MYCOTAXON

AN INTERNATIONAL JOURNAL DESIGNED TO EXPEDITE PUBLICATION OF RESEARCH ON TAXONOMY & NOMENCLATURE OF FUNGI & LICHENS

Volume XII October-December 1980 No. 1

CONTENTS

[MYCOTAXON for July-September 1980 (11: 409-513)
was issued August 13, 1980]

ISSN 0093-4666 *MYXNAE 12(1) 1-312 (1980)*

Library of Congress Catalogue Card Number 74-7903

Published quarterly by MYCOTAXON, Ltd., P.O. Box 264, Ithaca NY 14850
For subscription details, availability in microfilm and microfiche, and availability of articles as tear sheets, see back cover

MYCOTAXON

Vol. XII, No. 1, pp. 1-91 October-December 1980

A SYNOPSIS OF THE ORDERS AND FAMILIES OF PLECTOMYCETES WITH KEYS TO GENERA[1]

GERALD L. BENNY and JAMES W. KIMBROUGH

Department of Botany, University of Florida,
Gainesville, Florida 32611

SUMMARY

A synopsis of six orders, including 12 families of Plectomycetes is presented. The Ophiostomatales and Pithoascaceae are described as new, and the Ascosphaeriales, Eurotiales, Microascales, Onygenales, Chadefaudiellaceae, and Dendrosphaeraceae are validated. Keys to 90 plectomycete genera and an annotated list of nonplectomycete genera are provided.

Attempts to present systems of classification that reflect natural relationships have resulted in numerous changes and realignments of taxa in the Ascomycetes. Many of the pertinent systems have been reviewed by Nannfeldt (1932), Luttrell (1951), and Ainsworth *et al.* (1973).

A system that has had perhaps the greatest impact upon our concepts of the Plectomycetes is that of Nannfeldt (1932) in which he recognized three major groups of Euascomycetes: Plectascales, Ascohymeniales, and Ascoloculares. The Plectascales were characterized as having free ascogonia and antheridia which, along with the ascogenous hyphae, are soon surrounded by sterile mycelium. In simpler taxa the ascocarp forms a ball or maze of hyphae within which the asci are scattered irregularly. In more complex forms a firm, more complicated peridium develops which contains loose mycelium with scattered, globose asci. Included are both ostiolate and nonostiolate forms. Although the ostiolate taxa were traditionally placed in the Pyrenomycetes, Nannfeldt believed that a centrum with globose, irregularly disposed, deliquescent asci showed greater affinities to simpler cleistothecial families. He included cleistocarp-

---

[1] Florida Agricultural Experiment Station Journal Series No. 2362.

ous Gymnoascaceae and Aspergillaceae, and perithecial Ophiostomataceae and Chaetomiaceae, in the Plectascales.

Evanescence or deliquescence of asci in the Chaetomiaceae led Nannfeldt (1932), Miller (1941, 1949), and Gäumann (1949) to consider the hymenial taxa among the Plectomycetes. Cleistothecial taxa such as the Coronophorales (von Arx and Müller, 1954) and the Erysiphales and Meliolales (Miller, 1941, 1949) also have been placed here, although Luttrell (1951) notes that all clearly have either hymenia or basal tufts of asci. The irregular disposition of asci led Miller (1949) to conclude that the Myriangiales also belonged in the Plectomycetes. Luttrell (1951), however, emphasized the stromatic ascocarp, lysigenous development, and bitunicate asci and he placed the Myriangiales in the Loculoascomycetes. Ascus arrangement in the Elaphomycetales led Hawker (1954), Luttrell (1951), Wehmeyer (1975), and Alexopoulos and Mims (1979) to consider them Plectomycetes, while others have accepted them as specialized Tuberales (Martin, 1961; Ainsworth, 1971; Fennell, 1973; Korf, 1973).

The Ascosphaerales remain an anomaly. As reviewed by Fennell (1973), these fungi have been shifted between the Hemiascomycetes and Plectomycetes. The extremely reduced ascocarp is comparable only to that of *Monascus* while the ascogenous system and resulting asci are somewhat similar to those produced by some members of the Ophiostomataceae.

While the systematic treatments of Winter (1887), Lindau (1897), and Gäumann (1928) placed all cleistothecial ascomycetes either in the Plectascales or Perisporiales, later workers (Miller, 1949; Luttrell, 1951; von Arx and Müller, 1954) assigned most Perisporales to the Ascohymeniales. The Plectascales or Plectomycetes, as a result, came to be recognized for a time as a stable group of fungi.

Cain (1956b) appears to be one of the first to question relationships within the Plectomycetes. He stated "It is becoming increasingly evident that the taxa Plectascales and saprophytic Perisporiales do not represent natural orders or even a few related groups but a miscellaneous assemblage of a large number of phylogenetically unrelated taxa in which the ascocarps produce ascospores no longer adapted to aerial dispersal by being forcibly discharged into the atmosphere." He concluded that the cleistothecial type of ascocarp was the result of a progressive evolution away from dispersal of ascospores by means of air currents immediately following their production (*i.e.*, typical of that of most Ascohymeniales and Loculoascomycetes). This pattern of evolution has resulted in a modification in ascal arrangement, a shortening of asci, a loss of paraphyses, and other ascocarp changes. The theory that cleistothecial ascomycetes were derived from Pyrenomycetes and Discomycetes has been followed by Cain and Malloch in subsequent publications on the subject (see Malloch, 1979). Malloch believes that cleistothecial ascomycetes were derived from four major taxonomic groups: (1) Pleosporales, (2) Diaporthales, (3) Hypocreales, and (4) Pezizales or other operculate Discomycetes (Malloch, 1979).

Today there exist two extremes in the classification of Plectomycetes, one in which only the single order Eurotiales is accepted (Fennell, 1973; von Arx, 1974b), and another in which the plectomycetous genera are distributed among 19 families of Pyrenomycetes, Discomycetes, and Loculoascomycetes (Malloch, 1979). Fennell (1973) recognized the following families of EUROTIALES: Amorphothecaceae, Cephalothecaceae, Eurotiaceae, Gymnoascaceae, Monascaceae, Onygenaceae, Pseudeurotiaceae, Thermoascaceae, and Trichocomataceae (sic). These taxa were distinguished largely on peridial types and their associated anamorphs. The novel approach of Malloch (1979) included the following arrangement of families: DIAPORTHALES--Cephalothecaceae, Chaetomiaceae, Coniochaetaceae, Endomycetaceae, Melanosporaceae, Microascaceae, Pseudeurotiaceae, Sordariaceae, and Xylariaceae; HYPOCREALES--Nectriaceae and Trichocomaceae; PEZIZALES--Ascobolaceae, Monascaceae, Onygenaceae (incl. Gymnoascaceae), and Pyronemataceae; and PLEOSPORALES--Eremomycetaceae, Phaeotrichaceae, Sporormiaceae, and Zopfiaceae.

The taxonomic characters relied upon most heavily by Malloch include ascocarp initials, types of mycelium, ascocarp morphology, presence or absence of paraphyses, ascus structure and formation, ascospore structure, pigmentation, microchemistry, and the presence and type of anamorph. In most of Malloch's studies only mature ascocarps grown in culture or herbarium material were studied.

We agree in general with the concept put forward by Cain and Malloch that cleistothecial ascomycetes should be distributed among a great number of families. In our opinion one of the most useful characters employed in placing a number of these families in their proper order is that of centrum development. The "Cain-Malloch hypothesis" ignores the centrum as a valid characteristic. Yet in the analysis of development in various taxa of Plectomycetes one can see a number of modifications in the centrum, even though in essentially all of these fungi the asci ultimately become globose, evanescent or deliquescent, and irregularly disposed. This makes the taxon, in the traditional sense, a plectomycete. The ontogenetic pathways through which various taxa reach this point are highly diverse. Members of *Ceratocystis*, *Sphaeronaemella*, and *Faurelina* bear asci from a basal hymenium (Parguey-Leduc, 1977). As the ascogenous hyphae ramify upward, asci differentiate, and by a basal dissolution become free within the centrum. A similar phenomenon appears to take place in *Ascosphaera* (Spiltoir, 1955; Spiltoir and Olive, 1955) in which the asci are freed within the liquid of the nutriocyte, while in *Monascus* the asci also deliquesce.

Members of the Microascaceae appear to have evolved away from a hymenial configuration. In the microascaceous centrum a peripheral layer of paraphysoidal elements develops that grows inward toward the ascogenous hyphae. The manner in which the ascogenous hyphae ramify and form asci among these elements differs in the genera of the Microascaceae. The most hightly evolved ascogenous system, and that most typical of the Plectomycetes, is exemplified in the Eurotiales. The centrum of the eurotiacean fungi is completely filled with vegetative cells of various types and arrangements within which the ascogenous hyphae ramify, differentiate, and develop asci at several levels. These vegetative hyphae will remain in some taxa as a maezaedium or capillitium.

We agree that there is sufficient evidence presented to justify the transfer of a number of taxa to different orders of the Ascohymeniales or Loculoascomycetes (Malloch, 1979), but in other instances the evidence is too fragmented and superficial. More data must be obtained on centrum ontogeny, types of ascogenous systems, septal ultrastructure, fine structure of ascospores and asci, and microchemistry of ascospores, ascus walls, and peridium before we can go beyond the point of speculation about evolutionary lines. We concur with the general feeling that the Plectomycetes represent an artificial assemblage of taxa. With current evidence, however, most taxa can be delt with more accurately using an ordinal framework that expresses intermediate evolutionary changes. The centrum provides this framework. At least six orders have been recognized that develop a plectomycete centrum. They include the Ascosphaerales, Elaphomycetales, Eurotiales, Microascales, Onygenales, and Ophiostomatales. In the following pages we characterize these orders, attempt to justify their retention, and provide our views on their relationship to other Ascomycetes. The following key may be used to distinguish them:

KEY TO THE ORDERS OF PLECTOMYCETES

A. Centrum composed of vegetative hyphae or cells within which ascogenous hyphae ramify and differentiate; asci globose, evanescent, borne at all levels; interstitial hyphae sometimes forming a capillitium or mazaedium..B

- B(A). Ascocarps hypogeal, mycorrhizal, usually large (0.5-5 cm)........ELAPHOMYCETALES (p. 6)
- BB(A). Ascocarps not as above........................C
  - C(BB). Peridium lacking, or if present,of loose, interwoven hyphae; ascocarps nonostiolate, glabrous, tomentose, or with well developed appendages; racket hyphae often present; anamorphs arthro- or aleurioconidial...ONYGENALES (p. 8)
  - CC(BB).Peridium present of various tissue types, appendages not highly differentiated, when present; anamorphs phialoconidial...............EUROTIALES (p. 23)

AA. Centrum develops from the proliferation of ascogenous hyphae borne in basal layers, tufts, columns, or ramifying outward among peripheral, filamentous, paraphysoidal cells; asci becoming scattered after basal dissolution, globose in youth, deliquescent with age..D

- D(AA). Ascogonial system simple, enlarged; ascocarps membranous or consisting of thin-walled interwoven hyphae; asci deliquescing early; ascospores enclosed in one or more sacklike membranes; anamorphs single or meristem arthroconidia......... ASCOSPHAERALES (p. 36)
- DD(AA).Ascogonial system complex; asco-

carps more elaborate with peridia of several layers........................E

E(DD). Ascospores usually dextrinoid when young, with one, two, or no germ pores; asci usually catenulate; centrum initiated by paraphysoidal hyphae; ascocarps with or without beaks or ostioles; walls of beaked taxa cellular..............MICROASCALES (p.40)

EE(DD). Ascospores not dextrinoid, without germ pores; centrum of pseudoparenchymatous cells; asci not catenulate; ascogenous hyphae arise from basal layers, central columns, or tufts; ascocarps ostiolate or not, beaks, when present, composed of parallel hyphae, usually relatively long.............OPHIOSTOMATALES (p.48)

ELAPHOMYCETALES Trappe, Mycotaxon 9: 330. 1979.

Ascocarps hypogeal, globose, up to 5 cm in diam, variously colored, smooth or ornamented, often tomentose and ensheathed by proliferated ectomycorrhizae of associated plants. Peridium variously textured, composed of up to three layers: outer peridium or crust flaking off at maturity; cortex hard, usually broken into cones or pyramids; and inner peridium fleshy. Gleba a single cavity, hollow at first but soon becoming stuffed with ascogenous hyphae and sterile filaments, powdery with ascospores and, in some species, a capillitium. Asci globose, four- to eight-spored, formed directly from the ascogenous hyphae, nonamyloid, evanescent. Ascospores globose, pigmented, ornamented. Anamorph: *Cenococcum graniforme* (Sow.) Ferd. & Winge reported for some *Elaphomyces* spp.

One family: Elaphomycetaceae Tul., Fungi Hypog., p. 100. 1851, with only a single genus included: *Elaphomyces* Nees *ex* Fr. Type: *E. granulatus* Fr., Syst. Mycol. 3: 58. 1829. About 30 spp. are known (see Dodge, 1929; Kobayasi, 1960; Hawker *et al.*, 1967, for descriptions of some spp.).

Discussion: Because of their hypogeal, mycorrhizal habit, ascocarp size and shape, Elaphomycetaceae have been considered to be specialized Tuberales (Fennell, 1973; Korf, 1973). As noted earlier, however, the deliquescent, irregularly arranged asci led others to consider them to be related to the Plectomycetes. Trappe (1979) felt that because their relationships to the Tuberales or Pezizales are equally unsatisfying, they deserve recognition as a new order. We agree with this disposition of the family because it equally does not relate to other plectomycetous taxa. When one considers the habitat, ascocarp size, and manner of spore dissemination, one might conclude a closer relationship to the Tuberales. Perhaps the irregular disposition of asci resulting from the loss of a hymenium might be equated to a similar condition in the Basidiomycetes typified by the Lycoperdales. The end point of evolution in one gasteromycete line terminates in the Lycoperdales, a similar situation might exist in the Pezizales-Tuberales-Elaphomycetales complex. Even though the ascus of *Elaphomyces* is thought to evanescent, it has been observed in *E. granulatus* (Hawker, 1968) and in *E. persoonii* Vitt. (pers. observ.) that the ascal walls remain persistent until late in ascosporogenesis. Using SEM, one observes that asci of *E. persoonii* appear to tear along a preformed line of dehiscence, whereas in *E. granulatus* the ascal wall disintegrates in a multiperforate pattern. No obvious line of dehiscence has been detected, however, in ultrathin sections of the ascal walls observed recently, using the transmission electron microscope (D.A. Samuelson, pers. comm.), of *E. persoonii*. The ascocarp wall of *Elaphomyces* appears unique, although its thickness and consistency are much more like the Tuberales than those of any of the Plectomycetes. Spore size and ornamentation also relate more closely to those of the Tuberales.

Many, if not all, species of *Elaphomyces* are ectomycorrhizal on species of *Picea*, *Pinus*, and *Quercus*. Other associations with *Vaccinium* and the fern genus *Osmunda* are suspected (pers. observ.).

The anamorph of *Elaphomyces* was thought to be *Cenococcum graniforme* (Trappe, 1964) and later confirmed (Trappe, 1971). The unique hyphal arrangement in the mycorrhizal mantle of *Cenococcum* is identical to that of the peridial cells of *Elaphomyces* (Trappe, 1971; Trappe and Kimbrough, 1972). *Mesophellia*, a genus traditionally placed in the Elaphomycetaceae (Dodge, 1929), was found to be a basidiomycete and was transferred to the Mesophelliaceae (Lycoperdales) along with *Abstoma*, *Castoreum*, and *Radiigera* (Zeller, 1944). It is still included there (Dring, 1973). Clémencet (1932) proposed the genus *Ascoscleroderma* for the stipitate *Elaphomyces cyanosporus* Tul. Trappe (1979) notes that the "stipe" is merely an emphemeral, basal mycelial tuft and is unworthy of being used as a character to separate genera in the Elaphomycetaceae. He synonymized the two genera.

ONYGENALES Ciferri *ex* Benny & Kimbrough, *ord. nov.*

Onygenales Ciferri, *nomen nudum*, Atti Ist. Bot. Univ. Pavia, Ser. 5, 14: 239. 1957 (without Lating diagnosis; Art. 36).

Ascocarpi nonostiolati sessiles vel stipitati cum vel sine appendicibus; paries peridii laxus ex hyphis tenui vel crassitunicatis compositus; asci cum vel sine hamis, ovoidei vel subclavati, evanescentes, octospori; ascosporae nonseptatae, hyalinae vel late coloratae; anamorphoses ex aleurioconidiis vel arthroconidiis constantes; saepe keratinophilus.

Ascocarps nonostiolate, sessile or stipitate, with or without appendages; wall of peridium lax, composed of thin- or thick-walled hyphae; asci with or without croziers, ovoid or subclavate, evanescent, eight spored; ascospores nonseptate, hyaline or bright colored; anamorphs consisting of aleurioconidia or arthroconidia; frequently keratinophilic.

We consider three families: Dendrosphaeraceae, Gymnoascaceae, and Onygenaceae.

Discussion: The phylogenetic relationships of the Onygenales have been the subject of much discussion and speculation in recent years. The three families that we include here have historically been placed in the Plectascales, Aspergillales, or Eurotiales. Recognition of the Onygenales as an order of Plectomycetes has not been generally followed and the relationship of these families to other groups of ascomycetes has not been clearly established. They are critical taxa for those who propose the origin of Ascomycetes from Zygomycetes or lower taxa (Bessey, 1950). They represent perhaps the end point of evolution for those who would derive the Ascomycetes from floridean algae (Demoulin, 1975). Cain (1956a) suggested that the

Gymnoascaceae may have evolved from the Aspergillaceae and the Aspergillaceae from the Hypocreales. Malloch (1970b) and Cain (1972) speculate that the Onygenaceae may have originated from certain operculate Discomycetes, and in a later paper the family (Onygenaceae incl. Gymnoascaceae) was placed in the Pezizales (Malloch, 1979).

Although the production of sessile versus stipitate ascocarps was classically used to separate members of Gymnoascaceae from the Onygenaceae, Malloch and Cain (1970a, 1971a) placed both stipitate and sessile taxa in their version of the Onygenaceae. Redhead and Malloch (1977) further expanded their concept of the Onygenaceae when they included *Galactomyces*, a genus that lacks an ascocarp.

We disagree with the transfer of the Onygenales to the Pezizales. While the criteria used by Malloch (1970b), *i.e.*, colorless mycelium, lack of phialides, colorless ascospores, and spores without germ pores might be used as evidence to support a theory of evolution, they are not adequate data for use in trying to establish an oridnal relationship. Aside from the unique mechanism of ascospore release through an operculum, Pezizales have a number of other features that make them stand apart from the Onygenaceae. Anamorphs of Pezizales, when they occur, are blastoconidial, not aleurio- or arthroconidial. Cleistocarpy is extremely common among Pezizales. In all of these pezizalean taxa, however, the asci have remained persistent and retained an apical operculum or a modified operculum. The Tuberales, which most agree evolved from the Pezizales, have retained persistent asci and often a hymenium, even though they have lost their active mechanism of spore discharge. While the Onygenales and Pezizales are similar in having colorless ascospores without germ pores (although many species of the Pezizales have pigmented ascospores), spore size, shape, and ornamentation appear quite different in members of the two orders. Both groups usually have naked ascogonia, yet those of Pezizales are often large, beaded coils with trichogynes, not small, intertwined pairs as is common in Onygenales. Although aedquate data are available, there are suggestions at the ultrastructural lavel that ascosporogenesis is different in members of the two orders (Beckett *et al.*, 1974; Hill, 1975).

Several members of the Pezizales, for example *Ascodesmis*, appear highly reduced and form only a remnant of excipulum. It is likely that certain of the Arachnioideae (Gymnoascaceae) represent greatly reduced members of the Pezizales, and in fact point to one of the evolutionary pathways. However, until more data are available, we are unwilling to merge the two orders. As particular species and genera are studied critically, transfers from the Onygenales to the Pezizales, or the reverse, may be necessary. We anticipate, however, that there are numerous taxa in which adequate links will never be established, and these fungi will be retained in the Onygenales.

KEY TO THE FAMILIES OF ONYGENALES

A. Ascocarps relatively small (mostly less than 2 cm long), mostly sessile, some stipitate or elevated on a hyphal tuft..........................B
 B(A). Ascocarps with a completely closed peridial wall (a true cleistothecium), one to several cells thick...........Onygenaceae (p.10)
 BB(A). Ascocarps not completely closed, peridium of loosely interwoven hyphae that in some cases is highly differentiated and thick walled....Gymnoascaceae (p.15)
AA. Ascocarps large (up to 17 cm long), producing a basal rhizoid and apically branched, with each branch bearing an irregularly shaped receptacle; stipitate..Dendrosphaeraceae (p.22)

Onygenaceae Fr., Summ. Veg. Scand. 2: 446. 1849.

Ascocarps variously shaped, stipitate or sessile, hyaline or light colored, never dark brown or black, glabrous to hairy or tomentose, nonappendaged or variously appendaged, nonostiolate, frequently highly variable within a collection, arising from ascocarp initials that are either prominant coils or swollen cells. Asci subglobose to globose, irregularly disposed, nonstipitate, evanescent, usually arising from prominent croziers. Ascospores one-celled, hyaline to brightly colored, never dark, variously shaped, often oblate, always lacking germ pores, smooth to roughened or ridged, with equatorial ridges in some. Anamorphs produced as aleurioconidia or arthroconidia. Conidia hyaline, one to several celled, smooth or roughened. Frequently occurring on keratinous substrates, also on plant debris or soil.

Type genus: *Onygena* Pers. *ex* Fr. Fourteen genera accepted.

Discussion: The family Onygenaceae was revised by Boedijn (1935a) to include three monogeneric subfamilies of stipitate Plectomycetes (Dendrosphaeroideae--*Dendrosphaera;* Onygenoideae--*Onygena;* and Trichocomoideae--*Trichocoma*). Ciferri (1957) later raised these taxa in rank, the Onygenaceae to Onygenales and the three subfamilies to family status. Kobayasi *et al.* (1959) cultured *Onygena corvina* Alb. & Schw. *ex* Fr. but they were unable to induce ascocarp formation. The discovery of an arthroconidial anamorph, however, led them to believe that *Onygena* was not related to *Trichocoma* and *Penicilliopsis*. Malloch and Cain (1970a) disregarded the stipitate nature of the ascocarp as a good family character and placed *Arachnomyces* in the Onygenaceae. In their monograph, Malloch and Cain (1971a) considered Onygenaceae to be cleistocarpous Gymnoascaceae which produced arthroconidial or aleurioconidial anamorphs and were often keratinophilic. They included *Aphanoascus*, *Arachnomyces*, *Dichotomomyces*, *Onygena*, *Thermoascus*, and the new genera *Ascocalvatia* and *Xynophila* in the enlarged family. They considered both *Anixiopsis* and *Keratinophyton* to be synonyms of *Aphanoascus*. De Vries (1969), Udagawa and Takada (1973), and von Arx (1974b) maintain *Anixiopsis* as a separate genus. *Pleuroascus*, a fungus not reported since its original description by Massee and Salmon (1901), was redescribed from culture by Malloch and Benny (1973) and placed in the Onygenaceae because of ascocarp characters and an arthroconidial anamorph. We disagree with the broader concept of *Pleuroascus* proposed by Lodha (1978).

Von Arx and Samson (1973) described two monotypic genera, *Xanthothecium* and *Leucothecium*, the latter possessing an arthroconidial anamorph and other features of the Onygenaceae. Although the type of *Xanthothecium*, *X. peruvianum* (Cain) v. Arx & Samson was placed in *Arachnomyces* (Malloch and Cain, 1970a) it appears to be more closely related to *Anixiopsis*, *Keratinophyton*, and *Leucothecium*. Another monotypic genus, *Neoxenophila*, based on *N. foetida* Apinis & Clark (1974), was isolated from rodent hair, and although it is unusual in being heterothallic, it is included in the Onygenaceae because of its close similarity to *Aphanoascus* and *Xynophila*. We also include two other genera, *Diehliomyces* (Gilkey, 1954) and *Xylogone* (von Arx and Nilsson, 1969) in the family. Although *Xylogone* produces dark ascocarps, atypical of the Onygenaceae *sensu* Malloch and Cain, it does possess the characteristic arthroconidial anamorph. *Anixiopsis* also produces dark ascocarps. *Diehliomyces* is a parasite in commercial mushroom beds and has large ascocarps, often reaching 3 cm in diam, a feature that led Diehl and Lambert (1930) to describe it as a species of *Pseudobalsmia* (Tuberales *sensu* Korf, 1973). Gilkey (1954) proposed *Diehliomyces* for the single species, *D. microsporus* (Diehl & Lambert) Gilkey, and placed it in the Eurotiales close to the Gymnoascaceae because of its peridium of interwoven hyphae, evanescent asci, and arthroconidia formed from peridial hyphae. Hawker (1959) agreed with Gilkey and thought that *Diehliomyces* might be intermediate between the Gymnoascaceae and the Elaphomycetaceae because of the crustlike peridium. Although they are comparable in size, the multilayered peridium of *Elaphomyces* (Dodge, 1929; Kobayasi, 1960) is distinctly different from the interwoven hyphal wall of *Diehliomyces*.

Redhead and Malloch (1977) described the yeastlike genus *Galactomyces* based upon two species of *Endomyces*, *E. geotrichum* Butler & Peterson and *E. reessii* van der Walt. The genus was placed in the Onygenaceae because the species produced arthroconidia and the ascospores possessed equatorial grooves. Their concept of the Onygenaceae was expaned from that of Malloch and Cain (1971a) to include members of the Gymnoascaceae (see Malloch, 1979). We do not accept Redhead and Malloch's placement of *Galactomyces*, but concur with von Arx (1977a) in transferring both species to the emended genus *Galactomyces*. *Dipodascus aggregatus* Francke-Grosmann has been shown to produce multiperforate septa (Kreger-van Rij and Veenhuis, 1974). Members of the Onygenaceae should produce centrally perforate septa with associated Woronin Bodies typical of other ascomycetes (Gull, 1978). The anamorph of *E. geotrichum* (*Geotrichum candidum* Link *ex* Pers.) has also been shown to produce multiperforate septa (Steele and Fraser, 1973), a feature supportive of von Arx's scheme. An arthrosporic anamorph is also characteristic of species of *Dipodascus*. *Dipodascus uninucleatus* Biggs was removed from the genus and placed in *Dipodascopsis* (Batra, 1978). This genus (of uncertain affinities according to von Arx *et al.*, 1977) lacks an anamorph, produces typical ascomycete septa (Kreger-van Rij and Veenhuis, 1974), and has a different physiology and cell wall composition (Weijman, 1977), data again that support von Arx's concept of these taxa. Our views on the relationship of the Gymnoascaceae are discussed later, but we feel that genera of the two families should not be combined into a single taxon.

KEY THE THE GENERA OF ONYGENACEAE

A. Ascocarps relatively large (1-3 cm in diam); found only in beds of cultivated mushrooms, *Agaricus bisporus* (Lange) Singer..........*Diehliomyces*
Type species: *D. microsporus* (Diehl & Lambert) Gilkey, Mycologia 46: 790. 1954. One species (see Diehl and Lambert, 1930; Hawker, 1959).

AA. Ascocarps smaller, rarely 5 mm in diam, often 1 mm in diam; habitat otherwise......................B

B(AA). Ascocarps stipitate; on hooves, horns, claws, owl boluses, and other keratinophilic substrates.........*Onygena*
Type species: *O. equina* (Willd.) Pers. *ex* Fr., Syst. Mycol. 3: 207. 1829. Three species (Ward, 1899; Malloch, 1970b).

BB(AA). Ascocarps sessile; habitat variable..........C

C(BB). Ascocarps covered with a tomentum or bearing various types of appendages..............D

CC(BB). Ascocarps glabrous or nearly so..................H

D(C). Ascocarps under a dense tomentum...*Xynophila*
Type species: *X. mephitalis* Malloch & Cain, Can. J. Bot. 49: 845. 1971. One species.

DD(C). Ascocarps not under a dense tomentum, bearing appendages..................E

E(DD). Ascocarps covered with hyphalike appendages.........................*Dichotomomyces*
Type species: *D. cejpii* (Mil'ko) Scott, Trans. Brit. Mycol. Soc. 55: 314. 1970. One species (see Udagawa, 1970; Malloch and Cain, 1971a).

EE(DD). Appendages not hyphalike.........................F

F(EE). Ascocarp appendages tightly coiled.........................*Pleuroascus*
Type species: *P. nicholsonii* Massee & Salmon, Ann. Bot. (Lond.) 15: 330. 1901. One species (see Malloch and Benny, 1973).

FF(EE). Ascocarp appendages usually only curved to recurved, if coiled, only at the tips........................G

G(FF). Ascospores oblate, reddish brown; anamorph not produced...................*Arachnomyces*
Type species: *A. nitidus* Massee & Sal-

mon, Ann. Bot. (Lond.) 16: 68. 1902. Three species (see Malloch and Cain, 1970a).

GG(FF). Ascospores globose to ovoid or lenticular, hyaline to light brown; anamorph a *Chrysosporium*..................*Neoxenophila*
Type species: *N. foetida* Apinis & Clark, Trans. Brit. Mycol. Soc. 63: 263. 1974. One species.

H(CC). Ascospores cylindrical; centrum traversed by strands of sterile hyphae........................*Ascocalvatia*
Type species: *A. aveolata* Malloch & Cain, Can. J. Bot. 49: 840. 1971. One species.

HH(CC). Ascospores not cylindrical; no sterile tissue within the centrum..................................I

I(HH). Ascospores with an equatorial rim or crest..J

J(I). Ascospores with an equatorial rim, hyaline to yellowish, lenticular, finely verrucose................*Leucothecium*
Type species: *L. emdenii* v. Arx & Samson, Persoonia 7: 378. 1973. One species.

JJ(I). Ascospores with an equatorial crest, yellow-brown, oblate, smooth..........................*Keratinophyton*
Type species: *K. terreum* Randhawa & Sandhu, Sabouraudia 3: 252. 1963. One species.

II(HH). Ascospores lacking equatorial wings or crests...K

K(II). Ascospores oblate.........................L

KK(II). Ascospores ovoid to ellipsoid............M

L(K). Ascospores yellowish, finely echinulate............................*Xanthothecium*
Type species: *X. peruvianum* (Cain) v. Arx & Samson, Persoonia 7: 377. 1973. One species.

LL(K). Ascospores reddish brown, reticulate......*Anixiopsis*
Type species: *A. stercoraria* Hansen, Bot. Zeit. 7: 131. 1897. One species (see Udagawa, 1966; de Vries, 1969).

M(KK). Ascospores ovoid to ellipsoid, echinulate; thermophilic;

ascocarps yellowish brown........*Thermoascus*
Type species: *T. aurantiacus*
Miehe, Die Selbst. Hues., p. 70,
1907. One species (see Apinis,
1967).

MM(KK). Ascospores sphaerical, smooth,
mesophilic; ascocarps dark..........*Xylogone*
Type species: *X. sphaerospora*
v. Arx & Nilsson, Svensk Bot.
Tidskr. 63: 345. 1969. One or
two species.

Gymnoascaceae Baranetsky, Bot. Zeit. 30: 158. 1872.

Ascocarps small, more or less globose, usually with variously shaped peridia which consist of anastomosing, branched or loosely interwoven, thin- or thick-walled, smooth, echinulate, or tuberculate hyphae. Appendages, when present, short or long, spirally coiled, ctenoid, straight, or uncinate. Asci irregularly disposed in the ascocarp, usually originating from croziers, globose to ovoid to clavate, eight spored, evanescent. Ascospores one-celled, small, globose, oblate or lenticular, smooth, rough or variously sculptured, usualy hyaline or lightly colored, seldom dark. Anamorphs arthroconidial or aleurioconidial. Habitat mostly on dung, plant debris, feathers, hair, or in soil; some species produce anamorphs that cause skin, lung, and other infectous diseases of man and other animals.

Type genus: *Gymnoascus* Baranetsky, Bot. Zeit. 30: 158. 1872. Twenty-four genera accepted.

Discussion: Taxonomy of the Gymnoascaceae has recently been a subject of controversy. Von Arx (1971a) reviewed the taxonomic status of the fungi in the family at that time. Up to 19 genera had been recognized: *Actinodendron*, *Ajellomyces*, *Apinisia*, *Arachniotus*, *Arthroderma*, *Auxarthron*, *Ctenomyces*, *Eidamella*, *Gymnoascus*, *Myxotrichum*, *Nannizzia*, *Narasimhella*, *Petalosporus*, *Pseudoarachniotus*, *Rollandina*, *Shanorella*, *Spiromastix*, *Toxotrichum*, and *Tripedotrichum*. Most of the genera were believed to have a good conceptual basis, but some such as *Actinodendron*, *Eidamella*, *Pseudoarachniotus*, and *Rollandina* were found to be synonyms of other genera. *Actinodendron* (Orr and Kuehn, 1963a) was based upon a mixture of *Oncocladium flavum* Wallr. and its conidia (Hughes, 1968). Ascospores were not present as described by Orr and Kuehn (1963a) and, therefore, the genus cannot be a member of the Gymnoascaceae. *Eidamella*, while recognized as a valid genus by Benjamin (1956a), was later treated as a species of *Myxotrichum* by Orr *et al.* (1963c). The remaining genera that were treated as doubtful by von Arx (1971a) were disposed as follows: *Pseudoarachniotus*, a synonym of *Arachniotus*; *Narasimhella* was thought to be a valid genus; and several species were transferred from *Pseudoarachniotus* and *Arachniotus* to *Amauroascus*. Von Arx also proposed three monotypic genera, *Arachnotheca*, *Byssoascus*, and *Eleutherascus*, based upon species previously described in *Arachniotus*. One species, *Eleutherascus lectardii* (Nicot) v. Arx, was later the basis for another monotypic genus, *Hemiascosporium spinulosum* Batra (1973), the type of the Hemiascosporiaceae of the Endomycetales. The similarity between *Eleutherascus* and *Hemiascosporium* was recognized by Huang (1975) who also noted its similarity to *Ascodesmus* (Pezizales). It is our opinion that *Eleutherascus* is a simplified, operculate discomycete, perhaps related to *Ascodesmus*.

