic and significant in later nomenclatural situations. Dillen's (1718, 1719) "Catalogus" of the plants around Gisse was, because of its increased coverage of the fungi, a substantial contribution to the thinking of Linnaeus on this group (cf. Ainsworth, 1976; Lütjeharms, 1936), and so on authors subsequent to Linnaeus, including the "founding Fathers" of mycology, C. H. Persoon and E. M. Fries. Dillen kept no fungus herbarium, and practically nothing has been known about the fungi included in Dillen's "Catalogus." For this reason, and to clarify the specific matter of the typification of *Hydnum* Linn. per Fries, I travelled to the University of Oxford, where Dillen by the terms of the will of William

Sherard, held the first Sherard Chair of Botany, and where the reliquiae of Dillen and Sherard reside in the University Herbarium, the Botany Department library, and the Bodleian Library.

At least five separate sets of illustrations, none published, are known to exist in Dillen's materials. They are as follows.

1). Some years ago, a portfolio of colored aquarelles executed by Dillen* was catalogued in the Botany Department library. It was borrowed by an historian of mycology through another institution, and apparently never returned, although item no. 2 below *was* returned in its place. These plates of English fungi were seen and reported on by Massee (1907) in some detail, but their whereabouts are not presently known. They obviously represented fungi described in Dillen's proposed revision of Ray's "Synopsis," which was never published. Although they must clearly have illustrated Dillen's concepts of the taxa in the "Synopsis" (which Dillen had already revised and published under Ray's name in order to ensure higher sales), their importance to the pre-Linnaean literature is significantly less than illustrations for the "Catalogus" of Gisse plants.

2). A portfolio of colored aquarelles (exact number - at least 110 taxa represented - size not measured, unfortunately), on the cover of which appears (in Dillen's hand) *"Fungi Catal*[*o*]*gi Gissensis* [and in smaller script] *de ea referentes.*" While the "Fungi Anglici" portfolio is valuable as a voucher for Dillen's later taxonomic concepts, the Gisse portfolio in invaluable, for Dillen directs the user of the "Catalogus" to the portfolio as a reference work. Even Linnaeus, who travelled to Oxford at the bidding of Dillen in 1737, and who made a great impression on Dillen, had an opportunity to see and refer to this portfolio, which must have been assembled at or before the time of publication of the "Catalogus" in 1718. Whether or not Linnaeus actually saw it or not, of course, is not known.

In format the portfolio is interesting. On each page appears a colored aquarelle of a single taxon, executed on different paper from that of the portfolio itself, cut out and pasted in the portfolio. Below each illustration is printed (by Dillen, but in rather formal script) the description of the taxon as it appeared in the "Catalogus" (but without notes on the month of appearance), and a reference to the appropriate page in the "Catalogus," if such exists, for many more fungi are illustrated than are described in the "Catalogus."

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*MS Sherard no. 209. Fungi Anglici depicti ad seriam Synopsis Stirpium Britanniae J. Raii, Edit. 3. Aliique inventi & depicti post ejusdem Libri Editionem editam. 264 drawings and manuscript note, 14.5 X 10 inches.

In at least one instance, the description has been changed. On colored plate 52 (lower) is written, "*Boletus parvus, pileo (non pediculo) tenui variegato. Cat. Giss.* 189." In the copy of the "Catalogus" in the Botany library, the description reads, "*Boletus parvus, pediculo tenui variegato...,*" but the word "*pediculo*" is crossed out, and the word "*pileo*" inserted above it, in the characteristic brown ink and hand of Dillen, thus attesting that this copy of the book was Dillen's own.

Occasionally, an illustration lies loose in the portfolio, although another of the same fungus (in the same pose) is mounted in the normal fashion. In one instance (colored plate 66), the loose illustration's caption reads "*Agaricus luteus villosus, Carpini.* 1716. Dec." The description in the portfolio itself is more complete, refers to "Cat. 193" (where the same description is printed), but omits "1716. Dec.," which appears in the "Catalogus" itself. It might be conjectured that such loose illustrations were not satisfactory to Dillen (and indeed they are somewhat less detailed than the mounted aquarelles) and so were not used for the portfolio. But they may well have been the basis from which the printed descriptions in the "Catalogus" were written, for, even though the fungi appear in the chapter of October-November, under "*Agaricus luteus* ..." appears "Dec."

In certain places, pencil sketches substitute for colored aquarelles. For the most part, these sketches are wholly in pencil, but in at least two instances, pencil was used to "complete" a colored aquarelle (cf. more on this subject below).

Insofar as I know, no one has published any commentary on this portfolio, nor has it been critically examined in order to correlate the printed descriptions in the "Catalogus," the colored aquarelles, and modern taxonomic concepts to arrive at modern names for the fungi illustrated. Some are easy (*Clavariadelphus pistillaris*, *Armillaria mellea*, etc.), but others are more difficult.

3). In the back of the portfolio (cf. 2 above) there are several similar colored aquarelles, executed, usually, several to a page, on somewhat different, rougher paper than that of the portfolio itself (unfortunately, the paper of these loose illustrations was not critically compared with that of the cut and pasted illustrations mounted *in* the portfolio). In several instances, these illustrations are nearly identical to those in the portfolio (for example, colored portfolio illustrations 38 and 40 are to be found also in the loose sheets in the back). In almost every case, these loose illustrations are less detailed than those of the portfolio itself, and invariably the captions are less detailed, and in normal script rather than the formal printing of the portfolio. In some cases, portions of these sheets have been cut out, presumable to be pasted somewhere, perhaps in the portfolio.

I concluded that these loose illustrations were sketches, with rudimentary descriptions in note form. Presumably, when such sketches were acceptable to Dillen, he cut them out and transferred them to the portfolio (in no case could a cut-out area be found with the description left behind, so that it could be compared with those in the portfolio to ascertain whether the shape of the cutout could be matched with that of the pasted illustration in the portfolio). In most instances, the sketches were too rough, and the illustrations for mounting in the portfolio were executed again from start.

4). Separate from all of the above is a set of 11 plates (numbered Tab. I - XI), composed of black-and-white aquarelles (!), cut out, pasted on smaller sheets of paper (perhaps 25 X 20 cm), and numbered (arabic) consecutively within each sheet. They surely represent a set of plates from which to lithograph for a publication.

In the "Catalogus" the illustration of *Erinaceus* (the only fungus represented) was a lithograph (executed by Dillen, as were all the plates in the "Catalogus"). One of the black-and-white aquarelles is a very close match for that original lithograph, indicating that one was taken from the other (with no conclusion as to which was the original and which the copy).

Upon closer examination, it was found that many of the colored aquarelles of the "Gissensis" portfolio were matched by black-and-white aquarelles of the Tabulae. A few of these matches are given in Table II, but I suspect that if each black-and-white were thoroughly searched for in the portfolio, it would be found. In a few cases, the black-and-white illustration is matched by a pencil sketch in the portfolio, but again there is no way to ascertain which illustration served as the model for the other.

5). Loose within the black-and-white plates there is a small corner of a single sheet, with only a portion of a pen-and-ink illustration of a mushroom and "Tab. I" shown. The corner is margined with a double line, however, nearly exactly as are the plates of the "Catalogus." The portion of mushroom matches one figure of the black-and-white aquarelles, indicating a relationship between the two, but the placement of the figure is different in each, so it is impossible to ascertain the model and the copy. This small fragment is indicative, however, that all or some of these figures were to be rendered into lithographs and printed.

As stated already, the exact relationship between these various sets of illustrations cannot be ascertained. The only fungus illustrated in the "Catalogus" is *Erinaceus.* The plate in the "Gissensis" portfolio is entirely different from the illustration in the "Catalogus," but an almost identical illustration appears in the black-and-white aquarelles, indicating a possible relationship between the

Table I

Dillen Equivalents to Tournefort's Fungus Genera

Tournefort's Name	Dillen's Name	Modern "Equivalent"
Fungus	Amanita	Agaricoid forms
	Erinaceus	Hydnoid forms
Fungoides	Peziza (membranacei)	Discomycetes, s. l.
	Peziza (Duriores)	Bird's nest fungi
Boletus	Morchella (Scrobiculis excavatus)	Morchella, phalloids
	Boletus (porosi)	Boletus, s. l.
Agaricus	Agaricus (lamellati)	Lenzites, Daedalea, Panus
	Agaricus (porosi)	Polypores
Lycoperdon	Bovista	Puff balls
Coralloides	Fungoides (with three subdivisions)	Clavarioid forms
Tubera	Tubera	Truffeloid forms

Table II

Equivalents between "Gissensis" portfolio and Black-and-white aquarelles

"Gissensis" portfolio		Black-and-white aquarelles	
No. 15,	lower left	Tab. II	no. 10
21,	upper left	IV	4
22,	lower right	II	11
22,	lower left	III	5
23,	lower left	IV	8
28,	lower pencil sketch	III	9
28,	upper right	IV	12, 13
30,	lower right (larger)	V	7
31,	lower left	V	3
32,	upper left, inner	V	4, with changes
32,	upper right	V	5
32,	lower	V	6
33		VII	1
34		VII	1
35,	upper, combines into	VIII	1
47,	left	IX	1
48,	right	X	1
48,	left	X	4
49		IX	2
52,	upper (pencil	X	3
55,	upper left	IX	3
55,	upper middle	IX	4
56,	lower left (pencil)	IX	5
70,	upper left	XI	9
72,	lower right (pencil)	VI	5
76,	upper left	VI	3

black-and-whites and the "Catalogus," bypassing the "Gissensis" portfolio. Some or all of the black-and-whites were intended for publication (cf. no. 5 above), but were never produced in published form.

Clokie (1964) mentioned that in the Oxford library was to be found a printed sheet "consisting of three title-pages of works projected by Dillenius. (a) One for another edition of the *Catalogus plantarum circa Gissam nascentium...*" This may well account for the black-and whites which are in roughly publishable form, and/or the fragment labelled "Tab. I."

The colored "Gissensis" portfolio's intent is obvious by Dillen's own words - it is to be used as a reference work for the identification of the fungi in the "Catalogus."

Dillen also compiled "Historia Muscorum," another example of his preoccupation with the cryptogams. An extensive herbarium serves as the reference source for that book, and assumedly failing to preserve the fungi, Dillen sought to secure his taxonomic concepts by executing the various collections of illustrations. His "Gissensis" portfolio and his "Fungi Anglici" portfolio are, therefore, valuable contributions to pre-Linnaean mycology.

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NOTES ON TWO AMERICAN HYALOSCYPHACEAE ON ASPEN

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SUMMARY

Dasyscyphus populicola (Seaver) McKnight and *Perrotia populina* (Seaver) Dennis, two members of the Hyaloscyphaceae found on *Populus tremuloides* Michx. are discussed. Detailed descriptions, illustrations and a discussion of their environmental adaptations are given. *Dasyscyphus populicola* was found to have an efficient hygroscopic mechanism for fruit body expansion and to fruit in the Spring, while *P. populina* lacks this mechanism and fruits later.

Among the fungi which inhabit aspen groves and aspen-conifer forests of the western United States, two species of Hyaloscyphaceae have been a source of taxonomic confusion.

In the original descriptions of *Lachnella populicola* and *L. populina*, Seaver (1951) commented on their macroscopic similarity. However, he found that microscopic characters were adequate to distinguish them. Dennis (1963) recognized that they should be in separate genera but left the specific identity of *L. populicola* in doubt. Based on comparative studies of both live and herbarium specimens, including types, McKnight (1976) transferred *L. populicola* to *Dasyscyphus*. Detailed descriptions, illustrations and a discussion of adaptation to environmental conditions are given here for each species.

DASYSCYPHA POPULICOLA (Seaver) McKnight, Mycologia 68: 1131. 1976.

= *Lachnella populicola* Seaver, N. Amer. Cup-Fungi (Inoperculates), p. 270. 1951.

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(Illustrations: FIGS. 1-14, 30)

Apothecia: superficial, gregarious to crowded, sometimes forming contiguous or nearly contiguous masses, arising singly from the substrate which is often blackened by superficial hyphae, centrally stipitate, covered with brown hairs.

Receptacle: salverform or goblet-shaped, often splitting radially at maturity, red-brown, covered with concolorous hairs which are long and dense at the margin and short and sparse at the base, and appearing globose on drying.

Disc: 1.5 mm in diam, cupulate when young, becoming expanded and nearly planate when mature, and cupulate again on drying, dingy white to cream, concealed in dried material.

Stipe: 0.5 mm long, 0.3 mm thick, concolorous with receptacle, showing white medulla when broken.

Asci: cylindrical or clavate with hemispherical to conical apex and tapered base, (40-) 5-65 (-70) × 4.5-6.0 (-8.0) µm, distinct J+ pore plug, 8-spored, thin-walled except at the apex which is 1-2 µm thick near the pore, often subtended by a crozier.

Ascospores: 7.0-9.0 (-13.0) × (1.8-) 2.0-3.0 (-4.0) µm, elliptic fusiform with slightly rounded apices, nearly bipolarly symmetric but slightly larger in apical portion, hyaline, thin-walled, nonseptate, without visible surface ornamentation, usually lacking conspicuous storage bodies or other inclusions.

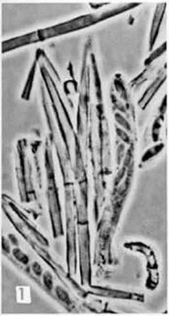
Paraphyses: 2.5-3.5 (-4.0) µm in diam at widest point, exceeding asci by ca 15 µm, distinctly lanceolate with acute apex, 1- or 2-septate, hyaline, thin-walled, unbranched above the base, without conspiculous inclusions or external ornamentation.

Subhymenium: 10-25 µm thick, of compact, hyaline textura intricata.

Excipulum: medullary exciple not clearly differentiated from ectal exciple, hyaline, grading to light buff in the outermost cells, grading from thin-walled, composed of textura angularis near the subhymenium to textura oblita near the surface, outermost cell layer giving rise to hairs.

Hairs: 3.0-5.5 × 250 µm, cylindrical with a slightly tapered base and slightly enlarged apex, usually curved away from the substrate, with variable wall thicknesses up to 1 µm, multiseptate with septa which are thinner than outer cell wall, dark brown with light brown apex, with hyaline contents, granulate with brown, round, sessile or short stalked particles up to 0.6 µm in diam, some hairs with hyaline or yellowish masses of refractive matter at the apex. The re-

FIGS. 1-14. Microscopic characters of *Dasyscyphus populicola*. FIGS. 1-7, Holotype, 638×. 1, 2. Asci and paraphyses. 3. Ascus. 4. Paraphyses. 5. Mature spores in ascus. 6. Short excipular hairs. 7. Long excipular hairs. FIGS. 8-14, McKnight F6427. 8. Face view of receptacle showing attachment of hairs to ectal exciple, 683×. 9, 10. Excipular hairs, 683×. 11-14. Ascus development, 896×. 11. Very immature ascus. 12. Young ascus with spores cleaved out and pore plug developed. 13. Mature ascus with fully developed spores and pore plug. 14. Ascus after spore discharge through pore.



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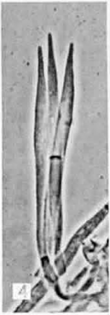

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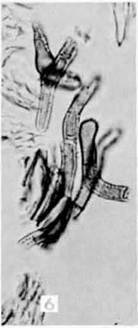

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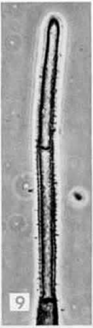

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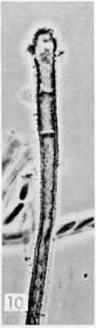

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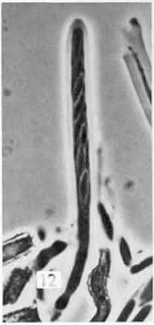

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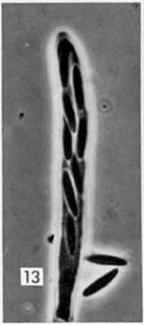

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ceptacle also has numerous, small, brown, clavate 1- or 2-celled hairs interspersed among the longer ones.

Asexual state: not observed.

Habitat: apothecia seated on patches of dark brown hyphae on decorticated, weathered stems of *Populus tremuloides* Michx. and perhaps other hardwoods.

Range and Season: Rocky Mountains and Cascade Range from Arizona to Colorado and central Washington. Fruiting in early spring or in spring-like conditions at higher altitudes.

Type: The collection labelled "*Lachnella populicola* sp. nov." at NY and stamped "type" is presumably the holotype. It was collected in the vicinity of Tolland, Colorado, 8,000-10,000 ft elevation, August 24-26, 1910, by F. J. Seaver and Elsworth Bethel. The label also states "on aspen apparently."

Illustrations: Dennis, 1963. Kew Bull. 17:358, fig. 54.

Specimens examined: ARIZONA: Gilbertson 9380, 28.V.1970, Santa Catalina Mountains, Pima County (BPI). COLORADO: Bethel 25.V.1913, on *Populus tremuloides* (NY); Seaver and Bethel 30.VI.1912, Lake Eldora, on *Populus tremuloides* (NY); Seaver and Bethel 24-26.VIII.1910, holotype, vicinity of Tolland, *Populus tremuloides* (NY). UTAH: McKnight F6427, 14.VI.1964, Mutual Dell, American Fork Canyon, Utah County, on decorticated wood (BRY); McKnight 11752, 26.V.1970, Uintah Mountains, Summit County on decorticated wood (BPI). WASHINGTON: Haines 108, 9.V.1965, Skykomish, King County, on *Populus tremuloides* (NYS); Stuntz 12034, V.1963, near Maltby, King County, on hardwood twigs (WTU); Stuntz 12978, collected by D. Hall, V.1963, near Maltby, King County, on hardwood twigs (WTU). WYOMING: McKnight 10355, 24.VI.1967, West side of Teton Pass, Teton County, on hardwood in and around snowbank (BPI).

Observations: Seaver (1951) did not report the date of the type collection from the vicinity of Tolland, Colorado, but the printed label on the packet gives "August 24-26, 1910." The Colorado collection made three years earlier by Bethel was taken on May 25. This latter collection date agrees more closely with most of the others reported above. These dates suggest a very early fruiting for the fungus. The Uintah Mountains, Utah and Wyoming specimens were found on decorticated wood, presumably aspen, and were fruiting under melting snow. Haines's collection from west central Washington was recorded from *Populus tremuloides*, on May 9. Although later, the Utah County, Utah collection was found in association with another snowbank species, *Guepiniopsis alpinus* (Tracy & Earle) Brasfield. Spring conditions can be found at such high elevations even in late August when the type collection was made. Although records of *D. populicola* are few, the collections reported here indicate a rather wide distribution throughout the Rocky Mountains and Northwest.

Dasyscyphus populicola is recognized by its brown-stalked, crowded apothecia with flat, fully exposed, whitish disc. Its early spring fruiting and blackened but not sunbleached, decorticated *Populus* substrate help distinguish it in the field from *Perrotia populina*. It is distinguished from its closest relative, *D. clandestinus* (Bull. ex Fr.) Fuckel, by being more robust in most of its characters and in the fact that the latter species is restricted to canes of *Rubus*, predominantly in Europe. Another relative, *D. calyculaeformis* (Schum. ex Fr.) Rehm, differs in having a strong pigment release when immersed in 3% KOH, in having slightly larger spores, and by growing on a wide variety of hardwood twigs.

PERROTIA POPULINA (Seaver) Dennis, Kew Bull. 17:358. 1963.

= *Lachnella populina* Seaver, N. Amer. Cup-Fungi (Inoperculates), p. 270. 1951.

(Illustrations: FIGS. 15-29)

Apothecia: superficial, gregarious to crowded, often several hundred together on the substrate which is often greyed by exposure to the elements, centrally stipitate, covered with brown hairs.

Receptacle: subglobose to goblet-shaped, with incurved margin at first, later straight or occasionally recurved, concolorous with disc or more often darker, dull ochraceous brown becoming almost black in old specimens.

Disc: 3.0 mm across, cupulate when young, expanding to deeply concave with steep sides when mature, deeply cupulate or hysteriform when dried, occasionally pitted, *pale yellowisg pink* (Centr. 31) to *strong yellow* (Centr. 84), *light yellowish brown* (Centr. 76), or *dark yellow* (Centr. 88), uniformly colored or darker toward the margin, exposed when mature and sometimes exposed in dried material. (Colors from Kelly & Judd, 1955).

Stipe: 0.5 mm long, 0.3 mm thick, concolorous with receptacle, showing white medulla when broken.

Asci: (55-) 60-80 (-90) × (5.5-) 7-9 (-11) μm, cylindrical with slightly tapered base and hemispherical to truncate apex, lacking a pore or plug, wall 1.5 μm thick, slightly thinner at the apex, no reaction with Melzer's solution, 8-spored, no croziers observed at base.

Ascospores: (7-) 8-13 (-14 × 2.0-3.5 (-4.5) μm, elliptic-fusiform with blunt, rounded apices, slightly curved along the longitudinal axis, nearly bipolarly symmetric but slightly larger in the apical portion, nonseptate, thin- to thick-walled with a central area which appears lighter with phase microscopy, without visible surface ornamentation, biseriate or obliquely biseriate in the ascus.

Paraphyses: 2.5-4.0 μm in diam at the widest point, exceeding the asci by 5-10 μm, filiform to clavate with hemispherical apices, widest at a point level with ascus tips, tapered to a cylindrical base, 1-4-septate, hyaline, thin-walled without conspicuous inclusions or external ornamentation.

Medullary excipulum: hyaline, of highly branched hyphae 1-2 μm diam forming widely spaced textura intricata, not readily distinguished from subhymenium.

Ectal excipulum: hyaline, composed of large-celled textura angularis with distinct walls, with a thin layer of textura porrecta on its inner surface and a layer of brown textura prismatica from which the excipular hairs arise.

Hairs: 3.0-5.0 × up to 200 (-230) μm, cylindrical with slightly enlarged apex and narrowed base, dark brown with pigment in walls, contens hyaline, thin-walled at first but becoming thick-walled with age, unbranched, regularly multiseptate, sparsely or densely covered externally with concolorous short-stalked granules up to 1 µm in diam, arising from periclinal hyphae but forming an acute angle with the surface of the receptacle, curved to conform to the curvature of the receptacle, sometimes with conspicuous yellow to hyaline crystals at the tip; crystals irregular in shape, highly refractive with phase microscopy, forming masses up to 10 µm across; short hairs are sometimes interspersed among the longer ones, lighter in color, thinner-walled, covered with capitate granules, straight, unbranched, single-celled or septate, cylindrical, sometimes turning dark blue-green in 3% KOH solution.

Asexual state: not observed.

Habitat: apothecia usually found on gray, weathered, decorticated wood of *Populus tremuloides* Michx., often associated with sterile black hyphae.

Range and Season: Colorado to Utah, Montana and Oregon. Probably throughout the natural range of *Populus tremuloides*, appearing from late summer through early autumn.

Type: R. W. G. Dennis (1963) designated collection #140 by Seaver and Shope in NY as lectotype, as no holotype was mentioned in the protologue. The packet states, "Univ. of Colo. Camp, on *Populus*, July 22-Sept. 18, 1929."

Illustrations: Dennis, 1963. Kew Bull. 17:359, fig. 55.

Specimens examined: COLORADO: Seaver & Shope #140, Lectotype, 22.VII-18.IX.1929, Tolland, on *Populus tremuloides* Michx. (NY); F. J. Seaver and Elsworth Bethel, 24-26.VIII.1910, Tolland, as *Trichopeziza albolutea* (NY); F. J. Seaver and Paul F. Shope #107, 22.VII-18.IX.1929, Tolland (NY). UTAH: C. T. Rogerson 4096, 2.IX.1971, Cache National Forest, Cache Co., on *Populus tremuloides* (NYS); J. H. Haines #601, 22.VII.1967, Webster Flat near Cedar City (NYS); K. H. McKnight F1922, 13.VI.1957, U. S. Forest & Range Experiment Station, Ephriam Canyon, Sanpete Co., on *Populus tremuloides* (BRY); K. H. McKnight F2618, F2680, 31.VII.1961, U. S. Forest Service Guard Station, Payson Lakes, Utah Co., on *Populus tremuloides* (NY, BPI); K. H. McKnight F2676, 2.VIII.1961, Moon Lake, Duchesne Co., on *Populus tremuloides* (BRY). WYOMING: A. H. Smith #35027, 12.VIII.1950, Medicine Bow Mountains, Carbon Co. (MICH).