Samson (1972) revised *Pseudogymnoascus* and *Gymnoascus* and listed the valid species in each genus. He also redefined the genus *Auxarthron* based on ascospore morphology, and not on the presence of swellings on the peridial hyphae at the septa as it was in the original definition (Orr *et al.*, 1963b).

In a reexamination of the Gymnoascaceae, von Arx (1977b) rearranged several genera described by Orr and coworkers (Ghosh *et al.*, 1963; Orr, 1976, 1977a, 1977b, 1977c; Orr and Kuehn, 1974a, 1964b; Orr, Ghosh, and Roy, 1977; Orr, Roy, and Ghosh, 1977; Roy *et al.*, 1978; Sigler and Carmichael, 1976). Von Arx (1977b) believed that species of the following genera formed the basis for several of Orr's taxa: *Disarticulatus*, *Petalosporus*, *Plunkettomyces* (based on species of *Arachniotus*); *Kuehniella* (based on a species of *Arachnotheca*); *Gymnascella*, *Gymnoascoideus*, *Macronodus*, *Tripedotrichum*, *Uncinocarpus* (based on species of *Gymnoascus*). *Rollandina* (Roy *et al.*, 1978) was thought by von Arx (1977b) to be a *nomen confusum*, based partly upon a species of *Nannizzia* (Benjamin, 1956a; Apinis, 1968). Utilizing mainly ascospore morphology, von Arx (1977b) recognized the following genera in the Gymnoascaceae: *Ajellomyces*, *Amauroascus*, *Arachniotus*, *Arachnotheca*, *Arthroderma*, *Auxarthron*, *Byssoascus*, *Ctenomyces*, *Emmonsiella*, *Gymnoascus*, *Myxotrichum*, *Nannizzia*, *Narasimhella*, *Pseudogymnoascus*, and

Shanorella. In his review of the family, however, he failed to mention *Pectinotrichum* (Varsavsky and Orr, 1977), although he had recognized it earlier as a valid taxon (von Arx, 1974b).

Recently, evidence was presented by McGinnis and Katz (1979) to support the conbination of the teleomorphs of *Blastomyces dermatitidis* Gilch. & Stolk (*Ajellomyces*: McDonough and Lewis, 1968) and *Histoplasma capsulatum* Darl. (*Emmonsiella*: Kwon-Chung, 1972) within the single genus *Ajellomyces*. *Renispora* is another gymnoascaceous taxon with a relatively small ascocarp and an anamorph similar to *Histoplasma capsulatum*. Most Gymnoascaceae produce anamorphs belonging to *Chrysosporium*, *Malbranchia*, or *Oidiodendron* (Sigler and Carmichael, 1976).

Keys to the genera of Gymnoascaceae expressing various taxonomic persuasions have been presented by von Arx (1971b), Fennell (1973), and Orr, Roy, and Ghosh (1977). We are following mainly the concepts of von Arx (1971b, 1977b) and Apinis (1964) in the keys presented below. Only a continued study of types, observing sporulation in pure culture, and establishing anamorph-teleomorph relationships will prove the accuracy of the American (Orr *et al.*) or the Dutch (von Arx *et al.*) systems of classification. Kendrick and DiCosmo (1979) have provided an excellent compilation of anamorph-teleomorph associations in the Ascomycetes.

KEY TO THE SUBFAMILIES OF GYMNOASCACEAE

A. Peridial hyphae more or less thin walled;
many species strongly keratinophilic;
appendages lacking or reduced; coils often
present as peridium.................................B

B(A). Appendages lacking; peridial hyphae
generally similar to the vegetative
hyphae, inconspicuous or lacking;
asci appearing naked.............Arachnioideae
Apinis, Mycol. Pap. 96: 4. 1964. (p.18)
Type genus: *Arachniotus* Schroet.
Six genera recognized.

BB(A). Appendages relatively inconspicuous, curved, coiled, elongate,
slender, hyphal or of irregular
cells, macroconidial; peridial
hyphae disarticulating; many
species keratinophilic; anamorphs

often causing infectious diseases of man and animals............Arthrodermoideae
Apinis, Mycol. Pap. 96: 4. 1964. (p. 19)
Type genus: *Arthroderma* Berk.
Six genera recognized.

AA. Peridial hyphae (at least out layer) thick walled and markedly different from vegetative hyphae; appendages often conspicuous, ctenoid, clavate, straight, hooked or branched vertically...........Gymnoascoideae
Apinis, Mycol. Pap. 96: 3. 1964. (p. 20)
Type genus: *Gymnoascus* Baranetsky
Six genera recognized.

KEY TO THE GENERA OF ARACHNIOIDEAE

A. Ascospores fusiform, elliptical to reniform or allantoid..B

AA. Ascospores not fusiform, but either spherical, lenticular or oblate.................................C

B(A). Ascospores fusiform, with longitudinal ridges..................................*Byssoascus*
Type species: B. *striatisporus* (Barron & Booth) v. Arx, Persoonia 6: 377. 1971. One species (see Barron and Booth, 1966).

BB(A). Ascospores elliptical to reniform or allantoid, with pitted walls........*Renispora*
Type species: R. *flavissima* Sigler, Gaur, Lichwardt & Carmichael, Mycotaxon 10: 133. 1979. One species.

C(AA). Ascospores spherical.............................D

CC(AA). Ascospores lenticular or oblate, often with an equatorial marking.......................E

D(C). Ascospores ornamented, reddish or brownish; asci from ascogenous hyphae; peridium lacking, but asci sometimes surrounded by hyphae...*Amauroascus*
Type species: A. *verrucosus* (Eidam) Schroet., *in* Cohn's Kryptogamen-Fl. Schleisens 3(2): 211. 1893. Five species (see von Arx, 1971b).

DD(C). Ascospores with thick walls, covered with a hyaline sheath, bluish or violet; asci borne on croziers; peridium of thick-walled, anastomosing hyphal filaments.........*Arachnotheca*

Type species: A. *glomerata* (Müller & Pracha-Aue) v. Arx, Persoonia 6: 376. 1971. Two species. Syn.: *Kuehniella* Orr (see von Arx, 1971b, 1977b).

E(CC). Gametangia more or less equal, wound around one another; asci borne on short ascogenous hyphae; ascospores lenticular or oblate, often with an equatorial rim or furrow; ascocarps usually sessile........................*Arachiotus*

Type species: A. *ruber* (van Tiegh.) Schroet., *in* Cohn's Kryptogamen-Fl. Schleisens 3(2): 211. 1893. Eight species (see von Arx, 1971b, 1977b; a different concept presented by Orr, Ghosh, and Roy, 1977). Syn.: *Disarticulatus* Orr; *Petalosporus* Ghosh, Orr & Kuehn; *Plunkettomyces* Orr; *Pseudoarachniotus* Orr & Kuehn; *Waldemaria* Batista, Silva Maia & Cavalcanti.

EE(CC). Gametangia ringlike; asci borne on croziers; ascospores lenticular with a thin equatorial ring, hyaline or pale yellowish; ascocarps elevated on hyphal tufts.........................*Narasimhella*

Type species: *N. hyalinospora* Kuehn, Orr & Ghosh) v. Arx, Persoonia 6: 374. 1971 (see Thirumalacher and Mathur, 1966). Two species known.

KEY TO THE GENERA OF ARTHRODERMOIDEAE

A. Peridial hyphae disarticulating at maturity..........B

AA. Peridial hyphae not disarticulating..................C

B(A). Ascospores flattened, oblate, with an equatorial band, smooth...........*Shanorella*

Type species: *S. spirotricha* Benjamin, El Aliso 3: 319. 1956. One species.

BB(A). Ascospores globose with finely echinulate walls.......................*Apinisia*

Type species: *A. graminicola* La Touche, Trans. Brit. Mycol. Soc. 51: 283. 1968. Two species (see Apinis and Rees, 1976).

C(BB). Tight coils not present, appendages

curved....................................*Spiromastix*
Type species: *S. warcupii* Kuehn & Orr, Mycologia 54: 160. 1962. One species.

CC(BB). Coils present, either as appendages or as peridia.......................................D

D(CC). Constricted or dumbell-shaped hyphae not present in peridia, latter consisting of coiled hyphae..........................*Ajellomyces*
Type species: A. *dermatitidis* McDonough & Lewis, Mycologia 60: 77. 1968. Two species known (see Kwon-Chung, 1973). Syn.: *Emmonsiella* Kwon-Chung (see McGinnis and Katz, 1979).

DD(CC). Coils present as appendages; peridium consisting of more or less constricted cells.................E

E(DD). Peridial cells deeply constricted (dumbbell shaped) and relatively short; appendages coiled and uncommon; anamorph a *Trichophyton* Malst...................................*Arthroderma*
Type species: A. *curreyi* Berk., Outl. Brit. Fungol., p. 357. 1860. Thirteen species known (see Padhye and Carmichael).

EE(DD). Peridial cells slightly constricted and relatively long; appendages coiled, elongate and slender or macroconidial; anamorph a *Microsporon* Gruby..............*Nannizzia*
Type species: N. *gypsea* (Nannizzi) Stockdale, Sabouraudia 1: 46. 1961. Nine species known (see Apinis, 1964).

KEY TO THE GENERA OF GYMNOASCOIDEAE

A. Appendages conspicuous and regularly septate, each segment bearing unilateral enlargements or branchlets...............................*Ctenomyces*
Type species: C. *serratus* Eidam, *in* Cohn's Beitr. Biol. Pfl. 3: 274. 1880. One species (see Benjamin, 1956a; Orr and Kuehn, 1963b).

AA. If appendages are septate, segments not unilaterally enlarged.................................B

B(AA). Ascospores fusoid or ellipsoid................C

BB(AA). Ascospores globose to subglobose or oblate..................................D

C(B). Peridium and appendages dark brown to nearly black; appendages variously hooked, pointed, bramblelike and relatively conspicuous.............................. *Mxyotrichum* Type species: *M. chartarum* (Nees) Kunze, Myk. Hefte 2: 110. 1823. Ten species known (see Orr *et al.*, 1963c for key to species). Syn.: *Actinospira* Corda; *Eidamella* Matr. & Dass.; *Toxotrichum* Orr & Kuehn (see also von Arx, 1974b).

CC(B). Peridium not dark brown or black, light brown, yellow-brown, red, or yellow; appendages not readily observed, short, blunt.......................*Pseudogymnoascus* Type species: *P. roseus* Raillo, Zentbl. Bakt. Parasitkde, Abt. 2, 78: 520. 1929. Two species known (see Samson, 1972; Orr, 1979).

D(BB). Ascospores oblate.................*Gymnoascus* Type species: *G. reessii* Baranetsky, Bot. Zeit. 30: 158. 1872. Six species known (see Orr *et al.*, 1963a, 1977b; Samson, 1972; von Arx, 1974b, 1977b for a discussion of generic limits). Syn.: *Gymnascella* Peck; *Gymnoascoideus* Orr *et al.*; *Macronodus* Orr; *Neogymnomyces* Orr; *Tripedotrichum* Orr & Kuehn; and *Uncinocarpus* Sigler & Orr.

DD(BB). Ascospores globose to subglobose..........E

E(DD). Ascospores globose, wall smooth; peridium and appendages with tuberculate wall.*Pectinotrichum* Type species: *P. llanense* Varsavsky & Orr, Mycopath. Mycol. Appl. 43: 331. 1971. One species known.

EE(DD). Ascospores globose to subglobose, wall rough or echinulate; peridium and appendages relatively smooth, not tuberculate............................*Auxarthron* Type species: *A. californiense* Orr & Kuehn, Can. J. Bot. 41: 1442. 1963. Seven or eight species known (see Samson, 1972; key to species in Orr, 1977a).

Dendrosphaeraceae Ciferri *ex* Benny & Kimbrough, *fam. nov.*

Dendrosphaeraceae [as Dendrosphaeriaceae], *nomem nudum*, Atti Ist. Bot. Univ. Pavia, Ser. 5, 14: 240. 1957 (without Latin diagnosis; Art. 36).

Ascocarpi longistipitati rhizomorphas basilares tenuis et aliquot receptacula (vel conceptacula) apicales formantes; receptacula globosa, elongata vel irregularia; asci numerosi, globosi, evanescentes, octospori, irregulariter dispositi, post maturitates pulveracei; ascosporae globosae, per hyphas vaginantes encrustatae et ornatae; capillitium hyaline septatum ex hyphis tenuibus enatum; anamorphosis ex aleurioconidiis constans.

Ascocarps long stipitate, forming slender basal rhizomorphs and several apical receptacles (or conceptacles); receptacles globose, elongate or irregular; asci numerous, globose, evanescent, eight spored, irregularly disposed, powdery after maturity; ascospores globose, encrusted and ornamented by ensheathing hyphae; capillitium hyaline, septate, arising from slender hyphae; anamorph consisting of aleurioconidia.

Holotype: *Dendrosphaera eberhardtii* Pat.

Discussion: The Dendrosphaeraceae contain a single genus, *Dendrosphaera eberhardtii* Pat., which was originally collected by Eberhardt in Tonkin (now northern Vietnam) and later was described by Patouillard (1907). Because of its large size it was compared with *Onygena* and *Trichocoma*. A second collection from the Molluccas (now Indonesia) was reported by Lloyd (1924), and both Saccardo (1913) and Clements and Shear (1931) placed *Dendrosphaera* in the Onygenaceae. In Boedijn's (1935b) studies of the development of *D. eberhardtii*, he revised Patouillard's description of the fungus and suggested that it belonged in a subfamily of the Onygenaceae, the Dendrosphaeroideae. In another publication, Boedijn (1935a) proposed three subfamilies of the Onygenaceae: Onygenoideae for *Onygena* only; Trichocomoideae for *Trichocoma* only; and Dendrosphaeroideae for *Dendrosphaera*. Large stipitate ascocarps characterized the family, while ascospore ornamentation, morphology, ontogeny, and habitat were considered adequate for subfamily distinction. Ciferri (1957) elevated Boedijn's family and subfamilies to ordinal and familial rank, although the Onygenaceae and Trichocomaceae had been used as families sometime earier (Cohn, 1872; Fischer, 1897). Ciferri failed to publish a Latin diagnosis for the Dendrosphaeraceae so we have provided one to validate the family.

Kobayasi (1975) redescribed *D. eberhardtii* and summarized its distribution, in southeast Asia (Malaya, Vietnam, Japan) and in Australasia (Java, Borneo, Malluca). Kobayasi (1976) was the first to describe and illustrate the aleurioconidial anamorph. It is largely on the basis of the anamorph that me are including the Dendrosphaeraceae in the Onygenales. The family contains the single monotypic genus with descriptions being provided by Patouillard (1907), Boedijn (1935b), and Kobayasi (1975). The fungus has been reported infrequently, although it might not be as rare as reports indicate since it has been collected several times in the same region of Asia (Boedijn, 1935b). Its large size, and rhizomorphs growing deeply within the soil, suggest that it might be mycorrhizal. More collections must be made, and one must note carefully the habitat, plant associations, and ontogenetic features before one can confidently establish its affinities to other taxa.

EUROTIALES Martin *ex* Benny & Kimbrough, *ord. nov.*

> Eurotiales Martin, *nomen nudum*, Outline of the fungi, Studies Nat. Hist. Iowa Univ. 18(Suppl.): 16. 1941 (without Latin diagnosis; Art. 36).

Ascogonia helicoidea; ascocarpi nulli vel praesentes, nonostiolati, hyalini vel varie colorati, stromatici vel nonstromatici, ex hyphis vel pseudoparenchymatibus constantes; asci globosi, evanescentes, irregulariter dispositi, plerumque octospori; ascosporae unicellulares, hyalinae vel varie coloratae, laeves vel ornatae; anamorphosis plerumque ex phialoconidiis constans.

Ascogonia coiled; ascocarps lacking or present, hyaline or variously colored, nonostiolate, sromatic or nonstromatic, consisting of hyphae or pseudoparenchyma; asci globose, evanescent, irregularly disposed, usually eight spored; ascospores one celled, hyaline or variously colored, smooth or ornamented; anamorph usually consisting of phialoconidia.

We consider two families, the Trichocomaceae and the Cephalothecaceae.

Discussion: The Eurotiales contain fungi that have at various times been classified in several orders: Aspergillales (Bessey, 1950; Luttrell, 1951), Eurotiales (Martin, 1941a; Ainsworth, 1961, 1971; Alexopoulos, 1962; Fennell, 1973; Müller and Loeffler, 1976; Alexopoulos and Mims, 1979), Gymnascales (Clements and Shear, 1931), Hypocreales (Cain, 1956a, 1972; Malloch, 1979), Perisporales (Clements and Shear, 1931), Plectascales (Gäumann, 1928; Nannfeldt, 1932; Langeron and Vanbreuseghem, 1965; Dennis, 1968; 1978; Wehmeyer, 1975). Fennell (1973) included nine families in her treatemnt of the Eurotiales; Amorphothecaceae Parbery (1969), which she suggested may be closest to the Hemiphacidiaceae (Helotiales); Cephalothecaceae von Höhnel (1917); Eurotiaceae Clements & Shear (1931), a synonym of the Trichocomaceae; Gymnoascaceae (Benjamin, 1956a; Kuehn, 1958, 1959; von Arx, 1971b, 1977b), treated here under the Onygenales; Monascaceae Schroeter (1894), treated here under the Ascosphaerales; Onygenaceae (Malloch and Cain, 1971a), treated here under the Onygenales; Pseudeurotiaceae Malloch & Cain (1970b), a synonym of the Cephalothecaceae; Thermoascaceae Apinis (1967), whose two genera are now in separate families, *Thermoascus* in the Onygenaceae and *Dactylomyces* (Malloch and Cain, 1972b). Our treatment of the Eurotiales includes only two families: the Cephalothecaceae and the Trichocomaceae.

Although there is great variation in the type of ascocarp, all genera included here have a basic type of centrum structure, and with minor exceptions, a phialoconidial anamorph. Many genera have flanged or ridged ascospores without germ pores. Most have brightly colored conidia and mycelia.

Cain (1956a) believed the Aspergillaceae to be evolved from groups close to the Hypocreales or directly from them because of their similar phialidic anamorphs and brightly colored mycelium, conidia, and ascospores. Malloch and Cain (1972b) reemphasized these similarities in their treatment of these taxa under the Trichocomaceae, comparing stroma, ascocarp peridium, asci, ascospores, and anamorphs. Malloch (1979) placed the Trichocomaceae in the Hypocreales. Malloch (1970b) felt that the orgins of the Pseudeurotiaceae were obscure, but that members of the family have some features in common with members of the Diaporthales (*Endoxyla*, *Gnomonia*, *Phomatospora*). In the proposal of the new family, Malloch and Cain (1970b) noted that the

Pseudeurotiaceae differed from the Eurotiaceae (Trichocomaceae *sensu* Malloch and Cain) in having dark ascocarps and ascospores and simple conidiophores, but failed to mention an ordinal relationship. Malloch (1979), however, placed the Pseudeurotiaceae in the Diaporthales.

It would be unwise at this time to transfer these families to the Hypocreales and Diaporthales of the Pyrenomycetes. While existing data do suggest a possible evolutionary link between these taxa, they do not appear to us to justify a formal transfer. While it may be possible on occasion to link an isolated ascospore, peridial, or conidial characteristic, there will be numerous taxa in which no substantial link can be established. The Eurotiales is the appropriate order in which to maintain these taxa until further information is available.

KEY TO THE FAMILIES OF EUROTIALES

A. Ascocarps brightly colored; ascospores often pulley shaped; anamorphs of compound or rarely simple philoconidia.....Trichocomaceae (p.25)

AA. Ascocarps usually dark colored; ascospores not pulley shaped; anamorphs of simple phialoconidia or sympoduloconidia...............................Cephalothecaceae (p.31)

Trichocomaceae Fischer, Nat. Pflanzenfam. 1(1): 310. 1897.
=Eurotiaceae

Hyphae hyaline to yellow or red, forming ascocarp initials on vegetative mycelium or within stromatic tissues. Ascogonia varying from tightly coiled pairs to large spiraled rings. Ascocarps remaining naked or buried within stromata, ellipsoidal, globose to hairy, soft to very firm, and nonostiolate, Peridium of compact hyphae, loose reticulum, or lacking. Asci globose to subcylindrical, irregularly disposed, stipitate or sessile, evanescent, with or without croziers. Ascospores oblate (bivalved) to ellipsoidal to globose, hyaline to yellow, red, or violet, smooth to roughened or ridged, often with an equatorial ridge or crest, without germ pores, and one celled. Anamorphs belonging to the phialoconidial states *Acremonium*, *Aspergillus*, *Gliocladium*, *Merimbla*, *Paecilomyces*, *Penicillium*, *Raperia*, *and Sagrahamala*, or lacking, conidia hyaline to brightly colored, rarely dark, smooth or sculptured.

Type genus: *Trichocoma* Junghuhn. Praemissa Fl. Crypt. Javae Ins. 1: 9. 1838. Twenty-two genera accepted.

Discussion: Most of the genera accepted here have traditionally been placed in the Aspergillaceae or Eurotiaceae. As was noted by Malloch and Cain (1972b) the name Trichocomaceae predates the Eurotiaceae and must be considered the valid family name. Benjamin (1955) pointed out the confusion that may occur when families are based solely on the anamorph, and despite the recent use of the name (Gäumann, 1964) Aspergillaceae, it can not be applied to the teleomorph.

Malloch (1970b) included a number of genera in the Trichocomaceae: *Dactylomyces*, *Dichlaena*, *Emericalla*, *Eupenicillium*, *Eurotium*, *Hemicarpenteles*, *Penicilliopsis*, *Sartorya* (now *Neosartorya*, Malloch and Cain, 1972b), *Talaromyces*, and *Trichocoma*. A large number of taxa were excluded from the family because they had been placed there based upon superficial characteristics. In an extensive treatment of the family, Malloch and Cain (1972b) recognized 16 genera, including five that were described as new. Several of these names were predated by those of Subramanian (1972), published approximately two months earlier. Malloch and Cain (1973b) recognized these synonyms and corrected the family name spelling from Trichocomataceae to Trichocomacear. Five genera have been added subsequently to the family, *Fennellia* (Wiley and Simmons, 1973) and *Hemisartorya* (Rai and Chowdhery, 1975) with *Aspergillua* anamorphs, *Sagonema* (Stolk and Orr, 1974) with an *Acremonium* anamorph, and we are adding *Aphanoascus* (anamorph a *Paecilomyces*) and *Roumegueriella* (anamorph a *Gliocladium*). Subramanian (1979) presented a discussion of ontogeny, anamorphic associations, illustrations, and a partial key to the members of the Trichocomaceae. We are including twenty-two genera in the Trichocomaceae which can be distinguished by using the following key.

KEY TO THE GENERA OF TRICHOCOMACEAE

A. Anamorph an *Aspergillus* or *Raperia*..................B
AA. Anamorph an *Acremonium*, *Gliocladium*, *Merimbla*, *Paecilomyces*, *Penicillium*, or *Sagrahamala*...........M
B(A). Ascocarps lacking......................*Edyuilla*
Type species: *E. athecia* (Raper & Fennell) Subramanian, Curr. Sci. 41: 756. 1972. One species (see Raper and Fennell,

1965). Syn.: *Gymnoeurotium* Malloch & Cain.

BB(A). Ascocarps present............................C

C(BB). Ascocarps developing within a sclerotium or sclerotic tissue...............................D

CC(BB). Ascocarps not developing within a sclerotium or sclerotic tissue.........................G

D(C). One to three or more cleistothecia borne in each stroma.......................E

DD(C). One ascocarp borne in each stroma..........F

E(D). Sclerotial tissue, except outermost layers, dissolving at maturity; young sclerotia covered with yellow, spicular hairs; ascospores smooth, no furrows..............*Dichlaena*
Type species: *D. lentiscii* Mont. & Dur., Fl. Alg., p. 405. 1846-1849. Two species known (see Ram, 1971; Malloch and Cain, 1972b).

EE(D). Sclerotial tissues not dissolving at maturity; young sclerotia glabrous; ascospores with an equatorial grove.................*Petromyces*
Type species: *P. alliaceus* Malloch & Cain, Can. J. Bot. 50: 2653. 1972. One species known (see Raper and Fennell, 1965). Syn.: *Syncleistostroma* Subram.

F(DD). Ascocarp wall thick and many layered; ascospores hyaline..*Hemicarpenteles*
Type species: *H. paradoxus* Sarbhoy & Elphick, Trans. Brit. Mycol. Soc. 51: 156. 1968. Three species known (see Udagawa and Takada, 1971; Subramanian, 1972).

FF(DD). Ascocarp wall one layered; ascospores colored................*Sclerocleista*
Type species: *S. ornata* (Raper, Fennell & Tresner) Subramanian, Curr. Sci. 41: 757. 1972. Two species.

G(CC). Ascocarp wall of loosely interwoven hyphae; ascospores ovoid and spinulose, globose to subglobose and winged.................H

GG(CC). Ascocarp with a definite wall, either composed of compressed hyphae or pseudoparenchymatous cells; ascospores lenticular.......I

H(G). Ascospores globose to subglobose with two wings and spines; anamorph an *Aspergillus*...........*Hemisartorya*
Type species: *H. maritima* Rai &

Chowdhery, Kavaka 3: 73. 1979. One species (see Subramanian, 1979).

HH(G). Ascospores ovoid and spinulose; anamorph a *Raperia*..............*Warcupiella*
Type species: *W. spinulosa* (Warcup) Subramanian, Curr. Sci. 41: 757. 1972. One species (see Raper and Fennell, 1965; Subramanian, 1979). Syn.: *Sporophormis* Malloch & Cain.

I(GG). Ascocarps surrounded by hülle cells...............J

II(GG). Ascocarps not surrounded by hülle cells...........K

J(I). Ascogonia relatively large, globose cells......................*Fennellia*
Type species: *F. flavipes* Wiley & Simmons, Mycologia 65: 937. 1973. Two species (see Samson, 1979).

JJ(I). Ascogonia coiled.................*Emericella*
Type species: *E. variecolor* Berk. & Br. Intro. Cryptog. Bot. p. 340. 1857. Twelve species known (see Malloch, 1970b; Raper and Fennell, 1965; Cristensen and Raper, 1978 for keys to species; new species and combinations in Malloch and Cain, 1972a; Samson and Mouchacca, 1974, 1975a; Udagawa and Horie, 1976; Udagawa and Muroi, 1979; Horie, 1979).

K(II). Ascocarp wall composed of a single layer of flattened cells.........................*Eurotium*
Type species: *E. herbariorum* (Wigg.) Link ex Fr., Syst. Mycol. 3: 332. 1829. Seventeen or more species known (see Raper and Fennell, 1965; Malloch, 1970b; Blaser, 1976 for keys to species; new species and combinations in Malloch and Cain, 1972a; Samson and Mouchacca, 1974, 1975a).

KK(II). Ascocarp wall composed of several layers of flattened cells...............................L

L(KK). Ascocarp wall without appendages.....................*Neosartorya*
Type species: *N. fischeri* (Wehmer) Malloch & Cain, Can. J. Bot. 50: 2621. 1972. Twelve species (see

Raper and Fennell, 1965; Malloch and Cain, 1972b; Kwon-Chung and Kim, 1974). Syn.: *Sartorya* Vuill.

LL(KK). Ascocarp wall with projecting sterile hyphae...............*Chaetosartorya*
Type species: *C. chrysella* (Kwon-Chung & Fennell) Subramanian, Curr, Sci. 41: 761. 1972. Two species known (see Wiley and Simmons, 1973). Syn.: *Harpezomyces* Malloch & Cain.

M(AA). Asci formed in a stroma..........................N

MM(AA). Asci not formed in a stroma......................O

N(M). Stroma stipitate, containing fertile locules..............*Penicilliopsis*
Type species: *P. claviaeformis* Solms-Laubach, Ann. Jard. Bot. Buitenzorg 6: 53. 1887. One species known (see Malloch and Cain, 1972b).

NN(M). Stroma sessile; asci developing centripetally from the center of a pseudoparenchymatous stroma..*Eupenicillium*
Type species: *E. crustaceum* Ludwig, Lehrb. nied. Krypt., p. 263. 1892. More than 30 species known (see Malloch, 1970b; Pitt, 1974 for key to species; new species by Stolk and Veenbaas-Rijks, 1974; Udagawa and Horie, 1977).

O(MM). Ascocarps lacking; anamorph a *Paecilomyces*..........................*Byssochlamys*
Type species: *B. nivea* Westling, Sven. Bot. Tidskr. 3: 134. 1909. Four species known (see Stolk and Samson, 1971; Samson and Tansey, 1975).

OO(MM). Ascocarps present..............................P

P(OO). Ascocarps several mm tall, brush-like......................*Trichocoma*
Type species: *T. paradoxa* Junghuhn, Praemissa Fl. Crypt. Javae Ins. 1: 9. 1838. One species known (see Boedijn, 1935a; Kominami *et al.*, 1952; Malloch and Cain, 1972b).

PP(OO). Ascocarps smaller, not brushlike..........Q

Q(PP). Ascocarp wall cellular...........................R

QQ(PP). Ascocarp wall composed of several layers of loosely interwoven hyphae; usually not thermophilic..........................T

R(Q). Ascocarp brown, composed of one or more layers of pseudoparenchymatous cells; thermophilic.........................*Dactylomyces*
Type species: *D. thermophilus* Sopp, Skr. Vidensk. Skrift Cristian. Mat.-naturv. 11: 35. 1912. Two species (see Stolk, 1965; Apinis, 1967).

RR(Q). Ascocarps cream colored to orange...................................S

S(RR). Ascocarp red-orange, composed of a sclerotioid inner tissue of thick-walled cells surrounded by loose wefts of encrusted hyphae; not thermophilic; anamorph a species of *Paecilomyces*........................*Aphanoascus*
Type species: *A. cinnabarinus* Zukal, Ber. Deut. Bot. Ges. 8: 296. 1890. One species known (see Udagawa, Furuya, and Horie, 1973; Udagawa and Takada, 1973; Jong and Davis, 1975).

SS(RR). Ascocarps cream to light orange, composed of a two layered peridium, the outer of thin-walled cells, a *textura globosa* in surface view......*Roumegueriella*
Type species: *R. rufula* (Berk. & Br.) Malloch & Cain, Can. J. Bot 50: 64. 1972. One species (see Hughes, 1951).
Syn.: *Lilliputia* Boud. & Pat.

T (QQ). Peridial hyphae thick walled, sometimes appendaged.............*Sagenoma*
Type species: *S. viride* Stolk & Orr, Mycologia 66: 676. 1974. One species known.

TT(QQ). Peridial hyphae relatively thin walled, not appendaged..................U

U(TT). Asci produced singly from croziers.........*Hamigera*
Type species: *H. avellanea* Stolk & Samson, Persoonia 6: 344. 1971. Two species known.

UU(TT). Asci produced in chains, not from croziers..............................*Talaromyces*
Type species: *T. vermiculatus* (Dang.)

C.R. Benjamin, Mycologia 47: 684. 1955. Sixteen or more species known. New species described by Stolk and Samson, 1972; Samson and Mahoney, 1977. Syn.: *Carpenteles* Langeron.

Cephalothecaceae von Höhnel, Ann. Mycol. 15: 362. 1917.
=Pseudeurotiaceae Malloch & Cain, Can. J. Bot. 48: 1815. 1970.

Ascocarp initials coiled, mature ascocarps globose to subglobose, glabrous, covered with a tomentum, or appendaged, haline or black. Peridium pseudoparenchymatous or cephalothecoid. Asci globose to clavate, evanescent, irregularly disposed in the centrum. Ascospores one celled, without germ pores, sheathed or unsheathed, smooth or variously ornamented, variously shaped. Anamorphs phialoconidial, sympoduloconidial, chlamydosporic, or lacking.

Type genus: *Cephalotheca* Fuckel, Symb. Mycol. Nachtr. 1: 297. 1871. Ten genera are accepted, inclusive of those formerly placed in the Pseudeurotiaceae (Malloch and Cain, 1970b).

Discussion: The family Cephalothecaceae was created for *Cephalotheca* and other cleistothecial Ascomycetes with a cephalothecoid (platelike) peridium (von Höhnel, 1917). These genera include: *Argynna*, *Cephalotheca*, *Eosphaeria*, *Marchaliella*, *Samarospora*, *Testudina*, and *Zopfiella*. Nannfeldt (1932) followed von Höhnel in reserving the family for those fungi with a cephalothecoid peridium. Ciferri (1958) added a new stipitate genus, *Batistia*, based upon *Xylaria annulipes* Mont. and proposed two tribes, the Batistieae for the stipitate and woody *Batistia* and the Cephalothecieae for the remaining carbonaceous and sessile taxa. Malloch and Cain (1970b) revised the concept of the Cephalothecaceae to include only the genus *Cephalotheca*. They disregarded the cephalothecoid peridium as a valid family character since this wall type had been found in a number of unrelated taxa. Malloch and Cain were unable to germinate the ascospores of *Cephalotheca sulfurea* Fuckel and, therefore, they were unable to determine whether or not germ pores were present. They (Malloch and Cain, 1970b) were able to observe that germ pores were lacking in the ascospores of several other plectomycetous taxa related to *C. sulfurea*. For those remaining genera, *Emericellopsis*, *Fragosphaeria*, *Pseudeurotium*, and *Testudina*, and five new genera, *Cryptendoxyla*, *Hapsidospora*, *Leuconeurospora*, *Mycoarachis*, and *Nigrosabulum*. Germ pores, if they are present in the ascospore wall, should be visible when observed with the light micorscope. The inability to convincingly demonstrate germ pores in ascospores of *Cephalotheca sulfurea* is a weak basis for maintaining *Cephalotheca* in a separate family since all of the other characteristics of the Cephalothecaceae and Pseudeurotiaceae are similar. If germ pores are later found to be present in the ascospores of *C. sulfurea* and other characters also support this difference, then both families can again be maintained. We agree, however with Malloch and Cain (1970b) that the presence of a cephalothecoid peridium alone is not justification for placing taxa in the Cephalothecaceae. Platelike peridia have been found also in the following taxa: Microascaceae (Plectomycetes); Chaetomiaceae, Sordariaceae (Pyrenomycetes); Eremomycetaceae, Testudinaceae (Loucloascomycetes) (Malloch, 1970b; Hawksworth and Booth, 1974). Recently, additional taxa have been described with this type of wall: *Chaetomidium arxii* Benny (1980; Chaetomiaceae), *Rhytidospora* spp. (Jeng and Cain, 1977; Krug and Jeng, 1979; Melanosporaceae), and several new genera of the Testudinaceae (Hawksworth, 1979). Cleistothecial genera of uncertain affinities also produce cephalothecoid peridia: *Albertinella* (Kirschstein, 1936), *Argynna* (Morgan, 1895; see also Martin, 1941b), and *Batistia* (Ciferri, 1958). Von Arx (1971a) placed *Argynna*, *Neotestudina*, and *Testudina*, along with *Lepidosphaeria* and *Pseudophaeotrichum* in the Testudinaceae of the Pseudosphaeriales. The Testudinaceae and Phaeotrichaceae are considered by von Arx and Müller (1975) to be synonymous with the Zopfiaceae (Pseudosphaerineae, Dothideales). Barr (1976, 1979a, 1979b) later included the Zopfiaceae (as a synonym of the Massariaceae) in the Melannommatales (Loculoedaphomycetidae, Loculoascomycetes).