Observations: *Perrotia populina* may be distinguished in the field by its late fruiting time and gray, weathered, decorticated, aspen substrate. It differs from *P. flammea* (Alb. & Schw. ex Fr.) Boud., on similar substrate, in having orange to brown hairs whereas the hairs of *P. flammea* are rust red. Microscopically *P. populina* is distinctive in having no pore plug or other apparent apical apparatus, nonlanceolate paraphyses, and no color change in 3% KOH. The absence of a pore plug is a rare character in the Helotiales. It occurs in *P. flammea*, the type species of *Perrotia*, and in some species of *Lachnellula* including all of those with colored hairs such as *L. arida* (Phill.) Dennis. The lack of an ascal pore is evidence which suggests not only that *P. populina* is appropriately placed in *Perrotia*, but that *Perrotia* is related to

FIGS. 15-28. Microscopic characters of *Perrotia populina*. FIGS. 15-19, Lectotype, 683×. 15. Asci and paraphyses. 16. Paraphysis. 17. Medullary exciple. 18. Hair. 19. Hair with crystal mass at tip. 20. McKnight F2618, 683×. Surface view of receptacle showing attachment of hairs to ectal exciple. FIGS. 21-28. McKnight F2618, 896×. 21. Spores. 22-28. Developmental states of asci showing tearing of ascus tip.


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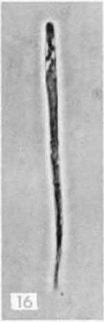
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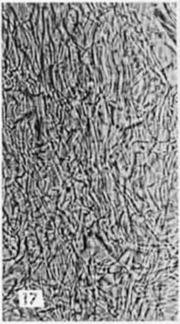
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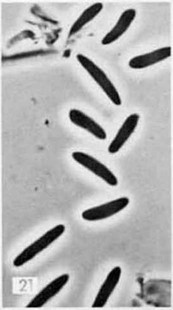
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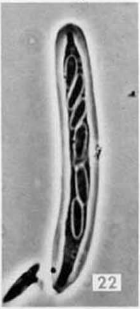
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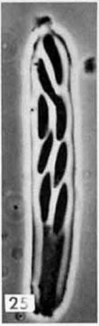
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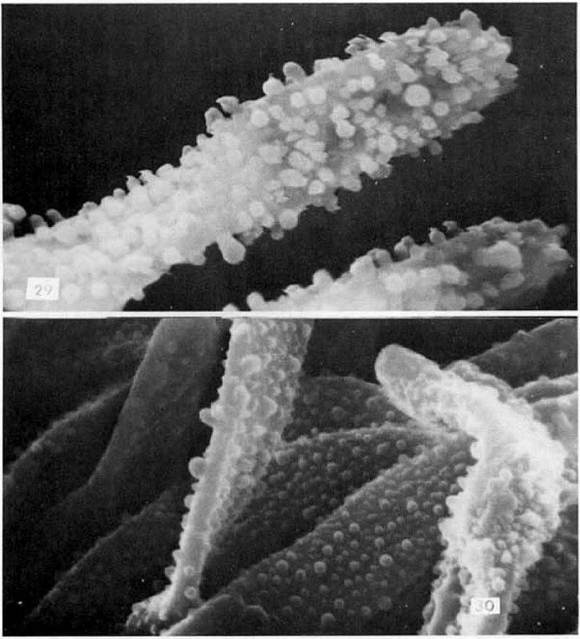

FIGS. 29-30. Scanning electron micrographs of excipular hairs. 29. *Perrotia populina*, lectotype, ca 5700×. 30. *Dasyscyphus populicola*, type, ca 6300×.

Lachnellula in the Hyaloscyphaceae subfamily Trichoscyphelloideae as suggested by Dennis (1962).

GENERAL DISCUSSION

The two species described above are examples of Hyaloscyphaceous fungi adapted to different environmental situations. *Dasyscyphus populicola* is typical of tribe Lachneae in being adapted to moist conditions of early spring and melting snow. Its lanceolate paraphyses and flexible exciple act as a hygroscopic mechanism which exposes the disc when moist and covers it when dry. It has a pore plug mechanism which enables the spores to be shot from the apothecia when the disc is exposed (FIGS. 11-14), and thin-walled spores and asci which offer minimal protection from desiccation and irradiation. *Perrotia populina* on the other hand is typical of the subfamily Trichoscyphelloideae in being adapted to dry, exposed conditions. Its paraphyses are narrower and do not expand as greatly as those of the previous species. Its hygroscopic mechanism is not as efficient. It has thicker ascus and spore walls, but no visible pore plug or operculum. The spores are discharged by a tear in the hemispherical ascus tip (FIGS. 22-28). More observation of fresh material is necessary to determine what environmental conditions trigger spore release and how this differs from those Hyaloscyphaceae with pore plugs.

We gratefully acknowledge the loan of Seaver's type specimens from the Cryptogamic Herbarium of the New York Botanical Garden (NY), and the thorough review of the manuscript by Donald Pfister of the Farlow Herbarium.

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NEW SPECIES IN THE LICHEN GENUS *PARMOTREMA* MASS.

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SUMMARY

The following eleven new species of *Parmotrema* Mass. are described: *P. concurrens* Hale, *P. conferendum* Hale, *P. enteroxanthum* Hale, *P. expansum* Hale, *P. indicum* Hale, *P. lopezii* Hale, *P. neotropicum* Kurokawa, *P. progenes* Hale, *P. reitzii* Hale, *P. subcompositum* Hale, and *P. vartakii* Hale. New combinations are made as follows: *Parmotrema balense* (Winn.) Hale, *P. neolobulascens* (Winn.) Hale, *P. pseudonilgherrense* (Asah.) Hale, *P. subsumptum* (Nyl.) Hale, and *P. yodae* (Kurok.) Hale.

1. *PARMOTREMA CONCURRENS* Hale, sp. nov.

Thallus saxicola, adnatus vel fere adpressus, cinereoalbidus, 5-8 cm latus, lobis rotundatis, congestis, 5-10 mm latis, margine ciliatis, ciliis ca. 1 mm longis, superficie et pro parte margine isidiatis, isidiis simplicibus, crassis, 0.1-0.15 X 0.2-0.3 mm, basi rumpentibus; superne opacus, emaculatus, planus, aetate fissus, hyphis fungorum nigris obtectus; cortex superior epicorticatus, 15 µm crassus, stratum gonidiale 15 µm crassum, medulla alba, ca. 100 µm crassa, cortex inferior 9-11 µm crassus; subtus niger, sparse rhizinosus, ambitu nudus, castaneus. Apothecia non visa.

Chemistry: Atranorin, salazinic acid, and gyrophoric acid.

Holotype: Brique, Pernambuco, Brazil, *L. Xavier Filho* 752, May 1970 (US) (Figure 1).

Additional specimens examined. Brazil: Goiana, Pernambuco, *Xavier* 764 (US); Caruaru, Pernambuco, *Epaminondas* 11656, 11658 (US).

Aside from the unusual combination of acids, this species is characterized by the simple, stumpy isidia and the saxicolous habit. It could be related to the African endemic *Parmotrema pseudocrinitum* (Abb.) Hale, which contains only gyrophoric acid but which is larger and more loosely adnate. It is part of the species complex which I had identified as "Parmelia subcrinita" in my monograph of *Parmelia* subgenus *Amphigymnia* (Hale, 1965). With the introduction of thin-layer chromatography the chemistry and taxonomy of this complex have finally been resolved. Most of the specimens with a black lower surface and isidia have proved to be *P. ultralucens* (Krog) Hale (Krog, 1974), a large, loosely attached species with salazinic acid and lichexanthone in the medulla. Other specimens containing only salazinic acid have been re-identified as *P. subisidiosum* (Müll. Arg.) Hale, which has a strongly reticulately maculate to cracked cortex. The few remaining specimens found to contain salazinic acid with gyrophoric acid are described here as new. The species has been collected so far only in the state of Pernambuco in Brazil.

2. *PARMOTREMA CONFERENDUM* Hale, sp. nov.

Thallus corticola vel saxicola, laxe adnatus, membraneus, pallide viridi- vel stramineo-cinereus, 8-12 cm latus, lobis rotundatis latisque, 5-12 mm latis, margine ciliatis sorediatisque, ciliis modicis, usque ad 2 mm longis, soraliis linearibus vel aetate irregularibus et submarginalibus; superne planus, nitidus, valde albo-maculatus, aetate rimosus; cortex superior epicorticatus, 8-11 µm crassus, stratum gonidiale 10-15 µm crassum, medulla alba, 80-110 µm crassa, cortex inferior 9-10 µm crassus; subtus pallide castaneus vel centro nigricascens, dense rhizinosus, rhizinis brevibus, ad marginem obsitis. Apothecia non visa.

Chemistry: Atranorin and norlobaridone.

Holotype: On rocks along stream, El Valle, Estado Mérida, Venezuela, elevation 2600 m, *M. E. Hale* 43291, 8 Feb. 1974 (US) (Figure 2).

Additional specimens examined. United States: Mason Co., Texas, *Whitehouse* 25201a (US). Venezuela: San Jacinto, Estado Mérida, *Hale & López* 42276 (MERF, US); Rubio, Estado Táchira, *Hale & López* 45720 (MERF, US). Argentina: Horco Molle, Tucumán, *Culberson* 14910 (DUKE, US).

Parmotrema conferendum is part of the *P. recipiendum* (Nyl.) Hale complex, a group of species that are uniformly brown below, rhizinate to the margin, and white maculate above. The other sorediate species include *P. subsumptum* (Nyl.) Hale (comb. nov. Basionym: *Parmelia subsumpta* Nyl. Flora 52:117. 1869) (salazinic acid only) and *P. reitzii* Hale (see below) (salazinic acid and norlobaridone), parallel to the isidiate series related to *P. neotropicum* Kurok. (see below). This is a rare species compared with the pantropical *P. subsumptum*, but it has been reported in Ethiopia by Winnem (1975).

3. *PARMOTREMA ENTEROXANTHUM* Hale, sp. nov.

Thallus saxicola, laxe adnatus, fragilis, cinereo-albidus, usque ad 15 cm latus, lobis latis, subcongestis, 6-10 mm latis, eciliatis vel sparsissime ciliatis, submargine lobulato-dissectis, superficie isidiatis, isidiis incrassatis, pustulato-inflatis, dactyloideo-ramosis, usque ad 1 mm altis, aetate rumpentibus et subsorediatis; superne planus, opacus, emaculatus, primum continuus deinque rimosus, cortice fragili; cortex superior epicorticatus, columnari-paliformis, 15-18 µm crassus, stratum gonidiale 10-15 µm crassum, medulla pro parte alba vel flavida, sub pustulis intense crocea, 150-170 µm crassa, cortex inferior 15-16 µm crassus; subtus niger, modice rhizinosus, ambitu nudus, castaneus. Apothecia numerosa, subpedicellata, 4-10 mm diametro, amphithecio subdenticulato, ruguloso, disco imperforato; hymenium 130-140 µm altum; sporae 4-8, 16-18 X 28-30 µm, episporio 2.5 µm crasso.

Chemistry: Atranorin, salazinic acid, and unidentified pigments.

Holotype: On rocks in open pasture, La Carbonera, Estado Mérida, Venezuela, elevation 2100 m, *M. Hale and M. López-Figueiras* 44177 (US; isotypes in MERF, UPS) (Figure 3).

Additional specimens examined. Venezuela: La Carbonera, Estado Mérida, *Hale & López* 44163; Pico Banderas, Estado Táchira, *Hale & López* 45393 (MERF, US).

This unusual species has no close affinities with any other *Parmotremata*. The dactyloid, inflated isidia are large and become dense with age. The medullary pigments probably include entothein, but other species with these pigments (Hale, 1974) usually contain gyrophoric acid or rarely protocetraric acid (*P. lopezii* below). It occurs on rocks in open pastures and other disturbed areas at about 2000 m elevation and probably represents an Andean endemic.

4. *PARMOTREMA EXPANSUM* Hale, sp. nov.

Thallus saxicola vel corticola, laxe adnatus, subfragilis, cinereo-albidus vel aetate in herbario stramineo-albidus, 10-20 cm latus, lobis rotundatis, subimbricatis, 6-10 mm latis, centrum versus parce dissectis vel breve laciniatis, margine modice ciliatis, ciliis 0.5-1.0 mm longis, subcrassis, simplicibus vel furcatis, isidiis sorediisque destitutus; superne laevis, opacus, albo-reticulatus, aetate reticulatim rimosus; cortex superior epicorticatus, 15-16 µm crassus, stratum gonidiale 15 µm crassum, medulla alba, 120-150 µm crassa, cortex inferior 15-17 µm crassus; subtus niger, modice rhizinosus, margine anguste nudus, castaneus. Apothecia numerosa, adnata vel subpedicellata, 4-7 mm diametro, eciliata, disco imperforato; hymenium 60-70 µm altum; sporae 8, 9 X 16-18 µm; pycnidiosporae 0.5 X 6-7 µm.

Chemistry: Atranorin and salazinic acid.

Holotype: On rocks, Patarra, Province of San José, Costa Rica, elevation 1300 m, *M. Guiros* 1462, 4 July 1948 (US; isotype in UPS) (Figure 4).

Additional specimens examined. Costa Rica: San José, *Valerio* s. n. (US). Panama: Volcán Chiriquí, *Hale* 38843, 38917, 38919, *Scholander* s. n. (US). Brazil: Serra de Caldas, Minas Gerais, *Mosén* 2316 (S, US).

This species is obviously closely related to *Parmotrema cetratum* (Ach.) Hale, which also has salazinic acid but a much more conspicuously reticulate-cracked cortex and perforate apothecia. *Parmotrema expansum* has generally narrow lobes and a distinct brown bare zone below at the margins; it never becomes laciniate as *P. cetratum* does. It has been collected only in Central America except for a tentively identified specimen from Brazil.

5. *PARMOTREMA INDICUM* Hale, sp. nov.

Thallus corticola vel (ut typus) saxicola, laxe adnatus, paulo coriaceus, viridi- vel albo-cinereus, 8-20 cm latus, lobis rotundatis, 8-16 mm latis, margine ciliatis sorediatisque, ciliis sparsis vel modicis, usque ad 2 mm longis, soraliis linearibus, aetate submarginalibus et orbicularibus; superne opacus, emaculatus, continuus vel aetate rimosus; cortex superior epicorticatus, 11-13 µm crassus, stratum gonidiale 15-18 µm crassum, medulla alba, 100-130 µm crassa, cortex inferior 15 µm crassus; subtus niger et modice rhizinosus ad centrum, obscure castaneus nudusque marginem versus. Apothecia non visa.

Chemistry: Atranorin, gyrophoric acid, and norlobaridone.

Holotype: On rocks in stream, forest below Silver Cascade, Kodaikanal, Tamil Nadu, India, elevation 1800 m, *M. E. Hale and P. G. Patwardhan* 43874 (US; isotype in UPS) (Figure 5).

Additional specimens exxmined. India: Devicolum, Kerala, *Hale* 47595, 47596 (US); Thekkadi, Kerala, *Hale* 46579 (US); Oothu, Tamil Nadu, *Hale* 43666 (US).

This species is closely related to the pantropical *Parmotrema sancti-angelii* (Lynge) Hale (gyrophoric acid present), on the one hand, and to the rare Asian species *P. yodae* (Kurokawa) Hale (comb. nov. Basionym: *Parmelia yodae* Kurokawa, Jour. Coll. Arts Sci. Chiba Univ. 5(1):97. 1967) (norlobaridone present), on the other. This combination of the two acids is also known in *Parmotrema balense* (Winn.) Hale (comb. nov. Basionym: *Parmelia balensis* Winn. Norw. Jour. Bot. 22:151. 1975), an African species with heavy, almost effigurate white maculation and a very coriaceous thallus. The soralia of *P. indicum* are usually typically linear and powdery but with age may become submarginal as well with development of coarsely pustulate-sorediate patches. The species is known so far only from the Western Ghats region in India.

6. *PARMOTREMA LOPEZII* Hale, sp. nov.

Thallus corticola, laxe adnatus, coriaceus, pallide viridi-flavicans, 10-15 cm latus, lobis rotundatis latisque, usque ad 20 mm latis, margine integris, raro sparse ciliatis, sorediis isidiisque destitutus; superne planus, continuus, opacus, emaculatus; cortex superior epicorticatus, 9-10 µm crassus, stratum gonidiale 10-15 µm crassum, medulla pallide flava vel aetate fere crocea, 140-160 µm crassa, cortex inferior 16-18 µm crassus; subtus niger et sparse rhizinosus ad centrum, castaneus nudusque marginem versus. Apothecia subpedicellata, eciliata, usque ad 15 mm diametro, imperforata; hymenium 70-80 µm altum; sporae (sec. spec. *Hale* 45200a) 8, 12-13 X 25-27 µm, episporio 2.5 µm crasso.

Chemistry: Atranorin, usnic acid, protocetraric acid, and unidentified pigments (including entothein).

Holotype: El Cobre Chiquito, Páramo de Tamá, Estado Táchira, Venezuela, elevation 2700 m, *M. López-Figueiras* 45564, 28 March 1975 (US; isotype in MERF) (Figure 6).

Additional specimens examined. Venezuela: La Carbonera, Estado Mérida, *Hale & López* 42016, 42017a; Betania, Estado Táchira, *Hale & López* 45200a (US).

This conspicuous lichen is characterized by the large, pale yellowish green, leathery thallus and the pale yellow to orange medulla. There is only one other species with a pigmented medulla and protocetraric acid, *P. cristatum* (Nyl.) Hale, which differs in having dentate-ciliate apothecia and a strongly yellow medulla (Hale, 1974). *Parmotrema lopezii* occurs on trees in open forests at 2000-2700 m and appears to be restricted to the Andean region.

7. *PARMOTREMA NEOTROPICUM* Kurokawa, sp. nov.

Thallus corticola, adnatus vel laxe adnatus, pallide stramineo-viridis vel cinereo-albidus, 6-9 cm latus, lobis rotundatis, 8-14 mm latis, margine ciliatis, ciliis modicis vel sparsis, ca. 1 mm longis; superne planus, nitidus, albo-maculatus, aetate irregulariter reticulatim rimosus, isidiatus, isidiis simplicibus vel parce ramosis, cylindricis, 0.1 X 0.3-0.6 mm, aetate crebris; cortex superior epicorticatus, 11-14 µm crassus, stratum gonidiale 15-18 µm crassum, medulla alba, 130-160 µm crassa, cortex inferior incoloratus, 15-18 µm crassus; subtus pallide castaneus vel centro nigricascens, rhizinosus, rhizinis brevibus, crebris, usque ad marginem obtectis. Apothecia non visa.

Chemistry: Atranorin, often traces of usnic acid (as in the holotype), and salazinic acid.

Holotype: On conifers, km. 1145 on highway 190, west of San Cristóbal, Chiapas, Mexico, elevation 2120 m, *M. E. Hale* 20190, 25 March 1960 (US) (Figure 7).

Additional specimens examined. United States: Rockingham Co., North Carolina, *Hale* 16381 (US); DeKalb Co., Alabama, *Sierk* 1018 (US); Seminole Co., Florida, *Rapp* s. n. (FLAS, US). Cuba: Sierra Maestra, Oriente, *Imshaug* 24798 (MSC, US). Mexico: Veracruz, *Hale* 19859 (US); Chiapas, *Hale* 20013, 21141, 20230, 20267, 20614, 21205 (US).

This is an isidiate member of the *Parmotrema recipiendum* (Nyl.) Hale group, representing the chemical population with salazinic acid alone in the medulla. Externally it is indistinguishable from the other isidiate members, *P. haitiense* (Hale) Hale (norlobaridone) and *P. subtinctorium* (Zahlbr.) Hale (salazinic acid and norlobaridone). It has a rather restricted range from southern United States into Cuba and Mexico.

8. *PARMOTREMA PROGENES* Hale, sp. nov.

Thallus corticola, laxe adnatus, coriaceus, albido-cinerascens, 7-10 cm latus, lobis latis rotundatisque, subimbricatis, 6-10 mm latis, margine sparse ciliatis, isidiis et sorediis destitutus; superne planus vel rugulosus, opacus, emaculatus; cortex superior epicorticatus, 12-14 µm crassus, stratum gonidiale 10-15 µm crassum, medulla alba, ca. 150 µm crassa, cortex inferior 12-14 µm crassus; subtus niger, modice rhizinosus, marginem versus nudus, castaneus. Apothecia numerosa, adnata, usque ad 11 mm diametro, eciliata, disco imperforato; hymenium 100 µm altum; sporae 8, 10 X 20-22 µm, episporio 2.5 µm crasso; pycnidiosporae 0.5 X 4-5 µm.

Chemistry: Atranorin, protocetraric acid, echinocarpic acid, and associated unknown substances.

Holotype: Santarem, Brazil, *Spruce* 113 (BM; isotype in US) (Figure 8).

Additional specimens examined. Peru: Tingo Maria, San Martín, *Allard* 21644 (US).

This species would probably be identified as *Parmotrema zollingeri* (Hepp) Hale without a chemical test, although it is somewhat smaller and more adnate. It represents the fertile parent morph of *P. dilatatum* (Vain.) Hale, which has the same chemistry but is sorediate. I recently found that many specimens which I had called "Parmelia dilatata" (see Hale, 1965:245) contain only protocetraric acid in the medulla and produce mostly linear, marginal soralia on the main lobes; these can be identified as *Parmotrema robustum* (Degel.) Hale, a pantropical species. The remaining specimens, which occur almost exclusively in the New World and tend to be more laciniate with soralia produced on short marginal laciniae, represent the typical population of *P. dilatatum*.

9. *PARMOTREMA REITZII* Hale, sp. nov.

Thallus corticola, laxe adnatus, pallide stramineoviridis, 10-15 cm latus, lobis rotundatis, parum lobatis, 7-10 mm latis, margine ciliatis sorediatisque, ciliis brevibus, 0.3-0.8 mm longis, soraliis marginalibus, linearibus; superne laevis, nitidus, valde albo-maculatus, cortice continuo vel aetate fisso; cortex superior epicorticatus, 10-15 µm crassus, stratum gonidiale 10-15 µm crassum, medulla alba, 100-140 µm crassa, cortex inferior castaneus vel incoloratus, 8-10 µm crassus; subtus pallidus vel aetate nonnihil nigricascens centrum versus, dense rhizinosus, rhizinis brevibus, fere usque ad marginem obtectis. Apothecia non visa.

Chemistry: Atranorin, salazinic acid, and norlobaridone.

Holotype: Lajes, Santa Catarina, Brazil, elevation 950 m, *Reitz and Klein* 12927 (US) (Figure 9).

Additional specimens examined. Brazil: Passo do Socorro, Santa Catarina, *Reitz & Klein* 15573 (US). Venezuela: Páramo de Tamá, Estado Táchira, *Hale & López* 45099 (US, MERF).

Parmotrema reitzii appears to be a "hybrid" species in the *P. recipiendum* group, coordinate with *P. subsumptum* (salazinic acid) and *P. conferendum* (norlobaridone), as explained above in the discussion of *P. conferendum*. This species occurs so far only in South America at mid elevations.

10. *PARMOTREMA SUBCOMPOSITUM* Hale, sp. nov.