With these transfers the following genera remained in the Cephalothecaceae: *Cephalotheca*, *Cryptendoxyla*, *Emericellopsis*, *Fragosphaeria*, *Hapsidospora*, *Leuconeurospora*, *Mycoarachis*, *Nigrosabulum*, and *Pseudeurotium*. *Mycoarachis inversa* Malloch and Cain should not be in this group as Malloch and Cain (1970b) suggest since it produces two-celled ascospores. It probably has affinities with the Hypocreales. Greenish ascospores and a *Cephalosporium*-like anamorph are common in the latter order. *Leuconeurospora* was transferred to the Micorascaceae by von Arx (1978; see the discussion under Microascales and Pithoascaceae). Three genera of Pseudeurotiaceae (Cephalothecaceae as interpreted here) have been proposed in recent years: *Aporothielavia* (Malloch and Cain, 1973a), *Connersia* (Malloch, 1974a), and *Leucosphaera* (von Arx *et al.*, 1978). Hawksworth (1979) did not include *Argynna* among the genera that he placed in the Zopfiaceae.

The following key is based, in part, on one presented by Malloch and Cain (1970b).

KEY TO THE GENERA OF CEPHALOTHECACEAE

A. Ascocarp wall cephalothecoid..........................B
AA. Ascocarp wall not cephalothecoid......................E
  B(A). Ascospores cylindrical, smooth walled............................*Cryptendoxyla*
    Type species: C. *hypophoia* Malloch & Cain, Can. J. Bot. 48: 1816. 1970. One species known.
  BB(A). Ascospores ellipsoidal, fusoid, or reniform...................................C
C(BB). Ascospores reniform..................*Fragosphaeria*
  Type species: F. *purpurea* Shear, Mycologia 15: 124. 1923. Two species known see Chesters, 1934).
CC(BB). Ascospores ellipsoid.............................D
  D(CC). Ascocarps covered with a yellow tomentum...............*Cephalotheca*
    Type species: C. *sulfurea* Fuckel, Symb. Mycol. Nachtr. 1: 297. 1871. One or two species (see Malloch and Cain, 1970b; Ram, 1971).
  DD(CC). Ascocarps white, tomentose, often with several dark appendages..................*Aporothielavia*
    Type species: A. *leptoderma* (Booth) Malloch & Cain, Mycologia 65: 1074. 1973. One species known.
E(AA). Ascospores with a sheath..............*Leucosphaera*
  Type species: *L. indica* von Arx, Mukerji & Singh, Persoonia 10: 141. 1978. One species known.
EE(AA). Ascospores lacking sheath........................F
  F(EE). Ascospore wall ornamented.................G
  FF(EE). Ascospore wall smooth.....................H
G(F). Ascospores ellipsoid, with hyaline wings........................*Emericellopsis*

Type species: E. *terricola* van Beyma, Ant. van Leeuwen. Ned. Tijdschr. Hyg. 6: 265. 1940. Two to nine species recognized (see Groslags and Swift, 1957; Malloch and Cain, 1970b; Beljakova, 1974b).

GG(F). Ascospores globose with reticulations...*Hapsidospora*
Type species: H. *irregularis* Malloch & Cain, Can. J. Bot. 48: 1819. 1970. Two species known (see Beljakova, 1975).

H(FF). Ascospores light brown.........*Pseudeurotium*
Type species: P. *zonatum* van Beyma, Zent. Bakt., Abt. II, 96: 416. 1937. Two or three species (see Malloch and Cain, 1970b).

HH(FF). Ascospores hyaline........................I

I(HH). Ascospores globose....................*Nigrosabulum*
Type species: N. *globosum* Malloch & Cain, Can. J. Bot. 48: 1823. 1970. One species.

II(HH). Ascospores lunate, ovoid, or elliptical, depending on the surface viewed..........*Connersia*
Type species: C. *rilstonii* (Booth) Malloch, Fungi Canadensis No. 32: 1. 1974. One species.

ASCOSPHAERALES Gaümann *ex* Benny & Kimbrough, *ord. nov.*

Ascosphaerales Gaümann, *nomen nudum*, Die Pilze, Birkhaüser, Basel und Stuttgart, p. 107. 1964 (without Latin diagnosis; Art. 36).

Ascocarpi reducti, simplices, nonostiolati, sine appendicibus, cum muro celluloso vel noncelluloso; asci deliquescentes, singuli vel aliquot per ascocarpum; ascosporae unicellulares, hyalinae vel pigmentosae, sine poris germinantibus, liberae vel in sphaerulis compactis glomeratae; anamorphoses ex aleurioconidiis vel arthroconidiis meristemibus constantes.

Ascocarps reduced, simple, nonostiolate, lacking appendages, with cellular or noncellular wall; asci deliquescent, single or several per ascocarp; ascospores one celled, hyaline or pigmented, without germination pores, free or united into compact spore balls; anamorphs consisting of aleurioconidia or meristem arthrospores.

Two families are considered here, the Ascosphaeraceae and Monascaceae.

Discussion: *Ascosphaera* and *Monascus*, the two genera on which these families are based, are both anomalies within the Ascomycetes. *Ascosphaera* was long considered related to the Endomycetaceae (Gaümann, 1928), while *Monascus* has been traditionally accepted as a reduced member of the Eurotiales. Spiltoir and Olive (1955) interpreted the enlarged ascogonium within which asci develop as a reduced cleistothecium and related it to the development found in *Monascus*. Both have a morphologically comparable ascogenous system, a reduced vegetative phase, a peridium composed of a single wall or a thin cellular sheath, ascogenous hyphae developing within an enlarging ascogonial cell, early deliquescence of asci from their point of attachment, asci floating free within a liquid centrum, eventual deliquescence of asci leaving spores or membrane-bound groups of spores, *i.e.*, spore balls, within the cavity, and anamorphs which are arthroconidial or meristem arthroconidial. Morphologically and developmentally they are similar and possibly related, and on this basis we include them in the same order.

One can only speculate on the relationship of the Ascosphaerales to other groups of Ascomycetes. In reference to plectomycetous taxa, Cain (1972) stated that "with the exception of the Onygenaceae and Monascaceae whose affinity is with the Pezizales, the families are related to various orders of ostiolate Ascomycota." Malloch (1979) placed the Monascaceae in the Pezizales but stated that *Monascus* may well represent the sole genus in a highly evolved family, and not just a simple, reduced discomycete. We see no justification for considering the Monascaceae closely related to the Pezizales, although they could possibly have had a common ancestry. While ascogonial and early ascocarp development are somewhat similar to those of certain Pezizales, peridial, ascal, and other features are too variable to make an accurate comparison. Most anamorphs of the Pezizales are blastoconidial, rarely sympoduloconidial; not arthroconidial or aleurioconidial.

Considerable interest was shown in the presence of a trichogyne in *Ascosphaera* (Spiltoir, 1955) in which its occurrence suggested a possible relationship to the higher Ascomycetes. While a trichogynal element is present in *Ascosphaera*, its ontogeny is quite different from those formed by numerous Pezizales. Multiple trichogynes present in *Bettsia* and *Arrhenosphaera* are somewhat suggestive of those in *Coprotus* and *Pyronema* (Pezizales), but too little is known about the cytological features of the ascogenous system in the Ascosphaeraceae to make a comparison beyond that point.

Although the presence of trichogynes and other ascogonial features of the Ascosphaeraceae and Monascaceae point to a possible phylogenetic relationship to higher ascomycetes, we disagree with the transfer of either of these taxa to the Pezizales. Fennell (1973) has noted a similar manner of ascus detachment and free-floating asci in the Ascosphaeraceae and Ophiostomataceae. This feature alone, however, is insufficient to suggest a relationship there. Luttrell (1955) suggested that the Pericystales (=Ascosphaerales *s.s.*) may represent a disjunct taxon perhaps related to the Gymnoascales (=Onygenales here). We propose to retain them in the Plectomycetes.

KEY TO THE FAMILIES OF ASCOSPHAERIALES

A. Ascocarp walls acellular; associated with bees..............................Ascosphaeraceae
AA. Ascocarp walls cellular; osmophilic, found in starcy substrates, or legume roots.Monascaceae

Ascosphaeraceae Olive & Spiltoir *in* Spiltoir and Olive, Mycologia 47: 242. 1955.

=Synascomycetaceae Vartichak, Le Botaniste 25: 365. 1933 (not validly published, Art. 36; see Cooke and Hawksworth, 1970).

=Pericystaceae Bessey, Morph. Tax. Fungi, p. 352. 1950 (not validly published, Art. 36; see Cooke and Hawksworth, 1970).

Hyphae septate; ascogonia swollen, with one to several trichogynes, becoming the nutricyte or acellular wall of the ascocarp; asci eight spored, produced in membrane-bound balls, upon evanescence ascospores may or may not remain in membrane-bound spore balls; ascospores one celled; anamorph a *Chrysosporium*, or absent; associated with honeybees, leaf cutting bees, and solitary bees.

Type genus: *Ascosphaera* Olive & Spiltoir. Three genera known.

Discussion: *Ascosphaera*, known in the older literature as *Pericystis*, may represent the most simplified plectomycete. The species of this genus have received considerable attention as the cause of chalk brood and other diseases in beehives. Spiltoir (1955) has shown that from a swollen cell of the female gametangium a trichogyne is extended and contacts a male hypha, plasmogamy occurs, and a portion of the trichogyne adjacent to the swollen cell produces an intrahyphal growth that extends back into the swollen cell. The intrahyphal growth with compatable nuclei becomes branched and through a crozier system forms asci at various levels within the large thick-walled cell. Spiltoir and Olive (1955) referred to this cell as a "nutriocyte." Within the nutriocyte numerous asci develop and eventually deliquesce, leaving spore balls throughout. Variable numbers of asci may be surrounded by a common membrane, which after ascal deliquescence becomes a large spore ball. If the nutriocyte is interpreted as a highly reduced ascocarp with deliquescent asci irregularly disposed, the fungus can be construed to be a plectomycete.

The family Ascosphaeraceae was created for two species and one variety of the genus *Ascosphaera* (Spiltoir and Olive, 1955). The genus had previously been placed in the Synascomycetaceae by Vartichak (1933) and the Pericystaceae by Bessey (1950). Gäumann (1964) placed the family in an order of its own, removing it from the Eurotiales where it was originally placed by Spiltoir and Olive. Skou (1972) erected the new genus *Bettsia* based on *Ascosphaera alvei* (Betts) Olive & Spiltoir, a saprophyte on stored pollen in the beehive. *Ascosphaera apis* (Maassen & Claussen) Olive & Spiltoir var. *major* (Prökschl & Zobl) Olive & Spiltoir was raised to species rank and a new species *Ascosphaera proliperda* Skou, was described. Stejskal (1974) described the new genus *Arrhenosphaera* and compared it with other taxa in the family. Skou (1975) described two new species of *Ascosphaera*, *A. aggregata* Skou and *A. fimicola* Skou, and the anamorph of *Bettsia alvei* (Betts) Skou, *Chrysosporium farinaecola* (Burnside) Skou. Fennell's (1973) suggestion that the Ascosphaeraceae and Ophiostomataceae may be related was not accepted by Skou (1975) who follows Luttrell (1955) in considering them a disjunct taxon possibly related to the Eurotiales.

KEY TO THE GENERA OF ASCOSPHAERACEAE

A. Ascogonia with 3-10 trichogynes; ascospores globose to ovoid; spore balls breaking apart early...................................B

AA. Ascogonia with one trichogyne; ascospores ellipsoid, short, cylindrical, or allantoid; spore balls remain intact.....*Ascosphaera*
Type species: *A. apis* (Maassen & Claussen) Olive & Spiltoir, *in* Spiltoir and Olive, Mycologia 47: 242. 1955. Six species known see Skou, 1972, 1975, 1979). Syn.: *Pericystis* Betts *non Pericystis* Agardh (see Spiltoir and Olive, 1955).

B(A). Spore cysts small, 19-34 μm in diam, variable in shape, containing a single spore ball; ascospores sphaerical; 3 trichogynes present.........*Bettsia*
Type species: *B. alvei* (Betts) Skou, Friesia 10: 7. 1972. One species.

BB(A). Spore cysts larger, 220-500 μm in diam, with several spore balls; ascospores sphaerical to ovoid; 4-10 trichogynes present..........*Arrhenosphaera*
Type species: *A. cranei* Stejskal, J. Apicult. Res. 13: 44. 1974. One species known.

Monascaceae Schroter, *in* Engler and Prantl, Nat. Pflanzenfam. 1(1): 148. 1894.

Mycelium hyaline to pinkish, slender; ascocarp initials produced as a forked branch with one branch becoming swollen and curved and the other remaining slender and eventually surrounding the first; ascocarps small, reddish, nonostiolate, produced on a stalklike hypha, glabrous, transparent; ascocarp peridium very thin and poorly differentiated, one to two cells deep in cross section, cells gelatinizing, forming a crust; asci irregularly disposed, subglobose to globose, evanescent, without croziers; ascospores hyaline to reddish, enclosed after ascal dissolution in a saclike membrane derived from the inner peridial cells; anamorphs arthroconidial or meristem arthrospores.

Type genus: *Monascus* van Tiegh. Four genera accepted.

Discussion: Ascocarps of *Monascus* have poorly differentiated peridia which are one to two cells thick. They are initiated as a forked branch with one branch becoming swollen and the other remaining filamentous and eventually coiling around it. Ascogenous hyphae developing from within the centrum often form both binucleate and uninucleate cells which soon become detached in most taxa, floating free within a liqud matrix. An enlarging ascogonial cell within the centrum appears to be the dominant characteristic of the Monascaceae. The peridial wall gelatinizes in *Monascus* but remains parenchymatous in other genera. Malloch (1970b) placed two genera in the family, *Ascorhiza* and *Monascus*, and Samson and Mouchacca (1975b) added *Leiothecium* which they had isolated from soil. While we include *Leiothecium* in our key to the genera of the Monascaceae, we have great reservations about its inclusion here. The ascogonial coil of *Leiothecium* does not have the enlarged cell typical of the other genera included here. Samson and Mouchacca did not illustrate or describe the development of the ascogenous and centrum tissues. Without this information we can not established family relationships. *Ascorhiza* has been found in the root nodules of legumes (Lechtova-Trnka, 1931) and *Xeromyces* and *Monascus* are small organisms usually associated with fermenting, starchy substrates or, as in *Xeromyces*, osmophilic (Fraser, 1953). Malloch (1970b) placed *Xeromyces* in the Thelebolaceae of the Pezizales, and later in the Pyronemataceae (Malloch, 1979), but clearly it does not belong here. The ascogenous system is distinctly different in *Thelebolus* and *Pyronema*, and Samuelson and Kimbrough (1978) have shown that ultrastructurally the asci of *Thelebolus* are a modified bitunicate type suggesting relationships to the Loculoascomycetes. The genus *Backusia* described by Thirumalacher *et al.* (1964) has been shown by Cole and Kendrick (1968) to be synonymous with *Monascus*.

Genera of the Monascaceae are usually placed in or near the Eurotiales. In morphology and development they appear to be more closely related to the Ascosphaeraceae.

KEY TO THE GENERA OF MONASCACEAE

A. Ascospores smooth; on starchy, fermenting or osmophilic substrates..............................B
AA. Ascospores reticulate; in roots or soil..............C
    B(A). Asci two spored; peridium not gelatinizing; osmophilic...............*Xeromyces*
        Type species: *X. bisporus* Fraser,
        Proc. Linn. Soc. NSW 78: 245. 1953.
        One species (see Malloch, 1970b).
    BB(A). Asci eight spored; peridium gelat-

inizing; on starchy, fermenting substrates............................*Monascus*
Type species: *M. ruber* van Tieghem, Bull. Soc. Bot. France 31: 226. 1884.
Many species (see Malloch, 1970b).
Syn.: *Backusia* Thirumalacher, Whitehead & Mathur.

C(BB). In root nodules; ascogonia and antheridia paired asci forming from disassociated ascogonial cells within an enlarging primordial cell.....................*Ascorhiza*
Type species: *A. leguminosarum* Lechtova-Trnka, Compt. Rend. Hebd. Seances Acad. Sci. 192. 497. 1931. One species known.

CC(BB). Found in soil; ascogonia and antheridia not paired; asci not developing inside swollen primordial cells...............*Leiothecium*
Type species: *L. ellipsoideum* Samson & Mouchacca, Can. J. Bot. 53: 1634. 1975.
One species known.

MICROASCALES Luttrell ex Benny & Kimbrough, *ord. nov.*

Microascales Luttrell, *nomen nudum*, Taxonomy of the Pyrenomycetes, Univ. Missouri Studies 24(3): 108. 1951 (without Latin diagnosis; Art. 36).

Ascocarpi globosi, pyriformes vel irregulares, plerumque atrocolorati, ostiolati vel nonostiolati, cum vel sine appendicibus; asci solitari vel catenulati, ovoidei vel globosi, octospori, deliquescentes; ascosporae dextrinoideae, unicellulae, atrocoloratae, cum 1-2 vel sine poris germinantibus; anamorphoses ex annelloconidiis, aleurioconidiis, vel arthroconidiis constantes.

Ascocarps globose, pyriform or irregular, usually dark colored, ostiolate or nonostiolate, with or without appendages; asci solitary or catenulate, ovoid or globose, eight spored, deliquescent; ascospores dextrinoid, one celled, dark colored, with one or two or without germination pores; anamorphs consisting of annelloconidia, aleurioconidia, or arthroconidia.

Three families recognized: Chadefaudiellaceae, Microascaceae, and Pithoascaceae.

Discussion: The family Microascaceae was proposed by Luttrell (1951) to accomodate *Microascus* which had been placed traditionally in the Ophiostomataceae (Nannfeldt, 1932) or the Eurotiaceae (Emmons and Dodge, 1931). Members of the family were characterized as having beaked ascocarps with evanescent asci disposed irregularly thoughout the centrum. Luttrell separated *Microascus* from other taxa of the order on the basis of centrum structure. The centrum of members of the Microascaceae consists of filamentous cells and that of Ophiostomataceae of pseudoparenchyma. Corlett (1966) added *Petriella* to the family. Barron *et al.* (1961a, 1961b) noted that these taxa were characterized by predominantly asymmetrical, honey-colored to reddish-brown, hairy ascocarps. Corlett (1963, 1966) observed that asci developed directly from filamentous ascogenous hyphae, not croziers. Various annelloconidial and aleurioconidial states have been reported as anamorphs, including *Scopulariopsis*, *Graphium*, *Doratomyces*, *Sporothrix*, and *Wardomyces*. A notable addition to the emended family was the inclusion by Malloch (1970a) of taxa with nonostiolate ascocarps. He concluded that Microascaceae most closely resemble Chaetomiaceae but differ from the latter in having dextrinod ascospores and in lacking croziers, and that the asci are irregularly disposed as opposed to fascicled. He included four ostiolate genera, *Lophotrichus*, *Microascus*, *Petriella*, and *Pithoascus*, and two cleistocarpus genera, *Petriellidium* and *Kernia*.

In a monograph of *Lophotrichus*, Seth (1971) emended the genus and described a new species. He proposed the family Lophotrichaceae for this genus and placed it in the Microascales, noting that its production of irregular asci excluded it from the Chaetomiales. A comparison of centrum development in *Lophotrichus* (Whiteside, 1962) and in *Microascus* (Corlett, 1963, 1966) clearly indicates that these taxa cannot be placed in separate families. Therefore, we are retaining *Lophotrichus* in the Microascaceae (*sensu* Malloch, 1970a) since this name has priority over the Lophotrichaceae (Seth, 1971). Von Arx (1973b) described a new genus *Pithoascus* based upon three species previously included in *Microascus* [*P. intermedius* (Emmons & Dodge) v. Arx, *P. nidicola* (Massee & Salmon) v. Arx, and *P. Schumacheri* (Hansen) v. Arx]. He later transferred *Microascus exsertus* Skou to and described two new species of *Pithoascus*, and added four new species to *Petriellidium* (von Arx, 1973c). Von Arx provided a key to species of both *Pithoascus* and *Petriellidium*.

In his revision of *Microascus*, von Arx (1975c) described one new species and noted the close similarity of certain species to members of *Kernia* and *Chaetomium*. *Leuconeurospora* was proposed by Malloch and Cain (1970b) to accommodate *Eurotium pulcherrimum* Wint. and was tentatively placed in the Pseudeurotiaceae. Udagawa and Furuya (1973) later examined *Leuconeurospora* and, because of its irregularly disposed asci and one-celled, reddish-brown ascospores, suggested a possible relationship to *Microascus*, although they could not determine if the ascospores were dextrinoid or if germ pores were present. Von Arx (1978) includes *Leuconeurospora* in his key to the Microascaceae, although he seriously questions its status there and suggested that it may be related to the Sordariaceae or to the Testudinaceae (which has dothidiaceous affinities). We agree that it does not belong in the Microascaceae. A similar species was described by Locquin-Linard (1975) as the type species of the new genus *Faurelina*. This genus, like *Pithoascus*, has dextrinoid ascospores but lacks germ pores (von Arx, 1978). In addition, they both produce arthroconidia, not annelloconidia which are typical of the family. On this basis we are setting aside *Faurelina* and *Pithoascus* and placing them in a new family, Pithoascaceae.

Locquin-Linard (1977) recognized an additional genus, *Enterocarpus*, a nonostiolate member of the Microascaceae with apical tufts of hairs and ascospores surrounded by a hyphal "capillitium." Centrum features need to be compared with those of *Kernia* and *Microascus*. Until *Enterocarpus* is compared with other members of the Microascaceae it will be difficult to determine whether the "capillitium" is merely elongated paraphysoidal elements as are found in *Microascus* or if they are unique structures that can be used for generic distinction.

Dispite the unique type of ascocarp, were are including *Chadefaudiella* (Chadefaudiellaceae) in the Microascales because of the similarity of centrum ontogeny, especially the formation of chained asci and paraphysoidal elements, to members of the Microascaceae (Corlett, 1963; Locquin-Linard, 1973; Parguey-Leduc, 1977).

KEY TO THE FAMILIES OF MICROASCALES

A. Ascospores with one or two germ pores;
    anamorphs annelloconidial or aleurioconidial....................................Microascaceae
    (p. 43)
AA. Ascospores without germ pores; anamorph

arthroconidial or lacking............................B
B(AA). Ascocarps all pseudoparenchymatous;
ascospores dextrinoid when young;
anamorphs arthroconidial...........Pithoasaceae
(p. 45)
BB(AA). Ascocarps with pseudoparenchymatous
tissue below, parallel, branching,
anastomosing, thick-walled hyphae
above (=so-called capillitium);
ascospores ?dextrinoid; anamorphs
unknown.....................Chadefaudiellaceae
(p. 46)

Microascaceae Luttrell *ex* Malloch, Mycologia 62: 734. 1970.

Microascaceae Luttrell, *nomen nudum*, Taxonomy of the Pyrenomycetes, Univ. Missouri Studies 24(3): 108. 1951 (without Latin diagnosis, Art. 36).

=Lophotrichaceae Seth, Nova Hedwigia 19: 592. 1971 (1970).

Ascocarps variously shaped, appendaged, tomentose, or glabrous, dark; ascocarp initials coiled; asci evanescent, formed singly or catenulate, variously shaped, lacking croziers; ascospores one celled, dextrinoid when young, straw to copper colored at maturity, wall smooth, with one or two germ pores; anamorphs aleurioconidial, annelloconidial, or absent.

Type genus: *Microascus* Zukal. Six genera known.

Discussion: When Luttrell (1951) proposed the Microascales, he included two families, the Microascaceae and Ophiostomataceae. Barron *et al.* (1961a, 1961b), Corlett (1963, 1966), Malloch (1970a), and von Arx (1973c, 1975c, 1978) have more or less recognized this relationship. Malloch (1970a) redefined the family to include both ostiolate and nonostiolate taxa while von Arx further extended the family to include taxa that produce arthroconidial anamorph and ascospores without germ pores. We exclude the latter taxa, however, and include only the six genera that form ascospores with germ pores in the Microascaceae. The key below is adapted from that of von Arx (1978).

KEY TO THE GENERA OF MICROASCACEAE

A. Ascocarps with a wall of *textura epidermoidea*; ascospores with two germ pores;

anamorphs include *Graphium*, *Scedosporium*, and *Arthrographis*.......................................B

AA. Ascocarps with pseudoparenchymatous walls composed of angular, dark cells.......................C

B(A). Ascocarps ostiolate; ascospores reddish brown, often asymmetrical......*Petriella*

Type species: *P. sordida* (Zukal) Barron & Gilman, *in* Barron, Cain, and Gilman, Can. J. Bot. 39: 839. 1961. Six species known (see Barron *et al.*, 1961a; Malloch, 1970a).

BB(A). Ascocarps usually not ostiolate; ascospores usually yellowish, rarely reddish, symmetrical...............*Petriellidium*

Type species: *P. boydii* (Shear) Malloch, Mycologia 62: 738. 1970. Six species known (see von Arx, 1973c).

C(AA). Ascospores embedded in a hyphal "capillitium" at maturity, each with a prominant germ pore.............................*Enterocarpus*

Type species: *E. uniporus* Locquin-Linard, Rev. Mycol. 41: 513. 1977. Two species.

CC(AA). Ascospores small, not embedded in a "capillitium," or with two germ pores............D

D(CC). Ascocarps ostiolate; ascospores asymmetrical, with one germ pore...........................*Microascus*

Type species: *M. longirostris* Zukal, Verh. Zool.-Bot. Ges., Wien 35: 339. 1885. Twelve species known (see von Arx, 1975c for key to species; additional species described by Ram, 1971; Udagawa and Furuya, 1978; see also Barron *et al.*, 1961b; Morton and Smith, 1963).

DD(CC). Not as above............................E

E(CC). Ascocarps nonostiolate, with or without tufts of hairs; ascospores with one or two germ pores, hyaline, reddish, yellowish, or brownish.........................*Kernia*

Type species: *K. nitidia* (Sacc.) Nieuwland, Amer. Midl. Nat. 4: 379. 1916. Five species known (see Malloch and Cain, 1971c for key to species). Syn.: *Magnusia* Sacc. *non* *Magnusia* Klotzsch (see Benjamin, 1956b).

EE(CC). Ascocarps usually ostiolate, with an apical tuft of thick-walled hairs; ascospores with two germ pores, yellowish or brownish.................. *Lophotricus*
Type genus: *L. ampullus* Benjamin, Mycologia 41: 347. 1949. Five species known (see Seth, 1971 for key to species; additonal species described by Morinaga *et al.*, 1978).

Pithoascaceae Benny & Kimbough, *fam. nov.*

Ascocarpi globosi vel ellipsoidei, nigri vel atrocolorati, immersi vel semiimmersi, raro superficiales, ostiolati vel nonostiolati, solitarii vel aggregati, saepe crustacei; asci globosi vel subclavati, evanescentes, octospori; ascosporae in statu juvenili dextrinoideae, laeves vel cum costis longitudinalibus, fusiformes vel naviculiformes, pallidae vel atrocoloratae, cum poris germinantibus; anamorphoses absentes vel ex arthroconidiis vel chlamydosporis constantes.

Ascospores globose or ellipsoid, black or dark colored, immersed or semiimmersed, rarely superficial, ostiolate or nonostiolate, solitary or aggregated, often crustaceous; asci globose or subclavate, evanescent, eight spored; ascospores dextrinoid in youth, smooth or with longitudinal ribs, fusoid or naviculate, pale or dark colored, with germination pores; anamorphs lacking or consisting of arthroconidia or chlamydospores.

Type genus: *Pithoascus* von Arx, Proc. Kon. Ned. Acad. Wetensch. Amsterdam, Ser. C, 76: 292. 1973. Two genera included.

Discussion: We propose the Pithoascaceae for those taxa of Microascales with arthroconidial anamorphs and narrowly fusoid or naviculate ascospores without germ pores. The dextrinoid ascospores and similar ascocarp structure and development suggest a relationship to the Microascaceae. We include two genera, *Pithoascus* and *Faurelina*. *Byssoascus* of the Gymnoascaceae (von Arx, 1971b), with its narrowly fusoid, straw-colored ascospores with longitudinal ribs and arthroconidial anamorph appears similar to *Faurelina*. They differ, however, in that *Byssoascus* develops asci from a crozier system and has very thin, light-colored peridial hyphae. Von Arx (1971b) acknowledged that *Byssoascus* did not appear to be related to other Gymnoascaceae, but he, like Barron and Booth (1966) who described the type, placed it there on superficial resemblances. Further study might prove that *Byssoascus* is a reduced form of Microascales.

The arthroconidial anamorphs of *Pithoascus* and *Faurelina* are very similar and appear to belong to *Arthrographis* (von Arx, 1978). Although the narrowly fusoid, ribbed ascospores of *Leuconeurospora* appear similar to those of *Faurelina*, the former differs in having unchained, globose asci, hyaline ascospores, and a cephalothecoid peridium. We concur with von Arx's (1978) decision to place *Leuconeurospora* in the Loculoascomycetes.

KEY TO THE GENERA OF PITHOASCACEAE

A. Ascospores smooth, straw to copper colored; ascocarps thicked walled, ostioles absent or inconspicuous, peridium often encrusted....................................*Pithoascus*
Type species: *P. nidicola* (Massee & Salmon) v. Arx, Proc. Kon. Ned. Acad. Wetensch. Amsterdam, Ser. C, 76: 292. 1973. Six species (see von Arx, 1973c, 1978).

AA. Ascospores with longitudinal ribs, light brown to copper; ascocarps elongate or pustulate, nonostiolate, peridium not encrusted....................................*Faurelina*
Type species: *F. fimigenes* Locquin-Linard, Rev. Mycol. 39: 127. 1975. Two species (see von Arx, 1978).

Chadefaudiellaceae Faurel & Schotter *ex* Benny & Kimbrough, *fam. nov.*

Chadefaudiellaceae Faurel & Schotter, *nomen nudum*, Compt. Rend. Hebd. Seances Acad. Sci. 249. 151. 1959 (without Latin diagnosis; Art. 36).

Ascocarpi elongati, nonostiolati, ex peridio pseudoparenchymate in substrato immerso et "capillitio" aerio constantes; asci catenulati, globosi vel clavati, evanescentes, octospori; ascosporae sinae poris germinantibus, nondextrinoideae; anamorphoses ignoti.

Ascocarps elongate, nonostiolate, consisting of a pseudoparenchymatous peridium embedded in the substrate and an aerial "capillitium"; asci catenulate, globose or clavate, evanescent, eight spored; ascospores without germination pores, nondextrinoid; anamorph unknown.

Type genus: *Chadefaudiella* Faurel & Schotter, Compt. Rend. Hebd. Seances Acad. Sci. 249: 152. 1959 (see also Faurel and Schotter, 1966; Faurel and Locquin, 1972). Only a single genus included.

Discussion: Chadefaudiella was originally described for a single species, *C. quezelii* Faurel & Schotter (1959), that was observed on gazelle dung collected at Koudou, Chad (Africa). In a more elaborate description (Faurel and Schotter, 1966), they showed that the fungus produces an elongate ascocarp with striate sides, setae that anastomose apically, a gleba with capillitia, globose, evanescent asci, and one-celled, fusiform ascospores. Although they repeated the description and Latin diagnosis provided in the earlier paper (Faurel and Schotter, 1959), additional illustrations were published in the second publication. A second species, *C. thomasii* Faurel & Locquin (1972), was described from dung collected in Algeria. Locquin-Linard (1973) later described and compared ascocarp development and ascus ontogeny in the two species of *Chadefaudiella*, clearly demonstrating that in *C. quezelii* the asci are formed in chains and that the ascospores are striate.

A second genus, *Faurelina*, described later was thought to be related to *Chadefaudiella* (Locquin-Linard, 1975). Parquey-LeDuc and Locquin-Linard (1976) studied the only species of *Faurelina*, *F. fimigenes*, and concluded that it belonged in the ascolocular Pyrenomycetes. Von Arx (1978) transferred the species into the Microascaceae because it produces dextrinoid ascospores. He also transferred *Leuconeurospora elongata* Udagawa & Furuya to *Faurelina*. We have treated *Faurelina* in the Pithoascaceae (see above).

Chadefaudiella, the only genus of the Chadefaudiellaceae, is placed in the Microascales because it produces asci in chains and has other characteristics of taxa of Microascaceae and Pithoascaceae. The ascospore wall of *C. quezelii* is striate as is the spore wall of *Faurelina fimigenes* (Locquin-Linard, 1973, 1975). Since the Latin diagnosis was not originally provided for Chadefaudiellaceae by Faurel and Schotter (1959) or subsequent workers, we have provided one above.

OPHIOSTOMATALES Benny & Kimbrough, *ord. nov.*

Ascocarpi ostiolati vel nonostiolati, globosi, pyriformes vel irregulares, interdum rostrati, fuscati, carbonacei, vel raro late colorati et carnosi; asci solitarii vel catenulati, globosi vel late ellipsoidei, octospori, irregulariter dispositi, deliquescentes; ascosporae unicellulae, variables, plerumque laeves, hyalinae vel luteolae, interdum striatae, a latere procatae, vel cum vagina gelatinosa, sine poris germinantibus, nondextrinoideae; anamorphoses variables ex phialoconidiis, blastoconidiis, annelloconidiis, vel sympoduloconidiis constantes; pleurumque in cellulosa viventi.