Thallus corticola, laxe adnatus, coriaceus, cinereoalbus, ca. 10 cm diametro, lobis latis, rotundatis, usque ad 15 mm latis, margine ciliatis, ciliis saepe densis, 1-3 mm longis, margine et submargine sorediatis, soraliis linearibus; superne nitidus, continuus, valde albo-maculatus vel fere effiguratus; cortex superior epicorticatus, 14-15 µm crassus, stratum gonidiale 18 µm crassum, medulla alba, 90-120 µm crassa, cortex inferior 16-17 µm crassus; subtus niger, sparse rhizinosus, marginem versus late nudus, castaneus. Apothecia non visa (vel raro evoluta in Ethiopia, sporis non visis).

Chemistry: Atranorin, gyrophoric acid, and norstictic acid (norstictic acid lacking in some populations).

Holotype: West slope of Mt. Kilimanjaro, east of Lemosho Glades, Kilimanjaro Province, Tanzania, elevation 2500-2800 m, *R. Santesson* 21262, 14 Jan. 1970 (UPS) (Figure 10).

Additional specimens examined. Same locality as the holotype, *Santesson* 21263a (UPS). A number of records from Ethiopia are given by Winnem (1975:162) but I have not examined these.

This species is the sorediate morph of *Parmotrema compositum* (Hale) Hale, which has approximately the same range and habitat. According to Winnem (1975:162), it is common in the *Erica* zone (2700-3600 m) in Ethiopia. She also reports a population lacking norstictic acid which could be confused with *P. neolobulascens* (Winn.) Hale (comb. nov. Basionym: *Parmelia neolobulascens* Winn., Norw. Jour. Bot. 22:157. 1975), a more coriaceous, sparsely ciliate, and consistently sublaminally sorediate species.

Parmotrema subcompositum is part of a unique group of species concentrated mainly in Africa. All are heavily white maculate to effigurate maculate and leathery and occur at high elevations. The chemistry of the group indicates long isolation with "hybridization" between populations containing gyrophoric acid, norstictic acid, alectoronic acid, or norlobaridone in various combinations. For example, *P. compositum* and *P. subcompositum* contain gyrophoric acid with or without norstictic acid, *P. neolobulascens* gyrophoric acid, *P. diversum* (Hale) Hale and *P. lobulascens* (Stein. & Zahlbr.) gyrophoric acid and alectoronic acid, *P. balense*, *P. spilotum* (Hale) Hale, and *P. subschimperi* (Hale) Hale norstictic acid and norlobaridone, and *P. nilgherrense* (Nyl.) Hale and *P. pseudonilgherrense* (Asah.) Hale (comb. nov. Basionym: *Parmelia pseudonilgherrensis* Asah., Jour. Jap. Bot. 29:370. 1954) alectoronic acid. All of the species in this group are either sorediate or nonsorediate; none have isidia.

11. *PARMOTREMA VARTAKII* Hale, sp. nov.

Thallus corticola, laxe adnatus vel suberectus, pallide viridi- vel albido-cinereus, 5-8 cm latus, lobis rotundatis, parce dentatis, 4-8 mm latis, margine ciliatis, ciliis numerosis, 0.4-0.9 mm longis, simplicibus, isidiis sorediisque destitutus; superne planus vel rugulosus, opacus, emaculatus vel paulo albo-maculatus, pycnidiis numerosis; cortex superior epicorticatus, 14-16 µm crassus, stratum gonidiale 15 µm crassum, medulla alba, 130-150 µm crassa, cortex inferior 12-13 µm crassus; subtus niger et sparse rhizinosus ad centrum, ambitu late nudus, stramineus vel albidus. Apothecia numerosa, substipitata, eciliata, usque ad 10 mm diametro, amphithecio rugoso, valde albo-maculato, disco imperforato; hymenium 60-65 µm altum; sporae 8, 8-10 X 16-18 µm; pycnidiosporae 0.5 X 8-9 µm.

Chemistry: Atranorin, α-collatolic acid, and traces of alectoronic acid.

Holotype: Thorn forest, Bandipur, along the Mysore-Ooty road, Karnataka, India, elevation 1400 m, *M. E. Hale and P. G. Patwardhan* 46454, 20 Jan. 1976 (US) (Figure 11).

Additional specimens examined. India: Bandipur, Karnataka, *Hale* 46442, 46450, 46476 (US), *Vartak* s. n. (Poona).

This apparently highly endemic species is characterized by the imperforate, eciliate apothecia, short cilia, and the predominance of α-collatolic acid. It is more usual to have equal or greater concentration of alectoronic acid. The white rim below suggests relationship with *Parmotrema wainii* (A. L. Sm.) Hale, which has long marginal cilia and ciliate apothecia, *P. subrugatum* (Kremp.) Hale, which has large, dentate-ciliate apothecia and large spores, and *P. rigidum* (Lynge) Hale, a New World species with eciliate but strongly perforate apothecia. It is also externally very similar to *P. abessinicum* (Kremp.) Hale, a pantropical species with norlobaridone. The species is named in honor of Dr. V. D. Vartak of the Maharashtra Association for the Cultivation of Science, who first discovered it.

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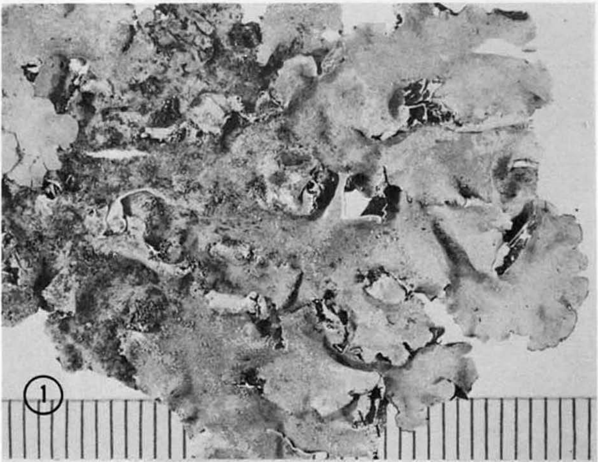
Explanation of Figures

Figure 1: *Parmotrema concurrens* (*Xavier* 752 in US). Figure 2: *P. conferendum* (*Hale* 43291 in US). Figure 3: *P. enteroxanthum* (*Hale & Lopez* 44177 in US). Figure 4: *P. expansum* (*Guiros* 1462 in US). Figure 5: *P. indicum* (*Hale & Patwardhan* 43874 in US). Figure 6: *P. lopezii* (*Lopez* 45564 in US). Figure 7: *P. neotropicum* (*Hale* 20190 in US). Figure 8: *P. progenes* (*Spruce* 113 in US). Figure 9: *P. reitzii* (*Reitz & Klein* 12927 in US). Figure 10: *P. subcompositum* (*Santesson* 21262 in UPS). Figure 11: *P. vartakii* (*Hale & Patwardhan* 46454). Scale in mm for all figures.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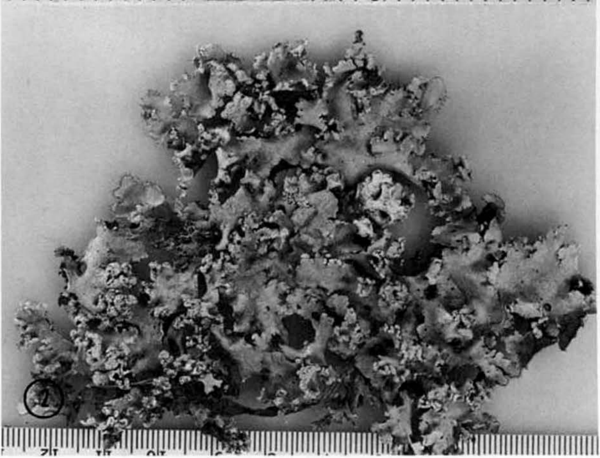
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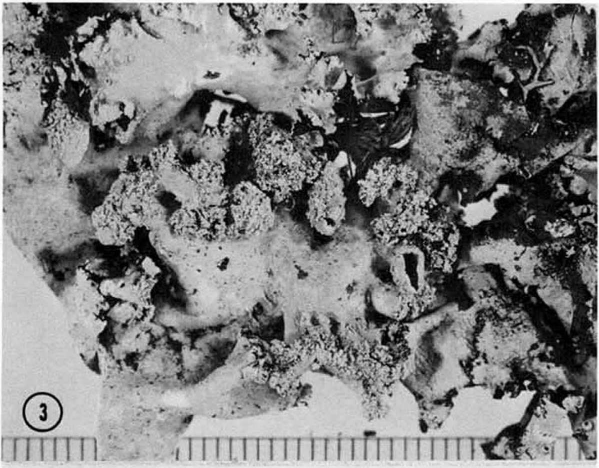

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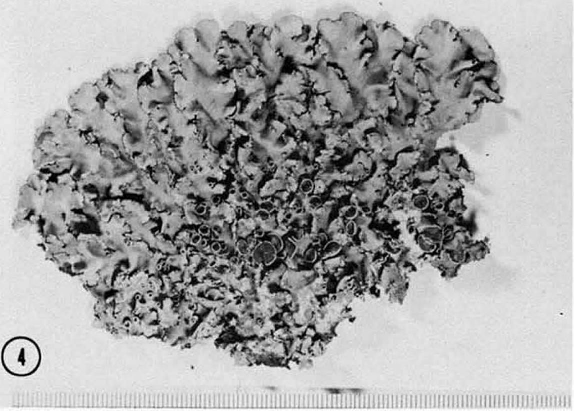

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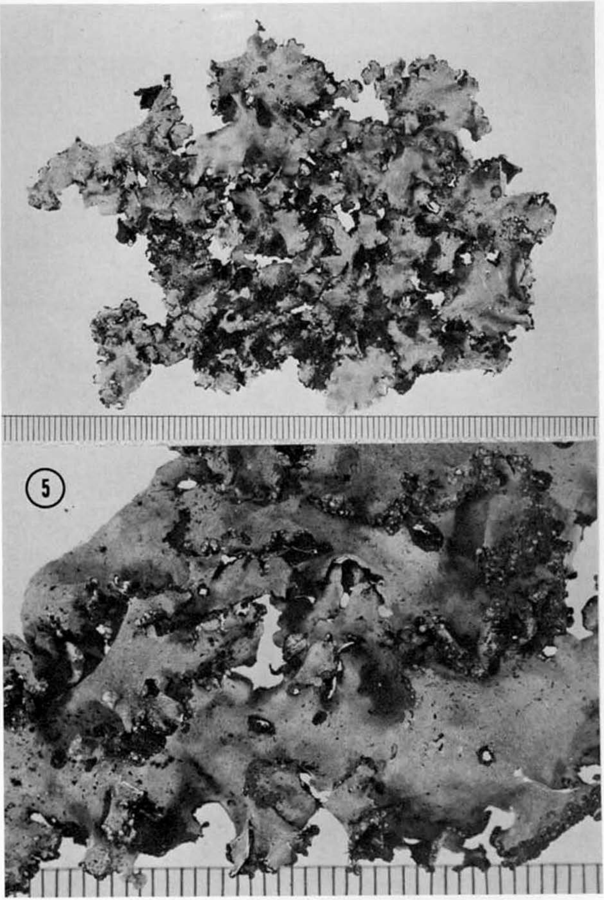
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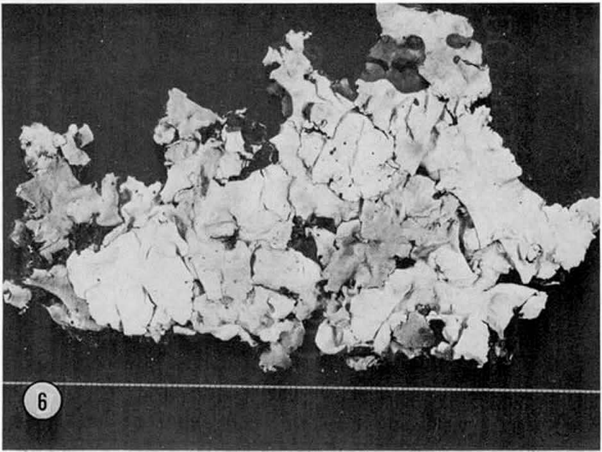

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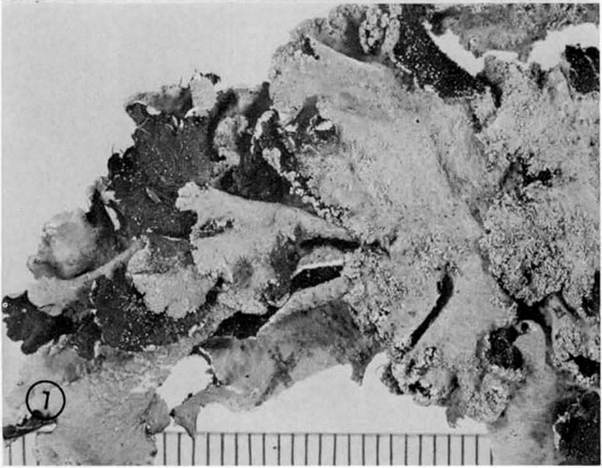

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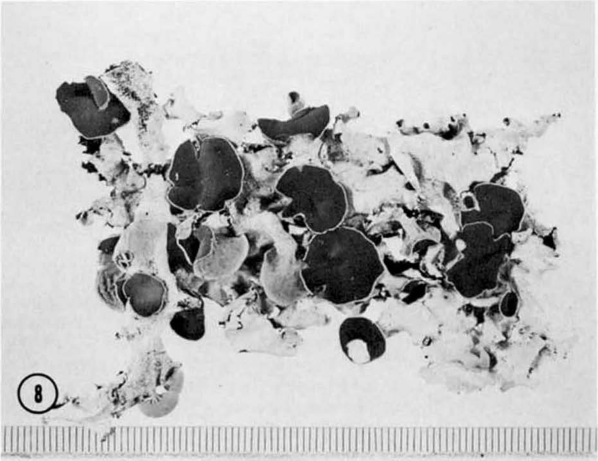

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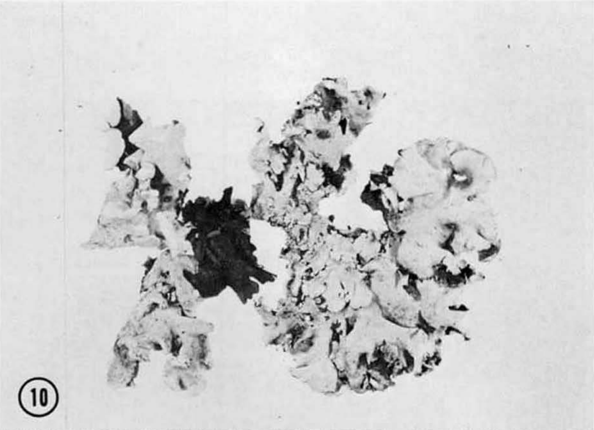

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MYCOTAXON

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A NEW HETEROCHAETE

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Heterochaete maculata Lowy, sp. nov. Figs. 1-2

Fructificatio in humido ceraceo-gelatinosa, tenua, resupinata, maculata, confluens, fusca, minuta (2-4 mm late X 50-75 µm crassa); in sicco atrofusca; setulis gelatinosus, rectus, scopulosus, dispersis, ± 70 X 30 µm, cum apicibus albidis; dikaryoparaphyseae angusto-cylindraceae, sparsae, ad apicem ramosae; hyphae nodosae; gloeocystidia numerosa, irregulariter subclavata, 45-55 X 6-8 µm; metabasidia plerumque ovoidea vel ovoidea-elongata, 16.5-21.0 X 8.5-10.5 µm, cruciatim septata; basidiosporae leviter curvato-cylindraceae, 10.5-12.0 X 4.5-5.5 µm, per repetitionem germinantes.

Holotype: Venezuela. Río Caracas, Dto. Fed. On unidentified wood, 22-VII-1972. Leg. K.P.Dumont, R.F.Cain, G.J. Samuels & B.Manara. Dumont VE-5672 (NY); Isotypes (LSUM), (VEN).

Fructification thin, waxy-gelatinous when wet, resupinate, appearing as irregular brownish spots or patches ± 2(-4) mm, becoming confluent; margin narrow, whitish and conspicuous; drying dark brownish; pegs erect, gelatinous, craggy (as seen by scanning electron microscopy), scattered, ± 70 X 30 µm, with whitish tips; dikaryoparaphyses few, narrowly cylindrical, up to 52 X 2.5 µm, apically dendroid; hyphae with clamp connections; gloeocystidia numerous, with homogeneous contents, irregularly subclavate, 45-55 X 6.0-8.0 µm; basidia densely clustered in a hymenial layer ± 25 µm thick; probasidia subglobose to ovoid, 8.0-9.5 X 8.5-10.5 µm; metabasidia mostly ovoid to ovoid-elongate, 16.5-21.0 X 8.5-10.5 µm, cruciate septate; crystalline accretions scattered throughout the subhymenium; basidiospores

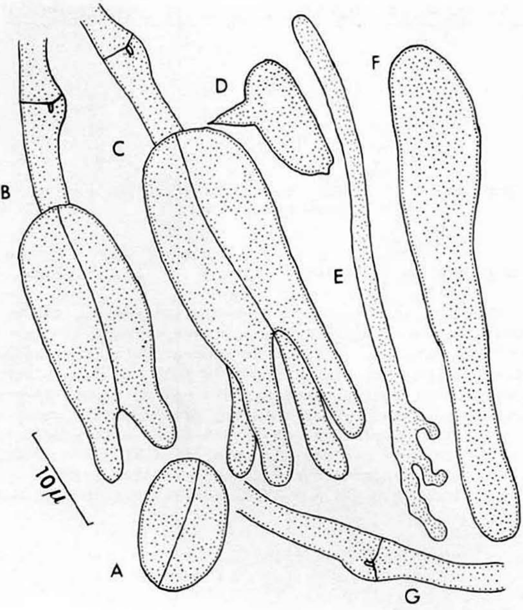

Fig. 1. Heterochaete maculata Lowy (Dumont-VE 5672). A, 2-celled probasidium; B, 2-sterigmate, developing basidium; C, 4-sterigmate metabasidium, sterigmata not fully formed; D, basidiospore germinating by repetition; E, apically branched dikaryoparaphysis; F, gloeocystidium; G, hypha with clamp connection.

slightly curved cylindrical, 10.5-12.0 X 4.5-5.5 µm, germinating by repetition.

One of the distinguishing criteria for the separation of Heterochaete from Exidia is the presence in the former

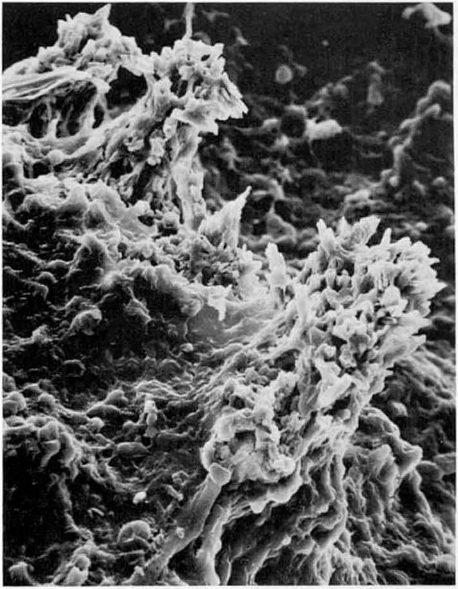

Fig. 2. Fragment of hymenial surface of Heterochaete maculata showing 3 pegs, one in foreground, two in background. Note also the convoluted hymenium. apx. × 1500.

of sterile hymenial structures termed pegs, which are gelatinized and composed of compact fascicles of more or less parallel hyphae that arise from the subhymenium. They may be quite small (as in H. maculata) but are generally clearly visible under a hand lens, although their distribution may be sparse. In order to examine more closely the gross structure of the pegs of H. maculata, a portion of the type collection was mounted with silver conducting paint on an aluminum disc, coated in vacuo with a layer of gold (ca 20 nm) and observed with a Hitachi S-500 scanning electron microscope operated at 20 kv. Fig. 2 shows that the pegs are composed of craggy bundles of gelatinized hyphae. A comparative study of the sterile hymenial elements of other Heterobasidiomycetidae (Exidia, Pseudohydnum, Protodontia) is under way, since this may reveal significant morphological features heretofor overlooked which may provide additional taxonomically useful criteria on the generic level.

The pegs of Heterochaete sometimes have basidiospores clinging to them and consequently may act as a spore dispersal mechanism through the agency of insects. The same may be true of the papillae of Exidia spp. which I have observed are also frequently covered with basidiospores. Sterile hymenial structures such as spines, setae and asterophyses, found in other Basidiomycetes, may serve this function as well.

The new species appears to be closest to Heterochaete sanctae-martae Bodman (1952) from Colombia, the type collection of which I have examined (SUI). H. maculata differs from this in its gross morphology, characterized by small, irregular patches surrounded by a whitish mycelial zone and by its prominent gloeocystidia (Fig. 1 F) which are absent in H. sanctae-martae.

ACKNOWLEDGMENT

For the operation of the scanning electron microscope the technical assistance of Mr. Michael T. Postek of the LSU Botany Department is gratefully acknowledged.

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MYCOTAXON

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UN NOUVEAU COLEOSPORIUM AUTOXENE (UREDINALES)

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Résumé : *Coleosporium himalayense* sp. nov. est une espèce microcyclique, autoxène sur *Pinus excelsa* WALL. trouvée dans l'Himalaya du Népal. Elle est voisine de C. *crowellii* CUMM. d'Amérique du Nord. On ne peut rapprocher ces deux Rouilles d'aucune autre espèce hétéroxène à cycle complet.

Summary : *Coleosporium himalayense* sp. nov. is a microcyclic species autoecious on *Pinus excelsa* WALL. found in Nepalese Himalaya. It is not very different from the North American C. *crowellii* CUMM. The two Rusts cannot be related with any other heteroxenous macrocyclic species.

La plupart des espèces du genre *Coleosporium* (Urédinales) sont des parasites à cycle complet ayant un Pin pour hôte écidien (stade *Peridermium*) et une Angiosperme pour hôte urédo-télien.

Il n'en existe qu'un petit nombre qui sont microcycliques, c'est-à-dire qui produisent seulement des "téliospores" (1), et se développent sur les aiguilles de divers Pinus, ce sont :

- *Coleosporium pinicola* (ARTH.) JACK. sur *Pinus virginiana* MILL. dans l'Est des Etats Unis.
- *Coleosporium pini-pumilae* AZBUK. sur *Pinus pumila* (PALL.) RGL. et *P. sibirica* (RUPR.) MAYR. en Sibérie.
- *Coleosporium crowellii* CUMM. sur *Pinus ayacahuite* EHRENB., *P. cembroides* ZUCC., *P. culminicola* ANDR. et BEAM. *P. edulis* ENGELM., *P. monophylla* TORR. et FREM. et *P. reflexa* ENGELM. au Mexique et dans le Sud des Etats Unis.

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(1) Chez les *Coleosporium* les cellules que l'on a appelé téliospores sont les basides mêmes et non des probasides comme chez la plupart des autres Urédinales.

Coleosporium crowellii se distingue très nettement en raison de la forme corniculée des téliosores, qui atteignent 1 et parfois 2 mm de haut, dans lesquels les téliospores sont disposées en longues chaines. Chez les deux premières espèces les sores forment une simple croûte où les téliospores sont aussi disposées en chaines, au moins chez C. *pinicola* (DODGE, 1925), mais très courtes avec seulement 2 ou 3 éléments bien différenciés. Un autre caractère distinctif est l'épaississement apical de la paroi des téliospores très développé pour les deux premières espèces : 50µ chez C. *pinicola,* 40µ chez C. *pini-pumilae* alors qu'il est pratiquement nul chez C. *crowellii.*

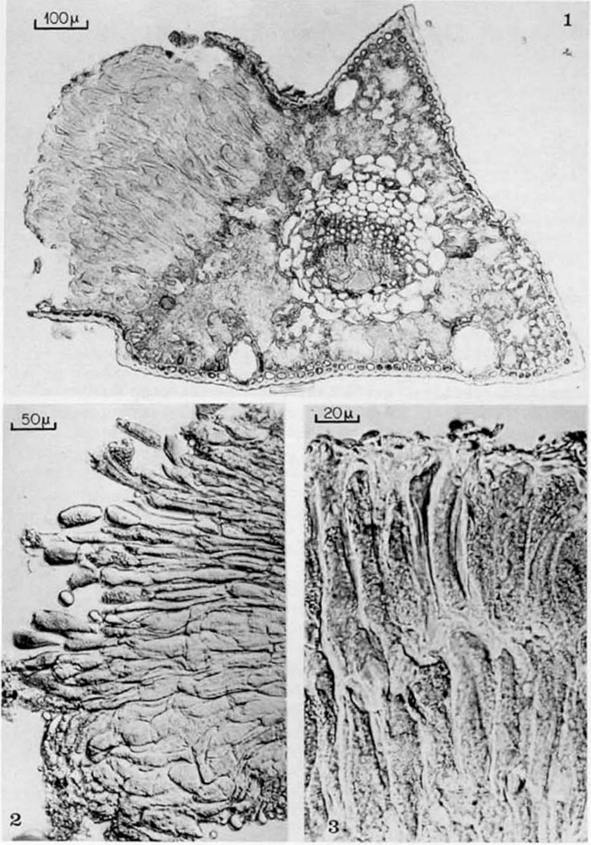
C'est de cette dernière espèce que se rapproche le plus une récente récolte réalisée dans l'Himalaya du Népal, pour laquelle je propose le binôme *Coleosporium himalayense.* Le parasite était abondant à la fin du mois de mai sur les aiguilles de l'année précédente de *Pinus excelsa* WALL., sur les pentes dominant l'aval de la vallée du Lantang vers 2700 m d'altitude. On rencontrait également, parfois sur les mêmes aiguilles, un *Peridermium* appartenant probablement au cycle de *Coleosporium campanulae* (PERS.) LEV. qui se comporte en hétéroxène et dont le stade Uredo est fréquent au voisinage sur *Campanula.* Par contre quelques centaines de mètres plus bas, dans les forêts de *Pinus roxburghii* SARG. on ne trouvait que le *Peridermium* mais pas l'espèce microcyclique.

Les téliosores développés sur les aiguilles de l'année précédente crèvent l'épiderme pour constituer des excroissances de couleur orangé clair et qui mesurent de 0,2 à 0,5 mm de haut, de 0,3 à 3,5 mm de long et de 0,2 à 0,3 mm de large.

Les téliospores sont disposées en chaines de trois à six cellules, étroitement comprimées les unes contre les autres et de ce fait de forme très variable , parfois irrégulière . Le plus souvent elles sont sensiblement cylindriques, leurs dimensions varient pour la longueur entre 50 et 125µ , pour le diamètre entre 15 et 30µ : elles sont très étirées dans la partie centrale du sore, nettement plus trapues dans les zones périphériques. Leur paroi est mince environ 0,5µ , sans épaississement apical.

Il n'est pas impossible que la taille, définitive des sores soit plus importante que celle que j'ai mesurée ; en effet, sur les spécimens récoltés, seulement un très petit nombre de téliospores sont arrivées à maturité et divisées en 4 cellules basidiales

Coleosporium himalayense n. sp. *Pycnia ignota. Aecia uredia-*



Coleosporium himalayense, I: coupe dans une aiguille de Pinus excelsa portant un sore.- 2: Sore écrasé montrant les téliospores disposées en chaînes.- 3: Téliospores des deux couches les plus externes.

que dessunt. Telia erumpentia epidermide rupto cincta, rufo-aurantiaca 0,3 - 3,5 mm *longa*, 0,2 - 0,3 mm *lata*, 0,2 - 0,5 mm *alta. Teliosporae catenulatae, irregulariter cylindraceae* 50 - 125 x 15 - 30 µ, *epispora tenuis ad apicem non incrassata.*

In acuibus Pini excelsae WALL., *inter* Syabru Bensi et Syarpagaon, 2700 m. alt., *in* Langtang *valle*, Nepal, 25-6-74 G. DURRIEU. *Typus in T.L.A., isotypus in P.C.*

La distinction de C. *himalayense* avec les trois autres espèces microcycliques connues est aisée :

Les C. *pinicola* et C. *pini-pumilae* se séparent par :

- l'absence d'épaississement apical de la paroi.
- la disposition en chaînes plus longues des téliospores.

Par rapport à C. *crowellii* les téliosores ont la même structure colonnaire mais en plus court en raison du plus faible nombre de cellules présentes dans une même file (5 à 6 au lieu d'une dizaine). Notre espèce occupe ainsi une place intermédiaire entre les deux premières et C. *crowellii* Les téliospores en sont de formes et de dimensions beaucoup plus irrégulières : 50 - 125 x 15 - 30 µ au lieu de 50 - 90 x 20 - 24 µ. Ceci mis à part, les affinités entre les deux espèces sont certaines, affirmées en particulier par l'absence d'épaississement apical de la paroi.

On se trouve donc en présence de deux groupes de *Coleosporium* autoxènes nettement distincts : C. *pinicola* et C. *pini-pumilae* d'une part, C. *crowellii* et C. *himalayense* de l'autre. Par la morphologie de ses téliospores et leur disposition en croûte ne comportant qu'un petit nombre de couches de spores différenciées le premier groupe se rattache de façon indubitable aux *Coleosporium* à cycle complet. Chez ceux-ci on observe en effet des espèces montrant des téliospores disposées en courtes chaînes (ce qui avait amené DIETEL à les distinguer dans un genre particulier : *Stichopsora*). On peut donc penser que ce premier groupe dérive des espèces macrocycliques par un phénomène bien connu chez les Urédinales : transformation de la potentialité du mycélium dicaryotique primaire qui, au lieu de produire des écidiospores donne directement des téliospores (loi de TRANZSCHEL). C'est sur cette base qu'ARTHUR (1934) rapproche C. *pinicola* de C. *inconspicuum* HEDG. et LONG, qui forme ses télies sur *Coreopsis* et ses écidies sur *Pinus virginiana* hôte de la Rouille microcyclique. Les deux espèces de ce groupe ont pu s'individualiser de façon totalement indépendante puisque dans leur région d'origine existent des *Coleosporium* à cycles complets. Ceci est illustré par leur disjonction géographique et leur spécificité puisque, comme le fait remarquer AZBUKINA (1968), C. *pinicola* parasite un Pin de la section *Diplopinus* tandis que C. *pini-pumilae* est hébergé par des espèces de la section *Haplopinus*.

Quant au deuxième groupe, il est beaucoup plus délicat de lui trouver des affinités avec des espèces à cycle complet. Le rapprochement fait par CUMMINS (1959) entre C. *crowellii* et C. *jonesii* (PK.) AETH. ne me semble établi que sur la seule identité de l'hôte écidien de cette dernière espèce (*Pinus edulis*) mais n'est corroboré par aucun caractère morphologique. Les différences notées pour caractériser les deux autres espèces microcycliques se retrouvent également dans une comparaison avec l'ensemble des espèces hétéroxènes. Il semble que l'on se trouve en présence de Rouilles qui n'ont aucun correspondant macrocyclique actuel. Faut-il considérer ces espèces comme les survivants d'un groupe lui aussi hétéroxène aujourd'hui disparu ? L'ancienneté du genre *Pinus* connu depuis le début du Crétacé, qui se classe ainsi comme l'un des plus anciens dans la nature actuelle n'interdit pas cette hypothèse. Les hôtes téliens auraient pu être soit des Angiospermes primitives soit même des plantes d'autres groupes (Ptéridophytes ? Benettitales ?).

La position taxinomique des espèces microcycliques sur *Pinus* a depuis longtemps fait l'objet d'une attention particulière. C'est ainsi qu'ARTHUR créait en 1906 le genre *Gallowaya*, conception qu'il abandonnait par la suite, mais qui fut reprise plusieurs fois par d'autres mycologues. En se basant sur le seul C. *pinicola* il est évidemment difficile d'établir une distinction générique puisqu'il n'y a en fait aucune différence de structure télienne avec certaines espèces héteroxènes à téliospores brièvement caténulées (*Stichopsora* de DIETEL). On ne peut retenir le seul fait que ce *Coleosporium* se comporte en microcyclique, sinon il faudrait aussi envisager de subdiviser de nombreux autres genres d'Urédinales qui présentent plusieurs types de cycles biologiques. Les caractères propres aux espèces du deuxième groupe, comme l'a déjà fait remarquer PETERSON (1972) pour C. *crowellii*, sont par contre bien mieux marqués. Mais il ne me paraît pas utile, pour le moment, de vouloir les séparer dans un genre particulier. Il semble que dans les *Coleosporium* il existe tous les passages entre les espèces ne différenciant qu'une seule couche de téliospores jusqu'à celles les produisant en longues chaînes. Une étude d'ensemble aurait certainement l'intérêt d'apporter d'importantes données sur la phylogénie de ces Rouilles.

Remerciements :

Je remercie R.S. PETERSON, Santa Fe (New Mexico) qui m'a très aimablement fourni un abondant matériel de *Coleosporium crowellii* sur divers hôtes, M. G. VIENNOT-BOURGIN qui a bien voulu se charger de la critique du manuscrit, Mme SANGERMA, Mlle MARQUE et M. LLUBES qui m'ont apporté leur concours technique.

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GYMNOASCOIDEUS, A NEW GENUS OF THE GYMNOASCACEAE

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SUMMARY

Gymnoascoideus petalosporus gen. et sp. nov. of the Gymnoascaceae is described and discussed. Gymnothecial elements are similar to those of *Gymnoascus* Baran. Asexual spores and disposition of the ascospores in the ascus, as well as cultural characteristics distinguish this genus from others of the family.

INTRODUCTION

Species of *Petalosporus* Ghosh, Orr, and Kuehn, *Arachniotus* Schroeter, and *Pseudoarachniotus* Kuehn have been cited in the mycological literature with respect to their pathological implications as well as new isolations from various substrates (1, 5, 6, 20, 21, 23, 24) but without specific identification. A study of several of the strains so labeled and others isolated elsewhere have shown that they do not represent any of the genera noted (4, 18), but rather represent a new genus of the Gymnoascaceae. It is described and discussed below.

The term "gymnothecium (gymnothecia)" is used here, as suggested by Novak and Galcozy (11) for ascocarps of the Gymnoascaceae. "Arthroaleuriospores," as defined by Orr et al. (17), and concurred with by Kwon-Chung (10), and Sun and Huppert (26), is used here as the term for asexual spores.

TAXONOMY

GYMNOASCOIDEUS Orr, Roy, and Ghosh, gen. nov.

Gymnothecia discreta interdum praesentis, frequenter confluentia, plerumque globosa, elementis rectangulariter anastomosantibus et reticulum efformantibus; gymnothecia discreta frequenter absentia sed elementa typica in et circum caespites ascorum disposita, rectangulariter ramosa, ad apices obtusa, plerumque e sporis asexualibus bene tecta; caespites asci plus minus globosi vel subglobosi, evanescentes octospori; ascosporae flavae ad flavo-brunneae, oblatae, crassitunicatae glabrae; sporae asexuales in forma arthroaleuriosporium hyalinae vel brunneae cylindricae; hyphae ampullaceae praesentes.

Species typica: *Gymnoascoideus petalosporus* Orr, Roy, and Ghosh

Discrete gymnothecia sometimes present, frequently confluent, mostly globose; elements of the gymnothecia anastomosing at right angles to form a reticulum. Discrete gymnothecia frequently absent but with typical elements in and around the ascal clusters, branching at right angles, blunt at the apices, usually thoroughly covered by asexual spores. Ascal clusters more or less globose. Asci globose or subglobose, evanescent, 8-spored. Ascospores yellow to yellow-brown, oblate. Asexual spores of the arthroaleuriospore type, hyaline, buff, or brown, cylindrical, smooth. Racquet hyphae present.

Gymnoascoideus petalosporus Orr, Roy, and Ghosh, sp. nov. Figs. 1-20.

Fungus homothallicus. Gymnothecia discreta praesentia, plerumque confluentia, brunnea vel viridi-brunnea, plerumque globosa 150-750 (1050) µm diam, exappendiculata, elementis gymnothecia componentibus rectanguliter anastomosantibus et peridium clathratum efformantibus, glabrotunicatus, 3.1-5.6 µm latis; gymnothecia discreta frequenter carentia, sed elementa typica peridialis rectangulariter ramosa et ad apices obtusa in et circum caespites ascorum disposita; caespites ascorum plus minus globosi, 65-510 µm diam, plerumque sporis asexualibus tecta; asci globosi, 4.9-7.7 µm diam vel subglobosi 4.2-8.4 x 3.7-10.2 µm, evanescentes octospori; ascosporae in dispositione petaloidea in asco, flavae usque flavo-brunneae, in ambitu circulares 3.5-4.2 µm diam vel ovatae usque ellipticae 1.4-3.5 x 2.6-4.9 µm glabrotunicatae; status asexualis in forma arthroaleuriosporarum plus minus cylindricarum, 1.4-5.6 x 2.1-11.9 µm, hyalinarum vel brunnearum glabrotunicatarum compositus;

hyphae ampullaceae praesentes.

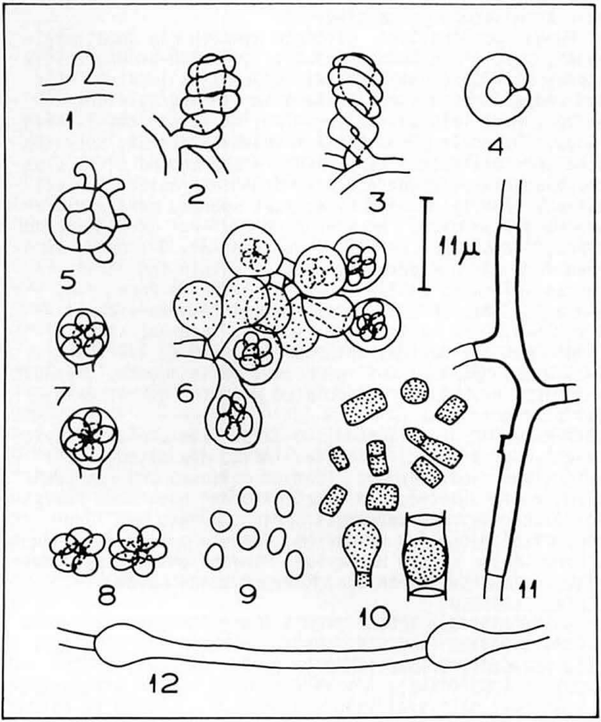
Fungus homothallic. Discrete gymnothecia sometimes present, mostly confluent, brown to greenish-brown, mostly globose, 150-750 (1050) µm diam, appendages lacking. Elements composing the gymnothecia anastomosing at right angles to form a latticelike peridium, walls smooth, 3.1-5.6 µm wide. Discrete gymnothecia frequently absent, but with typical peridial elements present in and around ascal clusters, branched at right angles, with blunt apices. Ascal clusters, usually covered by asexual spores, mostly globose, 65-510 µm diam. Asci globose, 4.9-7.7 µm diam or subglobose, 4.2-8.4 x 3.7-10.2 µm, evanescent, 8-spored, ascospores forming in a petaloid pattern within the ascus. Ascospores yellow to yellow-brown, circular in face view, 3.5-4.2 µm diam, or oval to elliptical in side view, 1.4-3.5 x 2.6-4.9 µm, walls thick, smooth. Asexual state of more or less cylindrical arthroaleuriospores, 1.4-5.6 x 2.1-11.9 µm, hyaline, buff or brown, walls smooth. Racquet hyphae present, usually associated with the gymnothecia or ascal clusters.

HOLOTYPE CULTURE (desiccated): 0-3325, from a nodular cyst on the eye of a human, Calcutta, India, deposited in the New York Botanical Garden. Isotype cultures and representative strains (desiccated disc cultures) have been deposited in the New York Botanical Garden, Bronx, New York 10458; Plant Pathology Herbarium, Cornell University, Ithaca, New York 14850; Farlow Herbarium, Harvard University, Cambridge University, Cambridge, Massachusetts 02138.

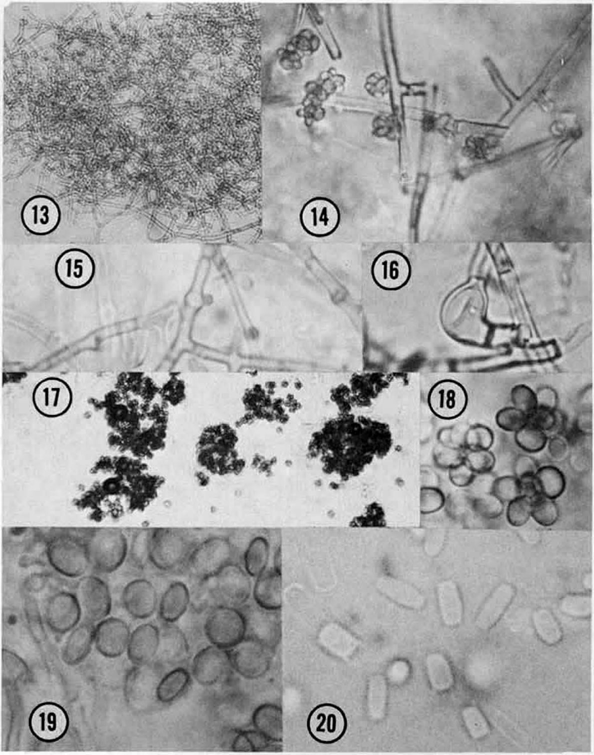
MATERIAL EXAMINED:

Soil isolates: INDIA: 0-2013 (Garg 1045), 0-3326 (Roi STM 1134), 0-3332 (Roi STM 1136); Ghosh and Roy isolates, 0-1239 (GR-62d), 0-1256 (GR-87), 0-1263 (GR-92), 0-1267 (GR-93), 0-1268 (GR-7), 0-1269 (GR-91). ITALY: all Varsavsky isolates, 0-3139 (I-13), 0-3164 (I-5), 0-3328 (I-79), 0-3334 (I-13A), 0-3341 (I-16, NRRL 6051), 0-3359 (I-14), 0-3386 (I-54), 0-3719 (I-14A). ENGLAND: 0-3442 (Dickinson 180). PANAMA: 0-3324 (Howard DHH 2). GUATEMALA: 0-3352 (Howard DHH 288c). U.S.A.: CALIFORNIA: Inyokern area, 0-3629.

Clinical sources: INDIA: 0-1270 (Ghosh GR-31) from tinea lesion, human; 0-3325 (Bose 503, NRRL 6001, UAMH 3589, ATCC 34351) from nodular cyst on eye, human. U.S.A.: CALIFORNIA: Los Angeles, 0-2067 (CBS 630.72) from tinea lesion, human. UTAH: Salt Lake City, 0-3552 (UAMH 3593) from tinea lesion, human; Bluffdale, 0-1505 (UAMH 3592) from tinea lesion, horse; Riverton, 0-3473 (IMI 183572, UAMH



Figures 1-12. Camera lucida drawings of structures of *Gymnoascoideus petalosporus*. Figs. 1-4. Sexual initials, lateral and top view. Fig. 5. Crozier formation. Figs. 6-7. Ascus and ascospore formation. Figs. 7-8. Petaloid position of ascospores. Fig. 9. Individual ascospores. Fig. 10. Arthroaleuriospores. Fig. 11. Typical peridial element. Fig. 12. Racquet hyphae.



Figures 13-20. *Gymnoascoideus petalosporus*. Fig. 13. Gymnothecium. x100. Fig. 14. Peridial element and ascospores in ascus. x450. Fig. 15. Typical peridial elements. x950. Fig. 16. Swollen node of peridial element. x450. Fig. 17. Ascal clusters. x45. Fig. 18. Ascospores in petaloid position within asci. x1000. Fig. 19. Ascospores. x950. Fig. 20. Arthroaleuriospores. x950.

3656) from tinea lesion, horse.

Other sources: INDIA: Orissa, 0-1163 (UAMH 3704) from rat dung; Jankia, 0-1177 (Ghosh GR-62, UAMH 3525) from horn. YUGOSLAVIA: S.R. Macedonia, 0-1299 (Hubálek 140 B) from feathers of *Passer domesticus* L. AUSTRALIA: Queensland, 0-3454 (Rees F 243) from feathers of a domesticated duck. ENGLAND (?): 0-3640 (UAMH 3527), contaminant in a culture of *Rollandina vriesii* Apinis (2). U.S.A.: ARIZONA, 0-2060 (Emmons 5006, CBS 629.72, NRRL 5544, ATCC 28556) from a rodent.

DISCUSSION

Colonies on Freezing agar (7), YpSs (3), SAB-PSA[2] (12), and Oatmeal-Salts agar (19) attain diameter of approximately 75-80 mm in 15-20 days at 30°C. Colonies are often at first white, arachnoid, becoming colored with patches of granular areas in shades of buff, tan, greenish-brown or brown shades. Sometimes colonies may not exhibit the white arachnoid mycelium, and instead may present tufted areas on the agar surface in the shades noted. Still other colonies may present a completely granular surface of these various colors. The colonial coloration is largely from the presence of asexual spores, which usually cover the gymnothecia or peridial elements and ascal clusters entirely. Reverse of the colonies is sometimes orange or brownish. Exudate or odor was not observed.

Sexual initials arise from the same or different parent hyphae (Figs. 1-4), one of the initials twining about the other (Figs. 2-4). Croziers (Fig. 5) are subsequently formed and produce asci (Figs. 6, 7).

Gymnothecia (Fig. 13) and ascal clusters (Fig. 17) may be present in the same culture, but gymnothecia are frequently absent, and only free elements of the same type as those forming the gymnothecia may be found among the ascal clusters (Figs. 11, 14, 15). Gymnothecia are more or less globose, and elements composing them are branched at right angles (Figs. 14, 15). This feature is similar to that found in species of *Gymnoascus* (15) and *Pseudogymnoascus* Raillo (22). Such elements tend to break off and present a blunt appearance. Appendages such as those found on peridial elements of *Gymnoascus* are lacking in *G. petalosporus*. Elements of *Gymnoascus* are smooth or asperulate and are usually smooth in *G. petalosporus* although they may occasionally be tuberculate. In addition, elements of *G. petalosporus* are sometimes enlarged and present an appearance similar to that of racquet hyphae and such elements do not tend to disarticulate. Occasional elements also become swollen at the nodes (Fig. 16) and somewhat resemble *Pseudogymnoascus*. Thin walled racquet hyphae (Fig. 12) are also present and are usually associated with the gymnothecia or ascal clusters.

Ascospores in the ascus assume a petaloid position (Figs. 7, 8, 18) similar to that found in species of *Petalosporus* (4). The morphology of the ascospores is similar to that of *Gymnoascus, Neogymnomyces* Orr (13), *Gymnascella* Peck (18), and *Pectinotrichum* Varsavsky and Orr (27) in being circular in face view and oval to elliptical in side view (Figs. 9, 19). They are also similar to ascospores of *Arthroderma* Berkeley and *Nannizzia* Stockdale and have been described by Padhye and Carmichael (19) as oblate spheroids. Although the ascospores assume the petaloid pattern (Figs. 4, 8. 14) similar to that of *Petalosporus,* they lack the slight lateral bulges characteristic of the ascospores of that genus. Ascospores of *Pseudogymnoascus* are ellipsoid to fusiform and have relatively thin walls compared to the walls of ascospores of the other genera noted above. The petaloid condition of the ascospores within the ascus is absent or rare in species of *Gymnoascus* and other genera of the Gymnoascaceae except *Petalosporus*.

Asexual spores of *G. petalosporus* are also similar to other related fungi producing arthroaleuriospores (Figs. 10, 20), especially species of *Malbranchea* Saccardo described by Singler and Carmichael (25). Unlike most Gymnoascaceae, however, arthroaleuriospores of this organism usually cover the gymnothecia, ascal clusters, and free peridial elements entirely. Except for aleuriospores in *Gymnoascus uncinatus* Eidam (15), asexual spores are unknown in species of *Gymnoascus*. Strains of *G. petalosporus* occasionally lose their ability to produce the sexual state and produce only arthroaleuriospores, thus resembling some strains of *Malbranchea* even more. Such spores are rarely of any value in determining species of the Gymnoascaceae.