Ascocarps ostiolate or nonostiolate, globose, pyriform, or irregular, sometimes with an elongate beak, dark, carbonaceous, or rarely light colored and fleshy; asci solitary or catenulate, globose or broadly ellipsoid, irregularly disposed, eight spored, deliquescent; ascospores striate, laterally ridged, or with a gelatinous sheath, without germination pores, nondextrinoid; anamorphs variable, consisting of phialoconidia, blastoconidia, annelloconidia, or sympoduloconidia; mostly cellulosic

Only one family: Ophiostomataceae.

Ophiostomataceae Nannfeldt, Nova Acta Regiae Soc. Sci. Upsal., Ser. 4, 8(2): 30. 1932 (with the characteristics of the order).

Discussion: Three genera have historically been placed in the Ophiostomataceae: *Ceratocystis* Ellis & Halst., *Europhium* Parker, and *Sphaeronaemella* Karst. ex Seeler. The type of the family, *Ophiostoma* Syd., was considered a later homonym of *Ceratocystis* by Hunt (1956) who monographed the genus. Article 10 of the International Code of Botanical Nomenclature (Stafleu, 1972) obviates any change in the family name. *Ceratocystis* is the largest genus and is of great economic importance because of plant pathogenic or wood-staining species. Recent treatments of the genus have utilized ascospore morphology as a criterion to separate the genus into smaller groups (Griffin, 1968; Olchowecki and Reid, 1974). Von Arx (1974a), however, suggested that species with a *Chalara*-type anamorph should be retained in *Ceratocystis* but those species with blastoconidia in sympodulae should transferred to *Ophiostoma*. *Europhium*, considered the cleistothecial counterpart of *Ophiostoma*, was maintained as a distinct genus by von Arx (1974a, 1974b). Both *Europhium* and *Ophiostoma* are condidered synonyms of *Ceratocystis* by Upadhyay and Kendrick (1975). We consider *Europhium* to be a synonym of *Ophiostoma*.

Von Arx (1974a) thought that several of the yeastlike genera that produce asci on ascophores, *i.e.*, *Ambrosiozyma*, *Cephaloascus*, *Botryoascus*, and *Hormoascus*, were related naturally to the Ophiostomataceae. The latter three taxa formed chains of asci that resembled conidia of *Verticicladiella*, a common anamorph in this family. Weijman and de Hoog (1975) support the separation of *Ceratocystis* and *Ophiostoma sensu* von Arx. They found that rhamnose was present in the walls of *Ophiostoma*, but not in *Ceratocystis*. This correlates well with the types of anamorphs and the presence of cellulose in species of these genera (Jewell, 1974). See table below:

Genus	Group[1]	Rhamnose[2]	Cellulose[3]	Anamorphs[4]
Ceratocystis	*Fimbriata*	-	-	Enteroblastic Phialidic
Ophiostoma	*Pilifera*, *Ips*, *Minuta*	+	+	Holoblastic Annello- or Sympoduloconidia

[1] Based on ascospore characters of *Ceratocystis sensu* Olchowecki and Reid, 1974; [2] Weijman and de Hoog, 1975; [3] Jewell, 1974; [4] Upadhyay and Kendrick, 1975.

Upadhyay and Kendrick (1975) described four new anamorphs associated with *Ceratocystis* (inclusive of *Europhium* and *Ophiostoma*), making the total number of anamorphic genera 16, the highest known for any genus. They also described a new ascomycete genus, *Ceratocystopsis*, based upon Olchowecki and Reid's (1974) *Minuta* group of *Ceratocystis*.

Recently, Redhead and Malloch (1977) have greatly expanded the concepts of Cain (1972) and von Arx (1974a), who believed that members of the Ophiostomataceae appear to be related to cellular and filamentous yeastlike taxa. In addition to *Ceratocystis*, *Europhium*, *Ophiostoma*, and *Ceratocystopsis*, Redhead and Malloch accepted the cleistothecoid *Amorphotheca*, and the cellular or filamentous, yeastlike genera *Ambrosiozyma*, *Ascoidea*, *Botryoascus*, *Cephaloascus*, *Endomyces*, *Hansenula*, *Hormoascus*, *Hypopichia*, *Pachysolen*, *Phialoascus*, and *Stephanoascus*. They felt that most of these genera have in common the formation of galeate ascospores, an insect association, growth in plant exudates, blastoconidial anamorphs, and globose to broadly clavate asci that do not arise from croziers. *Amorphotheca* was included because its blastoconidial anamorph, *Hormoconis resinae* (Lindau) v. Arx & de Vries (=*Hormodendron resinae* Lindau), resembled that of *Ambrosiozyma monospora* (Saito) van der Walt. With the inclusion of *Endomyces* and similar yeastlike genera in the Ophiostomataceae, they chose the family name Endomycetaceae since it had priority.

While Redhead and Malloch's proposal has some merit and certainly should be considered, their ideas are based upon morphology of the organisms as observed with the light microscope and do not include any data available on the ultrastructure or chemical analysis of hyphal, ascal, and spore walls. Valuable data on septal ultrastructure in many Hemiascomycetes must be analysed when proposing natural groups such as the Endomycetaceae. Four distinct septal types are known for the filamentous yeasts that may indicate natural lines of evolution (Kreger-van Rij and Veenhuis, 1973; Kurtzman, 1977). They are: (1) the dolipore type present in *Ambrosiozyma* spp. (Kreger-van Rij and Veenhuis, 1973); (2) the multiperforate type present in *Botryoascus*, *Endomycopsis*, *Saccharomycopsis* (Kreger-van Rij and Veenhuis, 1973), *Endomyces* (Kreger-van Rij and Veenhuis, 1972), and *Dipodascus* (Kreger-van Rij and Veenhuis, 1974); (3) a single narrow pore not plugged by Woronin bodies in *Endomycopsis*, *Arthroascus*, *Saccharomycopsis* (Kreger-van Rij and Veenhuis, 1973), and *Dipodascopsis* (Kreger-van Rij and Veenhuis, 1974); and (4) a typical ascomycetous septum plugged with Woronin bodies in *Cephaloascus* (Kurtzman, 1977).

Multiperforate septa occur, with some variations, in members of the Mucorales and Chytridiales (Gull, 1978). The septum with a single, central perforation plugged or surrounded by Woronin bodies is the type present in essentially all of the Ascomycetes and Deuteromycetes (Gull, 1978; Benny and Samuelson, 1980). On this basis we exclude all genera without the ascomycetous septum from the Ophiostomataceae. Since the genus *Endomyces*, including the type *E. decipiens* Reess, has multiperforate septa (Kreger-van Rij and Veenhuis, 1972), *Endomyces* and the family name Endomycetaceae must be excluded from the *Ceratocystis*-*Ophiostoma* complex. Hawes and Beckett (1977) have shown that *Chalara* sp., the anamorph of *Ceratocystis* *adiposa* (Butler) C. Moreau, has the typical ascomycetous septum. *Botryoascus*, also with the multiperforate septum, should be excluded from the family. Weijman (1975) has shown that *Botryoascus* and *Ceratocystis* have a different wall chemistry and also (Weijman, 1976) that on the basis of wall chemistry *Cephaloascus* was not related to *Ophiostoma* or *Europhium*. *Cephaloascus* can also be separated from *Ceratocystis* because of distinctly different anamorphs. For these reasons we exclude *Cephaloascus* from the Ophiostomataceae. *Ambrosiozyma* does not belong here because four species have a dolipore like septum reminiscent of certain basidiomycetes (Kreger-van Rij and Veenhuis, 1972, 1973; Flegler *et al.*, 1976; Gull, 1978). We believe that septal ultrastructure is useful in tracing phylogeny and relationships in Ascomycetes as has been done in Basidiomycetes (Moore, 1977, 1978; Tu and Kimbrough, 1978; Khan and Kimbrough, 1980).

A number of students have included *Sphaeronaemella* in the Ophiostomataceae (Dennis, 1968; Müller and von Arx, 1973), although von Arx and Müller (1954) believed earlier that it was a relative of Melanosporaceae with colorless ascospores. From a study of *S. fimicola* Marc. in culture, Cain and Weresub (1957) concluded that it was closely related to *Ceratocystis* but it should be included in the Hypocreaceae because of the structure and color of the ascocarps. Malloch (1974b) transferred two species of *Viennotidia* (Hypocreales) to *Sphaeronaemella* and provided a key to the four recognized species. He felt that the genus was unrelated to *Ceratocystis*, and in a later paper placed it in the Nectriaceae (Malloch, 1979). While we agree that similarities in anamorphs and ascocarp pigmentation suggest a relationship to the Hypocreales, we would restrict the Nectriaceae to taxa in which the asci remain persistant and possess an apical pore apparatus. Almost all of the Nectriaceae have two-celled ascospores, a feature not found in *Sphaeronaemella*.

Subbaromyces (Hesseltine, 1953) and *Chadefaudia* (Feldmann, 1957) have also been placed in the Ophiostomataceae. *Subbaromyces* was placed here because the ascocarps had long beaks composed of parallel hyphae, a centrum without paraphyses, and broadly clavate, deliquescent asci (Cole *et al.*, 1974). Ascospores of *S. splendens* Hesselt. are two celled and are surrounded by a gelatinous sheath, the asci are very elongate and they form from a basal cluster, they are thick walled in youth and are apically thickened. These features are suggestive of Loculoascomycetes.

Chadefaudia was included in the Ophiostomataceae by Feldmann (1957) because its asci were irregularly disposed in the centrum. Kohlmeyer (1972) examined the type of *Chadefaudia*, *C. marina* Feldmann, and found that the asci were formed in a hymenial layer, became detached early in their development, and were forced into the centrum during the maturation process giving the appearance of being irregularly disposed. We concur with Kohlmeyer's placement of this genus in the Halosphaeriaceae.

With the exclusion of the aforementioned genera and the synonymy of *Europhium*, four genera remain. They can be distinguished in the following key:

KEY TO THE GENERA OF OPHIOSTOMATACEAE

A. Ascocarps fleshy, bright or light colored.................................*Sphaeronaemella*
Type species: *S. helvellae* (Karst.) Karst. ex Seeler, Farlowia 1: 127. 1943. Four species known (see Malloch, 1974b for key)

AA. Ascocarps typically dark and crustose.................B

B(AA). Ascospores elongate, sheathed, sheath attenuated at the ends...*Ceratocystopsis*
Type species: *C. minuta* (Siem.) Upadhyay & Kendrick, Mycologia 67: 800. 1975 (eventually will include the *Minuta* group of *Ceratocystis* [see Olchowecki and Reid, 1974]).

BB(AA). Ascospores not as above......................C

C(BB). Ascospores short, curved, lunate, or naviculate, sheathed; anamorphs enteroblastic and phialidic; no cellulose or rhamnose in cell walls..............*Ceratocysis*
Type species: *C. fimbriata* Ellis & Halst., N.J. Agr. Exp. Sta. Bull. 76: 14. 1890. Many species (see Olchowecki and Reid, 1974 for keys to the species in the *Fimbriata* group of *Ceratocystis*).

CC(BB). Ascospores not as above, sheathed or not sheathed; anamorphs holoblastic, sympodial, or annellidic; cellulose and rhamnose in cell walls...............*Ophiostoma*

Type species: *O. pilifera* (Fr.) Sydow & Sydow, Ann. Mycol. 17: 43. 1919. Many species known (see Olchowecki and Reid, 1974 for keys to species in the *Ips* and *Pilifera* groups of *Ceratocystis*). Syn.: *Europhium* Parker.

AN ANNOTATED LIST OF CLEISTOTHECIAL ASCOMYCETES

Within the past two decades numerous studies on the biology and taxonomy of Ascomycetes have shown that many cleistothecial taxa represent a reduced or modified form of perithecial, apothecial, or pseudothecial groups. The list below summarizes these studies and expresses our view as to where these genera, with current knowledge, belong.

Actinodendron--a monotypic genus described in the Gymnoascaceae by Orr and Kuehn (1963a) but rejected by Hughes (1968) who found that it was based on the hyphomycete *Oncocladium flavum*.

Ajellomyces--included here in the Arthrodermoideae of the Gymnoascaceae (Onygenales).

Albertinella--based on *A. reticulata* Kirsch. but a second species, *A. polyporicola* (Jacz.) Malloch & Cain (1972a) has been added and the genus was placed among those taxa "of unknown affinities." Malloch (1970b) notes that a final disposition will await the determination of the presence or absence of germ pores in the ascospores. The absence of germ pores would suggest a relationship to the Cephalothecaceae. Udagawa and Horie (1971a) illustrated *A. polyporicola* as *Cephalotheca splendens* Udagawa & Horie (see Malloch and Cain, 1972a; Malloch, 1979).

Allescheria--We are following Malloch (1970a) in considering this genus a synonym of *Petriellidium*. Von Arx (1974b) considers *Allescheria gayonii* (Cost.) Sacc. & Syd. to be a synonym of *Monascus ruber* van Tiegh.

Amauroascus--included here in the Arachnioideae of the Gymnoascaceae (Onygenales).

Amorphotheca--a monotypic genus based upon *Amorphotheca resinae* Parbery (1969), the teleomorph of *Hormoconis resinae* (von Arx, 1973a). Parbery (1969) included *A. resinae* in a separate family, Amorphothecaceae (Eurotiales), a position accepted by Barr (1976). Fennell (1973) suggested a relationship with the Hemiphacidiaceae (Helotiales), and Redhead and Malloch (1977) placed it in the Ophiostomataceae (their Endomycetaceae) where it has been retained by Malloch (1979) because its anamorph is similar to that of

Ambrosiozyma. We are excluding *Amorphotheca* from the Plectomycetes for reasons given in the discussion of the Ophiostomataceae. It is probably a reduced discomycete as was suggested by Fennell (1973).

Amylocarpus--a marine fungus that is thought by Malloch (1970b) to be a member of the Hypocreaceae or Nectriaceae (Hypocreales), although it has been placed in the Aspergillaceae or Eurotiaceae (Trichocomaceae here) by Fennell (1973) and Kohlmeyer (1960; as *Plectolitus*). Lack of an anamorph in A. *encephaloides* Curr. hampers establishment of a closer relationship with the Trichocomaceae. *Plectolitus* Kohlm. is considered a synonym (Kohlmeyer and Kohlmeyer, 1971).

Anixiella--according to Muller and von Arx (1973) and Malloch and Cain (1971d), *Anixiella* (Cain, 1961b) is the cleistothecial counterpart of *Gelasinospora* (Sordariaceae). Species illustrated by Cain (1961b), Udagawa (1965), Udagawa, Furuya, and Horie (1973), Horie and Udagawa (1974), Mukerji and Saxena (1974), and Furuya and Udagawa (1977). Uecker (1979) has studied the the cytology and ascocarp ontogeny in *Anixiella endodonta* Malloch & Cain.

Anixiopsis--treated here in the Onygenaceae (Onygenales).

Aphanoascus--treated here in the Trichocomaceae (Eurotiales).

Apinisia--treated here in the Arthrodermoideae of the Gymnoascaceae (Onygenales).

Apodus--members of this genus have ovoid to cylindrical asci with an apical pore. Malloch and Cain (1971d) included A. *deciduus* Malloch & Cain in the Sordariaceae. Von Arx (1975a) described a second species, A. *oryzae* De Carolis & v. Arx, and suggested a relationship to *Zopfiella*.

Aposphaeriopsis--a synonym of *Cephalotheca* (q.v.) according to Chesters (1934). Malloch (1970b) discusses the genus in detail.

Aporothielavia--treated here in the Cephalothecaceae (Eurotiales).

Arachniotus--treated here in the Arachnioideae of the Gymnoascaceae (Onygenales). Species illustrated by Udagawa (1963b, 1970) and Udagawa and Takada (1968).

Arachnomyces--treated here in the Onygenaceae (Onygenales).

Arachnotheca--treated here in the Arachnioideae of the Gymnoascaceae (Onygenales).

Argynna--treated among the genera of unknown affinities by Malloch (1970b). *Argynna polyhedron* (Schw.) Morg. has a cephalothecoid peridium and, therefore, was placed in the Cephalothecaceae by von Höhnel (1917). Malloch and Cain

(1970b) excluded it from this family, however, since they felt that peridial type was not a stable family character. Martin (1941b) found long, stipitate, broadly clavate asci, and two-celled ascospores in material grown in culture. Von Arx (1971a) placed *Argynna*. *Lepidosphaeria*, *Neotestudina*, *Pseudophaeotricum*, and *Testudina* in the Testudinaceae as did von Arx and Müller (1975). Hawksworth and Booth (1974) treated the Testudinaceae as a synonym of the Zopfiaceae and all of the above genera except *Argynna* as synonyms of *Zopfia*. Further work must be done before affinities of this genus can be determined. Ainsworth (1971) placed *Argynna* in the Meliolales.

Arrhenosphaera--treated here in the Ascosphaeraceae (Ascosphaeraceae).

Arthroderma--treated here in the Arthrodermoideae of the Gymnoascaceae (Onygenales).

Ascocalvatia--treated here in the Onygenaceae (Onygenales).

Ascorhiza--treated here in the Monascaceae (Ascosphaerales).

Ascoscleroderma--treated here as a synonym of *Elaphomyces* (*q.v.*; see Trappe, 1979)(Elaphomycetales).

Ascosphaera--treated here in the Ascosphaeraceae (Ascosphaerales).

Auxarthron--treated here in the Gymnoascoideae of the Gymnoascaceae (Onygenales).

Backusia--treated here as a synonym of *Monascus* (Monascaceae; Ascosphaerales).

Batistia--a genus of uncertain affinities (see also Malloch, 1970b). *Batistia annulipes* (Mont.) Ciferri has a cephalothecoid peridium and, therefore, was included in the Cephalothecaceae *sensu* von Höhnel (1917) when originally described by Ciferri (1958). Ciferri proposed a monogeneric tribe, the Batistieae, because the ascocarp of *B. annulipes* was woody and stipitate, and the peridium was relatively thick, whereas, other members of the family had carbonaceous, sessile ascocarps with a relatively thin peridium.

Battarrina--considered a member of the Nectriaceae (Hypocreales) by Malloch (1970b). The sole species, *B. inclusa* (Berk. & Br.) Clements & Shear, is parasitic on ascocarps of *Tuber puberulum* Berk. & Br. (Hawker, 1955). It was originally described as a subgenus of *Hypocrea*.

Bettsia--treated here in the Ascosphaeraceae (Ascosphaerales).

Bombardia--a member of the Sordariaceae according to Müller and von Arx (1973) and Lundqvist (1972). The cleistothecia are clavate and the asci are typically sordariaceous.

Boothiella--according to von Arx (1974b, 1975a), *Boothiella* Lodhi & Mirza (1962) is a synonym of *Thielavia*.

Byssoascus--treated here in the Arachnioideae of the Gymnoascaceae (Onygenales).

Byssochlamys--treated here in the Trichocomaceae (Eurotiales).

Capsulotheca--considered a genus of unknown affinities by Malloch (1970b), although he suggested a possible relationship to the Pseudeurotiaceae. Von Arx (1974b) considered it a synonym of *Emericellopsis*.

Carothecis--a genus based upon *Cephalotheca palearum* Rich. (Clements and Shear, 1931) and thought to be a possible synonym of *Cephalotheca* by Ainsworth (1971). Malloch (1970b) could not locate herbarium material and, therefore, was not able to place the genus.

Carpenteles--treated here as a synonym of *Eupenicillium* (*q.v.*)(see von Arx, 1974b).

Celtidia--a monotypic genus, *Celtidia duplicispora* Janse, was synonymized with *Zopfia* by Malloch and Cain (1972a) and retained there by Hawksworth and Booth (1974). Hawksworth (1979) recognized *Celtidia* as a genus of the Testudinaceae.

Cenococcum--treated here as the anamorph of *Elaphomyces* (Trappe, 1971). The mycorrhizal mantles of the anamorphs and teleomorphs are identical.

Cephalotheca--treated here in the Cephalothecaceae (Eurotiales).

Ceratocarpia--included in the Eurotiales by Clements and Shear (1931) and Ainsworth (1971); although cleistothecial, ascospores of *C. cactorum* Rolland (1896) are muriform, a characteristic that best places this genus in the Loculoascomycetes (Luttrell, 1973).

Ceratocystis--treated here in the Ophiostomataceae (Ophiostomatales).

Ceratocystopsis--treated here in the Ophiostomataceae (Ophiostomatales).

Chadefaudia--originally placed in the Ophiostomataceae by Feldmann (1957) and recently transferred to Halosphaeriaceae by Kohlmeyer (1972). See the discussion under Ophiostomatales for details.

Chadefaudiella-treated here under the Chadefaudiellaceae (Microascales).

Chaetomidium--a member of the Chaetomiaceae classically defined as producing cleistothecia with hairs. It was combined with *Thielavia* (*q.v.*) by Malloch and Cain (1973a) but

but *Chaetomidium* was retained as a separate genus by von Arx (1975a) based on differences in peridial wall cells, ascospore morphology, and presence of ascocarp hairs. Von Arx (1975a), who provided a key to six species, considers *Chaetomidium* to be the cleistothecial counterpart of *Chaetomium*. New species have been described by Lodha (1974a) and Benny (1980), and illustrations have been provided by Furuya and Udagawa (1975; as *Thielavia*).

Chaetosartorya--treated here in the Trichocomaceae (Eurotiales).

Chaetotheca--treated as a genus of uncertain affinities by Malloch (1970b). *Chaetotheca fragilis* Zukal was transferred to *Cephalotheca* by Fischer (1897).

Cleistobombardia--described by Mirza in 1968 but considered a synonym of *Tripterosporella* (*q.v.*) by Malloch (1970b).

Cleistosoma--described by Harkness (1885) but considered a synonym of *Emericella* by Peek and Solheim (1958).

Cleistotheca--described by Zukal (1890), but according to Ainsworth (1971) it is a synonym of *Pleospora*.

Cleistothelebolus--the type, *C. nipigonensis* Malloch & Cain, was placed initially in the Thelebolaceae (Malloch, 1970b), later in the Eoterfeziaceae (Malloch and Cain, 1971b), and eventually in the Pyronemataceae (Malloch, 1979). Samuelson and Kimbrough (1978) have shown that *Thelebolus* is related more closely to the Loculoascomycetes. We would exclude *Cleistothelebolus* from the Pyronemataceae based upon recent cytological and ultrastructural evidence (Samuelson and Kimbrough, 1978) although Jeng and Krug (1976) still retain it in the Theleboleae of the Pyronemataceae.

Coniochaetidium--the cleistothecial counterpart of *Coniochaeta* of the Coniochaetaceae (Sordariales) according to Malloch and Cain (1971b) and von Arx (1975b). Von Arx provides a key to species and illustrations of species are given in Udagawa and Furuya (1975).

Connersia--treated here in the Cephalothecaceae (Eurotiales). *Connersia* Malloch (1974a) is a monotypic genus based upon *Pseudeurotium rilstonii* Booth (1961).

Copromyces--described by Lundqvist (1967) and included in the Sordariaceae. It is cleistocarpous with clavate, evanescent asci that lack an apical ring, and contain one to three warty, dark ascospores.

Corynascus-- based upon *Thielavia sepedonium* Emmons, the genus as concieved by von Arx (1973b) has a dark cleistothecial wall of irregular, thick-walled, flattened cells, ascospores with two germ pores, and a *Chrysosporium* or *Se-*

pedonium anamorph. Von Arx (1975a) later added another species, *C. setosus* (Dade) v. Arx, and provided a key to the four species recognized.

Corynascella--members of this genus produce ascospores with de Bary bubbles, walls with thickened ends perforated by a germ pore, and a light colored cleistothecium covered with dark hairs. The genus is based upon a single species, *C. humicola* v. Arx & Hodges (von Arx, 1975a). Additional species have been placed in *Corynascella* by von Arx (1975b) and Udagawa and Ueda (1979). It has sordariaceous affinities and appears to be related to *Thielavia*.

Crepinula--treated here as a synonym of *Cephalotheca* (Malloch, 1970b; Ainsworth, 1971).

Cryptendoxyla--treated here in the Cephalothecaceae (Eurotiales).

Ctenomyces--treated here in the Arthrodermoideae of the Gymnoascaceae (Onygenales).

Dactylomyces--treated here in the Trichocomaceae (Eurotiales).

Dendrosphaera--treated here in the Dendrosphaeraceae (Onygenales).

Dexteria--placed in the Eurotiales by Clements and Shear (1931). It produces elongate, septate ascospores, and the asci appear to be bitunicate; all chacteristics suggestive of the Loculoascomycetes.

Dichlaena--treated here in the Trichocomaceae (Eurotiales).

Dichotomomyces--treated here in the Onygenaceae (Onygenales). Illustrations provided by Udagawa (1970).

Didymium--a synonym of *Orbicula* (*q.v.*) according to Malloch (1970b).

Diehliomyces--treated here in the Onygenaceae (Onygenales).

Diplogelasinospora--described by Cain (1961b) for a sordariaceous species that produced nonostiolate ascocarps. An additional species was proposed by Udagawa and Horie (1972b), and illustrations were provided by Udagawa, Furuya, and Horie (1973).

Diplostephanus--a synonym of *Emericella* (*q.v.*) according to Raper and Fennell (1965).

Disarticulatus--treated here as a synonym of *Arachniotus* (von Arx, 1977b). Originally described by Orr (1977c).

Echinopodospora--this genus, proposed by Robinson (1970), is closely allied to *Zopfiella* (Sordariaceae) according to von Arx (1974b). New species were described by Morinaga *et al.* (1978) and Jong and Davis (1974), and illustrations were provided by Udagawa, Furuya, and Horie (1973).

Edyuilla--treated here in the Trichocomaceae (Eurotiales). A synonym of *Eurotium* (*q.v.*) according to Samson (1979).

Eidamella--treated here as a synonym of *Myxotrichum* (Orr *et al.*, 1963c), although it was recognized as a valid genus by Benjamin (1956a).

Eiona--a cleistocarpous marine genus found in Denmark and described by Kohlmeyer (1963). The top of the ascocarp deliquesces and it appears apothecoid at maturity. The ascospores have hyaline appendages at their tips (Kohlmeyer, 1968). Malloch (1970b) included the genus in the Halosphaeriaceae although Kohlmeyer (1972) did not place it there when he revised the family.

Elaphomyces--treated here in the Elaphomycetaceae (Elaphomycetales).

Eleutherascus--in our opinion this fungus is a reduced discomycete close to *Ascodesmus* (Pezizales; Jeng and Cain, 1976b), even though it has normally been placed in the Gymnoascaceae. Species illustrated by Udagawa and Horie (1975). *Eleutherascus* was described by von Arx (1971b) and additional species were proposed by van Emden (1975), Huang (1975), and Samson and Luiten (1975). A member of this genus was made the type of *Hemiascosporium* and included in the Hemiascomycetes (Batra, 1973; see also the discussion under the Gymnoascaceae).

Emericella--treated here in the Trichocomaceae (Eurotiales).

Emericellopsis--treated here in the Cephalothecaceae (Eurotiales). It has had from two to nine species recognized (Malloch and Cain, 1970b; von Arx, 1974b). Illustrations provided by Udagawa (1963b).

Emmonsiella--treated here as a synonym of *Ajellomyces* (McGinnis and Katz, 1979).

Enterocarpus--treated here in the Microascaceae (Microascales).

Eoterfezia--a genus based on *E. parasitica* Atkinson (1902) was found parasitizing a coprophilic *Sordaria*. It produces many clavate asci enclosed in a thin, membranous, undifferentiated peridium. It was made the type of the Eoterfeziaceae (Atkinson, 1902), a family later expanded by Malloch and Cain (1971b) to include *Cleistothelebolus*, *Lasiobolidium*, *Microeurotium*, *Orbicula*, and *Xeromyces*. Malloch (1970b) had initially placed these taxa in the Thelebolaceae but subsequently they have been transferred to the Pyronemataceae (Jeng and Krug, 1976; Malloch, 1979). A second species was described by Jeng and Cain (1976a). Final disposition of this genus will await the publication of additional data on cytology and development.

Ephemeroascus--a genus described by van Emden (1973) that is characterized by the formation of one-celled, brown ascospores with germ slits, a cleistothecium with a pseudoparenchymatous peridium, and a *Verticillium*-like anamorph. Van Emden placed *Ephemeroascus* in the Eurotiales but noted its similarity to the Coniochaetaceae. Von Arx (1975a) stated that the anamorph was typical of that of a number of species of *Nectria*, but was not able to determine the relationships of *Ephemeroascus*. We agree with Malloch's (1979) placement of this taxon in the Coniochaetaceae.

Eremodothis--this monotypic genus, proposed by von Arx (1975b), was based upon *Thielavia angulara* Das. It differed from other species of *Thielavia* in producing tuberiform cleistothecia and ascospores without germ pores. Malloch and Cain (1973a) did not include *Eremodothis angularis* (Das) v. Arx in *Thielavia* nor did they state where it should be placed.

Eupenicillium--treated here in the Trichocomaceae (Eurotiales). Species illustrated by Udagawa (1965 as *Carpenteles*, 1968, 1970), Udagawa and Awao (1969), Udagawa and Horie (1972c, 1973a, 1973b, 1974), Udagawa and Takada (1968), and Udagawa, Furuya, and Horie (1973).

Europhium--treated here in the Ophiostomataceae (Ophiostomatales) as a synonym of *Ophiostoma*.

Eurotiella--a synonym of *Allescheria* (q.v.) according to Ainsworth (1971) and Malloch (1970b).

Eurotiopsis Cost.--a synonym of *Allescheria* according to Ainsworth (1971) and Malloch (1970b). *Eurotiopsis* Karst. is a possible member of the Eurotiales (Ainsworth, 1971).

Eurotium--treated here in the Trichocomaceae (Eurotiales).

Fairmania--the type species, *Fairmania singularis* Sacc., was found to be identical to *Microascus doguetii* Moreau and Malloch and Cain (1971c) changed the name to *Microascus singularis* (Sacc.) Malloch & Cain. Von Arx (1975c) also accepted *M. singularis* as a valid species in his monograph of *Microascus*.

Faurelina--treated here in the Pithoascaceae (Microascales). *Leuconeurospora elongata* Udagawa & Furuya was transferred to *Faurelina* by both von Arx (1978) and Furuya (1978). Although the new combination is credited to Furuya, as *Faurelina elongata* (Udagawa & Furuya) Furuya, there is some question concerning which publication has priority (see Index of Fungi 4(18): 564. 1979).

Fennellia--treated here in the Trichocomaceae (Eurotiales).

Fleishhakia Auerswald--according to Cain (1961a) this is a synonym of *Preussia* (*q.v.*).

Fragosphaeria--treated here in the Cephalothecaceae (Eurotiales). Illustrated by Eliasson (1971).

Galactomyces--according to Redhead and Malloch (1977) this genus is a member of the Onygenaceae that lacks an ascocarp. Two species are included that were previously described in *Endomyces*, *E. geotrichum* and *E. reessii*. These fungi were both transferred to *Dipodascus* by von Arx (1977a).

Germslitospora--according to Lodha (1978) this monotypic genus, based upon *Thielavia savoryi* Booth, belongs in the Coniochaetaceae (Sordariales; Malloch and Cain, 1971d). Von Arx (1975a) earlier had transferred *T. savoryi* to *Coniochaetidium* (*q.v.*) but Udagawa and Furuya (1979) consider *Germslitospora* to be a valid genus.

Guilliermondia Boud.--a member of the Eurotiales according to Ainsworth (1971). It produces paraphyses and long stipitate asci from a basal hymenium, and dark ascospores (Boudier, 1904); all characters suggestive of the Sordariaceae. Malloch (1979), however, places the genus in the Ascobolaceae (Pezizales).

Gymnascella--treated here as a synonym of *Gymnoascus* (*q.v.*). Von Arx (1977b) believes that the type, *Gymnascella aurantiaca* Peck, is identical to *Gymnoascus reessii*. Orr, Ghosh, and Roy (1977) transferred three species of *Arachniotus* (*q.v.*) to *Gymnascella*.

Gymnoascoideus--treated here as a synonym of *Gymnoascus* (*q.v.*) according to von Arx (1977b) who spelled the name *Gymnoascoides*. *Gymnoascoideus* was originally described as a monotypic genus by Orr, Roy, and Ghosh (1977).

Gymnoascopsis--a member of the Eurotiales according to Ainsworth (1971).

Gymnoascus--treated here in the Gymnoascoideae of the Gymnoascaceae (Onygenales). Species illustrated by Udagawa (1963b, 1966).

Gymnoeurotium--treated here as a synonym of *Edyuilla* (*q.v.*)(see Malloch and Cain, 1973b). Von Arx (1974b) and Samson (1979) believe, however, that *Gymnoeurotium* is a synonym of *Eurotium* (*q.v.*).

Hamigera--treated here in the Trichocomaceae (Eurotiales). Species illustrated by Udagawa and Horie (1972c) and Udagawa and Takada (1967; as *Talaromyces*).

Hapsidospora--treated here in the Cephalothecaceae (Eurotiales).

Harpezomyces--treated here as a synonym of *Chaetosartor*-

ya (see Malloch and Cain, 1973b; von Arx, 1974b; Samson, 1979).

Heleococcum--Malloch (1970b) placed the genus in the Nectriaceae. Two species, *H. aurantiacum* Jørg. and *H. japonese* Tubaki have been described, both having two-celled ascospores. We restrict the Plectomycetes to those taxa that produce unicelled ascospores.

Hemiascosporium--treated here as a synonym of *Eleutherascus* (von Arx, 1971b); see the discussions under the Gymnoascaceae and *Eleutherascus* in this section.

Hemicarpenteles--treated here in the Trichocomaceae (Eurotiales). Species illustrated by Udagawa and Takada (1971).

Hemisartorya--treated here in the Trichocomaceae (Eurotiales). *Hemisartorya* Rai & Chowdhery (1975) closely resembles *Neosartorya* (*q.v.*). Samson (1979) believes that *Hemisartorya* may be based on a mixed culture, one component of which he identified as *Neosartorya fischeri* (Wehm.) Malloch & Cain. More study is needed in order to confirm Samson's observation.

Hexagonella--according to Ainsworth (1971) this genus is a member of the Eurotiales.

Honoratia--a synonym of *Preussia* according to Ainsworth (1971).

Inzengaea--a synonym of *Emericella* (*q.v.*) according to Raper and Fennell (1965).

Keratinophyton--treated here in the Onygenaceae (Onygenales).

Kernia--treated here in the Microascaceae (Microascales). It is the cleistothecial counterpart of *Petriellidium* (*q.v.*) (see Malloch and Cain, 1971c).

Kuehniella--treated here as a synonym of *Arachnotheca* (*q.v.*)(von Arx, 1977b).

Laasiomyces--according to Ainsworth (1971) this genus is a member of the Eurotiales. Malloch (1970b), however, found ostioles in the type material of *Laasiomyces microscopicus* Ruhl and excluded it from his studies. The ascocarps resemble those of *Ceratostoma caulincola* Fckl.

Lasiobolidium--originally placed in the Thelebolaceae by Malloch (1970b) but the genus was later placed in the Eoterfeziaceae by Malloch and Cain (1971b). *Lasiobolidium* was recently transferred to the Pyronemataceae by Jeng and Krug (1976). Although initially monotypic a second species, *L. orbiculoides* Malloch & Benny (1973), was described later.

Leiothecium--treated here in the Monascaceae (Ascosphaerales).

Leuconeurospora--treated here as a member of the Loculoascomycetes. *Leuconeurospora* Malloch & Cain (1970b) was originally described as a monotypic member of the Pseudeurotiaceae (=Cephalothecaceae here), based upon *Eurotium pulcherrimum* Wint. A second species, *L. elongata* Udagawa & Furuya (1973), was added that has since been transferred to *Faurelina* (*q.v.*) by two authors (von Arx, 1978; Furuya, 1978).

Leucosphaera--treated here in the Cephalothecaceae (Eurotiales).

Leucothecium--treated here in the Onygenaceae (Onygenales).

Levispora--according to Malloch (1970b), *L. terricola* Rout. is a synonym of *Pseudeurotium zonatum* van Beyma.

Lilliputia--Malloch and Cain (1972a) consider *Lilliputia* (Hughes, 1951) to be a synonym of *Roumegueriella* (*q.v.*).

Lophotrichus--treated here in the Microascaceae (Microascales). Species illustrated by Furuya and Udagawa (1973).

Macronodus--treated here as a synonym of *Gymnoascus* (*q. v.*)(see von Arx, 1977b). Orr (1977a) proposed *Macronodus* for a species with swollen peridial septa (as in *Auxarthron*, *q.v.*). but with different ascospore morphology and appendage branching. Orr provides a key to the species of both *Auxarthron* and *Macronodus*.

Magnusia--a synonym of *Kernia* according to Benjamin (1956b).

Marchaliella--according to von Arx (1971b), Hawksworth and Booth, and Hawksworth (1979), this genus is a synonym of *Testudina*

Melanocarpus--a genus created for *Myriococcum albomyces* Cooney & Emerson, a thermophilic, cleistothecial ascomycete. Although *M. albomyces* was transferred to *Thielavia* (*q.v.*) by Malloch and Cain (1972a), von Arx (1975a) says that it is not related to either *Chaetomidium* or *Thielavia*. Von Arx placed *Myriococcum albomyces* in a genus of its own, *Melanocarpus*, that appears to be related to members of the Sordariaceae.

Mesophellia--placed in the tribe Mesophellieae of the Elaphomycetaceae by Dodge (1929). According to Dring (1973), however, it belongs in the Gasteromycetes (see our discussion under the Elaphomycetales).

Microascus--treated here in the Microascaceae (Microascales). Species illustrated by Udagawa and Awao (1969) and Udagawa (1962, 1963a).

Microeurotium--the type, *Microeurotium albidum* Ghatak (1936), was first isolated as a laboratory contaminant. It was placed in the Thelebolaceae by Malloch (1970b) and later transferred to the Eoterfeziaceae (Malloch and Cain, 1971b). The ascus arises directly from an ascogonial cell and it is persistant as in members of the Thelebolaceae. Von Arx (1974b), however, considers *Microeurotium* and *Xeromyces* to be synonyms of *Monascus*. Recently, Jeng and Krug (1976) and Malloch (1979) placed other Eoterfeziaceae, including *Microeurotium*, in the Pyronemataceae (Jeng and Krug place these fungi in the tribe Theleboleae of the Pyronemataceae).

Microthecium--the cleistothecial counterpart of *Melanospora* according to Müller and von Arx (1973). Von Arx (1973b) considered it a synonym of *Melanospora*, although Udagawa and Takada (1974) noted that other than the lack of an ostiole also there are differences in spore ornamentation. Udagawa and Cain (1969) and Hawksworth and Udagawa (1977) monographed the genus and the latter authors provided a key to species. We retain *Microthecium* in the Melanosporaceae (Sphaeriales). Species were illustrated by Horie and Udagawa (1973b) and Udagawa and Horie (1971b).

Monascus--treated here in the Monascaceae (Ascosphaeriales).

Mycoarachis--initially included in the Pseudeurotiaceae (=Cephalothecaceae here) when originally described (Malloch and Cain, 1970b). It produces two-celled ascospores and, therefore, the genus does not fit into the Plectomycetes as we define them. Probably a member of the Hypocreales (see the discussion under the Cephalothecaceae for details).

Mycogala--according to Hughes (1951) this genus is a synonym of *Orbicula* (*q.v.*). Malloch (1970b) gives a complete list of *Mycogala* species and their synonyms.

Mycorhynchidium--described by Malloch and Cain (1971b) for a cleistothecial fungus with three-spored asci that are enclosed in a membraneous envelope (as in the Ascosphaeraceae) and two-celled ascospores. Malloch and Cain considered *Mycorhynchidium* to be the cleistothecial counterpart of *Mycorhynchus* (Hypocreales)(see Breton and Faurel, 1967; Rogerson, 1970). Some taxa in both genera have three-spored asci. Two-celled ascospores, however, are alien to the Plectomycetes as we define them.

Myrillium--a synonym of *Gymnoascus* according to Kuehn (1959).

Myriococcum--according to Malloch (1970b) the type species, *M. praecox* Fr., has never been shown to have produced ascospores. *Myriococcum albomyces* has since been transferred to *Melanocarpus* (*q.v.*) by von Arx (1975a).

Myxotrichum--treated here in the Gymnoascoideae of the Gymnoascaceae (Onygenales). Kuehn (1959) recognized nine species, whereas Orr *et al.* (1963c) treat seven species in their monograph. Malloch (1979) believes that *Myxotrichum* occupies an isolated position in the Onygenaceae (including the Gymnoascaceae) and he has considered putting it, along with *Toxotrichum*, *Tripedotrichum*, and *Byssoascus* (*q.v.*), in a separate family or treating it as a reduced member of the Pseudeurotiaceae (the Cephalothecaceae here). Species illustrated by Udagawa (1963b).

Nannizzia--treated here in the Arthrodermoideae of the Gymnoascaceae (Onygenales).

Narasimhella--treated here in the Arachnioideae of the Gymnoascaceae (Onygenales).

Neogymnomyces--treated here as a synonym of *Gymnoascus* as suggested by von Arx (1974b). It was originally described by Orr (1970).

Neosartorya--treated here in the Trichocomaceae (Eurotiales). Species illustrated by Udagawa and Kawasaki (1968; as *Sartorya*).

Neotestudina--the type, *Neotestudina rosatii* Segr. & Dest., is the cause of a mycetoma. Von Arx (1971a) included it in the Testudinaceae. Hawksworth and Booth (1974) transferred the species to *Zopfia* (*q.v.*), but later Hawksworth (1979) recognized *Neotestudina* as a genus of the Testudinaceae. *Pseudophaeotrichum* and *Pseudodelitschia* (*q.v.*) are synonyms.

Neoxenophila--treated here in the Onygenaceae (Onygenales).

Nephrospora--a synonym of *Microascus* (*q.v.*) according to von Arx (1975c).

Nigrosabulum--treated here in the Cephalothecaceae (Eurotiales).

Onygena--treated here in the Onygenaceae (Onygenales).

Onygenopsis--this genus belongs in the Eurotiales according to Ainsworth (1971). It is reported to be synonymous with *Eurotium diplocystis* Berk. & Br. (Petch, 1912), but Malloch (1970b) says that *E. diplocystis* is not a species of *Eurotium*.

Ophiostoma--treated here in the Ophiostomataceae (Ophiostomatales).

Orbicula--placed in the Eoterfeziaceae by Malloch and Cain (1971b), the Pezizales by von Arx (1974b), and the Pyronemataceae by Jeng and Krug (1976). The genus was monographed by Hughes (1951) and illustrations were provided by Udagawa and Furuya (1972a).

Pectinotrichum--treated in the Gymnoascoideae of the Gymnoascaceae (Onygenales).

Penicilliopsis--treated here in the Trichocomaceae (Eurotiales). Illustrated by Udagawa and Takada (1971).

Perisporium--a member of the Sphaeropsidales according to Cain (1961a).

Peristomium--a synonym of *Microascus* according to von Arx (1975c).

Petalosporus--treated here as a synonym of *Arachniotus* (see von Arx, 1974b, 1977b). The three species described by Ghosh *et al.* (1963) were transferred to *Arachniotus* by von Arx (1977b).

Petriella--treated here in the Microascaceae (Microascales). A synonym of *Microascus* according to Lodha (1978).

Petriellidium--treated here in the Microascaceae (Microascales).

Petromyces--treated here in the Trichocomaceae (Eurotiales).

Peyronellula--according to Stolk (1955) this genus is a synonym of *Emericellopsis*.

Phaeidium--a new name for *Laasiomyces* proposed by Clements and Shear (1931). See Malloch (1970b) for a discussion.

Phaeotrichum--a cleistocarpous loculoascomycete with appendaged ascocarps and two-celled ascospores that Cain (1956b) placed in a new family, the Phaeotrichaceae. Other species described by Malloch and Cain (1972a) and Furuya and Udagawa (1975).

Pisomyxa--a questionable member of the Eurotiales according to Ainsworth (1971).

Pithoascus--treated here in the Pithoascaceae (Microascales).

Plectolitis--a synonym of *Amylocarpus* (*q.v.*) according to Kohlmeyer and Kohlmeyer (1971).

Pleuroascus--treated here in the Onygenaceae (Onygenales).

Plunkettomyces--treated here as a synonym of *Arachniotus*. The type species, *P. littoralis* Orr (1977c), was examined by von Arx (1977b) and transferred to *Arachniotus* as a new species.

Pontoporeia--created for *Sphaeria biturbinata* Dur. & Mont. by Kohlmeyer (1963). Malloch and Cain (1972a) transferred *Pontoporeia* to *Zopfia* (*q.v.*) where it is still retained by Hawksworth and Booth (1974) and Hawksworth (1979).

Preussia--included in the Sporormiaceae (Pleosporales, Luttrell, 1973; Melanommatales, Barr, 1979b). Monographed by Cain (1961a) and shown to have a *Pleospora*-type centrum by Kowalski (1965, 1966).

Preussiella--created by Lodha (1978) for species of *Preussia* with ascospores lacking germ slits. Von Arx (1973b) transferred those species to *Westerdykella* (*q.v.*).

Pseudeurotium--treated here in the Cephalothecaceae (Eurotiales). Species illustrated by Udagawa (1965).

Pseudoarachniotus--treated here as a synonym of *Arachniotus*. Various species have been transferred to *Amauroascus* and *Arachniotus*, or treated as synonyms of species of *Arachniotus* and *Narasimhella* (von Arx, 1971b). Maintained as a valid genus by Orr, Ghosh, and Roy (1977).

Pseudogymnoascus--treated here in the Gymnoascoideae of the Gymnoascaceae (Onygenales).

Pseudophaeotrichum--a synonym of *Neotestudina* (*q.v.*), a genus in the Testudinaceae (von Arx, 1971b; Hawksworth, 1979).

Pteridosperma--a cleistocarpous member of the Melanosporaceae with two species originally escribed in *Microthecium* (Krug and Jeng, 1979). A key to species is provided by Hawksworth and Udagawa (1977, as *Microthecium*).

Pulveria--a cleistocarpous member of the Xylariaceae (Malloch and Rogerson, 1977).

Pycnidiophora--considered a synonym of *Preussia* (*q.v.*) by Cain (1961a) and Malloch (1970b). Von Arx (1974b) and von Arx and Müller (1975), however, consider it a synonym of *Westerdykella* (*q.v.*). Species illustrated by Mukerji and Saxena (1974).

Rechingeriella--a fungus recently transferred to *Zopfia* (Hawksworth and Booth, 1974) but it is now recognized as a distinct genus of the Testudinaceae (Hawksworth, 1979).

Renispora--treated here in the Arachnioideae of the Gymnoascaceae (Onygenales).

Rhexothecium--thought to be related to *Eremomyces* and placed in the Eremomycetaceae by Malloch (1979). Like *Eremomyces bilateralis* Malloch & Cain, *Rhexothecium globosum* Samson & Mouchacca (1975b) has similar ascospores, cleistothecial ontogeny, and manner of spore liberation.

Rhytidospora--a member of the Melanosporaceae whose type, *R. tetraspora* Jeng & Cain (1977) produces cephalothecoid peridia and ascospores which are dark brown, one-celled, produce a wrinkled wall, and two germ pores. Krug and Jeng (1979) add two additional species and provide a key to the species.

Richonia--according to Hawksworth (1979) a monotypic genus of the Testudinaceae. The type species is discussed in detail by Hawksworth and Booth (1974) under *Zopfia variospora* (Boud.) Arnaud.

Rollandina--we follow von Arx (1977b) in treating this genus as a *nomen confusum* since it appears to be based upon two fungi, a stalk that is the stipe of a small mushroom, and the ascocarp of a *Nannizzia* and its *Microsporon* anamorph (Benjamin, 1956a; Apinis, 1970). According to von Arx, *Rollandina sensu* Apinis (1970) is a synonym of *Nannizzia*, but Orr *et al.* (1977), Roy *et al.* (1978), and Ghosh *et al.* (1979) say it is identical to *Pseudoarachniotus hyalinosporus*. Von Arx (1971b, 1974b, 1977b) maintains, however, that *P. hyalinosporus* is identical to *Narasimhella poonensis* and cannot be synonymized with *R. capitata*.

Roumegueriella--a more recent name for *Lilliputia* Boud. according to Malloch and Cain (1972a). Malloch (1970b) placed the genus next to *Heleococcum* (*q.v.*) in the Hypocreaceae in spite of the former producing one-celled ascospores and the latter two-celled ascospores. Light-colored ascocarps, one-celled ascospores, and a *Gliocladium* anamorph suggests a possible relationship of *Roumegueriella* to the Trichocomaceae.

Royella--according to Malloch (1970b) this genus may be a synonym of *Dichotomomyces* (*q.v.*). *Royella* Dwivedi (1960) was published without a Latin diagnosis and, therefore, is a *nomen nudum*.

Sagenoma--treated here in the Trichocomaceae (Eurotiales).

Samarospora--according to Ainsworth (1971) this is a member of the Eurotiales.

Sarophorum--a synonym of *Penicilliopsis* according to Ainsworth (1971) and Malloch and Cain (1972b).

Sartorya--treated here as a synonym of *Neosartorya* (see Malloch and Cain, 1972b, for details).

Saturnomyces--according to Groslags and Swift (1957) this genus is a synonym of *Emericellopsis*.

Sclerocleista--treated here in the Trichocomaceae (Eurotiales).

Shanorella--treated here in the Arthrodermoideae of the Gymnoascaceae (Onygenales).

Sphaeronaemella--treated here in the Ophiostomataceae (Ophiostomatales).

Spiromastix--treated here in the Arthrodermoideae of the Gymnoascaceae (Onygenales).

Sporophormis--treated here as a synonym of *Warcupiella* (see von Arx, 1974b; Malloch and Cain, 1973b; and Samson, 1979).

Sporormiella--a synonym of *Preussia* (*q.v.*) according to von Arx (1974b).

Subbaromyces--although originally described as a member of the Ophiostomataceae (Hesseltine, 1953), we exclude it from the family and suggest affinities to the Loculoascomycetes.

Syncleistostroma--treated here as a synonym of *Petromy-*

ces. According to Samson (1979), Subramanian (1972) based the genus on an invalidly published anamorphic name. His publication appeared about two months prior to Malloch and Cain's (1972b) description of *Petromyces* (see discussion by Malloch and Cain, 1973b).

Talaromyces--treated here in the Trichocomaceae (Eurotiales). Species illustrated by Udagawa (1963b, 1966).

Testudina--placed in the Pseudeurotiaceae (Cephalothecaceae here) by Malloch and Cain (1970b) because it combined the characteristics found in two other genera included in the family, *Mycoarachis* and *Nigrosabulum*. Von Arx (1971a) placed *Testudina* in his new family Testudinaceae and Hawksworth and Booth (1974) placed the genus in synonymy with *Zopfia* (*q.v.*). More recently, however, Hawksworth (1979) recognized *Testudina* as a valid genus.

Thailandia--originally described as a member of the Gymnoascaceae (Vardhanabhuti, 1959), it was later found to be a species of *Candida* (Orr and Kuehn, 1971).

Thermoascus--treated here under the Onygenaceae (Onygenales).

Thielavia--according to von Arx (1975a) this genus is a cleistothecial member of the Sordariaceae, although many authors place it in the Melanosporaceae (Müller and von Arx, 1973) or the Chaetomiaceae (Malloch and Benny, 1973; Malloch and Cain, 1973a). Malloch and Cain (1973a) treated *Chaetomidium* (*q.v.*) as a synonym of *Thielavia*, but von Arx says that these genera can be separated readily on peridium structure, ascospore morphology, and ascocarp pubescence. Species are illustrated by Udagawa and Takada (1967), Udagawa and Horie (1972a), Horie and Udagawa (1973a, 1973b), and Udagawa and Muroi (1979). New species have been described by Lodha (1974b) and Tansey and Jack (1975). Keys to species are given in the papers of Malloch and Cain (1973a), Beljakova (1974a), and von Arx (1975a)

Thielaviella--according to von Arx (1974b, 1975a) this genus is a synonym of *Thielavia*.

Toxotrichum--treated here as a synonym of *Myxotrichum* (*q.v.*). The type is based upon *Myxotrichum cancellatum* Phil. (von Arx, 1974b).

Trichocoma--treated here in the Trichocomaceae (Eurotiales).

Trichodelitschia--according to Malloch (1970b), *Trichodelitschia* (Lundqvist, 1964) is the ostiolate counterpart of *Phaeotrichum*. Von Arx and Müller (1975) state that it is the ostiolate relative of both *Phaeotrichum* and *Neotestudina*, and Barr (1979b) includes all three genera in the Phaeotrichaceae.

Trichomonascus--a monotypic genus, *T. mycophagus* Jackson (1947), was found as a parasite on *Corticium confluens* Fr. and was placed by him in the Aspergillaceae (Trichocomaceae here). There is no family, however, in the Plectomycetes (*sensu* Benny and Kimbrough) in which this fungus can be placed. Based upon original descriptions and illustrations (Jackson, 1947), the mechanism of fertilization resembles that found in *Lasiobolus monascus* Kimbr. (Kimbrough and Benny, 1978) but other features are reminiscent of the Monascaceae, *i.e.*, a reduced vegetative phase with a cell developing into the ascocarp and the presence of a trichogyne. Fresh material will be needed to determine if asci are in fact produced, and if they are formed, if *Trichomonascus* is related to any other known taxon.

Trichoscytale--or *Trichoskytale*, treated here as a synonym of *Trichocoma* (see Malloch and Cain, 1972b).

Tripterospora--a cleistothecial counterpart of *Podospora* according to Müller and von Arx (1973). *Tripterospora* Cain (1956c) is maintained as a valid genus by Lundqvist (1969), Malloch (1970b), and Malloch and Cain (1971d), but Müller and von Arx (1975a) later placed it in synonymy with *Zopfiella* (*q.v.*).

Tripterosporella--described by Subramanian and Lodha (1968) and considered as one of the cleistothecial Sordariaceae (Malloch and Cain, 1971b).

Tripedotrichum--described from a collection of herbarium material that also contains *Myxotrichum chartarium* (Nees) Kunze (Orr and Kuehn, 1964b). We are following von Arx (1977b) in considering *Tripedotrichum* to be a synonym of *Gymnoascus*.

Ulospora--according to Hawksworth (1979) this is a member of the Testudinaceae. Incorrect citation of the basionym and improper combinations make *Ulospora* an invalid genus (see Hawksworth and Booth, 1974; von Arx and Müller, 1975; and Hawksworth, 1979).

Uncinocarpus--treated here as a synonym of *Gymnoascus*. *Uncinocarpus* Sigler & Orr (Sigler and Carmichael, 1976) was described for a gymnoascaceous fungus with a *Chrysosporium* anamorph. Von Arx (1977b) believes that this fungus is similar to *Gymnoascus uncinatus* Eidam.

Veronaia--a member of the Eurotiales with unknown affinities according to Ainsworth (1971).

Waldemaria--treated here as a synonym of *Arachniotus*. The type of *Waldemaria* is considered to be identical to *Arachniotus dankaliensis* (Cast.) van Beyma (von Arx, 1971b; Orr and Kuehn, 1971). The latter authors provide an extensive discussion of *Waldemaria*.

Warcupia--a soil fungus that Paden and Cameron (1972) say shows some relationship to *Cleistothelebolus*, *Lasiobolidium*, and *Orbicula* (*q.v.*), all possible members of the Eoterfeziaceae.

Warcupiella--treated here in the Trichocomaceae (Eurotiales).

Westerdykella--a cleistothecial member of the Sporormiaceae described by Stolk (1955) but treated as a synonym of *Preussia* (*q.v.*) by Cain (1961a). Von Arx (1973b, 1974b) and von Arx and Müller (1975) consider it to be a valid genus and von Arx (1973b) has transferred several species into *Westerdykella*.

Xanthothecium--Treated here in the Onygenaceae (Onygenales) Illustrations provided by Udagawa (1963b, as *Anixiopsis*).

Xeromyces--treated here in the Monascaceae (Ascosphaerales).

Xylogone--treated here in the Onygenaceae (Onygenales).

Xynophilia--treated here in the Onygenaceae (Onygenales).

Zopfia--a member of the loculoascomycete family Testudinaceae that has been monographed by Hawksworth and Booth (1974). In the broad sense they included in the genus cleistothecial taxa with cephalothecoid peridia and two-celled ascospores. The following genera were synonymized with *Zopfia*: *Celtidia*, *Lepidosphaeria*, *Marchaliella*, *Neotestudina*, *Pontoporeia*, *Pseudophaeotrichum*, *Rechingeriella*, *Richonia*, and *Testudina* (*q.v.*). In a later examination of *Zopfia*, Hawksworth (1979) included only three species, *Z. albizia* Farr, *Z. biturbinata* (Dur. & Mont.) Malloch & Cain, and *Z. rhizophila* Rabenh., in the genus. Only *Pontoporeia* is still considered to be a synonym of *Zopfia*.

Zopfiella--a member of the Sordariaceae, considered to be the cleistothecial counterpart of *Triangularia* (Malloch and Cain, 1971d). These authors provide a key to species and Furuya and Udagawa (1972, 1973, 1975), Udagawa and Furuya, 1972b), Udagawa and Horie (1974, 1975), and Udagawa and Takada (1974) provide illustrations.

Zopfiofoveola--a monotypic genus proposed by Hawksworth (1979), based upon *Zopfia punctata* Hawks. & Booth, and placed in the Testudinaceae. Von Arx and Müller (1975), however, placed *Z. punctata* in *Lepidosphaera*.

ACKNOWLEDGEMENTS

The authors would like to thank Drs. R.K. Benjamin, R.P. Korf, E.S. Luttrell, and J.D. Rogers for taking the time to review the manuscript.

Literature Cited

Ainsworth, G.C. 1961. Ainsworth & Bisby's Dictionary of the Fungi. Fifth Ed. Commonwealth Mycological Institute, Kew, Surrey. 547 p.

______. 1971. Ainsworth & Bisby's Dictionary of the Fungi. Sixth Ed. Commonwealth Mycological Institute, Kew, Surrey. 621 p.

______, F.K. Sparrow, and A.S. Sussman (Eds.). 1973. The fungi, an advanced treatise. Vol. 4A. A taxonomic review with keys: Ascomycetes and Fungi Imperfecti. Academic Press, New York. 621 p.

Alexopoulos, C.J. 1962. Introductory Mycology. Second Ed. John Wiley and Sons, Inc., New York. 613 p.

______, and C.W. Mims. Introductory Mycology. Third Ed. John Wiley and Sons, Inc., New York. 632 p.

Apinis, A.E. 1964. Revision of British Gymnoascaceae. Mycol. Pap. No. 96. 56 p.

______. 1967. *Dactylomyces* and *Thermoascus*. Trans. Brit. Mycol. Soc. 50: 573-582.

______. 1968. Relationships of certain keratinophilic Plectascales. Mycopathol. Mycol. Appl. 35: 97-104.

______. 1970. Concerning *Rollandina*. Trans. Brit. Mycol. Soc. 55: 499-502.

______, and B.M. Clark. 1974. *Neoxenophila foetida* gen. et. sp. nov., a new keratinophilic ascomycete. Trans. Brit. Mycol. Soc. 63: 261-265.

______, and R.G. Rees. 1976. An undescribed keratinophilic fungus from Queensland. Trans. Brit. Mycol. Soc. 67: 522-524.

Arx, J.A. von. 1971a. Testudinaceae, a new family of Ascomycetes. Persoonia 6: 365-369.

______. 1971b. On *Arachniotus* and related genera of the Gymnoascaceae. Persoonia 6: 371-380.

______. 1973a. Centraalbureau voor Schimmelcultures Baarn and Delft progress report 1972. Verh. Kon. Ned. Acad. Wetensch. Afd. Naturk. Tweede Sect. 61(4): 59-81.

______. 1973b. Ostiolate and nonostiolate Pyrenomycetes. Proc. Kon. Ned. Acad. Wetensch. Amsterdam, Ser. C, 76: 289-296.

______. 1973c. The genera *Petriellidium* and *Pithoascus* (Microascaceae). Persoonia 7: 367-375.

______. 1974a. Centraalbureau voor Schimmelcultures Baarn and Delft progress report 1973. Verh. Kon. Ned. Acad. Wetensch. Afd. Naturk. Tweede Sect. 63: 1-20.

______. 1974b. The genera of fungi sporulating in pure culture. Second Ed. J. Cramer, Vaduz. 315 p.

______. 1975a. On *Thielavia* and some similar genera of Ascomycetes. Studies Mycol. (Baarn) No. 8. 29 p.

______. 1975b. On *Thielavia angulata* and some recently described *Thielavia* species. Kavaka 3: 33-36.

______. 1975c. Revision of *Microascus* with the description of a new species. Persoonia 8: 191-197.

______. 1977a. Notes on *Dipodascus*, *Endomyces* and *Geotrichum* with description of two new species. Ant. von Leeuwenhoek Ned. Tijdschr. Hyg. 43: 333-340.

______. 1977b. Notes on Gymnoascaceae. Persoonia 9: 393-400.

______. 1978. Notes on Microascaceae with the description of two new species. Persoonia 10: 23-31.

______, K.G. Mukerji, and N. Singh. 1978. *Leucosphaera*, a new genus of the Pseudeurotiaceae. Persoonia 10: 141-143.

______, and E. Müller. 1954. Die Gattung der amerosporen Pyrenomycetes.

Bietr. Kryptogamenfl. Schweiz 11: 1-434.

______, and ______. 1975. A re-evaluation of the bitunicate Ascomycetes with keys to families and genera. Studies Mycol. (Baarn). No. 9. 159 p.

______, and Nilsson. 1969. *Xylogone sphaerospora*, a new ascomycete from stored pulpwood chips. Svensk Bot. Tidsk. 63: 345-348.

______, L. Rodreques de Miranda, M. T. Smith, and D. Yarrow. 1977. The genera of yeasts and yeast-like fungi. Studies Mycol. (Baarn). No. 14. 42 p.

______, and R. A. Samson. 1973. Two new genera of the Eurotiales. Persoonia 7: 377-380.

Atkinson, G. F. 1902. Three new genera of the higher fungi. Bot. Gaz. (Crawfordsville) 34: 36-43.

Barr, M. E. 1976. Perspectives in the Ascomycotina. Mem. New York Bot. Gard. 28: 1-8.

______. 1979a. On the Massariaceae in North America. Mycotaxon 9: 17-37.

______. 1979b. A classification of Loculoascomycetes. Mycologia 71: 935-957.

Barron, G. L., and C. Booth. 1966. A new species of *Arachniotus* with an *Oidiodendron* conidial state. Canad. J. Bot. 44: 1057-1061.

______, R. F. Cain, and J. C. Gilman. 1961a. A revision of the genus *Petriella*. Canad. J. Bot. 39:837-845.

______, ______, and ______. 1961b. The genus *Microascus*. Canad. J. Bot. 39: 1609-1631.

Batra, L. R. 1973. Hemiascosporiaceae (Hemiascomycetidae: Dipodascales), a new family based on *Hemiascosporium spinulosum*. Mycologia 65: 795-802.

______. 1978. Taxonomy and systematics of the Hemiascomycetes (Hemiascomycetidae), pp. 187-214. *In* C. V. Subramanian (Ed.) Taxonomy of fungi. Vol. I. University of Madras, Madras.

Beckett, A., I. B. Heath, and D. J. McLaughlin. 1974. An atlas of fungal ultrastructure. Longman Group Ltd, London, 221 p.

Beljakova, L. A. 1974a. *Thielavia kirilenkoae* sp. nov., and the key to the species belonging to the genus *Thielavia* Zopf. Mikol. i Fitopato. 8: 73-77 (In Russian).

______. 1974b. Genus *Emericellopsis* van Beyma (Eurotiaceae). Mikol i Fitopato. 8: 385-395. (In Russian).

______. 1975. A new species of the genus *Hapsidospora* (Pseudeurotiaceae). Mikol. i Fitopato. 9: 524-525. (In Russian).

Benjamin, C. R. 1955. Ascocarps of *Aspergillus* and *Penicillium*. Mycologia 47: 669-687.

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

______. 1956b. *Magnusia* Sacc., a later homonym. El Aliso 3: 344.

Benny, G. L. 1980. A second species of *Chaetomidium* with a cephalothecoid peridial wall. Mycologia 72: 832-836.

______, and D. A. Samuelson. 1980. Ultrastructure of septa in the vegetative hyphae of *Chaetomidium arxii* and *Phillipsia domengensis* (Ascomycotina). Mycologia 72: 836-840.

Bessey, E. A. 1950. Morphology and taxonomy of fungi. Blakiston Co., Philadelphia, 791 p.

Blaser, P. 1976. Taxonomische und physiologische Untersuchungen uber die Gattung *Eurotium* Link ex. Fries. Sydowia 28: 1-49 (1974/1975).

Boedijn, K. B. 1935a. On the morphology and cytology of *Trichocoma paradoxa*. Ann. Jard. Bot. Buitenzorg 44: 243-256.

Booth, C. 1961. Studies of Pyrenomycetes: VI. *Thielavia*, with notes on some allied genera. Mycol. Pap. No. 83. 15 p.

Boudier, E. 1904. Sur un nouveau genre et une nouvelle espèce de Myriangiacées, le *Guilliermondia saccoboloides*. Bull. Soc. Mycol. France 20: 19-22.

Breton, A., and L. Faurel. 1967. Etude des affinités du genre *Mycorhychus* Sacc. et description du plusieurs espèces nouvelles. Rev. Mycol. (Paris) 32: 229-258.

Butler, E. E., and L. J. Peterson. 1972. *Endomyces geotrichum* a perfect state of *Geotrichum candidum*. Mycologia 64: 365-374.

Cain, R. F. 1956a. Studies of soil fungi. *Saturnomyces* a new genus of the Aspergillaceae. Canad. J. Bot. 34: 135-141.

______. 1956b. Studies of coprophilous Ascomycetes. II. *Phaeotrichum*, a new cleistocarpous genus in a new family, and its relationships. Canad. J. Bot. 34: 675-687.

______. 1956c. Studies of coprophilous Ascomycetes. IV. *Tripterospora*, a new cleistocarpous genus in a new family. Canad. J. Bot. 34: 699-710.

______. 1961a. Studies of coprophilous Ascomycetes. VII. *Preussia*. Canad. J. Bot. 39: 1633-1666.

______. 1961b. *Anixiella* and *Diplogelasinospora*, two genera with cleistothecia and pitted ascospores. Canad. J. Bot. 39: 1667-1677.

______. 1972. Evolution of the fungi. Mycologia 64: 1-14.

______, and L. K. Weresub. 1957. Studies of coprophilous Ascomycetes. V. *Sphaeronaemella fimicola*. Canad. J. Bot. 35: 119-131.

Chesters, C. G. C. 1934. Studies on British Pyrenomycetes. I. The life histories of three species of *Cephalotheca* Fuck. Trans. Brit. Mycol. Soc. 19: 261-279.

Christensen, M., and K. B. Raper. 1978. Synoptic key to *Aspergillus nidulans* group species and related *Emericella* species. Trans. Brit. Mycol. Soc. 71: 177-191.

Ciferri, R. 1957. *Trichocoma paradoxum* in Santo Domingo and the order Onygenales. Atti Inst. Bot. Univ. Pavia, Ser. 5, 14: 237-240.

______. 1958. *Batistia*, a new genus of the Cephalothecaceae family. Atti Inst. Bot. Univ. Pavia, Ser. 5, 15: 160-170.

Clémencet, M. 1932. Contribution à l'etude du développement et de l'anatomie des Ascomycètes hypogés. Les Elaphomycetacées. Botaniste 24: 3-104.

Clements, F. E., and C. L. Shear. 1931. The genera of fungi. The H.W. Wilson Company, New York, 496 p.

Cohn, F. 1872. Conspectus familiarum cryptogamarum secundum methodum naturalem dispositarum. Hedwigia 11: 17-20.

Cole, G. T., and W. B. Kendrick. 1968. Condiium ontogeny in hyphomycetes. The imperfect state of *Monascus ruber* and its meristem arthrospores. Canad. J. Bot. 46: 987-992.

______, R. V. Hardcastle, and P. J. Szaniszlo. 1974. *Subbaromyces splendens*: development and ultrastructure. Canad. J. Bot. 52: 2453-2457.