One strain (0-2060) usually fails to produce peridial elements on any medium at 22-25°C but will produce them on the same medium at 30°C. Another strain (0-3139) produces mostly gymnothecia and rarely produces only elements under any conditions. In this strain, fewer asexual spores are produced and gymnothecia are rarely covered.

Strains of *G. petalosporus* were isolated from various substrates including clinical sources as have been many other Gymnoascaceae. Some of the strains obtained from soil were isolated with *Microsporum gypseum* (Bodin) Guiart and Grigorakis (approximately 25%). Those from clinical sources were often isolated with species of *Trichophyton* Malmsten. Although some strains have been implicated pathologically as species of *Petalosporus* (9), *G. petalosporus* has not been shown to be pathogenic (24). The significance of the association of *G. petalosporus* with pathogenic species has not been determined. The distribution of *G. petalosporus* is apparently worldwide.

Since there are several genera in the Gymnoascaceae that produce ascospores which appear circular in face view and oval to elliptical in longitudinal view, a key to these genera follows.

KEY TO GENERA OF THE GYMNOASCACEAE WITH DISCOID-OBLATE TYPE ASCOSPORES

A. Gymnothecial elements swollen at septa..............B
AA. Gymnothecial elements not swollen at septa..........F
B. Gymnothecia dark colored, ascospores rimmed.......... ....*Tripedotrichum*
BB. Gymnothecia light colored...........................C
C. Gymnothecial appendages ctenoid or pectinate........D
CC. Gymnothecial appendages otherwise..................E
D. Gymnothecial elements surrounding a cleistothecium enclosing the asci and ascospores..........*Ctenomyces*
DD. Gymnothecial elements surrounding free asci and ascospores...............................*Pectinotrichum*
E. Swellings at septa regularly present resembling swollen joints, appendages bifurcate apically......*Macronodus*
EE. Swellings at septa infrequent not resembling swollen joints, appendages hooked or branched......*Gymnoascus*
F. Gymnothecia not netlike, elements arising at the base of ascal clusters...................................G
FF. Gymnothecia netlike.................................H
G. Gymnothecia present or absent; when present, elements tuberculate...........................*Gymnascella*
GG. Gymnothecia present, appendages uncinate, heterothallic................................*Uncinocarpus*
H. Ascospores regularly in a petaloid pattern within the ascus...I
HH. Ascospores rarely in a petaloid pattern within the ascus...J
I. Ascospores with slight lateral bulges.....*Petalosporus*
II. Ascospores lacking lateral bulges.......*Gymnoascoideus*
J. Gymnothecial appendages sinuous, without spirals..... ....*Neogymnomyces*
JJ. Gymnothecial appendages terminating spirals.........K

K. Gymnothecial elements tending to disarticulate, ascospores grooved on longitudinal axis........*Shanorella*

KK. Gymnothecial elements tending to disarticulate, ascospores lacking grooves on longitudinal axis.........L

L. Individual elements unequally swollen at ends, cameloid, spinose............................*Arthroderma*

LL. Individual elements slightly swollen at ends, bone shaped, smooth or rugose..................*Nannizzia*

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A NEW SPECIES OF GYMNOASCUS

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Gymnoascus intermedius n. sp. is described and compared with other species of the genus.

INTRODUCTION

Several strains of a gymnoascaceous fungus have been encountered during the routine screening of soils for fungi. Examination of these strains indicated that they represented a new species of *Gymnoascus* Baranetzky. It is described below.

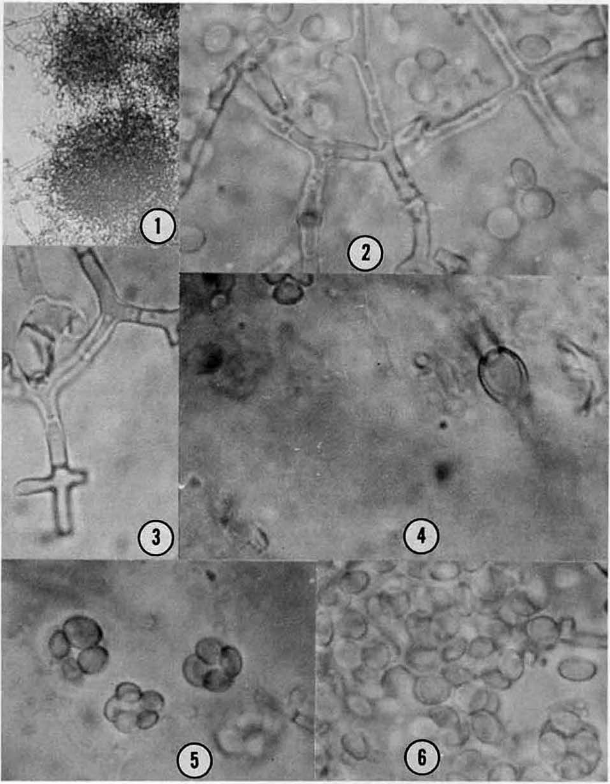
A desiccated disc culture of the holotype has been deposited in The New York Botanical Garden (NYBG), Bronx, N.Y. Desiccated disc cultures of isotypes and representative strains have been deposited in NYBG, Plant Pathology Herbarium, Corness University (CUP), Ithaca, N.Y., and in The Farlow Herbarium (FH), Harvard University, Cambridge, M.A.

TAXONOMY

Gymnoascus intermedius Orr, sp. nov. (Figs. 1-6)

Fungus homothallicus. Gymnothecia discreta praesentia plus minus globosa, 75-470 μm diam, confluentia flava vel galbina, exappendiculata; elementa gymnothecia componentia anastomosantia et peridium clathratum efformantia, glabra, 1.9-3.4 μm latis; asci elliptici, 5.7-6 x 6-8.6 μm, hyalini evanescentes octospori; ascosporae flavidulae crassitunicatae glabrae, in ambitu circulares, 3.4-4 μm diam, vel ovatae usque ellipticae 1.9-2.3 x 3.6-4 μm; status asexualis ignotis; hyphae ampullaceae praesentis.
Holotypus: in solo, Palo Verde, California, U. S. A., April 1959, Orr 0-313.

Fungus homothallic. Discrete gymnothecia present, more or less globose, 75-470 μm diam, confluent, in shades of yellow or yellow-green, appendages lacking; elements comp-



Figures 1-6. *Gymnoascus intermedius*. Fig. 1. Gymnothecia. x450. Fig. 2. Peridial elements. x1050. Fig. 3. Swollen node at element juncture. x1050. Fig. 4. Ampulliform swelling in peridial element. x1050. Fig. 5. Ascospores in asci. x1250. Fig. 6 Ascospores. x1250.

rising the gymnothecia anastomosing to form a latticelike peridium, smooth 1.9-3.4 µm wide. Asci elliptical, 5.7-6 x 6-8.6 µm, hyaline, evanescent, 8-spored. Ascospores yellow, walls smooth, circular in face view, 3.4-4 µm diam, or oval to elliptical in side view, 1.9-2.3 x 3.6-4 µm. Asexual spores unknown. Racquet hyphae present, in association with the gymnothecia.

Colonies on Freezing agar (2) and Oatmeal-Salts agar (8) green to yellow green, attaining a diameter of approximately 80 mm in 20-30 days at 25-30^{o}C; reverse coloration, odor or exudate not observed.

Sexual initials arising after 8-10 days from the same or different parent hyphae, one coiling about the other. Croziers soon produced, with asci forming in 10-15 days. Young gymnothecia (Fig. 1) containing asci and ascospores (Fig. 5) produced within 20 days and usually maturing by 30 days.

Material examined: U. S. A.: California: Palo Verde area, soil, Orr 0-104 (QM 9340), 0-291, 0-313 (NRRL 6272, ATCC 28555); lung of a pocket mouse, Orr 0-651.

DISCUSSION

Gymnothecia of *G. intermedius* are numerous, confluent, interlocking with one another. They are fragile and break easily upon separation so that many square, blunt ends are present (Figs. 2, 3). Gymnothecia are typical of the genus (5) in possessing anastomosing elements forming a latticelike peridium (Fig. 2).

Junctions of the peridial elements (nodes) are occasionally swollen (Fig. 3) and are similar to those observed in species of *Pseudogymnoascus* Raillo (9). Occasional elements in the peridial lattice become swollen (Fig. 4). This feature is rather infrequent in the Gymnoascaceae but has been observed in *Gymnoascoideus* Orr, Roy & Ghosh (7). Septal swellings in hyphal elements and appendages similar to those found in *Auxarthron* Orr & Kuehn have been reported by Apinis (1) and Samson (10) for species of *Gymnoascus*. I have observed swellings only in *G. uncinatus* Eidam; they are unlike those of *Auxarthron*. Septal swellings in *Auxarthron* and other genera were considered in detail by Orr (4). Variation in *G. reessii* Baran. was discussed by Orr et al. (6) and in *Gymnoascus* by Samson (10).

Ascocarps of *Gymnoascus intermedius* lack appendages as well as the "boat-hook" type branches considered typical of *Gymnoascus* by Orr et al. (5). Such gymnothecia may be confused with those of *Gymnoascoideus petalosporus* Orr, Roy & Ghosh (7) because of the numerous blunt ends present on peridial elements of both. Gymnothecia of the former, however, are yellow to yellow-green, and those of the latter are brown to greenish-brown. Furthermore, free elements and gymnothecia are covered by asexual spores in *Gymnoascoideus petalosporus*, but such spores are lacking in *Gymnoascus intermedius*.

Ascospores of *G. intermedius* are circular in face view oval to elliptical in side view (Figs. 2, 5, 6). This ascospore morphological type is common to several genera in the Gymnoascaceae (4). Padhye and Carmichael (8) have termed this ascospore shape, in species of *Nannizzia* Stockdale and *Arthroderma* Berkeley, to be "oblate spheroids." A key to the genera of the Gymnoascaceae producing such ascospores was prepared by Orr (4).

Asexual spores are absent in *G. intermedius* as in most species of *Gymnoascus* (5). *Gymnoascus uncinatus*, however, produces terminal aleuriospores and intercalary arthroaleuriospores.

Many of the Gymnoascaceae, including species of *Gymnoascus*, have been implicated pathologically (3). *Gymnoascus intermedius* has been isolated from soil and from the lung of a pocket mouse. Pathogenicity of *G. intermedius* has not been demonstrated.

There is little doubt that *G. intermedius* is closely related to *G. reessii* and other species of *Gymnoascus*. It is possible that *G. intermedius* may also be related to *Gymnoascoideus* and to *Pseudogymnoascus*. Genetic and scanning electron microscope studies might be useful in defining relationships of these genera more closely.

KEY TO SPECIES OF GYMNOASCUS

A. Peridial appendages lacking............*G. intermedius*
AA. Peridial appendages, long and/or short, present.....B
B. Elongate appendages uncinate, short ones hooked...... ....*G. uncinatus*
BB. Elongate appendages otherwise........................C
C. Appendages greatly elongate (to 500 µm), short ones sinuous, hooked.....................*G. longitrichus*
CC. Appendages otherwise.................................D
D. Elongate appendages branched with side branches curved or hooked...............................*G. reessii*
DD. Elongate appendages with two apical recurving hooks.. ....*G. dugwayensis*

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NOTES ON CORTICIACEAE

(BASIDIOMYCETES)

by

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Flavophlebia (Parm.) is given generic rank. *Sistotrema subangulisporum*, a species related to *Sistotrema pistilliferum* Hauerslev but without clamp connections and cystidia, is described as new. Also some new combinations are made viz. *Flavophlebia sulfureo-isabellina, Hypochnicium cymosum* and *Phlebia cremeo-alutacea.*

Flavophlebia (Parm.) K.-H. Larss. & Hjortst. nov. gen.

BASIONYM: *Phlebia* Fr. subgenus *Lilaceophlebia* Parm. sectio *Flavophlebia* Parm. Consp. syst. Cort. p 94, 1968.

GENERITYPUS: *Flavophlebia sulfureo-isabellina* (Litsch.) K.-H. Larss. & Hjortst.

Fruitbody resupinate, effused, at first thin, with age thickening, hymenium ceraceous, continuous, cracking with age, margin indistinctly thinning out. Hyphal system monomitic, individual hyphae mostly indistinct, thinwalled, with clamps. Cystidia cylindrical to subfusiform, thinwalled, normally enclosed. Basidia terminal, slightly stalked, with basal clamp, normally with four sterigmata. Spores oblong, subglobose or globose with sublateral apiculus, smooth, neither cyanophilous nor amyloid or dextrinoid.

Flavophlebia sulfureo-isabellina (Litsch.) K.-H. Larss. & Hjortst. nov. comb.

BASIONYM: *Corticium sulfureo-isabellinum* Litsch. in Pilát

Acta Mus. Nat. Pragae 2B (3):43, 1940.

Fruitbody resupinate, effused, thickening, ceraceous, cracking, in colour yellowish turning to ochraceous or pale brown, margin indistinct. Hyphal system monomitic, individual hyphae mostly indistinct, thinwalled, 2-2,5 um wide, those of the subhymenium sparsely branched, all hyphae with clamps. Cystidia cylindrical or subfusiform, thinwalled, enclosed or slightly projecting, 50-80 x 6 um. Basidia terminal, clavate, 20-30 x 6-8 um, with basal clamp, 4-sterigmate. Spores oblong, subglobose or rarely globose with sublateral apiculus, thinwalled, smooth, 7-8 x 5-6 um, with oily substance dispersed in the protoplasm.

HABITAT. As far as we know only collected on *Abies*. This circumstance may explain why no Swedish specimens are hitherto gathered.

DISTRIBUTION. Not yet collected in Scandinavia but is not uncommon in the Carpathians. Also noted from Austria, SSSR and France. A number of collections from North America have been studied.

REMARKS. In general aspect, *Flavophlebia sulfureo-isabellina* reminds one of *Phlebia,* which, however, in its wide sense no doubt is heterogeneous. Most species of *Phlebia* have spores which are allantoid, cylindrical or elliptical and basidia narrowly clavate. The fructifications vary in texture, sometimes ceraceus but mostly gelatinous as in the type species, *Phlebia radiata* Fr., which also has a more or less folded hymenium. This is not the case with the treated species. According to Parmasto, in his description of the section *Flavophlebia,* the basidia are broader and the basidiospores subglobose. Besides, the lateral attachment of the apiculus make the spores remind one of those of *Radulomyces confluens* (Fr.) M.P. Christ. However, there are no other links between *Radulomyces* and *Flavophlebia.*

In our opinion *Flavophlebia* is easily recognized by its yellowish fructification, clavate basidia, and by its subglobose, oilrich spores with distinct, sublateral apiculus.

For further information see Jackson (1948) who has thoroughly interpreted the species.

MATERIAL STUDIED. Poland. Nawojowa, Rezerwat Scisly Labowiec, 1973-09-11, Hallenberg,Hjortstam,Larsson 2003, 2006; Nawojowa, Rezerwat Scisly Labowiec, 1973-09-12, Hallenberg,Hjortstam,Larsson 2228, 2251, 2312; Babia Gora national park, 1973-09-15, Hallenberg,Larsson 2645, 2649; Babia Gora national park, 1973-09-16, Hallenberg,Larsson 2736. – SSSR. Bhodan potok Sheshulets, *Abies alba*, ad caudicem prolapsum putridum in piceeto, 1956-08-17, Parm. TAA-3929; Regio Krasnodar, Reservatum Caucasicum, Lager Tjagenja, *Abies Nordmanniana*, ad caudicum prolapsum in abieteto, 1966-09-18, Parm. TAA-19577. — France. Hte Garonne, Luchon, sur *Abies*, 1956-09-18, Boidin Ly 2435, (as *Gloeocystidiellum sulfureo-isabellinum*). — Canada. Ontario, L. Timagami, Gull L.P., on bark of *Abies balsamea* 1936-08-10, leg R. Biggs, det H.S. Jackson, Hb Cain 8811; Ontario, L. Timagami, Gull L.P., on *Abies balsamea*, 1935-08-06, leg R. Biggs, det V. Litschauer, Hb Cain 7365; Ontario, Algonquin pk, mileage 2, on *Abies balsamea*, 1940-10-13, H.S. Jackson, Hb Cain 12727; Ontario, Oxbow lake, W. of Algonquin pk, on *Abies balsamea*, 1941-08-20, leg R.F. Cain, det H.S. Jackson, Hb Cain UT 17919; Ontario, Dorset, Clear lake, on down *Abies balsamea*, 1954-10-06, leg M.k. Nobles, det J. Speirs, DAOM 52065; Nova Scotia, Sherbrook lake, Lunenburg Co., on *Abies balsamea*, 1954-07-05, J. Speirs, DAOM 31445.

Hypochnicium cymosum (Rog. & Jacks.) K.-H. Larss. & Hjortst. nov. comb.

BASIONYM: *Peniophora cymosa* Rog. & Jacks. Can. Journ. Res. C 133, 1948.

Syn.: *Lagarobasidium cymosum* (Rog. & Jacks.) Jülich.

Fruitbody resupinate, effused, often very thin and rather inconspicuous, whitish, smooth. Hyphal system monomitic, basal hyphae more or less distinctly thickwalled, 4-7 um wide, subhymenial hyphae thinwalled or slightly thickening, all hyphae with clamps. Cystidia subulate, thickwalled. somewhat sinuous, clamped at the base, 40-80 um long, projecting. Basidia subclavate, slightly sinuose, with clamped base, 10-15 x 4-6 um, 4-sterigmate. Spores subglobose, thickwalled, cyanophilous, 5 x 4 um, non-amyloid.

HABITAT. On decayed spruce wood

DISTRIBUBUTION. Earlier known from a few localities in North America and is certainly very rare everywhere. The species was previously not reported from Europe.

REMARKS. Jülich (1975) incorporated the species in *Lagarobasidium* with type species *Odontia pruinosa* Bres. Eriksson and Ryvarden (1976) in the Corticiaceae of North Europe make it clear that this species is the same as *Peniophora detritica* Bourd. & Galz. and they refer the species to *Hypochnicium* owing to its thickwalled and cyanophilous spores.

Peniophora cymosa is closely related to other species in *Hypochnicium*, preferably in having thickwalled and cyanophilous spores and in the shape of the basidia. It therefore ought to be referred to this genus.

MATERIAL STUDIED. Sweden. Västergötland, Töllsjö par., on stump of *Picea abies*, 1976-08-01, Hjm 6767. — Norway. Rana, Örtfjellmoen, on *Picea*, 1976-09-11, K-H Larsson s.n. — Poland. Zakopane, Morskie oko naţional park, on trunk of *Picea abies*, 1973-09-17, Halleberg,Larsson 2924. — Canada. Ontario, Timagami Lake, Bear Island, on wood of conifer, 1936-08-19, leg R. Biggs, det H.S. Jackson.

Phlebia cremeo-alutacea (Parm.) K.-H. Larss. & Hjortst. nov. comb.

BASIONYM: *Metulodontia cremeo-alutacea* Parm. Consp. syst. Cort. p 216, 1968.

Fruitbody resupinate, adnate, effused, firm, ceraceous, under a lens slightly velutinous (projecting cystidia), in colour ochre-yellowish, margin indistinct or whitish. Hyphal system monomitic, hyphae mostly indistinct, thinwalled, 2-3 um wide, with clamps. Cystidia numerous, richly encrusted, projecting, conically tapering, mostly 40-50 x 19-12 um, non-cyanophilous, non-amyloid. Basidia narrowly clavate, sometimes slightly constricted, 15-20 x 3,5-4 um, with 4 conspicuous sterigmata, about 5-8 um long. Spores ellipsoid, smooth, thinwalled, 4-4,5 x 2,5-3 um, non-amyloid, non-cyanophilous.

HABITAT. Most collections on coniferous wood but also on *Alnus* and other wood of deciduous trees.

DISTRIBUTION. A rare species in Sweden with few collections from Småland, Västergötland and Uppland. Also collected in Norway.

REMARKS. When Eriksson and Ryvarden (1976) treated the genus *Metulodontia* they excluded *M. cremeo-alutacea* owing to its relationship to the phlebioid fungi. As this idea is quite useful we have chosen to propose the new combination. The species fits well in *Phlebia* because of its sub-ceraceous fruitbody, conglutinate hyphae and narrow basidia. The strongly encrusted cystidia makes *Ph. cremeo-alutacea* similar to e.g. *Peniophora hydnoides* Cke. & Massee and *Phlebia gigantea* (Fr.) Donk of which at least the first one probably is a member of *Phanerochaete* Karst., but it differs from this genus i.a. in the presence of clamps.

MATERIAL STUDIED. Sweden. Småland, Femsjö par., Stenekullarna, NE of Kulkagölen, on decayed coniferous wood, 1939-10-06, Lundell 1690; Västergötland, Göteborg, St. Änggården, on stem of fallen *Alnus glutinosa*, 1938-10-28, T. Nathorst-Windahl

1337, 1835; Östad par., E of Valsjön, on fallen trunk of *Pinus*, 1968-05-02, Hjm s.n.; Dalsland, Sundals-Ryr par., N of Bollungen, on fallen trunk of *Pinus*, 1970-09-29, Hjm 3767; Uppland, Uppsala, Kronoparken, on decayed coniferous wood, 1932-09-13, Lundell 2059. — Norway. Rana, Örtfjellmoen, 76-09-11, K.-H. Larsson s.n. — SSSR. Regio Montano-Altaica, reservatum Altaicum, Oior, *Abies sibirica*, ad caudicem prolapsum in piceeto-pineto, alt. 800-900 m, 1959-08-21, Parm. 7908.

Sistotrema subangulisporum K.-H. Larss. & Hjortst. nov. spec.

Fructificatio resupinata, effusa, tenuis, hymenio ubique sulphureo, margine simili; hyphis tenuitunicatis, circiter 2,5 um latis, fibulis nullis; cystidiis nullis; basidiis urniformibus 20-25 x 5 um, certe 6-sterigmatibus, distincte incurvatis; sporis tenuitunicatis vel crassiusculis, hyalinis, subangulatis, 3,5-4 x 5-6 um vel diametro 4-5 um, nonamyloideis.

HOLOTYPUS: Sweden, Västergötland, Töllsjö par., NE of Skåpeskulle, on decayed *Pinus silvestris*, 1969-08-23, Hjm 1508.

Fruitbody resupinate, effused, closely attached to the substrate, thin, smooth, margin not differentiated. Hyphal system monomitic, hyphae thin or slightly thickening, 2-3 um wide, without clamps. Cystidia none. Basidia urniform, 20-25 x 5 um, with 6 (8) curved sterigmata. Spores subangular, smooth, with somewhat thickened walls and distinct apiculus, 3,5-4 x 5-6 um or 4-5 um across, non-cyanophilous, non-amyloid.

HABITAT. On decayed corticate or decorticate wood of *Pinus* in mixed forest (*Pinus, Picea, Quercus, Betula, Sorbus*) as well as in wet forests with *Sphagnum*.

DISTRIBUTION. A rare species and only noticed a few times in Västergötland in the SW part of Sweden.

REMARKS. *Sistotrema subangulisporum* is easily recognized by its yellowish fruitbody, angular basidiospores and hyphae without clamps. *Sistotrema pistilliferum* Hauerslev is close to the new species in having the same kind of spores but is in other respects well separated by its cystidia and the presence of clamps at all septa. *Sistotrema subtrigonospermum* Rogers also has angular spores but the symmetrical arrangement is different.

ADDITIONAL MATERIAL STUDIED. Sweden. Västergötland, Alingsås par., east side of lake L. Trän, on branch of *Pinus* in

Sphagnum-Picea forest, 1971-09-04, K.-H. Larsson 147, 150; Töllsjö par., N of the little lake Flottatjärn, on decayed coniferous wood, 1968-09-29, Hjm. s.n.; SE of the farmstead Holmared, on decayed trunk of *Pinus*, 1969-08-25, Hjm. 1580.

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MYCOTAXON

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NOTES ON HYPHOMYCETES. XVII.
A NEW SPECIES OF *PSEUDOSPIROPES*.

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ABSTRACT

Pseudospiropes lotorus Morgan-Jones is described and illustrated from an isolate from roots of *Lotus corniculatus* collected in Alabama.

INTRODUCTION

An isolate of a dematiaceous hyphomycete obtained from roots of *Lotus corniculatus* L. has been determined as an undescribed species of *Pseudospiropes* M. B. Ellis. This genus was established by Ellis (1971) to accommodate two taxa previously classified in *Helminthosporium* Link ex Fries but which possess macronematous thick-walled conidiophores bearing integrated, sympodial and heavily cicatrized conidiogenous cells. Holubova-Jechova (1973) transferred a third species to it from *Helminthosporium* and Sutton (1973) added a new species. Ellis (1976) further extended the genus to include three species which Hughes (1958) reclassified from *Helminthosporium* in *Pleurophragmium* Constantin. These have less prominent conidiophore scars than those species placed in *Pseudospiropes* initially. Ellis also added two new species. Species classified in *Pleurophragmium* differ from those of *Pseudospiropes* by the possession of subulate denticles on the conidiogenous cells.

TAXONOMIC PART

Pseudospiropes lotorus sp. nov. (Fig. 1).

Coloniae effusae, fuscae vel atrae, pilosae. Conidiophora macronemata, mononemata, erecta, recta vel flexuosa, crasse tunicata, septata, brunnea, apiceum versus pallidiora, laevia, cicatricibus conidialibus praedita, 90 - 180 X 4 - 6µm, basi interdum ad 12µm inflatum. Cellulae conidiogenae polyblasticae, in conidiophoris

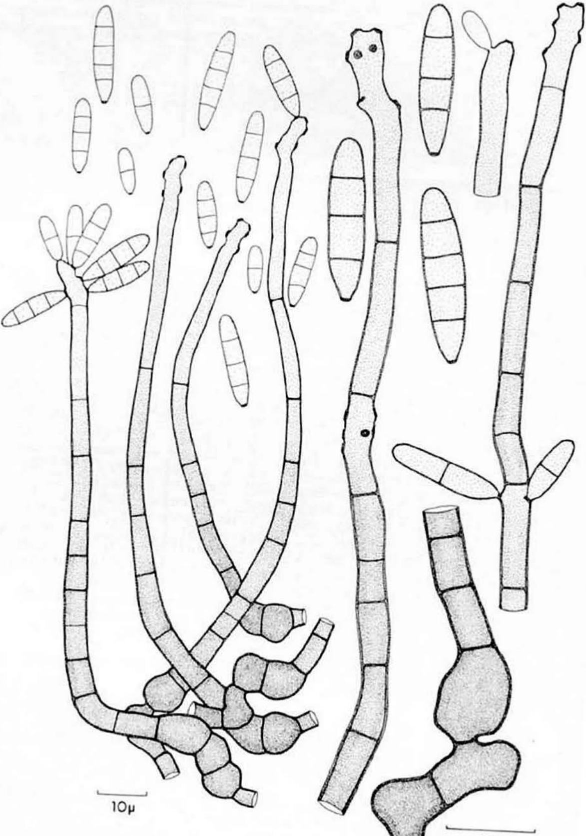

FIGURE 1. *Pseudospiropes lotorus*.
Conidiophores and conidia.

incorporate, terminales, interdum intercalares, sympodiales, cylindricae, usque ad 8 cicatricles. Conidia solitaria, sicca, acropleurogena, simplicia, ellipsoidea vel cylindrica, basi truncata, pallide brunnea, laevia, 1 - 4 septata, plerumque 3 septata, 10 - 17 X 3 - 4μm.

In culturis ex radicibus Loti corniculati, Auburn, Lee County, Alabama, June 1976, E. M. Clark, BPI, holotypus.

Colonies effuse, brown to black, hairy. Mycelium composed of flexuous, slender, branched, septate, smooth-walled, subhyaline to very pale brown hyphae, 1.5 - 3μm wide. Conidiophores macronematous, mononematous, frequently caespitose, simple but sometimes branched at the extreme base, erect, straight or somewhat flexuous, smooth, brown to pale brown, paler towards the apex, up to 19-septate, septa often close together and thin, 90 - 180 X 4 - 6μm, up to 12μm wide at the swollen base. Conidiogenous cells polyblastic, integrated, terminal but some times intercalary, sympodial, cylindrical, bearing a number of flat, small, dark, slightly protruding scars, 1 - 1.5μm in diameter. Conidia solitary, dry, acropleurogenous, simple, narrowly ellipsoid to cylindrical, very pale brown, smooth, 1 to 4-septate (mostly 3), with a distinct scar at the base, 10 - 17 X 3 - 4μm.

Isolated from roots of *Lotus corniculatus* L.; N. America.

Collection examined: Culture from *L. corniculatus*, Auburn, Lee County, Alabama, June 1976, E. M. Clark, BPI, AUA, type.

P. lotorus resembles *P. subuliferus* (Corda) M. B. Ellis and *P. rousselianus* (Mont.) M. B. Ellis. It differs from the former in having ellipsoid rather than clavate conidia, from the latter in having fewer conidial septa and from both by the possession of considerably smaller conidia.

ACKNOWLEDGMENT

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NOTES ON HYPHOMYCETES. XVIII.
CHAETOBLASTOPHORUM INGRAMII GEN. ET SP. NOV. AND *CYLINDROTRICHUM OBLONGISPORUM* SP. NOV.

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ABSTRACT

Chaetoblastophorum ingramii Morgan-Jones, a new genus and species, and *Cylindrotrichum oblongisporum* Morgan-Jones, a new species, are described and illustrated from collections made in Alabama.

INTRODUCTION

A continued survey of dematiaceous hyphomycetes occurring on leaf litter and decayed decorticated wood in Alabama has yielded several further novelties. Among these is a fungus having a similar conidiophore morphology to *Blastophorum* Matsushima but possessing setae around which the conidiophores are borne in loose fascicles, and a fungus which belongs to *Cylindrotrichum* Bonorden. In several respects both are unlike any taxa hitherto documented. The former is considered to be sufficiently different from *Blastophorum* to warrant the establishment of a new genus to accommodate it.

TAXONOMIC PART

Chaetoblastophorum gen. nov.

Deuteromycotina, Hyphomycetes.

(Etym. *Blastophorum* et Gr. *chaeta*, bristle)

Coloniae late effusae, albidae vel brunneae, pilosae vel velutinae. Mycelium partim superficiale, partim immersum, ex hyphis ramosis, septatis, subhyalinis vel brunneis compositum. Setae rectae vel flexae, laevibus, septatae, crasse tunicatae, atro brunneae. Conidiophora macronemata, in fasciculis aggregata, erecta, recta vel flexuosa, simplicia, laevia, atro brunnea vel pallide brunnea, sursum pallidiora, crasse tunicata, septata, apice refringentia, protrusionem fertilem formantia. Cellae conidiogenae polyblasticae, terminales, sympodiales. Conidia solitaria, acropleurogena, cylindrica, continua, hyalina, laevia.

Species typica: *Chaetoblastophorum ingramii* Morgan-Jones.

Colonies broadly effuse, whitish to brown, hairy to velvety. Mycelium partly superficial, partly immersed, composed of branched, septate, subhyaline to brown hyphae. Setae straight or flexuous, smooth, septate, thick-walled, dark brown. Conidiophores macronematous, aggregated in fascicles, erect, straight or flexuous, simple, smooth, dark brown to pale brown, upper part lighter, apex breaking open, forming a protruding fertile part. Conidiogenous cells polyblastic, terminal, sympodial. Conidia solitary, acropleurogenous, cylindrical, continuous, hyaline, smooth.

Chaetoblastophorum ingramii sp. nov. (Fig. 1)

Coloniae late effusae, albidae vel brunneae, pilosae vel velutinae. Mycelium partim superficiale, partim immersum, ex hyphis ramosis, septatis, subhyalinis vel brunneis, laevibus, 1.5 - 2µ crassis compositum. Setae rectae, interdum flexae, simplices, crasse tunicatae, laevibus, septatae, brunneae vel atro brunneae, acuminatae, ad apiceum obtusum vel acutum, 140 - 200 X 4 - 5µ. Conidiophora macronemata, gregaria, in fasciculis aggregata, cum setis consociata, erecta, recta vel flexuosa, simplicia, laevia, atro brunnea vel pallide brunnea, sursum pallidiora, crasse tunicata, septata, apice refringentia, protrusionem fertilem formantia, 65 - 90 X 3 - 4µ. Cellae conidiogenae polyblasticae, terminales, sympodiales. Conidia solitaria, acropleurogena, cylindrica, continua, hyalina, laevia, cum tunicis tenuibus, guttulata, apice rotundata, base truncata, in massam albidam in apice conidiophori aggregata, 11 - 13 X 2.5 - 3µ.

In foliis emortuis Quercus nigrae, Auburn University Forestry Plots, Auburn, Lee County, Alabama, April 1976, E.G. Ingram, BPI, holotypus.

The new species is named in honor of Mr. Edwin G. Ingram, who collected the leaves on which it was discovered.

Colonies broadly effuse, brown to white with the production of conidia, hairy or somewhat velvety. Mycelium partly superficial, mostly as swollen, brown, thick-walled, subglobose, up to 5µ wide cells; partly

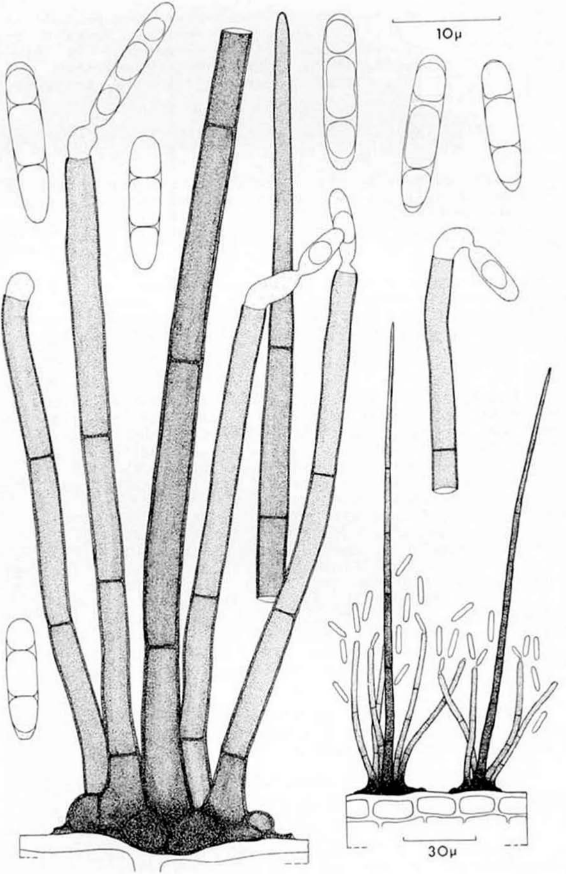

FIGURE 1. *Chaetoblastophorum ingramii*. Conidiophores and conidia.

immersed as branching, septate, cylindrical, smooth, subhyaline to very pale brown, 1.5 - 2μ wide hyphae. Setae straight, sometimes slightly flexuous, simple, thick-walled, smooth, septate, brown to dark brown, swollen slightly at the extreme base, attenuating to an obtuse or acute apex, sometimes fertile, producing conidia at the apex in the same manner as the conidiophores, 140 - 200 X 4 - 5μ arising from the swollen superficial cells as do the conidiophores. Conidiophores macronematous, mononematous, gragarious, aggregated in loose fascicles of up to five around a single seta, erect, straight or frequently flexuous, simple, smooth, dark brown at the extreme base to pale brown at the apex, thick-walled, septate, apex breaking open and proliferating percurrently forming a protruding fertile part. Conidiogenous cells integrated, terminal, hyaline, polyblastic, sympodial. Conidia solitary, acropleurogenous, cylindrical, continuous, hyaline, thin-walled, smooth, guttulate, apex rounded, base truncate to very slightly papillate, aggregating in a white mass at the apex of the conidiophores, 11 - 13 X 2.5 - 3μ.

On dead leaves of *Quercus nigra* L., North America.

Collection examined: on *Q. nigra*, Auburn University Forestry Plots, Auburn, Lee County, Alabama, April 1976, E.G. Ingram, BPI, AUA, type.

This genus is closely related to *Blastophorum*, based on *B. truncatum* Matsushima described from decayed leaves of *Castanopsis* sp., collected in Papua-New Guinea (Matsushima, 1971). Matsushima (1975) added a second species, *B. uniseptatum* Matsushima, found on leaves of *Quercus glauca* in Japan.

The conidia are produced in succession from conidiogenous loci on a thin-walled protrusion from the ruptured apical cell of the conidiophore in a manner similar to that described by Goos (1969) in *Cacumisporium capitulatum* (Corda) Hughes.

Chaetoblastophorum differs from *Blastophorum* by the possession of acuminate setae borne, together with the conidiophores, from a stromata-like aggregation of thick-walled, swollen, superficial hyphal cells.

Cylindrotrichum oblongisporum sp. nov. (Fig. 2).

Coloniae effusae, brunneae, pilosae. Mycelium partim superficiale, plerumque in substrato immersum. Conidiophora macronemata, mononemata, solitaria, erecta, simplicia, recta vel flexuosa, septata, brunnea vel pallide brunnea, apicem versus pallidiora, laevia, ex basibus bulbosis, 85 - 190 X 4 - 5μ. Phialides in

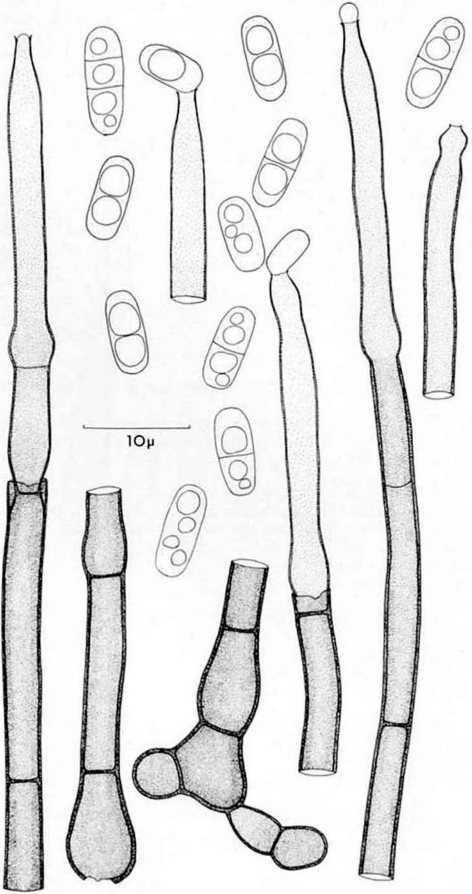

FIGURE 2. *Cylindrotrichum oblongisporum*. Conidiophores and conidia.

conidiophoris incorporatae, terminales, cylindricae. Conidia oblonga, utrinque rotundata, hyalina, laevia, 0 - 2 septata, guttulata, 6 - 7 X 2.5 - 3μ.

In ligno emortuo, Auburn University Forestry Plots, Auburn, Lee County, Alabama, April 1976, G. Morgan-Jones, BPI, holotypus.

Colonies effuse, brown, hairy. Mycelium partly superficial, mostly as swollen, pale brown to brown, thick-walled, up to 4.5μ wide hyphal cells; mostly immersed as branched, cylindrical, smooth, septate, subhyaline to pale brown, 2 - 3.5μ wide hyphae. Conidiophores macronematous, mononematous, solitary, erect, simple, straight or slightly flexuous, septate, proliferating percurrently and frequently nodose, brown to pale brown, paler towards the apex, 85 - 190 X 4 - 5μ, up to 6.5μ wide at the nodes, attenuating, sometimes sharply, towards the 1.5 - 2μ wide apex which bears a minute collarette, up to 8 wide at a bulbous base. Conidiogenous cells monophialidic, integrated, terminal. Conidia oblong, rounded at the ends, hyaline, guttulate, smooth, 0 to 2-septate, 6 - 7 X 2.5 - 3μ, obliquely borne at the apex.

On dead wood; North America.

Collection examined: on dead wood, Auburn University Forestry Plots, Auburn, Lee County, Alabama, April 1976, G. Morgan-Jones, BPI, AUA, type.

C. oblongisporum differs from *Cylindrotrichum oligospermum* (Corda) Bonorden, the type species of *Cylindrotrichum* Bonorden, in lacking polyphialidic, sympodial conidiogenous cells. In respect of its conidiogenous cells being monophialidic it resembles *Cylindrotrichum triseptatum* Matsushima. A third species, *Cylindrotrichum proliferum* Matsushima, possesses percurrently proliferating phialides. The conidia of *C. oblongisporum* are much shorter than those of *C. proliferum* and considerably shorter than those of *C. oligospermum* and *C. triseptatum*. The fungus on which the name *Cylindrotrichum triseptatum* M.B. Ellis is based is also closely similar in respect of its monophialidic conidiogenous cells. Its longer, cylindrical, three-septate conidia serve to distinguish it from *C. oblongisporum* however. *C. triseptatum* M.B. Ellis constitutes a later nomenclatural homonym of *C. triseptatum* Matsushima. The two fungi which these names are applied to are congeneric but not conspecific. The conidia of Matsushima's fungus are appreciably larger and have a protuberant, narrow, somewhat truncate base. A new name is therefore required for *C. triseptatum* M.B. Ellis and is herein proposed.

Cylindrotrichum ellisii Morgan-Jones nom. nov.

≡ *Cylindrotrichum triseptatum* M.B. Ellis, More Dematiaceous Hyphomycetes, 470, 1976.

Non *Cylindrotrichum triseptatum* Matsushima, Icones Microfungorum a Matsushima Lectorum, 48, 1975.

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I thank Dr. S. C. Jong, American Type Culture Collection, for kindly reviewing the manuscript and Mrs. Elaine Gillam Turner who typed the manuscript.

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NOTICE

IMA NOMENCLATURE COMMITTEE ANNOUNCEMENT AND IMC^2

Members of the International Mycological Association's Nomenclature Committee are currently assigned to one or more of six subcommittees wrestling with particular problems. Anyone who wishes to contribute to their deliberations may contact any member, or the Secretary of that subcommittee. For problems not assigned to an existing subcommittee, contact any member of the Secretariat. Meetings of each subcommittee and of the whole IMA Nomenclature Committee will be held during the Second International Mycological Congress, August 27th to September 3, 1977 at the University of South Florida, Tampa, Florida. All these meetings are open to anyone interested. A new Secretariat to serve until IMC^3 will be elected during those meetings.

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A NEW SPECIES OF EUPENICILLIUM FROM JAPANESE SOIL

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During the course of a 1972 survey of soil ascomycetes, a previously undescribed Eupenicillium was encountered from a soil sample collected in Itsukaichi's copse, one of the suburban areas of Tokyo. From a peculiar pattern of ornamentation in its ascospores, it is described here as E. lineolatum sp. nov.

Specimens cited are deposited as follows: No. 2776 (holotype) in the Mycological Herbarium, National Institute of Hygienic Sciences (NHL), Tokyo, Japan, and No. 4536 (isotype) in the Mycological Herbarium, Research Institute for Chemobiodynamics (IFM), Chiba University, Narashino-shi, Chiba, Japan.

Eupenicillium lineolatum Udagawa & Horie sp.nov. (Figs. 1-2)

Status conidialis: Penicillium lineolatum Udagawa & Horie st.nov.

Coloniae in agaro Czapekii celeriter crescentes, tenues et pro maxima parte submersae; cleistothecia plerumque absentia; in agaro maltoso vel agaro farina avenae mixto effusae, planae, tenues, granulares, cleistotheciis abunde productis, sulphureae ad primulinae; fructificationes conidiorum limitatae; reversum incoloratum vel stramineum.

Cleistothecia dispersa vel confluentia, superficialia, sulphurea vel aliquantum flavo-brunnea, globosa vel subglobosa vel plus minusve elongata, 65-130(-160) µm diam, vulgo hyphis flavis laxe intricatis circumdata; peridium primo sclerotioideum, deinde tenue et membranaceum. Asci octospori, singuli, terminales et laterales e hyphis ascogenis oriundi, primo obovoidei vel oblongi, deinde subglobosi vel ellipsoidei, 8-11.5 × 6-8 µm, postremo evanescentes. Ascosporae hyalinae, subglobosae vel late ellipsoideae, 3.0-4.0 × (2.5-)3.0-3.5 µm, leves apparentes sed sub 'SEM' lineolatae.

Status conidialis abundans in agaro cellulosa mixto. Conidiophora plerumque ex hyphis repentibus et ramosis enata, hyalina, 30-150 × 2.0-3.0 µm, septata, levia. Penicilli plerumque monoverticillati, sed interdum 1-2-ramos

12-30 µm longos gerentes. Phialides ad 8(-10) per verticillum, circa 9-12 × 2.5-3.0 µm, apicem versus angustatae. Conidia hyalina, ellipsoidea, (2.5-)3.0-4.0 × 2.0-3.5 µm, levia, catenata.

Typus No. 2776, NHL, isolatus e solo sylvae in Japonia.

Colonies on Czapek agar growing rapidly, thin, consisting of a spreading, submerged vegetative mycelium, with scanty growth of aerial hyphae, suggesting some type of nutrient deficiency; cleistothecia and conidial structures usually lacking.

Colonies on malt agar or oatmeal agar spreading broadly, plane, thin, with surface granular in appearance, quickly developing a dense layer of numerous cleistothecia which obscured loosely by aerial hyphae, sulphur yellow to slightly greenish yellow (Rayner 25f, 25); conidial structures limited and not affecting the colony appearance; reverse uncolored to straw yellow (Rayner 21'd).

Cleistothecia scattered or confluent in small groups, superficial, yellow to somewhat yellowish brown, globose to subglobose or slightly elongate, 65-130(-160) µm in diam, usually surrounded by a loose envelope of yellow encrusted hyphae; peridium at first consisting of sclerotioid masses of thick-walled, polygonal cells, becoming thin and membranaceous in age. Ascus formation rather quick outwards from the center within 10-14 days. Asci 8-spored, borne singly as short, terminal and lateral branches from ascogenous hyphae, at first obovoid or oblong, then becoming subglobose to ellipsoidal, 8-11.5 × 6-8 µm, evanescent at maturity. Ascospores hyaline, subglobose to broadly elliptical, 3.0-4.0 × (2.5-)3.0-3.5 µm, with walls superficially smooth but lineolate when viewed with SEM (Fig.2).

Conidial structures developed abundantly on cellulose agar and cornmeal agar. Conidiophores usually arising from trailing and branching hyphae, hyaline, 30-150 × 2.0-3.0 µm, septate, smooth-walled. Penicilli mostly monoverticillate but sometimes showing a few branch or secondary prolongation on the same conidiophore, producing tangled to loosely columnar chains of conidia up to 145-160 µm in length. Branches, when present, 12-30 µm in length. Phialides usually in small clusters up to 8(-10) in number, mostly 9-12 × 2.5-3.0 µm, tapering to fairly long conidium-bearing tips. Conidia hyaline, elliptical, with ends more or less pointed, variable in dimensions, (2.5-)3.0-4.0 × 2.0-3.5 µm, smooth-walled.

At 37 C, growth-rate slightly less than at 25 C, with reduced maturation of cleistothecia.

Holotype - No. 2776, NHL, isolated from soil sample in copse near Itsukaichi-machi, Nishitama-gun, Tokyo, Japan, August 11, 1972. Isotype - No. 4536, IFM.

Etymology - The epithet, lineolatum, refers to ascospore ornamentation.