Cooke, W. B., and D. L. Hawksworth. 1970. A preliminary list of the families proposed for fungi (including the lichens). Mycol. Pap. No. 121. 86 p.

Corlett, M. 1963. The developmental morphology of two species of *Microascus*. Canad. J. Bot. 41: 253-266.

______. 1966. Developmental studies in the Microascaceae. Canad. J. Bot. 44: 79-88.

Demoulin, V. 1975. The origin of Ascomycetes and Basidiomycetes, the case for a red algal ancestry. Bot. Rev. 40: 315-345. (1974).

Dennis, R. W. G. 1968. British Ascomycetes. J. Cramer, Lehre. 455 p.

______. 1978. British Ascomycetes, revised and enlarged edition. J. Cramer, Vaduz. 486 p. (c. 1977).

Diehl, W. W., and E. B. Lambert. 1930. A new truffle in the beds of cultivated mushrooms. Mycologia 22: 223-226.

Dodge, C. W. 1929. The higher Plectascales. Ann. Mycol. 27: 145-184.

Dring, D. M. 1973. Gasteromycetes, pp. 451-478. *In* G. C. Ainsworth, F. K. Sparrow, and A. S. Sussman (Eds.). The fungi, an advanced treatise. Vol. 4B. Academic Press, New York.

Dwivdei, R. S. 1960. A new genus of Plectascales from soil. Proc. Indian Sci. Congr. Assocs., Sec. 6, Ser. 3, 47: 320-321.

Eliasson, U. 1971. A Swedish find of *Fragosphaeria purpurea* Shear, a cleistothecial Ascomycete. Svensk. Bot. Tidskr. 65: 351-354.

Emden, J. A. van. 1973. *Emphemeroascus* gen. nov. (Eurotiales) from soil. Trans. Brit. Mycol. Soc. 61: 599-601.

______. 1974. Three new fungi from Surinam soil. Acta Bot. Neerland. 24: 193-197.

Emmons, C. W., and B. O. Dodge. 1931. The ascocarpic stage of species of *Scopulariopsis*. Mycologia 23: 313-331.

Faurel, L., and M. Locquin. 1972. A propos de la découverte d'un sécond représentant de la famille des Chadefaudiellacées (Champignons, Ascomycètes). Compt. Rend. Hebd. Scéances Acad. Sci., Ser. D, 275: 2853-2856.

______, and G. Schotter. 1959. Un champignon ascomycète inèdit, type d'une nouvelle famille de position systématique critique. Compt. Rend. Hebd. Séances Acad. Sci. 249: 150-152.

______, and ______. 1966. Notes mycologiques. V. Champignons coprophiles du Tibesti. Rev. Mycol. (Paris) 30: 330-351.

Feldmann, G. 1957. Un nouvel Ascomycète parasite d'une algue marine: *Chaudefaudia marina*. Rev. Gén. Bot. 64: 140-152.

Fennell, D. I. 1973. Plectomycetes. Eurotiales, pp. 45-68. *In* G. C. Ainsworth, F. K. Sparrow, and A. S. Sussman (Eds.). The fungi an advanced treatise. Vol. 4A. Academic Press, New York.

Fischer, E. 1897. Ascomyceten: Tuberaceen und Hemiasceen. *In* Rabenhorst's Kryptogamen-Flora von Deutschland, Oesteereich und der Schweiz. Erster Band. V. Abth. Edward Kummer, Leipzig. 131 p.

Flegler, S. L., G. R. Hooper, and W. G. Fields. 1976. Ultrastructural and cytochemical changes in the basidiomycete dolipore septum associated with fruiting. Canad. J. Bot. 54: 2243-2253.

Fraser, L. 1953. A new genus of the Plectascales. Proc. Linn. Soc. N. S. W. 78: 241-246.

Furuya, K. 1978. Note concerning *Leuconeurospora elongata*. Trans. Mycol. Soc. Japan 19: 149-150.

______, and S. Udagawa. 1972. Coprophilous Pyrenomycetes from Japan. II. J. Gen. Appl. Microbiol. 18: 455-467.

______, and ______. 1973. Coprophilous Pyrenomycetes from Japan. III. Trans. Mycol. Soc. Japan 14: 7-30.

______, and ______. 1975. Two new species of cleistothecial Ascomycetes, J. Jap. Bot. 50: 249-254.

______, and ______. 1977. New species of *Gelasinospora* and *Anixiella*. Trans. Mycol. Soc. Japan 17: 313-320.

Gäumann, E. A. 1928. Comparative morphology of fungi (trans. and rev. by C. W. Dodge). McGraw-Hill Book Company, New York. 701 p.

______. 1949. Die Pilze, Grundzüge ihrer Entwicklungsgeschichte und Morphologie. Birkhäuser, Basal. 382 p.

______. 1964. Die Pilze, Gründzuge ihrer Entwicklungsgeschichte und Morphologia. Birkhäuser, Basal und Stuttgart. 541 p.

Ghatak, P. N. 1936. On the development of the perithecium of *Microeurotium albidum*. Ann. Bot. (London) 50: 849-861.

Ghosh, G. R., G. F. Orr, and H. H. Kuehn. 1963. A new genus of the Gymnoascaceae with a rudimentary peridium. Mycopath. Mycol. Appl. 21: 36-44.

______, ______, A. C. Pier, and J. E. Galligher. 1979. Comparative ascospore morphology of certain strains of *Rollandina* by scanning electron microscopy. Mycotaxon 10: 21-28.

Gilkey, H. M. 1954. Taxonomic notes on Tuberales. Mycologia 46: 783-793.

Griffin, H. D. 1968. The genus *Ceratocystis* in Ontario. Canad. J. Bot. 46: 689-718.

Groslags, J. H., and M. E. Swift. 1957. The perfect stage of an antibiotic-producing *Cephalosporium*. Mycologia 49: 305-317.

Gull, K. 1978. Form and function of septa in filamentous fungi. pp.78-93. *In* J. E. Smith and D. R. Berry (Eds.). The filamentous fungi. Vol. 3. Developmental Mycology. John Wiley and Sons, Inc., New York. 464 p.

Harkness, H. W. 1885. Fungi of the Pacific Coast. Calif. Acad. Sci. 1: 159-176.

Hawes, C. R., and A. Beckett. 1977. Conidium ontogeny in the *Chalara* state of *Ceratocystis adiposa*. II. Electron microscopy. Trans. Brit. Mycol. Soc. 68: 267-276.

Hawker, L. E. 1954. British hypogeous fungi. Philos. Trans. Roy. Soc. London, Ser. B. Biol. Sci. 237: 429-546.

______. 1955. Hypogeous fungi. IV and V. Trans. Brit. Mycol. Soc. 38: 73-77.

______. 1959. The development of the fruit-body of *Diehliomyces microsporus* (Diehl and Lambert) Gilkey (Syn. *Pseudobalsamia microsporus* Diehl and Lambert). Trans. Bot. Soc. Edinburgh 38: 71-75.

______. 1968. Wall ornamentation of ascospores of species of *Elaphomyces* as shown by the scanning electron microscope. Trans. Brit. Mycol. Soc. 51: 493-498.

______, J. Fraymouth, and M. de la Torre. 1967. The identity of *Elaphomyces granulatus*. Trans. Brit. Mycol. Soc. 50: 129-136.

Hawksworth, D. L. 1979. Ascospore sculpturing and generic concepts in the Testudinaceae (syn. Zopfiaceae). Canad. J. Bot. 57: 91-99.

______, and C. Booth. 1974. A revision of the genus *Zopfia* Rabenh. Mycol. Pap. No. 135. 38 p.

______, and S. Udagawa. 1977. Contributions to a monograph of *Microthecium*. Trans. Mycol. Soc. Japan 18: 143-154.

Hesseltine, C. W. 1953. Study of trickling filter fungi. Bull. Torrey Bot. Club 80: 507-514.

Hill, T. W. 1975. Ultrastructure of ascosporogenesis in *Nannizzia gypsea*. J. Bacteriol. 122: 743-748.

Höhnel, F. von. 1917. Mycologische Fragmente CLXXIV. Über *Sphaeria uliginosa* Fries und die Cephalothecaceen. Ann. Mycol. 15: 360-363.

Horie, Y. 1979. New or interesting *Emericella* from herbal drugs. Trans. Mycol. Soc. Japan 20: 481-491.

______, and S. Udagawa. 1973a. Two records of *Thielavia* species from Thailand soil. Trans. Mycol. Soc. Japan 14: 47-51.

______, and ______. 1973b. Materials from the fungus flora of Japan (13). Trans. Mycol. Soc. Japan 14: 169-173.

______, and ______. 1974. *Anixiella* and *Gelasinospora* from Himalayan soils. Trans. Mycol. Soc. Japan 15: 196-205.

Huang, L. H. 1975. A new species of *Eleutherascus* from Peruvian soil. Mycologia 67: 293-302.

Hughes, S. J. 1951. Studies on micro-fungi. VIII. *Orbicula* and *Lilliputia*. Mycol. Pap. No. 42. 28 p.

______. 1968. Some Gymnoascaceae. Canad. J. Bot. 46: 939-943.

Hunt, J. 1956. Taxonomy of the genus *Ceratocystis*. Lloydia 19: 1-58.

Jackson, H. S. 1947. *Trichomonascus*, a new genus among simple Ascomycetes. Mycologia 39: 709-715.

Jeng, R. S., and R. F. Cain. 1976a. A new species of *Eoterfezia* from Mexico and Venezuela. Mycotaxon 3: 387-390.

______, and ______. 1976b. A new species of *Ascodesmis* from Venezuela. Mycotaxon 3: 391-395.

______, and ______. 1977. *Rhytidospora*, a new cleistocarpous genus of the Melanosporaceae. Mycotaxon. 5: 278-282.

______, and J. C. Krug. *Coprotiella*, a new cleistocarpous genus of the Pyronemataceae with ascospores possessing deBary bubbles. Mycotaxon 4: 545-550.

Jewell, T. R. 1974. A qualitative study of cellulose distribution in *Ceratocystis* and *Europhium*. Mycologia 66: 139-146.

Jong, S. C., and E. E. Davis. 1974. A new *Echinopodospora* with a *Chrysosporium* conidial state. Mycologia 66: 463-468.

______, and ______1975. The imperfect state of *Aphanoascus*. Mycologia 67: 1143-1147.

Kendrick, B., and F. DiCosmo. 1979. Teleomorph-anamorph connections in Ascomycetes, pp. 283-410. *In* B. Kendrick (Ed.) The Whole Fungus. National Museum of Natural Sciences (National Museum of Canada) and The Kananaskis Foundation, Ottawa.

Khan, S. R., and J. W. Kimbrough. 1980. Septal ultrastructure in some genera of the Tremellaceae. Canad. J. Bot. 58: 55-60.

Kimbrough, J. W., and G. L. Benny. 1978. The fine structure of ascus development in *Lasiobolus monascus* (Pezizales). Canad. J. Bot. 56: 862-872.

Kirschstein, W. 1936. Beiträge zur Kenntnis der Ascomyceten und ihrer Nebenformen besonders aus der Mark Brandenburg und dem Beyerischen Walde. Ann. Mycol. 34: 180-210.

Kobayasi, Y. 1960. On the *Elaphomyces* found in Japan. Nagaoa 7: 35-50.

______. 1975. On the genus *Dendrosphaera* of the Trichocomataceae. J. Jap. Bot. 50: 243-248. (In Japanese).

______. 1976. Conidial stage of *Dendrosphaera eberhardti* Pat. (Trichocomataceae). J. Jap. Bot. 51: 90-91. (In Japanese).

______, K. Tubaki, and D. Shimuzu. 1959. On *Onygena corvina* from Japan. Nagaoa 6: 52-58. (In Japanese).

Kohlmeyer, J. 1960. Wood-inhabiting marine fungi from the Pacific northwest and California. Nova Hedw. 2: 293-343.

______. 1963. Zwei neue Ascomyceten-Gattungen auf *Posidonia*-Rhizomen. Nova Hedw. 6: 5-13.

______. 1968. Dänische Meerespilze (Ascomycetes). Ber. Deutsch. Bot. Ges. 81: 53-61.

______. 1972. A revision of Halosphaeriaceae. Canad. J. Bot. 50: 1951-1963.

______, and E. Kohlmeyer. 1971. Synoptic Plates of Higher Marine Fungi, an Identification Guide for the Marine Environment. J. Cramer, Lehre. 87 p.

Kominami, K., Y. Kobayasi, and K. Tubaki. 1952. Is *Trichocoma paradoxa* conspecific with *Penicillium luteum*? Nagaoa 2: 16-23.

Korf, R. P. 1973. Discomycetes and Tuberales, pp. 249-319. *In* G. C.

Ainsworth, F. K. Sparrow, and A. S. Sussman (Eds.) The Fungi, an advanced treatise. Vol. 4A. Academic Press. New York.

Kowalski, D. T. 1965. Development and cytology of *Preussia typharum*. Bot. Gaz. (Crawsfordville) 126: 123-130.

______. 1966. The morphology and cytology of *Preussia funiculata*. Amer. J. Bot. 53: 1036-1041.

Kreger-van Rij, N. J. W., and M. Veenhuis. 1972. Some features of vegetative and sexual reproduction in *Endomyces* species. Can. J. Bot. 50: 1691-1695.

______, and ______. 1973. Electron microscopy of septa in ascomycetous yeasts. Antoine van Leeuvenhoek Ned. Tijkschr. Hyg. 30: 481-490.

______, and ______. 1974. Spores and septa in the genus *Dipodascus*. Can. J. Bot. 52: 1335-1338.

Krug, J. C. and R. S. Jeng. 1979. *Rhytidospora* and *Pteridiosperma*, gen. nov. (Melanosporaceae). Mycotaxon 10: 41-45.

Kuehn, H. H. 1958. A preliminary survey of the Gymnoascaceae. I. Mycologia 50: 417-439.

______. 1959. A preliminary survey of the Gymnoascaceae. II. Mycologia 51: 665-692.

Kurtzman, C. P. 1977. *Cephaloascus albidus*, a new heterothallic yeast-like fungus. Mycologia 69: 547-555.

Kwon-Chung, K. J. 1972. *Emmonsiella capsulata*: perfect state of *Histoplasma capsulatum*. Science 177: 368-369.

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

______, and S. J. Kim. 1974. A second heterothallic *Aspergillus*. Mycologia 66: 628-638.

Langeron, M., and R. Vanbrueseghem. 1965. Outline of mycology. (Trans. by J. Wilkerson). Sir Issac Pitman & Sons, Ltd., London. 426 p.

Lechtova-Trnka, M. 1931. Etude sur les bactéries des léguminuses et observations sur quelques champignons parasites des nodosites. Botaniste 23: 301-530.

Lindau, G. 1897. Pyrenomycetineae, pp. 321-491. *In* A. Engler und K. Prantl. Die natürlichen Pflanzenfamilien. I. Tiel, Abt. 1 Wilhelm Engelmann, Leipzig.

Lloyd, C. G. 1924. *Dendrosphaera eberhardti* from Dr. C. van Overeem, Java. Mycol. Notes 7: 1245.

Locquin-Linard, M. 1973. Recherches sur le genre *Chadefaudiella*. Rev. Mycol. (Paris) 38: 129-146.

______. 1975. *Faurelina*, nouveau genre d'Ascomycètes (Chadefaudiellaceae?). Rev. Mycol. (Paris) 39: 125-129 (1974-1975).

______. 1977. A propos de genres non ostiolés places dans la famille de Microascaceae (Ascomycètes). Creation d'un nouveau genre: *Enterocarpus*. Rev. Mycol. (Paris) 41: 509-523.

Lodha, B. C. 1974a. Studies on *Chaetomidium*. Beih. Nova Hedw. 47: 367-372.

______. 1974b. Studies on coprophilous fungi. III. *Thielavia*. Beih. Nova Hedw. 47: 361-366.

______. 1978. Generic concepts in some Ascomycetes occurring on dung, pp. 241-257. *In* Subramanian (Ed.) Taxonomy of fungi. Univ. of Madras, Madras.

Lodhi, S. A. and F. Mirza. 1962. A new genus of the Eurotiales. Mycologia 54: 217-219.

Lundqvist, N. 1964. The genus *Trichodelitschia* in Sweden. Svensk. Bot. Tidskr. 58: 267-272.

______. 1967. On spore ornamentation in the Sordariaceae, exemplified by the new cleistocarpous genus *Copromyces*. Ark. Bot., Ser. 2, 6: 327-337.

______. 1969. *Tripterospora* (Sordariaceae *s. lat.*, Pyrenomycetes). Bot. Not. 122: 589-603.

______. 1972. Nordic Sordariaceae *s. lat.*, Symb. Bot. Upsal. 20 (1): 1-374.

Luttrell, E. S. 1951. Taxonomy of the Pyrenomycetes. Univ. Missouri Stud., Sci. Ser., 24(3): 1-120.

______. 1955. The ascostromatic Ascomycetes. Mycologia 47: 511-532.

______. 1973. Loculoascomycetes, pp. 135-219, *In* G. C. Ainsworth, F. K. Sparrow, and A. S. Sussman (Eds.). The Fungi, an advanced treatise. Vol. 4A. Academic Press, New York.

Malloch, D. 1970a. New concepts in the Microascaceae illustrated by two new species. Mycologia 62: 727-740.

______. 1970b. The genera of cleistothecial Ascomycota. Ph.D. Dissert., Univ. of Toronto. 2 vols. 672 p.

______. 1974a. *Connersia rilstonii*. Fungi Canadensis No. 32.

______. 1974b. *Sphaeronaemella helvellae*. Fungi Canadensis No. 53.

______. 1979. Plectomycetes and their anamorphs, pp. 153-162. *In* B. Kendrick (Ed.). The Whole Fungus. Vol. 1. National Museum of Natural Sciences (National Museums of Canada) and the Kananaskis Foundation, Ottawa.

______, and G. L. Benny. 1973. California Ascomycetes: four new species and a new record. Mycologia 65: 648-660.

______, and R. F. Cain. 1970a. The genus *Arachnomyces*. Canad. J. Bot. 48: 839-845.

______, and ______. 1970b. Five new genera in the new family Pseudeurotiaceae. Canad. J. Bot. 48: 1815-1825.

______, and ______. 1971a. New genera of Onygenaceae. Canad. J. Bot. 49: 839-846.

______, and ______. 1971b. Four new genera of cleistothecial Ascomycetes with hyaline ascospores. Canad. J. Bot. 49:847-854.

______, and ______. 1971c. The genus *Kernia*. Canad. J. Bot. 49: 855-867.

______, and ______. 1971d. New cleistothecial Sordariaceae and an new family, Coniochaetaceae. Canad. J. Bot. 49: 869-880.

______, and ______. 1972a. New species and combinations of cleistothecial Ascomycetes. Canad. J. Bot. 50: 61-72.

______, and ______. 1972b. The Trichocomataceae: Ascomycetes with *Aspergillus*, *Paecilomyces*, and *Penicillium* imperfect states. Canad. J. Bot. 50: 2613-2628.

______, and ______. 1973a. The genus *Thielavia*. Mycologia 65: 1055-1077.

______, and ______. 1973b. The Trichocomaceae (Ascomycetes): synonyms in recent publications. Canad. J. Bot. 51: 1647-1648.

______, and C. T. Rogerson. 1977. *Pulveria*, a new genus of Xylariaceae (Ascomycetes). Canad. J. Bot. 55: 1505-1509.

Martin, G. W. 1941a. Outline of the fungi. Stud. Nat. Hist. Iowa Univ. 18 (Suppl.): 1-64.

______. 1941b. On *Argynna polyhedron* (Schw.) Morg. J. Wash. Acad. Sci. 31: 309-311.

______. 1961. Key to the families of fungi, pp. 497-517. *In* G. C. Ainsworth, Ainsworth & Bisby's dictionary of the fungi. Fifth Ed., Commonwealth Mycological Institute, Kew, Surrey.

Massee, G., and E. S. Salmon. 1901. Researches on coprophilous fungi. Ann. Bot. (London) 15: 313-357.

McGinnis, M. R., and B. Katz. 1979. *Ajellomyces* and its synonym *Emmonsiella*. Mycotaxon 8: 157-164.

McDonough, E. S., and A. L. Lewis. 1968. The ascigerous stage of *Blastomyces dermatitidis*. Mycologia 60: 76-83.

Miller, J. H. 1941. The Ascomycetes of Georgia. Plant Disease Rept., Aug. 1941. (Suppl.) 131: 1-93.

______. 1949. A revision of the classification of the Ascomycetes with special emphasis on the Pyrenomycetes. Mycologia 41: 99-127.

Mizra, J. H. 1968. *Cleistobombardia*, a new cleistothecial genus in the family Sordariaceae. Mycologia 60: 704-707.

Moore, R. T. 1977. Regnum fungi and the place of septal fine structure in fungal taxonomy, p. 499. *In* H. E. Bigelow and E. G. Simmons (Eds.) Abstracts, Vol. M-Z. Second Int. Mycol. Congr., Tampa, Florida.

______. 1978. Taxonomic significance of septal ultrastructure with particular reference to the jelly fungi. Mycologia 70: 1007-1024.

Morgan, A. P. 1895. New North American fungi. J. Cincinnati Soc. Nat. Hist. 18: 36-45.

Morinaga, T., K. Minoura, and S. Udagawa. 1978. New species of microfungi from southeast Asian soil. Trans. Mycol. Soc. Japan 19: 135-148.

Morton, F. J., and G. Smith. 1963. The genera *Scopulariopsis* Banier, *Microascus* Zukal, and *Doratomyces* Corda. Mycol. Pap. No. 86. 96 p.

Mukerji, K. G., and A. S. Saxena. 1974. Notes on *Achaetomium*, *Anixiella*, *Boothiella*, *Chaetomidium*, *Lophotrichus*, *Pseudeurotium*, *Pycnidiophora*, and the classification of the Chaetomiales. Beih. Nova Hedw. 47: 373-404.

Müller, E., and J. A. von Arx. 1973. Pyrenomycetes: Meliolales, Coronophorales, Sphaeriales, pp. 87-132. *In* G. C. Ainsworth, F. K. Sparrow, and A. S. Sussman (Eds.) The fungi, an advanced treatise. Vol. 4A. Academic Press, New York.

______, and W. Loeffler. 1976. Mycology an outline for science and medical students. (Trans. by B. Kendrick and W. Barlocher). George Thieme Pubs., Stuttgart. 306 p.

Nannfeldt, J. A. 1932. Studien über die Morphologie und Systematik der lichenisierten inoperculaten Discomyceten. Nova Acta Regiae Soc. Sci. Upsal., Ser. 4, 8 (2): 1-368.

Olchowecki, A., and J. Reid. 1974. Taxonomy of the genus *Ceratocystis* in Manitoba. Canad. J. Bot. 52: 1675-1711.

Orr, G. F. 1970. *Neogymnomyces*, a new genus of the Gymnoascaceae. Canad. J. Bot. 48: 1061-1066.

______. 1976. *Kuehniella*, a new genus of the Gymnoascaceae. Mycotaxon 4: 171-178.

______. 1977a. Another genus of the Gymnoascaceae with swollen septa on peridial elements. Mycotaxon 5: 283-290.

______. 1977b. A new species of *Gymnoascus*. Mycotaxon 5: 470-474.

______. 1977c. New Gymnoascaceae. Mycotaxon 6: 33-42.

______. 1979. The genus *Pseudogymnoascus*. Mycotaxon 8: 165-173.

______, G. R. Ghosh, and K. Roy. 1977. The genera *Gymnascella*, *Arachniotus*, and *Pseudoarachniotus*. Mycologia 69: 126-163.

______, and H. H. Kuehn. 1963a. *Gymnoascus verticillatus* Smith. Mycopath. Mycol. Appl. 21: 211-216.

______, and ______. 1963b. The genus *Ctenomyces* Eidam. Mycopath. Mycol. Appl. 21: 321-333.

______, and ______. 1964a. A re-evaluation of *Myxotrichum spinosum* and *M. cancellatum*. Mycologia 56: 473-481.

______, and ______. 1964b. A new genus of the Gymnoascaceae with dark ascocarps. Mycologia 56: 482-487.

______, and ______. 1971. Notes on the Gymnoascaceae. I. A review of eight species. Mycologia 63: 191-203.

______, ______, and O. A. Plunkett. 1963a. The genus *Gymnoascus* Baranetsky. Mycopath. Mycol. Appl. 21: 1-18.

______, ______, and ______. 1963b. A new genus of the Gymnoascaceae with swollen peridial septa. Canad. J. Bot. 41: 1439-1456.

______, ______, and ______. 1963c. The genus *Myxotrichum* Kunze. Canad. J. Bot. 41: 1457-1480.

______, ______, and E. Varasavsky. 1965. The genus *Amauroascus*. Mycopath. Mycol. Appl. 25: 100-108.

______, K. Roy, and G. R. Ghosh. 1977. *Gymnoascoideus*, a new genus of the Gymnoascaceae. Mycotaxon 5: 459-469.

Paden, J. W., and J. V. Cameron. 1972. Morphology of *Warcupia terrestris*, a new ascomycete genus and species from soil. Canad. J. Bot. 50: 999-1001.

Padhye, A. A., and J. W. Carmichael. 1971. The genus *Arthroderma* Berkeley. Canad. J. Bot. 49: 1525-1540.

Parguey-Leduc, A. 1977. Les asques des Pyrenomycetes. Rev. Mycol. (Paris) 41: 281-338.

______, and M. Locquin-Linard. 1976. L'ontogenie et la structure des peritheces de *Faurelina fimigenes* Locquin-Linard. Rev. Mycol. (Paris) 40: 161-175.

Parbery, D. G. 1969. *Amorphotheca resinae* gen. nov., sp. nov.: the perfect state of *Cladosporium resinae*. Austral. J. Bot. 17: 331-357.

Patouillard, N. 1907. Champignons nouveaux du Tonkin. Bull. Soc. Mycol. France 23: 69-79.

Peek, C. A., and W. G. Solheim. 1958. The hyphomycetous genera of H. W. Harkness and the ascomycetous genus *Cleistosoma* Harkn. Mycologia 50: 844-861.

Petch, T. 1912. Revision of Ceylon Fungi. III. Ann. Roy. Bot. Gard. (Peradeniya) 5: 265-301.

Pitt, J. I. 1974. A synoptic key to the genus *Eupenicillium* and to sclerotogenic *Penicillium* species. Canad. J. Bot. 52: 2231-2236.

Ram, C. 1971. Timber-attacking fungi from the state of Maranhão, Brazil. 'New species of Pyrenomycetes XI.' Nova Hedw. 21: 225-230 (1972).

Raper, K. B., and D. I. Fennell. 1965. The genus *Aspergillus*. The Williams and Wilkins Co., Baltimore. 686 p.

Rai, J. N., and H. J. Chowdhery. 1975. *Hemisartorya*, a new genus of cleistothecial Ascomycetes with *Aspergillus* state. Kavaka 3: 73-76.

Redhead, S. A., and D. W. Malloch. 1977. The Endomycetaceae: new concepts, new taxa. Canad. J. Bot. 55: 1701-1711.

Robinson, B. M. 1970. A new cleistocarpous genus *Echinopodospora* with two new species. Trans. Brit. Mycol. Soc. 54: 318-322.

Rolland, L. 1896. Aliquot fungi novi vel critici Galliae. Bull. Soc. Mycol. France 12:1-10.

Rogerson, C. T. 1970. The hypocrealean fungi (Ascomycetes, Hypocreales). Mycologia 62: 865-910.

Roy, K., G. R. Ghosh, and G. F. Orr. 1978. The genus *Rollandina*, pp. 215-224. *In* C. V. Subramanian (Ed.) Taxonomy of fungi. University of Madras, Madras.

Saccardo, P. A. 1913. Ascomycetae-Deuteromycetae. Sylloge Fungorum 22 (9): 1-1612.

Schröter, J. 1894. Hemiascineae, pp. 143-149. A. Engler und K. Prantl. Die natürlichen Pflanzenfamilien. I. Teil.,Abth. 1. Wilhelm Engelmann, Leipzig.

Samson, R. A. 1972. Notes on *Pseudogymnoascus*, *Gymnoascus*, and related genera. Acta Bot. Neerl. 21: 517-527.

_____. 1979. A compilation of the aspergilli described since 1965. Studies Mycol. (Baarn) No. 18: 38 p.

_____, and B. Luiten. 1975. *Eleutherascus tuberculatus*, a new heat resistant ascomycete. Trans. Brit. Mycol. Soc. 64: 338-340.

_____, and D. P. Mahoney, II. 1977.*Talaromyces galapagensis* sp. nov. Trans. Brit. Mycol. Soc. 69: 158-160.

_____, and J. Mouchacca. 1974. Some interesting species of *Emericella* and *Aspergillus* from Egyptian desert soil. Antoine van Leeuwenhoek Ned. Tijdschr. Hyg. 40: 121-131.

_____, and _____. 1975a. Additional notes on species of *Aspergillus*, *Eurotium* and *Emericella* from Egyptian desert soil. Antoine van Leeuwenhoek Ned. Tijdschr. Hyg. 41: 343-351.

_____, and _____. 1975b. Two new soil-borne cleistothecial ascomycetes. Canad. J. Bot. 53: 1634-1639.

_____, and M. J. Tansey. 1975. *Byssochlamys verrucosa* sp. nov. Trans. Brit. Mycol. Soc. 65: 512-514.

Samuelson, D. A., and J. W. Kimbrough. 1978. Asci of the Pezizales. IV. The apical apparatus of *Thelebolus*. Bot. Gaz. (Crawfordsville) 139: 346-361.

Seth, H. K. 1971. The genus *Lophotrichus* Benjamin. Nova Hedw.19:591-599.

Sigler, L., and J. W. Carmichael. 1976. Taxonomy of *Malbranchea* and some other Hyphomycetes with arthroconidia. Mycotaxon 4: 349-488.

Skou, J. P. 1972. Ascosphaerales. Friesia 10: 1-24.

_____. 1975. Two new species of *Ascosphaera* and notes on the conidial state of *Bettsia alvei*. Friesia 11: 62-74.

_____. 1979. A new homothallic species of *Ascosphaera*. Friesia 11:265-271.

Spiltoir, C. F. 1955. Life cycle of *Ascosphaera apis* (*Pericystis apis*). Amer. J. Bot. 42: 501-508.

_____, and L. S. Olive. 1955. A reclassification of the genus *Pericystis* Betts. Mycologia 47: 238-244.

Stafleu, F. A. (Chm. ed. com.). 1972. International code of botanical nomenclature. Regnun Veg. 82: 1-426.

Steele, S. D., and T. W. Fraser. 1973. The ultrastructure of *Geotrichum candidum* hyphae. Canad. J. Microbiol. 19: 1507-1512.

Stejskal, M. 1974. *Arrhenosphaera cranei*, gen. et sp. nov., a beehive fungus found in Venezuela. J. Apic. Res. 13: 39-45.

Stolk, A. C. 1955. *Emericellopsis minima* sp. nov. and *Westerdykella ornata* gen. nov., sp. nov. Trans. Brit. Mycol. Soc. 38: 419-424.

_____. 1965. Thermophilic species of *Talaromyces* Benjamin and *Thermoascus* Meihe. Antoine van Leeuwenhoek Ned. Tijdschr. Hyg. 31: 262-276.

_____, and G. F. Orr. 1974. *Sagenoma*, a new genus of Eurotiaceae. Mycologia 66: 676-680.

_____, and R. A. Samson. 1971. Studies on *Talaromyces* and related genera. I. *Hamigera* gen. nov. and *Byssochlamys*. Persoonia 6: 341-357.

_____, and _____. 1972. The genus *Talaromyces*. Studies on *Talaromyces* and related genera. II. Studies Mycol. (Baarn) No. 2. 65 p.

_____, and J. W. Veenbaas-Rijks. 1974. *Eupenicillium osmophilum* sp. nov. Antoine van Leeuwenhoek Ned. Tijdschr. Hyg. 40: 1-5.

Subramanian, C. V. 1972. The perfect states of *Aspergillus*. Curr. Sci.

41: 755-761.

______. 1979. Phialidic hyphomycetes and their teleomorphs-an analysis, pp. 125-148. *In* B. Kendrick (Ed.). The whole fungus. Vol. I. National Museum of Natural Sciences (National Museum of Canada) and the Kananaskis Foundation, Ottawa.

______, and B. C. Lodha. 1968. Two interesting coprophilous fungi from India. Curr. Sci. 37: 245-248.

Tansey, M. R., and M. A. Jack. 1975. *Thielavia australiensis* sp. nov., a new thermophilic fungus from incubator-bird (mallee fowl) nesting material. Canad. J. Bot. 53: 81-83.

Thirumalachar, M. J., and P. N. Mathur. 1966. *Narasimhella*, a new genus of the Gymnoascaceae. Sydowia 19: 184-186.

______, M. D. Whitehead, and P. N. Mathur. 1964. A new genus of Eurotiaceae from soil. Mycologia 56: 809-815.

Trappe, J. M. 1964. Mycorrhizal hosts and distribution of *Cenococcum graniforme*. Lloydia 27: 100-106.

______. 1971. Mycorrhiza-forming Ascomycetes, pp. 19-37. *In* E. Hacskaylo (Ed.). Mycorrhizae. Proceedings of the First North American Conference on Mycorrhizae, April 1969. U. S. D. A., Forest Service, Misc. Publ. 1189. Washington, D. C. 255 p.

______. 1979. The orders, families, and genera of hypogeous Ascomycotina (truffles and their relatives). Mycotaxon 9: 297-340.

______, and J. W. Kimbrough. 1972. *Elaphomyces veridiseptum*, a new species from Florida. Mycologia 64: 646-649.

Tu, C. C., and J. W. Kimbrough. 1978. Systematics and phylogeny of fungi in the *Rhizoctonia* complex. Bot. Gaz. (Crawfordsville) 139: 454-466.

Udagawa, S. 1962. *Microascus* species new to the mycoflora of Japan. J. Gen. Appl. Microbiol. 8: 39-51.