This species is characterized by its luxuriant growth on usual nutrient agar such as malt and oatmeal, the sulphur yellow colonies, the subglobose-broadly elliptical

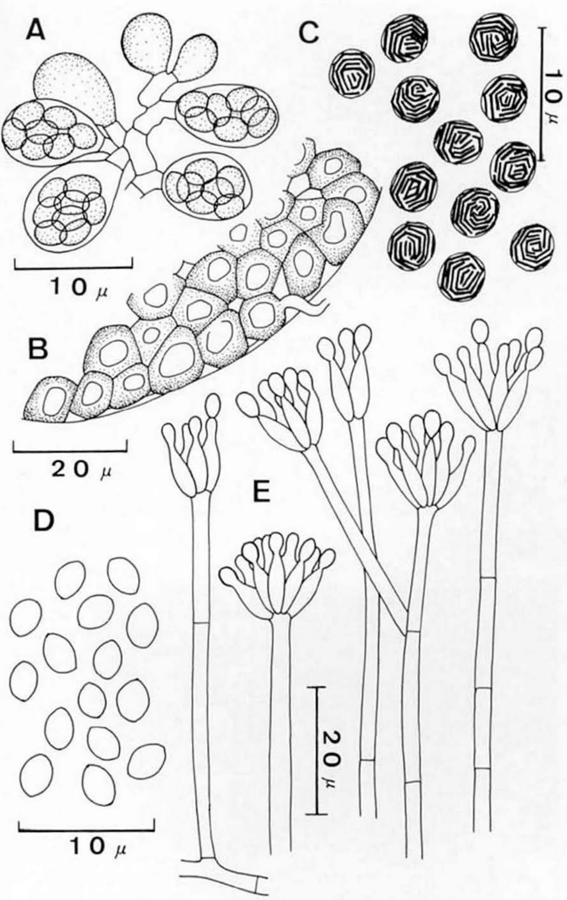
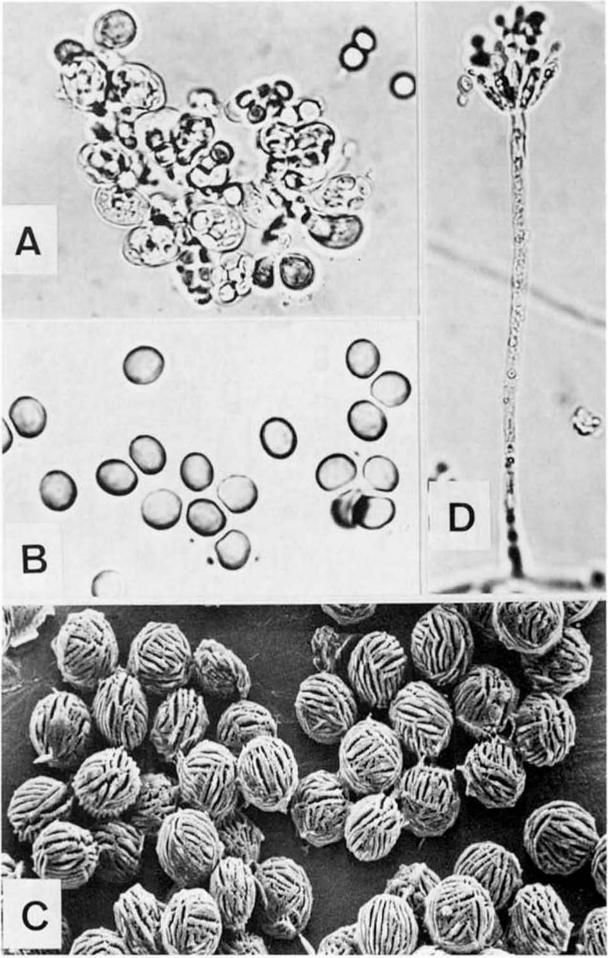


Figure 1. Eupenicillium lineolatum. A. Asci in clusters. B. Part of the wall of a cleistothecium. C. Ascospores. D. Conidia. E. Penicilli.


A
B
C
D

ascospores with lineolate surface, and the monoverticillate penicilli. Although the lineolate ornamentation of its ascospores is quite striking in appearance and makes the species readily distinguishable, the production of yellow pigmented hyphae in the colony aspect is reminiscent of that of E. abidjanum Stolk (Stolk, 1968; Scott, 1968) or even E. ehrlichii (Klebahn) Stolk & Scott (Stolk & Scott, 1967; Scott, 1968). However, it differs morphologically from the latter two species. Pulley-shaped ascospores with two equatorial crests are never produced in E. lineolatum.

E. levitum (Raper & Fennell) Stolk & Scott (1967) is also a similar species in having subglobose-broadly elliptical ascospores without any indication of an equatorial furrow or crests. Besides the ascospore ornamentation, it differs from E. lineolatum principally in the appearance and texture of colonies on Czapek agar, its sparse conidium formation on cornmeal agar, its larger ascospores, and its fragmentary penicilli.

From the resemblance in the general patterns of the penicilli, the conidial state of E. lineolatum should be placed in the Penicillium decumbens series of the Monoverticillata (Raper & Thom, 1949).

ACKNOWLEDGMENTS

The authors thank Dr. Robert A. Samson, Centraalbureau voor Schimmelcultures, for reading the manuscript and making helpful suggestions, and Dr. W. Gams, for revising the Latin description.

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Stolk, A.C. and D.B. Scott. 1967. Studies on the genus Eupenicillium Ludwig. I. Taxonomy and nomenclature of Penicillia in relation to their sclerotioid ascocarpic states. Persoonia 4: 391-405.

Figure 2. Eupenicillium lineolatum. A. Asci in various stages of development. × 1000. B. Light micrograph of ascospores, showing superficially smooth walls. × 1750. C. Scanning electron micrograph of ascospores. × ca.3500. D. Conidiophore. × 1000.

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AN ANNOTATED INDEX FOR BOLTON'S "HISTORY OF FUNGUSSES."

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ABSTRACT

Bolton's status as name-giver is discussed, an index provided to his major publication, and the consequences of starting point change on his names explained.

James Bolton (1758-1799), thought to be a teacher of art (Ainsworth, 1976), produced a three-volume publication popularly titled "An history of fungusses, growing about Halifax" (for full bibliographic data, see "Literature cited" below). In it, 182 plates, all in color, illustrated fungi, and apparently were executed either from Bolton's own drawings, or directly on the copper plates from fresh material. The series was the subject of later taxonomic commentary (Sartory & Maire, 1920*, La Planche, 1894), but very little else has been forthcoming concerning Bolton's life, associations and impact.

While tracing fungus epithets to their pre-starting point origins, I became intrigued with Bolton's style, chiefly based on the index provided by him to his publication. Although not explicitly stated, a quick look at his names (*"nomina trivialia"*) revealed that the great majority were new, coined by him. A bit more investigating disclosed that his "protologue" included older names for the same fungi, discarded by Bolton in favor of names of his own choosing. Moreover, several of Bolton's names were clearly homonymic, but Bolton's citations avoided these prior names, and hence Bolton's name, with no clues to the contrary, must be taken as new. For example, Bolton's

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*I have seen two citations to this work, one as stated after this paper, taken from the Krieger catalog of the mycological library of H. A. Kelly, the other in my own files written on a card as follows: "Sartory & Maire. 1919. 'On Bolton's history of fungusses Vol. I & II (1788),' Paris, E. le Framois." I no longer know the source of this second citation.

Agaricus muscarius cannot be confused with the popular binomial of Linnaeus, passed on to the starting point literature, for Bolton never mentions Linnaeus, and avoids reference to this epithet even by Schaeffer.

The literature cited by Bolton may be divided into two bodies. Firstly, there is the literature which employed phrase names, or polynomials, including the works of Micheli, Sterbeeck, Vaillant, early "Flora Danica" fascicles, Battarra, etc. Because these names are inadmissible, they are not considered as names in my notes presented below. Secondly, the publications of Bulliard and Schaeffer produced the lion's share of binomial names cited by Bolton, with later "Flora Danica" fascicles, Batsch, Hoffmann, and a few others also cited. But the publications by Haller, Curtis, Linnaeus, Scopoli, Hudson, Jacquin, Relhan and others are either hardly mentioned, or totally ignored. The result is a narrow perception of the literature, onto which is imposed Bolton's penchant for coining new names in place of old.

Nevertheless, in almost every instance where Bolton knew of other illustrations or descriptions of the "same" fungus, a preferred former name is stated and a protologue provided. Additional references to authors and plates were also mentioned, but without a fungus name, more than likely indicating that one name was preferred, the others dismissed.

Bolton's influence on later literature was sizable. Not less than 48 Bolton names were adopted specifically in 1821 (cf. Petersen, 1975a, etc.) and surely others later. Of the names which survived through the starting point, not less than 39 must be considered superfluous to names already in the literature, considered synonymous by Bolton himself. With the chance that the starting point for *Fungi caeteri* may presently be changed to 1753 (*Species plantarum* of Linnaeus), all 39 would be replaced by prior names, instead of surviving in their validated post-starting point state.

The text which accompanied the plates was often nearly irrelevant for descriptive purposes, instead narrating the location and name of the collector, and other non-morphological data. Whether or not the text can serve as "valid" description must be taken on an individual basis, presumably by modern monographers, but such considerations present additional problems to the proponents of early starting point. The text pages were not numbered, but the sequence of pagination and numbers of fungi strictly adhere to the sequence and contents of the plates, so the description is most popularly stated as, eg. "Plate 40 + accompanying text," or even as "p. 40, pl. 40." The latter can be accepted, for the introductory pages are separately paginated and render the total pagination in phase with the plates. Plates are cited below for accuracy only.

The information supplied in the index below is as follows. Firstly, the "*nomen triviale*" used by Bolton is at the left hand, alphabetically by genus; secondly, the plate number (and therefore page number) on which that fungus appears; thirdly, the origin of Bolton's epithet. New species are of two sorts: a) apparently truly new species, designated as sp. nov.; and b) new names for organisms with prior but inadmissible (polynomial) names, designated "sp. nov." The designation nom. nov. indicates the Bolton's name supplants a prior, admissible name. When *Bolton's* epithet was adopted in 1821 by a validating author(s), a separate note appears after the index itself. When Bolton himself directs the reader to a prior identical name, the original reference to that name is supplied, and when, in fact, the name originated even earlier, the true origin is indicated by one or more arrows. Literature abbreviations may be found in Petersen (1975a, etc.). Finally, when Bolton ignores reference to obviously homonymic prior names, the complete reference is given as "nom. nov. (non Sch 4: 68)" indicating Schaeffer's prior use of an identical name before Bolton.

The notes are keyed within the index, and provide the following data: a) the 1821 author who adopted *Bolton's* epithet (eg. G: 634 = Gray, p. 634: abbreviations from Petersen, 1975a); b) the prior name of choice cited by Bolton, and its true origin (eg. *A. sessilis* BH: 383 = *Agaricus sessilis* is earlier admissible name of choice cited by Bolton himself, originated by Bulliard, p. 383).

INDEX TO BOLTON'S "HISTORY OF FUNGUSSES."

AGARICUS

Epithet	*Plate no.*	*Origin*	*Notes*
acris	60	nom. nov.	1
adscendens	55	nom. nov.	
albus	153	nom. nov. (non Sch 4: 68)	
alumnus	155	nom. nov.	
amethystinus	63	nom. nov. (non HFA: 612)	
androsaceus	32	Sch 4: 60 LSP: 1176	
annulatus	23	nom. nov.	
aquosus	71	"sp. nov." (non "BH: 470")	
atro-albus	137	sp. nov.	
atro-rufus	51	Sch 4: 58	
betulinus	72	nom. nov. (non LSpPl: 1645)	
bulbosus	147	nom. nov. (non Sch 4: 61)	
caeruleus	12	"sp. nov."	
campanulatus	31	nom. nov. (non Sch 4: 28 ← LSP: 1175)	
campestris	45	Sch 4: 16 ← Scop: 425 ← LSP: 1173	
candidus	39	nom. nov. (non Sch 4: 54/ BEFC 1: 133)	
carnosus	146	nom. nov.	
castaneus	10	nom. nov. (non BH: 658)	
cespitosus	41	nom. nov.	
chanterellus	62	BH: 505 ← LSP: 1171 "chantarellus"	
ciliaris	53	nom. nov.	2
cinctulus	152	nom. nov.	3
cinnamomeus	150	nom. nov. (non LSP: 1173)	
clavus	39	BH: 541 ← Sch 4: 26 ← LSP: 1175	
clypiatus	57	nom. nov. (non LSP: 1174)	
concinnus	15	nom. nov.	
confertis	18	nom. nov.	4
congregatus	140	nom. nov.	
coriaceus	158	BH: 373	

cornucopioides	8	nom. nov	5
cristatus	7	nom. nov.	6
croceus	51 fig. 2	"nom. nov."	7
cuspidatus	66 fig. 2	nom. nov.	8
cyathoides	145	"BH" nom. nov.	9
cyaneus	143	BH: 641	
deliciosus	9	nom. nov. (non Sch 4: 7 ← Scop: 451)	
denticulatus	4	nom. nov.	10
domesticus	26	nom. nov.	11
durus	67 fig. 1	nom. nov.	
eburneus	4 fig. 2	BH: 524	
elasticus	16	nom. nov.	
elephantinus	28	nom. nov.	12
equestris	65	nom. nov. (non LSpPl: 1642)	
extinctorius	24	BH: 408	
farinaceus	64	nom. nov. (non HFA: 616)	13
fascicularis	29	nom. nov.	14
fimbriatus	61	nom. nov.	15
fimitarius	44	nom. nov.	
fissus	35	nom. nov.	
flabelliformis	157	Sch 4: 20	
flabellatus	72	nom. nov.	16
flavidus	149	Sch 4: 17	
flavus	56	nom. nov.	
fusco-pallidus	136	"sp. nov."	
infundibuliformis	34	nom. nov. (non Sch 4: 49)	17
integer	1	nom. nov. (non LSP: 1171)	
irregularis	13	nom. nov.	
laceratus	68	nom. nov.	
lactifluus	3	Sch 4: 3 ← LSP: 1172	
laricinus	19	nom. nov.	
lateralis	71	sp. nov. (non Sch 4: 31)	
latus	2	nom. nov.	
luridus	25	nom. nov. (non Sch 4: 30)	
luteo-albus	38 fig. 1	nom. nov. (as "lateo-albus")	18

luteus	50	sp. nov. (non HFA: 611)	
mammosus	69	nom. nov. (non LSP: 1174)	
melleus	141	nom. nov. (non Sch 4: 20)	
membranaceus	11	nom. nov.	
mollis	40	nom. nov. (non Sch 4: 49)	
muscarius	27	nom. nov. (non Sch 4: 13 ← LSP: 1172)	
myodes	139	Sch 4: 69	
nobilis	46	nom. nov.	
nuceus	70	nom. nov.	
oblectus	142	nom. nov.	19
oreades	151	nom. nov.	20
peronatus	58	nom. nov.	21
piperatus	21	BH: 601	
planus	72 fig. 3	nom. nov.	
plumosus	33	"sp. nov."	
politus	30	nom. nov.	
pompatus	5	nom. nov.	
procerus	37	nom. nov. (non Sch 4: 12 ← Scop: 418)	
pseudo-clypiatus	154	sp. nov.	
pseudo-cinnamoneus	22	nom. nov.	
pullatus	20	nom. nov.	22
pulvinatus	49	nom. nov.	
purpureus	41B	nom. nov. (non Sch 4: 67)	
quercinus	73	Sch 4: 57 ← Scop: 459	
radiatus	39C	nom. nov.	
ramosoradiatus	148	"sp. nov."	
repandus	6	nom. nov. (non BH: 586)	
rigidus	43	nom. nov.	
rubeus	36	nom. nov.	
serratus	14	nom. nov.	
sordidus	59	Dick 1: 16	
striatus	54	nom. nov. (non Sch 4: 18/BH: 433)	
tomentosus	156	BH: 402	
tortilis	41A	nom. nov.	23
trilobus	38	nom. nov.	

umbelliferus	39A	Sch 4: 73 ← LSP: 1175	
umbilicatus	17	Sch 4: 46 ← Scop: 431	
velutipes	135	nom. nov. (non CFL 4: pl. 70)	24
vernalis	48	nom. nov.	
verrucosus	47	nom. nov.	
villosus	42	nom. nov.	
violaceus	52	Sch 4: 3 ← LSP: 1173	
zonarius	144	nom. nov.	26

BOLETUS

albus	78	nom. nov. (non Sch 4: 92)	
annularius	169	BH: 316	
auriformis	82	nom. nov. (et comb. nov.)	
betulinus	160	BH: 348 ← GSN: 1436	
bovinus	85	nom. nov. (non LSP: 1178)	
calceolus	168	BH: 338	
elegans	76	nom. nov.	
hepaticus	79	"BH: 314" ← Sch 4: 82	
heteroclitus	164	nom. nov.	27
hispidus	161	BH: 351	
igniarius	80	BH: 361 ← LSP: 1176	
lacrymans	167 fig. 1	WJ 1: 111	
lateralis	83	nom. nov.	28
luteus	84	nom. nov. (non LSP: 1177)	
medulla-panis	167 fig. 2	WJ 1: 141	
obliquus	74	sp. nov.	
procerus	86	nom. nov.	
proteus	166	nom. nov.	
rangiferinus	138	"Blacks. Spec. Bot. pl. 1"	
resupinatus	165	sp. nov.	
squamosus	77	nom. nov. (non HFA: 626)	
suberosus	162	BH: 354	

substrictus	170	sp. nov.
subtomentosus	87	nom. nov. (non LSpPl: 1647)
tenax	75	nom. nov.
unicolor	163	BH: 365
versicolor	81	Sch 4: 88 ← LSP: 1176

CLATHRUS[29]

denudatus	93 fig. 2	nom. nov.
flavus	93 fig. 4	nom. nov.
fulvus	93 fig. 3	nom. nov.
nudus	93 fig. 1	nom. nov.
olivaceus	94 fig. 2	nom. nov.
sphaerocephalus	94 fig. 1	"sp. nov."
turbinatus	94 fig. 3	nom. nov.

CLAVARIA

coralloides	113	BH: 201 ← LSP: 1182
elegans	115	nom. nov.
fastigiata	112 fig. 2	"BH: 203†" ← LSpPl: 1652
gracilis	111	sp. nov.
gyrans	112 fig. 1	nom. nov. (non BEFC 1: 235)
muscoides	114	BH: 203 ← LSP: 1183
ophioglossoides	111 fig. 2	Sch 4: 123 ← LSP: 1182
pistillaris	110	Sch 4: 115 ← LSP: 1182

HELVELLA

agariciformia	98 fig. 1	sp. nov.
aurea	98 fig. 2	sp. nov. (non Relh: 1244)
cartilaginea	101	nom. nov.
caryophyllaea	173	Sch 4: 115/ BH: 284 (Auricularia)

coccinea	100	Sch 4: 100/ BH: 269 (Peziza)	
feritoria	97	nom. nov.	
fibulaeformia	176	sp. nov.	
hispida	96	Sch 4: 108 (non HFA: 635)	
membranacea	177	nom. nov.	
mesenterica	172	nom. nov. (non Sch 4: 108)	31
mitra	95	Sch 4: 105 ← LSP: 1180	
nicotiana	174	sp. nov.	
sarcoides	101	nom. nov. (non Dick 1: 21)	
vesciculosa	175	BH: 270	

HYDNUM

auriscalpium	90	Sch 4: 96 ← LSP: 1178
imbricatum	88	"sp. nov." (non LSP: 1178)
minimum	171	sp. nov.
repandum	89	BH: 311 ← LSP: 1647

LYCOPERDON[36]

bovista	117	BH: 154
cervinum	116	nom. nov.
epidendrum	119 fig. 1	BH: 145
globosum	118	"sp. nov."
gossypinum	178	nom. nov.
stellatum	179	BH: 160

MUCOR

botrytis	132 fig. 3	nom. nov.
cespitosus	132 fig. 2	nom. nov.

lycogalus	133 fig. 2	nom. nov.	
mucedo	132 fig. 1	nom. nov. (non LSP: 1185)	
roridus	132 fig. 4	nom. nov.	
septicus	134	nom. nov.	
urceolatus	133 fig. 1	Dick 1: 25	

PEZIZA

auricula	107	nom. nov. (non Elvela ∼ Sch 4: 103 ← LSP: 1157)	
coccinea	104	nom. nov. (non Elvela ∼ Sch 4: 100)	
coerulia	108 fig. 2	nom. nov.	32
cornucopioides	8	BH: 291 LSP: 1181	
fusca	109 fig. 2	sp. nov.	
inflecta	106 fig. 2	nom. nov.	33
lentifera	102 fig. 1	nom. nov. (non BH: 166)	
ochroleuca	105 fig. 1	nom. nov. (non Elvela ∼ Sch 4: 109)	34
scutellata	108 fig. 1	nom. nov. (non Elvela ∼ Sch 4: 101 ← LSP: 1651)	
striata	102 fig. 2	BH: 166 (Nidularia)	
tuba	106 fig. 1	"sp. nov."	
undulata	105 fig. 2	nom. nov.	
viridis	109 fig. 1	"BH: 252†"	

PHALLUS

esculentus	91	Sch 4: 135 ← LSP: 1178
impudicus	92	Sch 4: 134 ← LSP: 1179

SPHAERIA

agariciformia	130	"sp. nov."
bombardica	122	nom. nov. (non BEFC 1: 271)

brassicae	119 (as 199)	"Gleichen Suppl. t. 6" (Dick 1: 23)	
concentrica	180	"sp. nov."	
digitata	129	BH: 192 ← LSpPl: 1652 (Clavaria)	
depressa	122	nom. nov.	37
foliacea	131	nom. nov.	
glauca	121	nom. nov.	
maxima	181	nom. nov.	
militaris	128	"sp. nov." (non LSP: 1182, Clavaria)	
miniata	127	nom. nov.	
mori	120	nom. nov. (non RelS 2: 31)	
obducta	125	nom. nov.	
pertusa	126	"Dill[wyn] musc. t. 18, fig. 9"	
riccioidea	182	sp. nov.	
rugosa	123 fig. 2	sp. nov.	
sanguinea	121 fig. 1	nom. nov.	38
sulcata	124	sp. nov.	
truncata	127 fig. 2	nom. nov.	
tuberculosa	123 fig. 1	"Dill[wyn] musc. t. 18, fig. 7"	
viridis	121 fig. 2	sp. nov.	

NOTES ON THE INDEX

1. Fr: 65 - new name for A. spadiceus Sch 4: 27.
2. G: 633 (Coprinus) - new name for A. atromentarius BH: 413.
3. P: 229 - new name for A. leoninus Sch 4: 21.
4. G: 631 (Prunulus) - new name for A. digitaliformis BH: 435.
5. P: 189 - new name for A. mutabilis Sch 4: 6 Scop: 440.
6. Fr: 22 - new name for A. sylvaticus Sch 4: 62.
7. P: 197 - new name for A. ochraceus BH: 644 (cited as "ocraceus" by Bolton).
8. G: 631 (Prunulus gracilis var. ~) - new name for A. foraminulosus BH: 460.
9. G: 614 (Omphalia) - although there is an apparant prior name, Bolton miscited it.
10. G: 630 (Prunulus) - new name for A. amethysteus BH: 559 (cited as "amethystinus" by Bolton).
11. Fr: 311 - new name for A. fuscescens Sch 4: 10.
12. P: 203, H: 20 - new name for A. cinerascens BH: 598.
13. P: 214, H: 22 - new name for A. fasciatus Sch 4: 53.
14. Fr: 288 - new name for A. pulverulentus BH: 478†.
15. Fr: 94 - new name for A. infundibuliformis BH: 510.
16. P: 239 - new name for A. sessilis BH: 383.
17. P: 393 - although there is a prior name, Bolton miscited it.
18. P: 238 - new name for A. pumilis BH: 452.
19. G: 634 (Coprinus) - new name for A. fugax Sch 4: 30.
20. Fr: 127 - new name for A. pseudo-mouceron BH: 578.
21. Fr: 126 - new name for A. alliaceus BH: 551.
22. G: 634 (Coprinus cinereus [var.] ~) - new name for A. cinereus BH: 398†.
23. G: 613 - new name for A. truncorum Sch 4: 4 Scop: 426.
24. Fr: 119 - new name for A. nigripes BH: 476.
25. G: 617 - new name for A. tubaeformis Sch 4: 65.
26. G: 624 - new name for A. deliciosus Sch 4: 7 Scop: 451.
27. P: 244, G: 640 - new name for B. aurantius Sch 4: 79.
28. P: 437, M: 43, N&B: 336 - new name for B. nummularius BH: 335.
29. Starting date not considered as 1821: no data for validation in this genus.
30. G: 664 (Patellaria) - the improbable prior name cited by Bolton is Lycoperdon papillatum Sch 4: 127.
31. Schl: 60 (Thelephora) - new name for Auricularia tremelloides BH: 278.
32. G: 665 - new name for P. stercoraria BH: 256.
33. P: 458 - new name for P. coronata BH: 251.
34. P: 458 - new name for P. coriacea BH: 258.
35. P: 269 (Clavaria coralloides var. ~) - new name for C. rugosa BH: 206.
36. Because the starting date for this genus is not 1821, I have no data on validation of these names.