______. 1963a. Microascaceae in Japan. J. Gen. Appl. Microbiol. 9: 137-148.

______. 1963b. Notes on some Japanese Ascomycetes. I. Trans. Mycol. Soc. Japan 4: 94-102.

______. 1965. Notes on some Japanese Ascomycetes. II. Trans. Mycol. Soc. Japan 6: 78-90.

______. 1966. Notes on some Japanese Ascomycetes. III. Trans. Mycol. Soc. Japan 7: 91-98.

______. 1968. Three new species of *Eupenicillium*. Trans. Mycol. Soc. Japan 9: 49-56.

______. 1970. Notes on some Japanese Ascomycetes. IX. Trans. Mycol. Soc. Japan 10: 103-109.

______, and T. Awao. 1969. Notes on some Japanese Ascomycetes. VIII. Trans. Mycol. Soc. Japan 10: 1-8.

______, and R. F. Cain. 1969. Notes on the genus *Microthecium*. Canad. J. Bot. 47: 1915-1933.

______, and K. Furuya. 1972a. Notes on some Japanese Ascomycetes. Trans. Mycol. Soc. Japan 13: 49-56.

______, and ______. 1972b. *Zopfiella pilifera*, a new cleistoascomycete from Japanese soil. Trans. Mycol. Soc. Japan 13: 255-259.

______, and ______. 1973. The genus *Leuconeurospora*. J. Jap. Bot. 48: 111-116.

______, and ______. 1974. Notes on some Japanese Ascomycetes. XIII. Trans. Mycol. Soc. Japan 15: 206-214.

______, and ______. 1975. Materials for the fungus flora of Japan. (19). Trans. Mycol. Soc. Japan 16: 215-221.

______. and ______. 1976. Two noteworthy Ascomycetes, *Zopfiella matsushimae* and *Sporormiella pascua*. J. Jap. Bot. 51: 118-122.

______, and ______. 1978. A new species of *Microascus* and its peculiar conidial state. Mycotaxon 7: 91-96.

______, and ______. 1979. *Poroconiochaeta*, a new genus of the Coniochaetaceae. Trans. Mycol. Soc. Japan 20: 5-12.

______, ______, and Y. Horie. 1973. Mycological reports from New Guinea and the Solomon Islands. 19. Notes on some ascomycetous microfungi from soil. Bull. Nat. Sci. Mus. 16: 503-520.

______, and Y. Horie. 1971a. Taxonomical notes on mycogenous fungi. I. J. Gen. Appl. Microbiol. 17: 141-159.

______, and ______1971b. Mycological reports from New Guinea and the Solomon Islands. 11. Isolation of mushroom-inhabiting fungi. Bull. Nat. Sci. Mus. 14: 516-544.

______, and ______. 1972a. A new species of *Thielavia* and its *Chrysosporium* conidial state. Bull. Nat. Sci. Mus. 15: 191-196.

______, and ______. 1972b. *Diplogelasinospora* and its conidial state. J. Jap. Bot. 47: 297-306.

______, and ______. 1972c. New or noteworthy ascosporic *Penicillia* from the Phillipines. J. Jap. Bot. 47: 338-346.

______, and ______. 1973a. Surface ornamentation of ascospores in *Eupenicillium* species. Antoine van Leeuwenhoek Ned. Tidjschr. Hyg. 39: 313-319.

______, and ______. 1973b. Some *Eupenicillium* from soils of New Guinea. Trans. Mycol. Soc. Japan 14: 370-387.

______. and ______. 1974. Notes on some Japanese Ascomycetes. XII. Trans. Mycol. Soc. Japan 15: 105-112.

______, and ______. 1975. Notes on some Japanese Ascomycetes. XIV. Trans. Mycol. Soc. Japan 16: 337-347.

______, and ______. 1976. A new species of *Emericella*. Mycotaxon 4: 535-539.

______, and ______. 1977. A new species of *Eupenicillium* from Japanese soil. Mycotaxon 5: 493-497.

______, and Y. Kawasaki. 1968. Notes on some Japanese Ascomycetes. VI. Trans. Mycol. Soc. Japan 8: 115-121.

______, and T. Muroi. 1979. Some interesting species of Ascomycetes from imported spices. Trans. Mycol. Soc. Japan 20: 13-22.

______, and M. Takada. 1967. Notes on some Japanese Ascomycetes. IV. Trans. Mycol. Soc. Japan 8: 43-49.

______, and ______. 1968. Notes on some Japanese Ascomycetes. VII. Trans. Mycol. Soc. Japan 9: 12-17.

______, and ______. 1971. Mycological reports from New Guinea and the Solomon Islands. 10. Soil and coprophilous fungi. Bull. Nat. Sci. Mus. 14: 501-515.

______, and ______. 1973. The rediscovery of *Aphanoascus cinnabarinus*. J. Jap. Bot. 48: 21-26.

______, and ______. 1974. Notes on some Japanese Ascomycetes. XI. Trans. Mycol. Soc. Japan 15: 23-29.

______, and S. Ueda. 1979. *Corynascella inquinata*, a new cleistothecial ascomycete from sewage sludge. Mycotaxon 8: 292-296.

Uecker, F. A. 1979. Development and cytology of *Anixiella endodonta*. Bot. Gaz. (Crawfordsville) 140: 310-317.

Upadhyay, H. P., and W. B. Kendrick. 1975. Prodromus for a revision of *Ceratocystis* (Microascales, Ascomycetes) and its conidial states. Mycologia 67: 798-805.

Vardhanabhuti, S. 1959. Cultural characteristics and life history of a new human pathogen, *Thailandia candida*, nov. gen. et nov. sp. Sydowia 13: 98-104.

Varitchak, B. 1933. Deuxième contribution à l'étude du développement de Ascomycètes. L'évolution nucléaire dans le sac sporifère de *Pericystis apis* Maassen et sa signification pour la phylogénie de Ascomycètes. Botaniste 25: 343-390.

Varsavsky, E., and G. F. Orr. 1971. A new genus of the Gymnoascaceae. Mycopath. Mycol. Appl. 43: 229-234.

Vries, G. A. de. 1969. Das Problem: *Aphanoascus* Zukal oder *Anixiopsis* Hansen. Mykosen 12: 111-112.

Ward, H. M. 1899. VII. *Onygena equina* Willd., a horn-destroying fungus. Philosoph. Trans. Roy. Soc., London, Sect. B., 191: 269-291.

Wehmeyer, L. E. 1975. The Pyrenomycetous Fungi. Mycol. Memoir No. 6. J. Cramer, Lehre. 250 p.

Weijman, A. C. M. 1975. Annual report, pp. 15-17. *In* J. A. von Arx. Centraalbureau voor Schimmelcultures Baarn and Delft Progress report 1974. Verh. Kon. Ned. Akad. Wetensch. Naturk. Tweede Sect. 66: 1-23.

______. 1976. Cell-wall composition and taxonomy of *Cephaloascus fragrans* and some Ophiostomataceae. Antoine van Leeuwenhoek Ned. Tykschr. Hyg. 42: 315-324.

______. 1977. Carbohydrate composition and taxonomy of the genus *Dipodascus*. Antonie van Leeuwenhoek Ned. Tykschr. Hyg. 43: 323-331.

______, and G. S. de Hoog. 1975. On the subdivision of the genus *Ceratocystis*. Antonie van Leeuwenhoek Ned. Tykschr. Hyg. 41: 353-360.

Wiley, B. J., and E. G. Simmons. 1973. New species and a new genus of Plectomycetes with *Aspergillus* states. Mycologia 65: 934-938.

Winter, G. 1887. Ascomyceten: Gymnoasceen und Pyrenomyceten. *In* Dr. L. Rabenhorst's Kryptogamen-Flora von Deutschland, Oesterreich und der Schweiz. Pilze. Erster Band, II. Abth. 48. Eduard Kummer, Leipzig. 928 p.

Whiteside, W. C. 1962. Morphological studies in the Chaetomiaceae. II. Mycologia 54: 152-159.

Zeller, S. M. 1944. Representatives of the Mesophelliaceae in North America. Mycologia 36: 627-637.

Zukal, H. 1890. Ueber einige neue Pilzformen und uber das Vorhaltniss der Gymnoascaecen zu den überigen Ascomyceten. Ber. Deut. Bot. Ges. 8: 295-303.

A CLASSIFICATION OF PLECTOMYCETES AND OTHER CLEISTOTHECIAL ASCOMYCETES

(?=questionable member of taxon)

- PLECTOMYCETES
  - EUROTIALES
    - Cephalothecaceae
      - *Aporothielavia*
      - *Cephalotheca*
        - =*Aposphaeropsis*
        - ?*Carothecis*
        - =*Crepinula*
      - *Connersia*
      - *Cryptendoxyla*
      - *Emericellopsis*
        - ?*Capsulotheca*
        - =*Diplostephanus*
        - =*Peyronellula*
        - =*Saturnomyces*
      - *Fragosphaeria*
      - *Hapsidospora*
      - *Leucosphaera*
      - *Nigrosabulum*
      - *Pseudeurotium*
        - =*Levispora*
    - Trichocomaceae
      - =Eurotiaceae
      - =Trichocomataceae
      - *Aphanoascus*
      - *Byssochlamys*
      - *Chaetosartorya*
        - =*Harpezomyces*
      - *Dactylomyces*
      - *Dichlaena*
      - *Edyuilla*
        - =*Gymnoeurotium*
      - *Emericella*
        - =*Cleistosoma*
        - =*Inzengaea*
      - *Eupenicillium*
        - =*Carpenteles*
      - *Eurotium*
      - *Fennellia*
      - *Hamigera*
      - *Hemicarpenteles*
      - *Hemisartorya*
        - =*Sartorya*
      - *Penicilliopsis*
        - =*Sarophorum*
      - *Petromyces*
        - =*Syncleistostroma*
      - *Roumegueriella*
        - =*Lilliputia*
      - *Sagenoma*
      - *Sclerocleista*
      - *Talaromyces*
      - *Trichocoma*
        - =*Trichoskytale*
      - *Warcupiella*
        - =*Sporophormis*
  - ASCOSPHAERIALES
    - Ascosphaeriaceae
      - =Pericystaceae
      - =Synascomycetaceae
      - *Arrhenosphaera*
      - *Ascosphaera*
        - =*Pericystis*
      - *Bettsia*
    - Monascaceae
      - *Ascorhiza*
      - *Leiothecium*
      - *Monascus*
        - =*Backusia*
      - *Xeromyces*
  - OPHIOSTOMATALES
    - Ophiostomataceae
      - *Ceratocystis*
      - *Ceratocystopsis*
      - *Ophiostoma*
        - =*Europhium*
      - *Sphaeronaemella*
  - MICROASCALES
    - Chadefaudiellaceae
      - *Chadefaudiella*
    - Microascaceae
      - =Lophotrichaceae
      - *Enterocarpus*
      - *Kernia*
        - =*Magnusia*
      - *Lophotrichus*
      - *Microascus*
        - =*Fairmania*
        - =*Nephrospora*
        - =*Peristomium*
      - *Petriella*
      - *Petriellidium*
        - =*Allescheria*
        - =*Eurotiella*
        - =*Eurotiopsis*
    - Pithoascaceae
      - *Faurelina*
      - *Pithoascus*
  - ONYGENALES
    - Dendrosphaeraceae
      - *Dendrosphaera*
    - Gymnoascaceae
      - Arachnioideae
        - *Amauroascus*
        - *Arachniotus*
          - =*Disarticulatus*
          - =*Petalosporus*
          - =*Plunkettomyces*
          - =*Pseudoarachniotus*
          - =*Rollandina*
          - =*Waldemaria*
        - *Arachnotheca*
          - =*Kuehniella*
        - *Byssoascus*
        - *Narasimhella*
      - Arthrodermoideae
        - *Ajellomyces*
          - =*Emmonsiella*
        - *Apinisia*
        - *Arthroderma*
        - *Nannizzia*
        - *Renispora*
        - *Shanorella*
        - *Spiromastix*
      - Gymnoascoideae
        - *Auxarthron*
        - *Ctenomyces*
        - *Gymnoascus*
          - =*Gymnascella*
          - =*Gymnoascoideus*
          - =*Macronodus*
          - =*Neogymnomyces*
          - =*Tripedotrichum*
          - =*Uncinocarpus*
        - *Myxotrichum*
          - =*Actinospira*
          - =*Eidamella*
          - =*Toxotrichum*
        - *Pectinotrichum*
        - *Pseudogymnoascus*
    - Onygenaceae
      - =Thermoascaceae
      - *Anixiopsis*
      - *Arachnomyces*
      - *Ascocalvatia*
      - *Dichotomomyces*
        - =*Royella*
      - *Keratinophyton*

- *Leucothecium*
- *Neoxenophila*
- *Onygena*
- *Pleuroascus*
- *Thermoascus*
- *Xanthothecium*
- *Xylogone*
- *Xynophila*

PYRENOMYCETES

CHAETOMIALES

- Chaetomiaceae
  - *Chaetomidium*

HYPOCREALES

- Hypocreaceae
  - *Amylocarpus*
    - *=Plectolitus*
  - *Battarrina*
  - *Heleococcum*
  - *Mycoarachis*
  - *Mycorhynchidium*

SORDARIALES

- Coniochaetaceae
  - *Coniochaetidium*
  - *Ephemeroascus*
  - *Germslitospora*
- ?Eoterfeziaceae
  - (see Discomycetes)
- Halosphaeriaceae
  - *Chadefaudia*
  - *?Eiona*
- Melanosporaceae
  - *Microthecium*
  - *Pteridosperma*
  - *Rhytidospora*
- Sordariaceae
  - *Anixiella*
  - *Apodus*
  - *Bombardia*
  - *Copromyces*
  - *Corynascus*
  - *Corynascella*
  - *Diplogelasinospora*
  - *Echinopodospora*
  - *Eosphaeria*
  - *?Guilliermondia*
  - *?Melanocarpus*
    - *=Myriococcum*
  - *Thielavia*
    - *=Boothiella*
    - *=Thielaviella*
  - *Triptosporella*
  - *Zopfiella*
    - *=Cleistobombardia*
- Xylariaceae
  - *Pulveria*

DISCOMYCETES

HELOTIALES

- Hemiphacidiaceae
  - =Amorphothecaceae
  - *Amorphotheca*

PEZIZALES

- ?Eoterfeziaceae
  - *Cleistothelebolus*
  - *Eoterfezia*
  - *Lasiobolidium*
  - *Microeurotium*
  - *Orbicula*
    - *=Didymium*
    - *=Mycogala*
  - *Warcupia*
- Pyronemataceae
  - *Eleutherascus*
    - *=Hemiascosporium*

ELAPHOMYCETALES

- Elaphomycetaceae
  - *Elaphomyces*
    - *=Ascoscleroderma*

LOCULOASCOMYCETES

DOTHIDIALES

- ?Testudinaceae
  - *Celtidia*
  - *Lepidosphaeria*
  - *Neotestudina*
    - *=Pseudophaeotrichum*
  - *Richingeriella*
  - *Richonia*
  - *Testudina*
    - *=Marchaliella*
  - *Ulospora*
  - *Zopfia*
    - *=Pontoporeia*
  - *Zopfiofoveola*

PLEOSPORALES

- Phaeotrichaceae
  - *?Neotestudina*
  - (see Testudinaceae)
  - *Phaeotrichum*
  - *Trichodelitschia*
- Sporormiaceae
  - *Pruessia*
    - *=Fleishhakia*
    - *=Honoratia*
    - *=Sporormiella*
  - *Westerdykella*
    - *=Puressiella*
    - *=Pycnidiophora*
- ?Eremomycetaceae
  - *Eremomyces*
  - *Rhexothecium*

?LOCULOASCOMYCETES

- *Ceratocarpis*
- *Cleistotheca*
- *Dexteria*
- *Leuconeurospora*
- *Subbaromyces*

GENERA OF UNCERTAIN AFFINITIES

- *Albertinella*
- *Argynna*
- *Batistia*
- *?Capsulotheca*
- *Chaetotheca*
- *Eremodothis*
- *Eurotiopsis* Karst.
- *Guilliermondia*
- *Gymnoascopsis*
- *Hexagonella*
- *Laasiomyces*
  - *=Phaeidium*
- *Pisomyxa*
- *Samarospora*
- *Trichomonascus*
- *Veronaia*

INDEX OF TAXA

This index includes taxa at the generic level and above. Primary discussion of each taxon is found on page numbers in italics.

MYCOTAXON

Vol. XII, No. 1, pp. 92-96 October-December 1980

NEW TAXA OF RUSSULA FROM THE LESSER ANTILLES

D.N. PEGLER

The Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AE, England

AND

R. SINGER

Field Museum of Natural History, Chicago, Illinois 60605, U.S.A.

During the course of preparatory studies on the genus *Russula* Pers. ex S.F. Gray for forthcoming accounts due to appear in 'Flora Neotropica' and 'Agaric Flora of the Lesser Antilles, it became apparent that a number of new species needed to be described and an infrageneric revision is required to take account of the tropical species. Latin diagnoses of these new taxa are given here and more detailed, illustrated accounts will appear at a later stage.

Section **Pellicularieae** Heim in Prodr. Fl. Mycol. Madag. 1: 121 (1938) emend. Singer

Basidiocarp fragile, small to medium. Pileus with a membranous context and an acute margin which is plicate-striate from an early stage. Lamellulae present, numerous. Veil present or absent. Context soft, soon decaying. Spore print white to cartridge buff. Spores almost orthotropic, with a small, amyloid suprahilar plage. Pileipellis not epithelial. Tropical, often non-mycorrhizal or facultatively ectomycorrhizal. Type species: *R. annulata* Heim.

Russula hygrophytica Pegler, sp. nov.

Pileus 4.5–5.5 cm latus, convexus vel in centro tantum depressus, ad discum fuscus, ad marginem pallide griseo-brunneus, viscidus, sulcato-striatus, pectinato-fissus. Lamellae adnexae, albidae, simplices, moderate confertae, intervenosae, interdum furcatae. Stipes 4–5 × 0.5–1 cm, cylindricus, cavus, albidus, glaber. Caro membranacea, albida, immutabilis; odor nullus, sapor mitis vel tarde subacris. Sporae 6.5–9 × 6–8.5 (7.6 ± 0.5 × 7.3 ± 0.5) µm (excl. orn.), Q = 1.05, subglobosae, melleo-hylinae, valde amyloideae, ornamentatione cristato-reticulato praeditae. Basidia 34–47 × 8–11 µm, clavato-ventricosa, 2– vel 4-sporigera. Cheilocystidia 35–55 × 7–14 µm, clavato-mucronata, hyalina, tenuitunicata. Macrocystidia copiosa, 45–70 × 8–11 µm, clavata vel mucronata, intus contento in sulphovanillina caerulescente repleta. Trama hymenophoralis intermixta. Cuticula e stratis tribus composita. Epicutis 35–80 µm lata, ex hyphis filamentosis et dermatocystidiis numerosis efformata. Cutis 75–200 µm lata, ex hyphis dispersis, gelatinosa. Hypodermium 20–35 µm latum, ex hyphis brunneis, agglutinatis efformatum. Typus: Martinica, Plateau Perdrix, in silvis pluvialibus, 23 Aug. 1976, Fiard 506 F, K.

Closely related to the common and widespread, neotropical species, *R. puiggarii* (Speg.) Singer, but differs macroscopically in the more crowded lamellae, a more strongly tuberculate pileal margin, and occurring at a higher altitude in a hygrophytic forest rather than in a mesophytic locality. Microscopically the spores are smaller, the pileipellis has a more strongly developed gelatinized layer with numerous dermatocystidia, and the macrocystidia differ in shape.

Section **Metachromaticae** Singer, sect. nov.

Pileus carnosus, pigmenti destitutus. Lamellae confertae, cum ordinibus lamellularum intermixtae. Sporae in cumulo pallidae; macula suprahilari amyloidea. Macrocystidia crassitunicata, metachromatica in azureo cresylico. Epicutis pilei ex hyphis et dermatocystidiis composita. Species typicum: *R. metachromatica* Singer.

Section **Delicinae** (Bataille) Melzer & Zvara, Ceská Holubinky: 53 (1927) emend. Singer

Habit of Lactarius. Pileus with an acute margin. Lamellae subdecurrent, with few to numerous lamellulae but not regularly arranged. Context hard and firm, not brittle, scarcely discolouring on exposure. Spore print white to cream-colour. Spores with an amyloid suprahilar plage. Cystidia neither metuloidal nor metachromatic with Cresyl blue. Obligatorily ectomycorrhizal. Type species: *R. delica* Fr.

Russula littoralis Pegler, sp. nov.

Pileus 4–6.6 cm latus, carnosus, e hemisphaerico convexus vel leviter depressus, pallide cremeus vel eburneus, ad marginem lilacinus, glaber, humidus, non striatus. Lamellae adnato-decurrentes, pallide cremeae, ventricosae, saepe furcatae, moderate confertae, lamellulis paucis intermixtae. Stipes 2.5–5 × 1–1.7 cm, cylindricus, solidus, albidus, glaber, siccus, rugulosus. Caro usque ad 6 mm crassa, firma, albida, immutabilis; sapor mitis. Sporae 6.5–8 × 5.5–6.5 (7.5 ± 0.4 × 6 ± 0.3) µm (excl. orn.), Q = 1.22, subglobosae vel late ovoideae, hyalinae, ornamentatione verrucosa hemisphaerica amyloidea, verrucis 0.5 µm altis, vestitae. Basidia 35–45 × 8–10 µm, clavata, 2– vel 4-sporigera. Macrocystidia numerosa, 55–75 × 7–10 µm, lanceolata-fusiformia, ad apicem constricta vel mucronata, tenuitunicata, hyalina. Trama hymenophoralis intermixta, sphaerocystidibus numerosis praedita. Epicutis pilei ex hyphis pallisadice dispositis efformata. Typus: Martinica, Grand Macabou, in solo arenario, 9 Dec. 1976, Fiard 139 D, K.

Differs from *R. austrodelica* Singer, *R. delica* Fr. and *R. fuegiana* Singer in the smaller spores, lilaceous tints on the pileal margin, and the sea-shore association with the Sea-grape, *Coccoloba uvifera* L.

Section **Russula**

Basidiocarp fragile to robust, small to large. Pileus with acute or obtuse margin, often brightly coloured, sometimes brown or white; margin inrolled only in very early states. Lamellae white, cream, ochre or yellow; lamellulae absent or very few. Spore print white to deep ochraceous. Spores with suprahilar plage usually amyloid. Dermatocystidia often abundant, fusoid or clavate. Obligatorily ectomycorrhizal. Type species: *R. emetica* (Huds. ex Fr.) Fr.

Subsection **Emeticinae** Melzer & Zvara, Ceská Holubinky: 105 (1927).

Pileus red, purple, violet or orange, rarely green or yellow. Taste acrid or at least bitter, very rarely mild. Spore print white or cream. Dermatocystidia always conspicuous in the pileiellis.

Russula martinica Pegler, sp. nov.

Pileus 4.5–8 cm latus, convexo-expansus, depressus, coccineus, disco lutescens, siccus, subtiliter velutinus, ad marginem sulcatus. Lamellae adnatae, ochroleucae, moderatim confertae, lamellulis intermixtae. Stipes 4–5 × 1–2 cm, robustus, cylindricus, fistulosus dein cavus, albidus, glaber, rugosus. Caro 3–5 mm crassa, albida, immutabilis; odor inconspicuus; sapor leviter acris. Sporae in cumulo cremeo-bubalinae, 7–8.5 × 5.5–7.5 (7.7 ± 0.4 × 6.6 ± 0.4) µm (excl. orn.), Q = 1.16, subglobosae vel obovoideae, hyalinae, valde amyloideae, ornamentatione verrucosa, verrucis 0.5 µm altis numerosis obtectae macula suprahilari amyloidea. Basidia 25–30 × 7–9 µm, clavata, 4-sporigera. Acies lamellarum heteromorphosa; pseudocystidia copiosa, 50–75 × 5–10 µm, ventricoso-fusiformia vel acuminata, hyalina, tenuitunicata. Trama hymenophoralis irregularis, intermixta. Epicutis pilei ex elementis piliformibus plus minusve erectis, tenuitunicatis et dermatocystidiis composita. Typus: Martinica, Trace de Tombeau Caraibe, 1 Nov. 1975, Fiard 662 A, K.

Subsection **Heterophyllae** Fr., Monogr. Hymen. Suec. 2: 193 (1863).

Pileus typically grey, greyish olive, greyish blue, violaceous, citrine yellow or green, never red or orange; surface pruinose to finely tomentose. Taste mild or slightly bitter. Spore print white to cream. Epicutis lacking fuchsinophile hyphae.

Russula diversicolor Pegler, sp. nov.

Pileus 3.4–4 cm latus, convexus vel plano-convexus, depressus, versicolor, ad discum avellaneous, ad marginem alutaceus, olivaceo vel roseo intermixtus, subviscidus mox siccus, glaber, margine acuto, striato-pectinato praeditus. Lamellae adnatae, pallide cremeae, saepe furcatae, moderate confertae, lamellulis rarissimis intermixtae. Stipes 2–3 cm × 6–8 mm, cylindricus, cavus, albidus vel pallide griseus, glaber, laevis. Caro tenuissima, albida, immutabilis; odor distinctus; sapor mitis. Sporae 8–9.5 × 6.5–8.5 (8.8 ± 0.4 × 7.6 ± 0.4) µm. (excl. orn.), Q = 1.16, subglobosae vel obovoideae, hyaline, valde amyloideae, ornamentatione verrucosa, verrucis 0.5 µm altis numerosis obtectae; plaga suprahilari inamyloidea. Basidia 33–40 × 11–13 µm, inflato-clavata, 4-sporigera. Acies lamellarum sterilis. Pseudocystidia 55–80 × 6–11 µm, ventricoso-lageniformia, hyalina, tenuitunicata. Trama hymenophoralis irregularis, intermixta. Epicutis pilei ex hyphis trichodermialibus composita. Typus: Martinica, Anse à Voiles, 15 Oct. 1975, Fiard 628 A, K.

Russula venezueliana Singer is extremely similar to this species but has a more uniformly dark yellowish brown pileus, a greyish brown stipe, and some reticulation of the spore ornamentation. Typically in many species of the Heterophyllae the suprahilar plage remains inamyloid.

Russula cremeolilacina Pegler, sp. nov.

Pileus 4–5.3 cm latus, e convexo-expansus, depressus, ad disum cremeus vel pallide lilacinus, subviscidus, subrugosus. Lamellae adnatae, albidae vel cremeae, furcatae, moderate confertae. Stipes 3–6.5 × 1–1.2 cm, cylindricus, fistulosus, candidus, glaber, rugosus. Caro firma, candida, immutabilis; odor nullus; sapor mitis. Sporae 6.5–8.5 × 5.5–7(7.5 ± 0.4 × 6 ± 0.5) µm (excl. orn.), Q = 1.26, subglobosae vel obovoideae, hyalinae, amyloideae, ornamentatione verrucosa et subreticulata, verrucis 0.5 µm altis vestita; macula suprahilari amyloidea. Basidia 28–35 × 11–12 µm, inflato-clavata, 4-sporigera. Acies lamellarum heteromorphosa. Macrocystidia dispersa, 60–110 × 7–10 µm, mucronato-fusiformia, hyalina, tenuitunicata, contento in sulphovanillina atro caerulescentia repleta. Trama hymenophoralis irregularis, intermixta. Epicutis pilei ex hyphis suberectis et dermatocystidiis composita. Typus: Martinica, Caravelle, in silvis xero-mephyticis, 4 Sept. 1976, Fiard 772 A, K.

Closely related to the North temperate species, *R. cyanoxantha* (Schaeff. ex Secr.) Fr. but differing in the smaller stature and brighter pigmentation.

Subsection **Foetentinae** Melzer & Zvara, Ceská Holubinky: 98 (1927).

Pileus generally dull, yellow, brown or grey, very rarely green; pileal margin frequently plicate-tuberculate. Taste mostly acrid or bitter sometimes mild; odour often distinctive, nauseous, foetid or of bitter almonds. Spore print white, cream or pale ochre.

Russula marronina Pegler, sp. nov.

Pileus 2–5 cm latus, fragilis, plano-convexus, depressus, pallide brunneus, ad discum marroninus, glaber, in humido viscidus dein siccus, ad marginem lento sulcato-striatus. Lamellae adnatae, cremeae, saepe frucatae, moderate confertae. Stipes 2.5–4 cm × 5–9 mm, cylindricus vel ad basim attenuatus, lacunosus dein cavus, albidus, glaber, laevis. Caro tenuissima, albida, immutabilis; odor amygdalinus amarus revocans; sapor lente acerrimus. Sporae in cumulo pallide cremeae, 7.5–9 × 6.5–8(8.5 ± 0.4 × 7.2 ± 0.4) µm, Q = 1.18, subglobosae, hyalinae, ornamentatione subreticulata amyloidea, verrucis crassis 0.5–1 µm altis praeditae. Basidia 30–40 × 9–11 µm, clavata, 4-sporigera. Acies lamellarum heteromorphosa. Cheilocystidia macrocystidioidiis similia, 45–65 × 8–11 µm, fusiformia, hyalina vel lutea, contento in sulphovanillina caerulescentia repleta. Pleurocystidia nulla. Trama hymenophoralis irregularis, intermixta. Epicutis pilei gelatinosa, ex hyphis septatis filiformibus et dermatocystidiis dispersis composita. Typus: Martinica, Trinité, 3 Nov. 1975, Fiard 661 K.

Close to the *R. sororia*-group of North temperate regions, especially to *R. amoenolens* Romagn. but differing in the reddish brown pileus, white stipe and subglobose spores with a coarsely verrucose ornamentation.

Russula mephitica Pegler, sp. nov.

Pileus 2.7–5.6 cm latus, moderate carnosus, convexus mox depressus, pallide ochraceus vel pallide cinnamomeo-bubalinus, in statu humido glutinosus, glaber; ad marginem pectinatus. Lamellae adnatae, ochraceo-cremeae, saepe furcatae, moderate confertae, aequilongae. Stipes 2.5–4.5 cm × 8–12 mm, cylindricus, cavus, albidus, glaber. Caro tenuis, albida, immutabilis; odor forte odore *R. foetentis* similis; sapor mitis. Sporae 7.5–9 × 6–7.5(8 ± 0.4 × 6.7 ± 0.4) µm (excl. orn.), Q = 1.20, obovoideae vel late ellipsoideae, hyalinae, ornamentatione verrucosa amyloidea, verrucis grossis et connectivis raris obtectae. Basidia 28–34 × 9–10 µm, inflato-clavata, 4-sporigera. Acies lamellarum heteromorphosa. Macrocystidia numerosa, 40–75 × 8–12 µm, ventricoso-fusiformia, tenuitunicata, ad apicem in sulphovanillina caerulescentia. Trama hymenophoralis irregularis, intermixta. Epicutis pilei gelatinosa, ex hyphis filiformibus et dermatocystidiis composita. Typus: Martinica, Morne Chopotte, in silvis mesophyticis, 23 Dec. 1975, Fiard 678 K.

Similar to *R. foetens* (Pers. ex Fr.) Fr. but much smaller and more delicate. The species might be compared to *R. foetens* var. *minor* Singer or to *R. foetentula* Peck.

Russula ochrostraminea Pegler, sp. nov.

Pileus 3–5 cm latus, moderate carnosus, convexo-expansus, depressus, postremo perforatus, pallide ochraceo-bubalinus vel ochraceo-aurantiacus, valde viscidus, ad marginem plicato-tuberculatus. Lamellae adnatae, cremeae vel eburneae, intervenosae, moderate confertae. Stipes 2–3 cm × 8–10 mm, cylindricus, cavus, albidus vel pallide griseus, laevis, glaber. Caro ravida, immutabilis; odor debilis; sapor mitis. Sporae 7–9 × 6–8(8 ± 0.4 × 7 ± 0.5) µm (excl. orn.), Q = 1.15, subglobosae vel obovoideae, hyalinae, ornamentatione reticulata, verrucis 0.5–0.7 µm altis grossis confertis vestitae; macula suprahilari amyloidea. Basidia 35–38 × 10–12 µm, clavata, 4-sporigera. Acies lamellarum heteromorphosa. Macrocystidia dispersa, 35–65 × 7–12 µm, cylindrico-fusiformia, acuminata, subhyalina, in sulphovanillina pallide caerulescentia. Trama hymenophoralis irregularis, intermixta. Epicutis pilei ex hyphis intermixtis gelatinosis et dermatocystidiis efformata. Typus: Martinica, Rivière-Pilote, 30 Oct. 1975, Fiard 656 K.

The species occurs after heavy rains in otherwise dry situations. It belongs in the Subsection *Foetentinae* but is atypical in lacking a distinctive odour and the taste is mild. It might be compared to *R. consobrinoides* Heim, from Madagascar, but lacks the foetid odour of that species.

Subsection **Decolorantinae** Melzer & Zvara, Ceská Holubinky: 61 (1927).

Basidiocarp robust. Pileus cinnabar red, orange or yellow, rarely white, never brown or green. Taste mild. Spore print ochre or yellow. Dermatocystidia present in the pileipellis.

Russula matoubensis Pegler, sp. nov.

Pileus 6–10 cm latus, carnosus, e convexo applanatus, depressus, aurantiacus, subviscidus, glaber vel ad marginem areolatus, non-striatus. Lamellae adnatae, pallide cremeae, angustatae, saepe furcatae, confertissimae, cum ordinibus lamellularum intermixtae. Stipes 4–4.5 × 1.5–2 cm, ad basim attenuatus, e pileo concolor, siccus, glaber, laevis. Caro crassa, albida dein cinerascens; odor nullus; sapor mitis. Sporae 8.5–10 × 7.5–9(9.6 ± 0.6 × 8.3 ± 0.4) µm (excl. orn.), Q = 1.15, subglobosae vel obovoideae, hyalinae, amyloideae, ornamentatione reticulata, 0.5-ium alta; macula suprahilari amyloidea. Basidia 37–43 × 9–12 µm, clavata vel ventricosa, 2– vel 4-sporigera. Macrocystidia 60–75 × 5–9 µm, lanceolato-fusiformia, hyalina, tenuitunicata, intus in sulphovanillina caerulescentia. Trama hymenophoralis intermixta, hyalina. Epicutis pilei ex hyphis filamentosis et dermatocystidiis aurantiacis efformata. Typus: Guadalupa Insula, Basse Terre, Trace Victor Hughes, in solo nudo, 16 Aug. 1975, Fiard 550 A, K.