37. P: 490, G: 515 (Peripherostoma) - new name for Variolaria punctata BH: 185.
38. LD 22: 386, Schl: 59, M: 145, P: 279, G: 526 - new name for Hypoxylon phoenicium BH: 171.

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Bolton, James. An history of fungusses, growing about Halifax. With forty-four copper plates; on which are engraved fifty-one species of agarics. Wherein their appearances in the different stages of growth are faithfully exhibited in about two hundred figures, copied with great care from the plants, when newly gathered and in a state of perfection. With a particular description of each species, in all its stages, from the first appearance to the utter decay of the plant; with time they are gathered; the soil and situation in which they grow; their duration; and the particular places mentioned, where all the new and rare species were found. The whole being a plain recital of facts, the results of more than twenty years observation.

Vol. 1. 1788. xvi + 44 pp + 44 pls. Halifax.

Vol. 2. 1788 (similar title). xvii-xxv + pp. 45-92 + pls. 45-92. Huddersfield.

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ASCOSPORE GUTTULATION IN TRICHOPHAEOPSIS BICUSPIS AND IN ITS SUBSPECIES, TRICHOPHAEA EGUTTULISPORA

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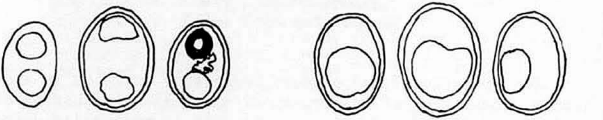
The presence of one or more refractive guttules in ascospores, consisting of an oleaginous material that absorbs oil stains such as Sudan IV, is not uncommon in operculate discomycetes. The genus *Trichophaea* was erected by Boudier (1885) for certain setose operculate discomycetes with ascospores containing one or two such oleaginous guttules. In the same publication Boudier erected *Tricharia* for similar species with eguttulate ascospores (that name being a later homonym, it has now been replaced by *Tricharina* Eckbl.). Gamundí (1966) synonymized the two genera and transferred both of the species mentioned by Boudier when he erected *Tricharia* to *Trichophaea,* having concluded that ascospore guttulation was not an acceptable generic character in this group. Other authors (Dennis, 1968; Eckblad, 1968; Le Gal, 1969; Korf, 1972, 1973; Rifai, 1968; Svrček, 1974) have failed to follow Gamundí's lead, and all accept both genera. The apothecia of species assignable to *Tricharina* appear to be much softer and have thinner-walled, paler, and more pointed hairs than species assignable to *Trichophaea.*

One species placed by Boudier (1886, 1907) in *Trichophaea, T. bicuspis* (Boud.) Boud., differs in many characters from other species placed there, especially in the peculiar excipulum composed of vertical rows of cells which are horizontally broader than tall, and in the long, thick-walled setae with (usually) a pronounced basal prong. Some indication of guttule-like, but non-oleaginous, inclusions can be seen in some ascospores, their prominence varying greatly from collection to collection. The inclusions are certainly unlike those seen in other species of *Trichophaea,* as already noted by Boudier (1886) and by Grelet (1939). The inclusions do not take Sudan IV dye, and appear resinous rather than oleaginous, recalling the refringent mature spores of *Fima-*

ria. Korf and Erb (1972) erected the genus *Trichophaeopsis* for this anomalous species, pointing out that in addition to resinous inclusions, there may also occur gas vacuoles (de Bary bubbles) in some spores in some collections (FIG. 1). Boudier's own difficulty in reconciling the inclusions in the ascospores of this species with the oil guttules of *Trichophaea* is attested by the packet label of a presumed paratype specimen in his herbarium, where he terms it *Tricharia bicuspis*, as reported by Kanouse (1958).



FIGS. 1, 2. Ascospores, × 1000. 1. *Trichophaeopsis bicuspis* subsp. *bicuspis*, immature and mature ascospores, each with two resinous inclusions; one mature ascospore with one such inclusion, an angular, refractive body, and a de Bary bubble. (*Daams*, 5.xi.1947, R.P.K. *1532*). 2. *T. bicuspis* subsp. *eguttulispora*, three ascospores, each with a single resinous inclusion. (*Gamundí*, LPS *36891*, holotype).

Gamundí (1973) described and fully illustrated *Trichophaea eguttulispora* Gamundí from Tierra del Fuego (the description and illustrations, at a slightly greater magnification, were repeated in her more recent treatment [Gamundí, 1975]). She considered her species close to *T. bicuspis*, and did not accept the genus *Trichophaeopsis*. Her choice of an epithet was based on her decision that the ascospores of her species are devoid of guttules, whereas those of *T. bicuspis* are biguttulate. My examination of the holotype specimen of *Trichophaea eguttulispora* (LPS 36891) confirms the excellence of her description and illustrations. In one respect, however, my findings are at variance with hers. While mounts in Melzer's Reagent or in lactic acid cotton blue do not readily display any internal guttulation, mounts in KOH-phloxine-glycerine (FIG. 2) show that the mature ascospores have a large, non-oleaginous, somewhat resinous appearing inclusion which fails to stain with phloxine. It is just the kind of material that puzzled Boudier (1886), Grelet (1939), and Korf and Erb (1972) in *T. bicuspis*, where it is usually found as two inclusions (FIG. 1) if distinguishable at all. Had Gamundí examined typical *T. bicuspis*, I am convinced she would have

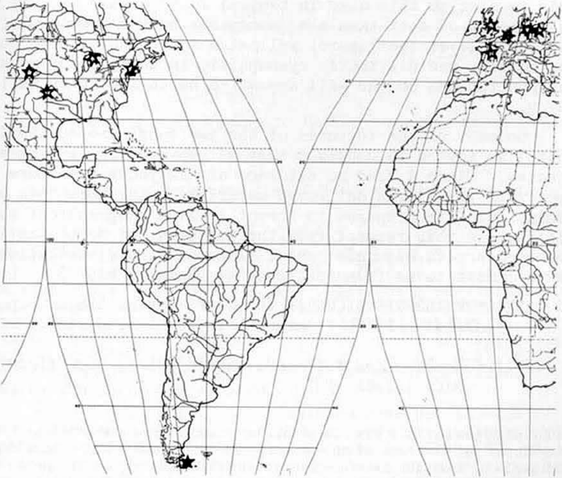


FIG. 3. Known distribution (from specimens examined by the author) of *Trichophaeopsis bicuspis*. ☆ = *T. bicuspis* subsp. *bicuspis*. ★ = *T. bicuspis* subsp. *eguttulispora*.

concluded that its spores were also eguttulate, just as did Kanouse (1958).

My earlier studies of *Trichophaeopsis bicuspis* (Kanouse, 1958, p. 138; Korf and Erb, 1972) have led me to doubt some of the characters stressed by Gamundí in distinguishing her species. The shorter asci (170-200 µm *vs.* 250-280 µm) recorded by Gamundí for her species seems a very unsuitable character for this group, for I find great variation among collections. Hymenial color may be a better character, but is useless in dried specimens. In the only specimens I have personally collected, the hymenium was the bluish-gray described for *T. bicuspis*. *Trichophaea eguttulispora* differs in having the fresh hymenium "ochroleuco vel pallide avellaneo." The third character she emphasized, eguttulate *vs.* biguttulate ascospores, is shown to be rather one of a single, non-oleaginous inclusion *vs.* usually two such inclusions.

Gamundí for the first time noted and illustrated faintly punctate ascospores in her material in iodine mounts. I am able to confirm this also in typical *T. bicuspis*. In all collections of both taxa the ascospores have a double wall, the outer layer (perispore) yellowish in KOH-phloxine-glycerine mounts, and distinctly cyanophilic in cotton blue mounts. The punctations on the wall appear to be in the inner wall layer.

So many of the features of the two fungi are so similar that I am forced to consider them as representing a single species. Since I find no evidence of the young or mature spores of the Tierra del Fuego material having more than one inclusion, I am prepared to accept it as a geographical race, distinct in this respect from the European and North American *Trichophaeopsis bicuspis* subsp. *bicuspis* (the distribution so far as known to me from specimens is shown in FIG. 3).

TRICHOPHAEOPSIS BICUSPIS (Boudier) Korf & Erb, subsp. **EGUTTULISPORA** (Gamundí) Korf, *comb. & stat. nov.*

≡ *Trichophaea eguttulispora* Gamundí, Bol. Soc. Argent. Bot. 15: 85. 1973.

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NOMENCLATURAL NOTES. IX.
A MISCONCEPTION IN REGARD TO DASYSCYPHUS AND DASYSCYPHA

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Things are nowhere near as bleak for the citation of species of *Dasyscyphus* as Holm's (1976) recent analysis implies. He correctly noted that when I (Korf, 1954) discovered that *Dasyscyphus* 1821, a long-neglected post-starting-point name, had to be adopted for species usually assigned to the large genus *Dasyscypha* 1870 (or to *Lachnum* 1871), I believed that "*Dasyscypha* Fuckel [1870] should be considered merely an orthographic variant [of *Dasyscyphus* Gray 1821], and combinations using either spelling should be considered valid, thus avoiding wholesale name changes."

Though nearly all recent authors have now adopted *Dasyscyphus* instead of *Dasyscypha*, Holm finds my opinion "hardly tenable." His analysis is that *Dasyscyphus* Gray 1821 was lectotypified by Korf (1954) with *D. virgineus*. *Dasyscypha* Fuckel 1870 was, according to him, first lectotypified by Clements and Shear (1931) with *Dasyscypha cerinea*. There appear to him to be two solutions, either one of which results in chaos.

Holm's OPTION ONE: Treat these as orthographic variants, as I had proposed. They then become homonyms [presumably because they are based on different (lecto)types (Art. 64, Note)], and *Dasyscypha* 1870 becomes a validly published but illegitimate generic name. All epithets published under this generic name are themselves illegitimate, and moreoever he states that they could not be transferred to *Dasyscyphus* (his example: *Dasyscyphus cerineus* cannot be proposed for *Dasyscypha cerinea* since it would be an illegitimate later homonym of the already illegitimate *Dasyscypha cerinea*). Presumably wholesale creation of new names (epithets) would be required.

Holm's OPTION TWO: Consider *Dasyscyphus* and *Dasyscypha* to be different names, not mere orthographic variants. This would make it possible to transfer every epithet from *Dasyscypha* (a legitimate name, and later synonym) to *Dasyscyphus*. The dire result would be, of course, wholly new author citations for each such transfer.

Holm's MISCONCEPTION lies in his belief that *Dasyscypha* Fuckel 1870 is a correct author citation. Holm states that the name "was validly published without any reference to previous authors such as Fries' *Peziza* tribus *Dasyscyphae*, and must be considered as a new generic name judged on its own merits." I take serious issue with that conclusion, and believe that Holm's view will not stand scrutiny. When Fuckel (1870) erected *Dasyscypha* he included 7 species. Two of these were Fuckel's own taxa, with no bearing on any previous use of the generic name. But the first 5 species he lists, inclusive of 2 varieties and 1 subspecies, *all* appear in Fries's *Systema mycologicum* (1822) in that exact tribus *Dasyscyphae*. While it is true that Fuckel ascribed the generic name to himself, one cannot ignore the very clear, though indirect, reference to Fries's tribe demonstrated by his citation of those pages of the *Systema* in three separate entries; even the formula "PEZIZA Lachnea *Dasysc.*" heads each page pair where the 7 specific and infraspecific epithets appear in the *Systema*. Authors other than Holm have had little difficulty in interpretation of what Fuckel did and intended to do: they nearly universally cite the genus either as *Dasyscypha* Fr., or as *Dasyscypha* (Fr.) Fuckel, but not as *Dasyscypha* Fuckel. Even the authors Holm claims lectotypified the generic name so cite it.

If, as I hold, the generic name cannot be *Dasyscypha* Fuckel, we need to concern ourselves with how to cite it correctly. Clearly Fuckel knew of, and adopted, Fries's (1822) tribe name, which he raised to generic rank. But is Fries the author of *Dasyscyphae?* The evidence is clear: Fries also adopted it from an earlier author, Nees von Esenbeck (1817), as can be seen by his unequivocal reference to Nees's publication of *Dasyscyphi* (Fries, Syst. mycol. 2(1): 77. 1822). This is, of course, the same *Peziza* 'familia' *Dasyscyphi* Nees which Gray (1821) had also elevated to generic rank, using the masculine gender and spelling *Dasyscyphus* (Nees's *Dasyscyphi* would appear to be masculine plural).

Since *Dasyscyphus* (Nees : Fr.) ex Gray 1821 and *Dasyscypha* (Nees : Fr. ex Gray) Fuckel are both based on the same taxon, they *necessarily* have the same type, and are merely orthographic (spelling) variants. *Dasyscypha* is not an illegitimate later homonym, but an orthographic variant, a different spelling because of a choice in gender. No names are made illegitimate, and no transfers or new author citations need be invoked. The dire results from both of Holm's options have evaporated. Correction of gender from feminine to masculine (where needed) is all that is required. And Holm's suggestion that "the status of *Dasyscypha* as an orthographic variant or not should be settled by an appropriate authority such as the Special Committee for Fungi and Lichens" proves wholly unnecessary.

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NOMENCLATURAL NOTES. X.
TYPIFICATION OF RUTSTROEMIA: A REBUTTAL

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Holm (1976) has recently challenged the nomenclatural typification of three genera of inoperculate Discomycetes, *Dasyscypha, Helotium,* and *Rutstroemia.* With regard to this last, we completely disagree with his general comments that "an analysis of the case reveals that none of these species [currently being used as the type] seems eligible as a lectotype," and that there has been an "abortive attempt to typify the generic name by *R. bulgarioides.*"

Although not specifically stated we assume that Holm refers to the well-documented case made by Honey (1928) for lectotypification of *Rutstroemia* Karst. by *R. bulgarioides* (Rab.) Karst. which has been accepted and defended by Dumont and Korf (1971). A second typification of the generic name was made by Clements and Shear (1931), who chose *R. firma* (Pers. ex Gray) Karst. This typification was accepted and further elaborated upon by White (1941) in his monograph of *Rutstroemia.*

Rutstroemia was originally described by Karsten (1871) for 7 species, but he (Karsten, 1885) later abandoned the generic name and distributed 6 of the original 7 species in 4 genera *(Chlorosplenium, Sclerotinia, Helotium,* and *Ciboria).* The seventh species, *R. amentacea* (Balb.) Karst., was not included, "apparently by oversight" according to Holm. It is this oversight species which Holm has selected as the *one* species available as a possible lectotype, thus making *Rutstroemia* a taxonomic synonym of *Ciboria* Fckl. 1870. Holm has also concluded that 3 of the original 7 original species, *R. macilenta* Karst., *R. firma,* and *R. bulgarioides,* "are more or less disqualified from consideration for lectotypification." It thus appears that his only justification, although not specifically stated, for the selection of *R. amentacea* is based upon the "residual method" (International Code of Botanical Nomenclature: Guide for the Determination of Types, paragraph e).

We cannot agree with Holm that "more or less disqualified from consideration for lectotypification" is disqualification! A type species is, we are instructed by the Code, not taxonomically typical, but merely that element with which the name is nomenclaturally bound. True, Karsten did abandon his generic name 14 years after he erected it. But the name must be typified, and the Code (Art. 8) forces us to follow the *first* lectotypification unless certain problems arise. We cannot now accept still a third lectotype, *R. amentacea,* using the residual method when previously designated types (two!) exist. The residual method is for the designation of types of names that do not have previous lectotypification(s).

We have already discussed at length (Dumont and Korf, 1971) why we feel compelled to accept Honey's (1928) designation of *R. bulgarioides.* We do not believe that it can be proved that Honey used *only* the "simple first species rule" that Holm claims to have been the basis of his choice. We have pointed out in that paper that Honey weighed other elements in making his lectotypifications, and that therefore the choice may not be superceded under Article 8 of the Code under the rubric of a choice "made arbitrarily." Honey's typification was in no way "abortive."

Holm apparently overlooked or at least did not discuss the typification of *Rutstroemia* by Clements and Shear (1931) with *R. firma,* the same species accepted as lectotype by White (1941). If someone is convinced that Honey's typifications *can* be overthrown under Article 8, then the Clements and Shear designation must stand. In that case, *Rutstroemia* would become available as an older name for *Poculum* Vel. emend. Dumont (Dumont, 1972, 1976). We hold that the correct name for *R. firma* is *Poculum firmum* (Pers. ex Gray) Dumont. We retain *Rutstroemia* for a presumably monotypic genus based on *R. bulgarioides. Piceomphale* Svrček (1957), based on the same species, is a later synomym.

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NOTES ON PHIBALIS. II.

KIRSCHSTEIN'S ENCOELIA SUBGEN. VELUTARIA (= VELUTARINA) AND ITS DISTINCTION FROM PHIBALIS

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In a recent delimitation of the genus *Phibalis* Wallr. [≡ *Encoelia* (Fr.) Karst.], Korf & Kohn (1976) accommodate two of the three subgenera originally proposed by Kirschstein (1935) in his broad circumscription of *Encoelia*, subgen. *Euencoelia* and subgen. *Encoeliopsis* (as *Phibalis* subgen. *Phibalis* and subgen. *Kirschsteinia* Korf & Kohn, respectively). While we did not accept Kirschstein's subgenus *Ocellaria*, we reserved judgement on a later Kirschstein (1938) subgenus, *Encoelia* subgen. *Velutaria* (Fuckel) Kirschst., proposed to include *E. rufo-olivacea* (Alb. & Schw. ex Fr.) Kirschst., *E. cinereofusca* (Schw.) Kirschst., and a new species, *E. sitchensis* Kirschst. Subsequent study of these three species confirms assignment of generic rank to *Velutarina* Korf, to which the first species is currently referred.

Although *Velutarina rufo-olivacea* (Alb. & Schw. ex Fr.) Korf, the type species of *Velutarina*, with its tough, reviving, powdery apothecia bears superficial resemblance to those species placed in *Phibalis* subgen. *Phibalis*, microanatomical features do not suggest intrageneric affinities. *Velutarina* is distinguished by the presence of large (ca. 30 μm broad), vesicular cells, which in fresh material are filled with greenish sap (Korf, 1973). These inflated cells are borne abundantly on short lateral branches and on apices of the thick-walled medullary hyphae, detaching and becoming aggregated in the ectal excipulum to form the "Rosenkrantz" described by Rehm (1892) so evident along the margin. Although loose vesicular cells and rhomboidal crystals form a powdery excipulum reminiscent of *Phibalis*, the vesicular cells are borne throughout the medullary excipulum with little reorientation of hyphae to form the well-defined ectal excipulum so characteristic of *Phibalis*. The unique vesicular cells with their green sap and the simple tissue organization place *Velutarina* outside of our circumscription of *Phibalis*.

Another distinctive character noted by Korf (1973) and others is the browning and punctation in age of ascospores, observed in this study in all three of Kirschstein's species. Beaton and Weste (1976) interpret this as the breaking up of a brown exospore. We observed such spores only in asci with badly deteriorated discharge apparatus, suggesting that these are senescent spores which have failed to discharge.

Comparison of holotype material of *Encoelia sitchensis*,[1] and of a second collection also on dead branches of spruce (*Durand 2*, Bökeberg, Skåne, Sweden, 9.vii.1904, CUP-D 33-88), with several collections of *Velutarina rufo-olivacea* reveals that these two species are synonyms. *Picea* is to be added to the long list of substrata for this polyphagous species.

Although *Velutaria cinereo-fusca* (Schw.) Bres. *in* Voss is also, as Rehm (1912) suggested, morphologically indistinguishable from *V. rufo-olivacea*, it is unclear whether Schweinitz's specimen was an Ascomycete or a Basidiomycete. Saccardo (1881, 1888) first treated the species as a Basidiomycete in *Cyphella*, later (Saccardo 1889, 1892) as an Ascomycete in *Lachnella*, then in *Pezicula*. Bresadola (in Voss, 1891) thought it an Ascomycete, provided an expanded description, and assigned it to *Velutaria*. Seaver (1951) emphatically assigned Schweinitz's species to *Cyphella* in the Basidiomycetes. Cooke (1961) concluded that *Peziza cinereofusca* Schw. had been applied to two Basidiomycetes: *sensu* Saccardo (1881) for a Roumeguère exsiccatum it is *Phaeosolenia densa* (Berk.) Cooke, while *sensu* Cooke it is a true (basidiomycetous!) *Lachnella*, for which he coined the superfluous name, *L. myceliosa* W.B. Cooke. Since the original description is vague, and Cooke, the only author who comments on having examined Schweinitz's type, found "only an immature Pyrenomycete upon it," the problem is probably insoluble.

Worthy of note is the reaction in Melzer's reagent of all three "species." Bluing of the ascus pore is extremely faint after rehydration in water but is markedly enhanced by pretreatment with 2% KOH, a phenomenon reported previously in several other discomycetous genera by Kohn and Korf (1975) and by Nannfeldt (1976). The weak bluing, so much enhanced by KOH pretreatment, may explain contradictions concerning the iodine reaction in the literature. Rehm (1892) had dis-

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[1] *Th. Rohde Hann-Münden*, Auf abgestorbenen Stämmchen von *Picea sitchensis*, Schleswig-Holstein, Germany, viii.1936 (B).

tinguished *V. rufo-olivacea* and *V. cinereofusca* sensu Bresadola primarily on the basis of a J— reaction in the latter species. Twenty years later Rehm (1912) failed to comment on the iodine reaction and admitted that the two species are morphologically indistinguishable. While Beaton and Weste's (1976) description of a "positive, but rather faint" iodine reaction in *Velutarina rufo-olivacea* agrees with our observations, Dennis (1956) describes for the same species "a rather broad pore, stained deep blue in Melzer's reagent."

After study of the type specimen of *Velutaria aeruginosa* Sacc. & Speg. *in* Saccardo (1878) [≡ *Lachnella aeruginosa* (Sacc. & Speg. *in* Sacc.) Sacc. & Speg. *in* Bizz.], I concur with Dixon (1974) that this species is also a synonym of *V. rufo-olivacea*. The host is *Vitis vinifera*.

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INDEX TO FUNGOUS AND LICHEN TAXA

This index includes genera, infrageneric taxa, species, and infraspecific taxa. New Taxa are in CAPITALS, and the pages where they are published are in *italics*. Sherwood's monograph of the Ostropalean fungi is separately indexed (pp. 271-277). Petersen's index to Bolton's "History of Fungusses" is itself an index (pp. 501-508). References to these indices are indicated by the notation *"see"*.

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ERRATA

Page 17, line 3: *for:* A = Crystalline layer.
read: D = Crystalline layer.

Page 60, line 27: *for:* a basal gelatinous appendage,
read: an apical gelatinous appendage,

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