Similar to *R. decolorans* (Fr.) Fr. but the stipe is orange and the context discolours only to grey rather than blackening.

MYCOTAXON

Vol. XII, No. 1, pp. 97-104 October-December 1980

TERMITARIOPSIS CAVERNOSA, GEN. AND SP. NOV., A SPORODOCHIAL FUNGUS ECTOPARASITIC ON ANTS

Meredith Blackwell

Hope College, Holland, Michigan 49423

Robert A. Samson

Centraalbureau voor Schimmelcultures, Baarn, Netherlands

and

J. W. Kimbrough

University of Florida, Gainesville, Florida 32911

SUMMARY

Four collections of army ants (*Neivamyrmex*) were infected with a sporodochial fungus with similarities to *Termitaria* Thaxter and *Mattirolella* Colla known only from species of termites and *Muiogone* Thaxter known from dipterans. This fungus is described here as *Termitariopsis cavernosa*, gen. et sp. nov. Morphological similarity of complex structures in these genera of entomophilous fungi and the proximity in nature of the ant and termite hosts are taken as evidence of possible phylogenetic relationship.

Four collections of army ants (*Neivamyrmex*) referred to us contained thalli of an undescribed fungus:

Neivamyrmex opacithorax Emery. Kansas; Riley Co., Manhattan, 26 V 1964, C. W. Rettenmeyer 3018, Colony E-387, 6 specimens. Kansas: Riley Co., Manhattan, Kansas State Hill, 7 VIII 1962, R. D. Akre, Colony E-278, 20 specimens. Kansas: Manhattan, C. W. Rettenmeyer 3593, Colony E-513. 6 specimens. *Neivamyrmex pilosus* (F. Smith). Panama: Canal Zone, Barro Colorado Island, 15 II 1961, E. O. Willis. 1 specimen.

Some infected portions of the insect integument were removed with the aid of a dissecting microscope (X40) and mounted in a glycerol solution containing acid fuschin (Benjamin, 1971) or crystal violet. Other infected portions were dehydrated through an alcoholic series to acetone and embedded in low viscosity plastic (Spurr, 1962) and sectioned with an ultramicrotome or were frozen and sectioned with a cryostat. For scanning electron microscopy infected portions of the insect were air dried, gold coated with a Polaron sputter coater, and examined in an AMR-1000 A microscope.

Termitariopsis Blackwell, Samson, et Kimbrough, gen. nov.
Entomophilous; thallus principalis crustosus, stromaticus; haustoria e fusco crassitunicato cellularum strato orientio; integer thallus principalis in excipulo sterili sporodochium maturans; cellululae excipuli cavitatem solitariam includentes; pseudoparenchymatum subhymenium hymenium phialidum, quod conida in ordine basipetalo apicaliter abscindit, emittens; sporodochi cavitas macroconidiis et microconidiis. Typus: *Termitaria cavernosa* Blackwell, Samson, et Kimbrough.

Entomophilous; primary thallus crustose, stromati; haustoria arising from a dark, thick-walled layer of cells; entire primary thallus maturing into a sporodochium with some excipular cells producing phialoconidium-like cells; pseudoparenchymatous subhymenium giving rise to hymenial layer of septate filaments; some of these filaments producing multicellular, appendaged macroconida; microconidia produced at the appendage tips.

Termitariopsis cavernosa Blackwell, Samson, et Kimbrough, sp. nov.
Entomophilous; thallus principalis crustosus, stromaticus, pluribus cellulis crassus; maturans in varianti forma sporodochium secundum positionem in insecto hospite, sed plerumque elongatus; basale stratum omnino crassitunicatis fuscis cellulae matricales haustorii, 5 x 10 µm; excipulum fuscis elongatis crassitunicatis sterilibus cellulis; interna sporodochi cavitas continens sphaericas ad elongatas crassitunicatas pseudoparenchymatas massas, facile separatas a subhymenio; phialidas, 2-3 µm in strato e subhymenio orientes, conidia a locis conidiogeneribus intra elongatas collarettas abscindentes, altitudinem excipuli attingentes, intra collarettas saltem quinque conidia; conidia hyalina cylindrica aut marginibus truncatis, 1.5 x 2.5-4 µm; caviats sporodochi interna continens hymenium filamentis septalibus minoribus dimidio quam altitudine filamentorum excipuli; emmittertia multicellularia appendiculata macroconidia, 20-30 x 40-60 µm; appendices macroconididiarum emmittentes spherica microconidia, 2 µm diametro.

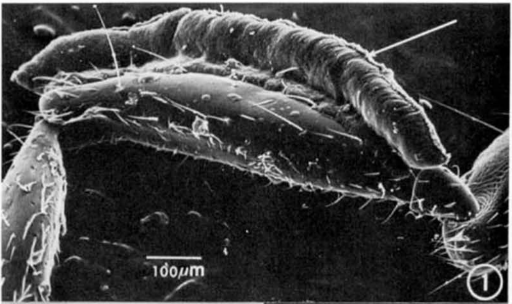
Holotypus in *Neivamyrmex opacithorax* Emery, 26 V 1964.
C. W. Rettenmeyer 3018. Kansas: Riley Co., Manhattan. Holotype deposited in BPI; isotypes in CBS (Baarn), Farlow.
Known from Kansas and Panama.

Entomophilous (Figs. 1,2); primary thallus crustose, stromatic, several cells thick; maturing to a sporodochium of varying shape depending upon the site of infection on the insect host, but usually elongated (Figs. 1,2); basal layer entirely of thick-walled, dark haustorial mother cells, 5x10 µm (Figs. 3,4), which give rise to haustoria on the lower side (Fig. 5) end with a hyaline pseudoparenchymatous subhymenium above (Fig. 4); excipulum of dark, elongated, thick-walled cells, 100 µm x 3 µm (Figs. 2,6,7), some of which contain phialoconidium-like cells, 2 x 4 µm (Figs. 6,7); internal sporodochial cavity containing hymenium of septate filaments less than half the height of the excipular filaments (Fig. 6); giving rise to multicellular, appendaged macroconidia, 20-30x40-60 µm (Figs. 6,8); macroconidial appendages giving rise to spherical microconidia, 2 µm diam (Fig. 8).

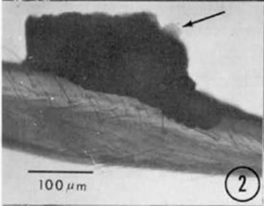
The Panamanian specimens differ from the Kansan specimens in that the sporodochial cavity is packed with macroconida and may represent a later stage of maturity.

The large multicellular, appendaged macroconidia and microconidia of *T. cavernosa* resemble those of *Muiogone* Thaxter, although the development is somewhat different. In *Muiogone* several transverse cell divisions of an internally proliferating filament are followed by divisions perpendicular to the first plane. In *T. cavernosa* one to several of the septate hymenial cells become inflated and diverge apically (Fig. 9). Cell divisions in two planes lead to the development of macroconidial structures with all tiers less pronounced than in *Muiogone* (Fig. 10,11,12). The function of the macroconidia and occasional microconidia produced at the appendages is assumed to be that of infection, although microconidia could serve as spermatia.

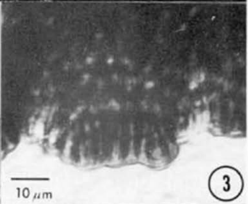
Termitariopsis cavernosa is similar in habit and some microscopic characters to species of the termitophilous genera *Termitaria* Thaxter and *Mattirolella* Colla. All three are sporodochial with black excipular cells, haustoria, basal layers with haustorial mother cells, and pseudoparenchymatous subhymenia (Colla, 1929; Khan, 1973; Khan and Kimbrough, 1973a, 1974b, Khan and Aldrich, 1973, 1975). Species of these genera are virtually indistinguishable at dissecting microscope magnifications, but basic internal differences are easily discerned at higher magnifications. The basal layer cells are all thick-walled in *T. cavernosa* and species of *Mattirolella*, while only some cells of this layer are thick-walled in *Termitaria* species. An epihymenial layer also characterizes *Mattirolella*. Internal sporodochial structure is clearly different in these genera. Only phialoconidia are present in *Termitaria*; phialoconidia and columns of sterile hyphae which form chambers, in *Mattirolella*; and macroconidia arising from a low hymenial layer, in *T. cavernosa*. The presence of what appear to be phialoconidia in some of the exicipular cells and absence of them within the exicipular cavity in *T. cavernosa* further serves to distinguish this species from those of the other two genera.



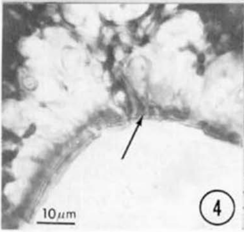
①



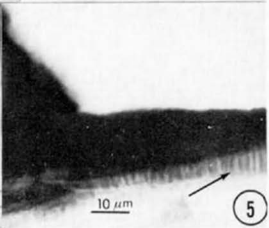
②



③



④



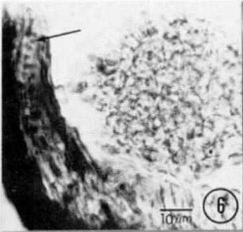
⑤

Another sporodochial fungus, *Aegeritella superficialis* Balazy et Wiśniewski, has been described on ants of the genus *Formica* L. from Poland (Balazy and Wiśniewski, 1974) and reported from Italy on the same ant genus (Wiśniewski, 1977). The pale brown sporodochia have a different morphology from those of *Termitariopsis* and produce one-celled blastospores.

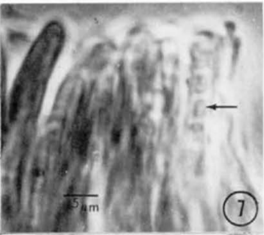
Until recently many ectoparasitic fungi known from termites were considered to be restricted to termite species and were not known to have morphological affinities with fungi on other insects. Blackwell and Kimbrough (1978) described *Hormiscioideus filamentosus* occurring on Brazalian termites and discussed its possible relationship to small filamentous ectoparasites of several other arthropods. Unfortunately, morphological simplicity makes it difficult to distinguish characters which denote relationship from those which arise by convergence under selection for a similar habitat. Kimbrough (unpublished) has found *Dimeromyces isopterus* Kimbrough, *Laboulbeniopsis termitarius* Thaxter, and *Coreomycetopsis oedipus* Thaxter, not only on termites, but also on mites and staphylinid beetles which were associated with the termites in a parasitic or commensal relationship. Examples of laboulbeniomycetous fungi known to infect several arthropods that are found in such parasitic or commensal assemblages are cited by Thaxter (1924), Blum (1924), and Benjamin (1965, 1971).

The termitophagous habit of some species of *Neivamyrmex*, the similar habitat and present overlapping ranges of these ants and the subterranean termite genus *Reticulitermes*, make it possible that *Termitaria*, *Mattirolella*, and *Termitariopsis* may have been derived from a common ancestor which was capable of infecting several species of insects living in these conditions. Speciation leading to the three genera could have occurred in different parts of an ancestoral range. In the case of *Termitariopsis*, if host change did occur, this may have limited gene flow in the manner described by Bush (1969) and lead to additional divergence from the ancestoral form, Benjamin (1967, 1968).

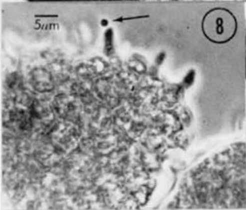
Figures 1-5. *Termitariopsis cavernosa*. Fig. 1. Fungal thallus on leg of *Neivarmymex opacithorax*. Excipular cells are closed over the margin (arrow) of the sporodochium at early stages. SEM. Fig. 2. Fungal thallus on leg of *N. opacithorax*. Macroconidium shown emerging (arrow) from partially broken sporodochium. Fig. 3. Crustose layer of thick-walled basal cells. Fig. 4. Cross section through basal layer of sporodochium showing dark excipular cells and pseudoparenchymatous subhymenium above the basal layer. Arrow indicates layer of cuticle from insect. Fig. 5. Longitudinal section through fungal thallus and insect cuticle showing haustoria (arrow).



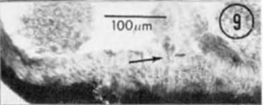
6



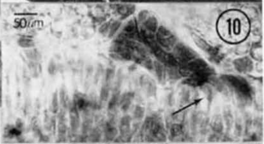
7



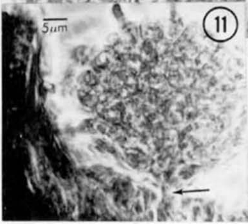
8



9



10



11

12

ACKNOWLEDGMENTS

We are grateful to Dr. Carl W. Rettenmeyer, Department of Systematic and Evolutionary Biology, University of Connecticut, Storrs, Connecticut, for calling our attention to his interesting collections of fungi and for providing us with information on the biology of these insects. Mrs. Maura Reynolds and Dr. Albert Bell, Hope College, Holland, Michigan, kindly translated the descriptions into Latin.

LITERATURE CITED

Balazy, S., and J. Wiśniewski. 1974. *Aegeritella superficialis* gen. et sp. nov. - epifityczny grzyb na mrówkach z rodzaju *Formica* L. Pr. Kom. Nauk Roln. i Kom. Nauk Lesn. PTPN Poznan 38: 3-15.

Benjamin, R. K. 1967. Laboulbeniales on semi-aquatic Hemiptera. *Laboulbenia*. Aliso 6(3): 111-136.

________. 1968. *Balazucia*, a new genus of Laboulbeniales allied to *Cucujoymyces* Spegazzini. Aliso 6(4): 47-56.

________. 1971. Introduction and supplement to Roland Thaxter's contribution towards a monograph of the Laboulbeniaceae. Biblioth. Mycol. 30: 1-155.

________. 1965. Study in specificity. Nat. Hist. 74: 42-49.

Blackwell, M., and J. W. Kimbrough. 1978. *Hormiscioideus filamentosus* gen. and sp. nov., a termite infesting fungus from Brazil. Mycologia 70: 1274-1280.

Blum, G. 1924. Zewi neue Laboulbenien aus Brasilien. Centralbl. für Bakt., Parasitenk, und Infektions krankh., 2-Abt. 62: 300-302.

Bush, G. 1969. Sympatric host race formation and speciation in frugivorous flies, of the genus *Rhagoletis* (Diptera, Tephritidae). Evolution 23: 237-251.

Colla, S. 1929. Su alcuni funghi parassiti delle termiti. Boll. Lab. Zool. Portici 22: 39-48.

Figures 6-12. *T. cavernosa*. Fig. 6. Macrocondium within sporodochial cavity with single cell of attachment to septate filaments of the hymenial layer. Arrow denotes phialoconidium-like cells within excipular filaments. Fig. 7. Excipular filaments with phialoconidium-like contents. Fig. 8. Multicellular, appendaged macroconidium with a single microconidium (arrow). Fig. 9. Earliest stage of macroconidium (arrow) observed. Note divergent apex. Fig. 10. Later stage of macroconidial development. Note the attachment to septate filament (arrow). Fig. 11. Macroconidium with attachment at a single filament (arrow). Fig. 12. Macroconidium with attachment at several filaments (arrow).

Khan, S. R. 1973. Morphology, development and ultrastructure of *Termitaria synderi* Thaxter, Ph.D. Dissertation, University of Florida. 27 p. + XXII pl.

__________ and H. C. Aldrich. 1973. Conidiogenesis in *Termitaria synderi* (Fungi Imperfecti). Can. Jour. Bot. 51: 2307-2314.

__________ and __________. 1975. The haustoria of *Termitaria synderi*. Jour. Invert. Path. 25: 247-260.

__________ and J. W. Kimbrough. 1974a. Taxonomic position of *Termitaria* and *Mattirolella* (entomogenous Deuteromycetes). Amer. Jour. Bot. 61: 395-399.

__________ and __________. 1974b. Morphology and development of *Termitaria snyderi*. Mycologia 64: 446-462.

Thaxter, R. 1914. On certain peculiar fungus-parasites of living insects. Botanical Gazette 58: 235-253.

__________. 1920. Second note on certain peculiar fungus-parasites of living insects. Botanical Gazette 69: 1-27.

__________. 1924. Contribution towards a monograph of the Laboulbeniaceae. Part III. Mem. Amer. Acad. Arts and Sci. 14: 309-426, illust.

Wiśniewski, J. 1977. Occurrence of fungus *Aegeritella superficialis* Bal. et Wis., 1974, on *Formica lugubris* Zett. in Italian Alps. Estratto dal Bol. della Soc. Entomol. Italiana 109: 83-84.

MYCOTAXON

Vol. XII, No. 1, pp. 105-110 October-December 1980

PHYSALACRIA LUTTRELLII BAKER EST UNE TYPHULA

J. BERTHIER

Laboratoire de Mycologie associé au C.N.R.S.
Université Claude Bernard, LYON I, Bât. 405
43, bd du 11 Novembre 1918, F 69622 VILLEURBANNE

SUMMARY

As proven by the presence of a basal sclerotium, Physalacria luttrellii Baker is in fact a Typhula.
Typhula luttrellii (Baker) comb. nov. is a new member of the subgenus Cnazonaria Corda because of the morphology and the structure of its basidiocarps and because of its gelatinous sclerotia with an inversed epidermoid structure.

INTRODUCTION

A l'occasion d'une révision des espèces du genre Physalacria, nous avons été amené à étudier le spécimen type d'une espèce décrite par Gladys BAKER (1946), Physalacria luttrellii, et conservé au NEW YORK BOTANICAL GARDEN (NY).

Ce champignon récolté par E.S. LUTTRELL en Géorgie (U.S.A.) n'est en aucune façon une Physalacria puisque sa clavule, bien que renflée, est recouverte d'un hyménium dépourvu de cystides (contrairement aux observations de G. BAKER) et que son stipe naît d'un sclérote (non reconnu comme tel par G. BAKER).

La structure de ce sclérote, associée aux caractéristiques du carpophore, indique qu'il s'agit là d'une véritable Typhula, qui ne s'identifiant à aucune des espèces décrites jusqu'alors dans ce genre, mérite la dénomination de Typhula luttrellii (Baker) Berthier.

La description que nous en donnons récapitule nos observations personnelles faites sur exsiccata.

DESCRIPTION

TYPHULA LUTTRELLII (Baker) nov. comb.

Basionyme = *Physalacria luttrellii* Baker, Mycologia 1946, *38*: 636; Corner, Suppl. Monogr. Clav., 1970 : 193.

Spécimen examiné = leg. E.S. Luttrell n° 5153 *TYPUS* (NY) Spalding County, Georgia (U.S.A.), sur tiges mortes de *Lespedeza bicolor*, 27- X-1943.

Carpophores ne dépassant pas 1,8 mm, à clavule renflée, piriforme voire globuleuse, portée par un stipe assez court souvent brunâtre à sa base et naissant d'un sclérote visible quand il a fait céder la couche superficielle du support ligneux.

Sclérote gélifié à épidermoïde inversé, non orné, à cutis réduit; vu par-dessus, l'épidermoïde présente de petites cellules fortement engrenées pourvues de nombreux crochetons.

Pour sa part G. BAKER, bien que ne reconnaissant pas l'individualité du sclérote, avait noté une structure particulière à la base des carpophores comme l'indiquent son illustration (fig. 23) d'une section longitudinale de carpophore ainsi que sa description puisqu'elle écrit: "The basal region (of the stipe) is of prosenparenchyma cells covered on the outer surfaces by dark brown pseudoparenchyma cells".

Clavule entièrement fertile, à trame non gélifiée fortement lacuneuse constituée d'hyphes rayonnantes, ramifiées, anastomosées (x 4-5 µm), renflées au niveau des cloisons (x 7-8 µm) dont chacune porte une boucle; les ultimes ramifications de ces hyphes à paroi très peu épaisse sont plus étroites (x 3-4 µm) et portent l'hyménium.

Au niveau de l'hyménium, nous n'avons pas noté la présence des cystides cylindriques et émergentes (40-50 x 6-7,5 µm) signalées par G.BAKER, mais seulement des basides et basidioles de plus grande taille que celles décrites par ce mycologue.

Basides tétrasporiques, nettement claviformes voire spatulées, à cloison basale bouclée, 20-30-35 x 8,5-9-9,5 µm (G. BAKER: 15-18 x 7-9 µm).

Basidioles jamais fusiformes contrairement à celles des *Physalacria*.

Spores ellipsoïdes, à petit apicule et à paroi amyloïde, 8-9-9,5-10 x 4-4,25-4,5 µm (G. BAKER: 8-11 x 4-5 µm).

Stipe pourvu d'une écorce bien distincte et gélifiée, épaisse de 20-30 µm, faite de fibres (x 3-4,5 µm) à paroi

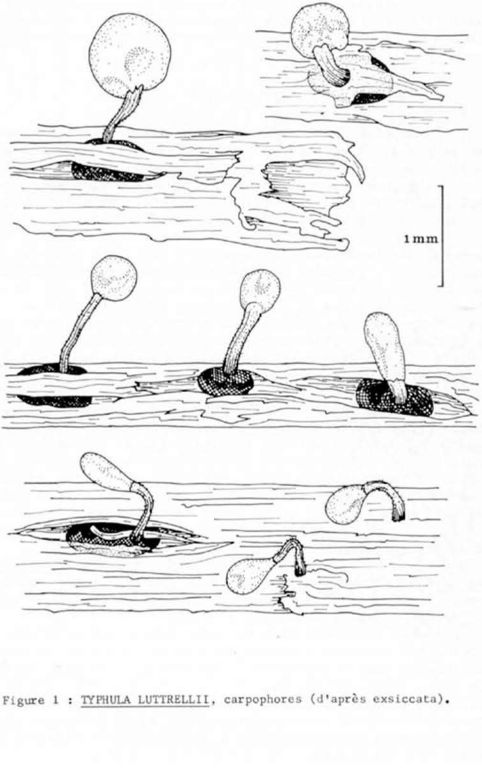


Figure 1 : TYPHULA LUTTRELLII, carpophores (d'après exsiccata).

propre un peu épaisse (0,5-0,75 µm) unies par une gelée évidente; moelle peut-être faiblement lacuneuse, constituée d'hyphes (x 2,5-3-4 µm) à paroi très peu épaisse.

Poils plus ou moins nombreux selon les carpophores; poils à base étroitement et hautement conique (x 3-5 µm) surmontée de prolongements grêles (x 1-1,5 µm), ramifiés, pouvant atteindre 100 µm de long.

DISCUSSION

La méprise de G. BAKER tient au fait que ce mycologue, abusé par la clavule renflée des carpophores conférant à ce petit champignon une allure de Physalacria, a d'une part cru distinguer des cystides dans l'hyménium et d'autre part mal interprété la structure particulière située à la base du stipe et qui correspond en réalité à un sclérote.

La présence de cet organe de résistance de petite taille souvent dissimulé dans le support et dont sont pourvues de nombreuses Typhula, a souvent échappé aux investigations des mycologues comme nous avons pu le constater lors de notre étude monographique du genre Typhula (BERTHIER 1976). Pourtant ainsi que nous l'avons montré la connaissance de la structure des sclérotes s'avère indispensable pour reconnaître l'appartenance des espèces à l'un des sept sous-genres distingués chez les Typhula et par là même faciliter la détermination.

Ainsi, le sclérote de T. luttrellii présente l'un des trois types fondamentaux de structure reconnus chez les Typhula, et particulièrement le plus original d'entre eux en raison de la nature de son épidermoïde qui caractérise, déjà à lui seul, le sous-genre Cnazonaria. En effet, une bordure de sclérote constituée d'un épidermoïde inversé (orné ou non) surmonté d'un cutis ne se rencontre que chez les espèces de ce sous-genre dont par ailleurs le sclérote est toujours gélifié.

Outre les caractéristiques de son sclérote, T. luttrellii présente tous les autres traits des Cnazonaria Corda, tels que nous les avons redéfinis et dont témoigne le type, T. setipes (Grev.) Berthier, à savoir :
carpophores à clavule bien marquée, peu ou pas gélifiée, portée par un stipe à écorce importante, gélifiée et bordée de fibres; spores amyloïdes (sauf chez T. lutescens Boud.). De plus, selon que les cellules de l'épidermoïde inversé du sclérote portent ou non de petites protubérances internes responsables d'une ornementation, nous avons distingué deux groupes parmi les Cnazonaria: T. luttrellii se rattache à celui des "Cnazonaria à épidermoïde non orné".

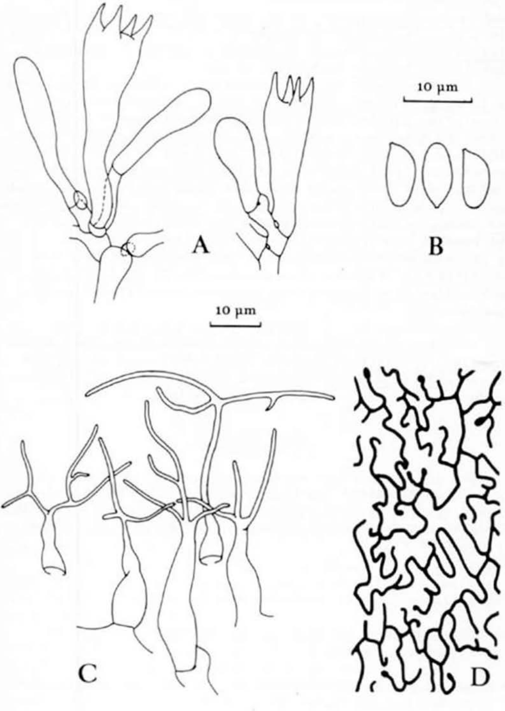


Figure 2 : TYPHULA LUTTRELLII

A- basides et basidioles; B- spores
C- poils du stipe; D- sclérote: bordure vue par-dessus.

Comme c'est le cas pour la majorité des espèces de cette "section", les hyphes du carpophore et du sclérote de *T. luttrellii* sont bouclées, à l'inverse de ce que l'on observe chez les *Cnazonaria* à sclérote orné.

Ainsi que nous en faisions état en 1976, à l'exception de *T. elegans* (Berk. et Curt.) Corner, champignon qui se singularise par ses carpophores particulièrement courts, trapus et à sclérote volumineux, toutes les autres espèces (10) de cette section diffèrent assez peu de celles à épidermoïde orné; il en est de même de *T. luttrellii* pour laquelle, néanmoins, toute synonymie nous paraîtrait hasardeuse. L'espèce dont elle se rapproche le plus est *T. sphaeroidea* Remsb. venant sur tiges de *Rubus* (U.S.A.: état de NY) qui possède des spores plus grandes, 10,5 - 12 x 4,5 - 6 µm et des basides moins renflées à leur sommet, 25-35 x 7-8 µm. D'ailleurs le trait le plus remarquable de *T. luttrellii* semble bien être ses basides nettement claviformes voire spatulées.

Nous pouvons donc conclure que le champignon appelé *Physalacria luttrellii* par G. BAKER appartient en réalité au genre *Typhula* où il se classe dans la section "à épidermoïde non orné" du sous-genre *Cnazonaria*.

REMERCIEMENTS

Nous exprimons notre gratitude au Professeur E.J.H. CORNER pour la lecture critique de cette note, ainsi qu'au Conservateur du New York Botanical Garden pour le prêt du spécimen décrit.

REFERENCES

BAKER Gladys E. 1946. Addenda to the genera *Helicogloea* and *Physalacria*. Mycologia, 38: 630-638.

BERTHIER J. 1976. Monographie des *Typhula* Fr., *Pistillaria* Fr. et genres voisins. Bull. Soc. Linn. Lyon, numéro spécial: 214 p.

CORNER E.J.H. 1970. Supplement to "a monograph of *Clavaria* and allied genera". Beih. Nova Hedwigia, 33: 299 p.

MYCOTAXON

Vol. XII, No. 1, pp. 111-116 October-December 1980

UNE NOUVELLE TREMELLALE CLAVARIOIDE : HETEROCEPHALACRIA SOLIDA GEN. ET SP. NOV.

J. BERTHIER

Laboratoire de Mycologie associé au C.N.R.S.
Université Claude Bernard, LYON I, Bât. 405
43, bd du 11 Novembre 1918, F 69622 VILLEURBANNE

SUMMARY

Heterocephalacria solida Berthet, a new species, is described and illustrated from a collection made in Colorado (U.S.A.). This capitate clavarioid fungus, having partially cruciately septate apices of the basidia and secondary spores (conidia) is a new member of the Tremellales.

INTRODUCTION

Au cours d'une étude comparative des espèces de *Physalacria* (petites Clavariacées capitées à "oléocystides") nous avons eu l'occasion d'examiner une récolte de F.E. et E.S. CLEMENTS provenant du Colorado (U.S.A.) et étiquetée *Physalacria solida* Clements.

Ce champignon plutôt humicole, à allure de *Physalacria* diffère des espèces de ce genre par sa clavule pleine, recouverte d'un hyménium dépourvu de cystides et constitué de basides subtremelloïdes.

Ces différences n'avaient pas échappé à Gladys BAKER (1941) qui excluait des *Physalacria* ce champignon, alors déposé à HARVARD (FH) en écrivant à son sujet:
"The specimen seen did not present typical physalacrian characters, in particular the basidia, which were apparently a heterobasidial type".

En effet, les basides claviformes de ce champignon, se cloisonnent en croix, à leur extrême sommet seulement. Ce phénomène peu courant se rencontre néanmoins chez d'autres champignons, corticioides comme *Metabourdotia* (OLIVE, 1957), clavarioides comme *Tremellodendropsis* (CORNER, 1953 et 1966,

A. CRAWFORD, 1954) et cyphelloides comme Heteroscypha (AGERER et OBERWINKLER, 1979).
Mais le spécimen de CLEMENTS avec ses carpophores simples et capités, ne ressemble en rien aux Tremellodendropsis qui ont tous, comme T. tuberosa espèce type du genre, des carpophores clavarioides rameux.

Cette espèce est donc le représentant d'un genre nouveau, Heterocephalacria, dont la position systématique sera discutée plus loin après que nous ayons décrit les caractéristiques de Heterocephalacria solida Berthier, malheureusement de façon incomplète puisque issues de la seule étude de spécimens secs.

DESCRIPTION

Spécimen examiné:
Physalacria solida F.E et E.S Clements in herbarium leg. F.E et E.S Clements n° 333(S) ex herb. Sydow, Minnehaha 2600 m, Colorado (U.S.A.), 7-IX-1906. "Geophilus gregarius ad terram et ad acus Pseudotsugae semel Picea-Pseudotsuga-hylio".

Espèce non décrite par ses auteurs mais répertoriée dans Cryptogamae Formationum Coloradensium (Univ. Colorado Museum 1972).

Carpophores simples, dressés, élancés, atteignant 18 mm, avec une clavule brutalement séparée du stipe; carpophores venant en petits groupes de 3-6 individus, sur la terre ou des rameaux de conifères.

Sur le sec, carpophores de couleur havane avec un stipe (MU. 7,5 YR 4/4-3/2) plus sombre que la clavule (MU. 7,5 YR 5/4-5/6). Stipe très long, régulier (x 0,2 - 0,3 mm) et comprimé; clavule (x 1,2 - 1,5 mm) droite ou réfléchie et présentant souvent deux lobes qui enserrent le stipe.

Clavule pleine recouverte d'un hyménium amphigène, dépourvu de cystides.
Trame de la clavule, lacuneuse et constituée d'hyphes lachement enchevêtrées, régulières (x 3-5-7 µm) à paroi mince ou peu épaisse, à cloisons sans boucles.
Sous-hyménium peu épais, non lacuneux fait d'hyphes plus étroites (x 3-5 µm) à articles courts et à cloisons pourvues de boucles.

Basides et basidioles claviformes, à cloison basale bouclée et à sommet souvent partiellement cloisonné en croix; cloisonnement apical plus ou moins précoce: précédant ou non la poussée des stérigmates; parfois pas de cloisonnement même chez les basides mûres ou agées.
Basides tétrasporiques, plus ou moins longuement claviformes, 25-30-35 µm x 6-7-8 µm au sommet, x 2-3 µm à la base.

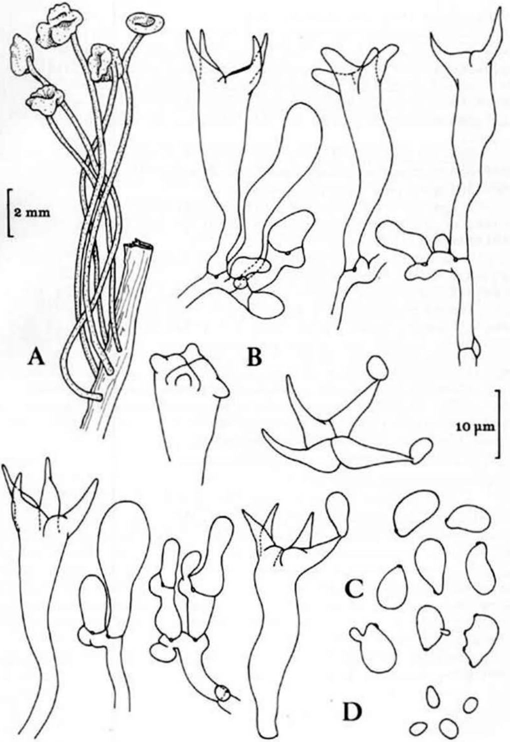


Figure 1 : HETEROCEPHALACRIA SOLIDA

A- carpophores (d'après exsiccata); B- basides et basidioles.
C- basidiospores, spores produisant des conidies; D- conidiospores.

Stérigmates longs et à base large, en forme de cornes.

Basidiospores hyalines, à paroi mince non amyloïde, 7-8-(10) x 3,25 - 3,5 - (3,75) µm, caractériséespar un apicule si court qu'il passerait inaperçu sans l'existence du bouchon apiculaire primaire. Basidiospores non répétitives semble-t-il mais cependant capablesde produire, sans cloisonnement préalable, des conidies en un ou plusieurs points.

Conidiospores ellipsoïdes, 3-4 x 1,5 -2 µm, se détachant facilement comme en témoignent les courtes cicatrices observées sur quelques basidiospores.

Stipe glabre, comprimé, plein, cortiqué et gélifié, constitué d'hyphes régulières à paroi un peu épaisse et à cloisons sans boucles.
Au niveau de l'écorce, épaisse de 10-15 µm, hyphes (x 2,5 - 4,5 µm) unies par une gelée abondante.
Plus à l'intérieur, hyphes seulement unies par un très mince gel; hyphes étroites (x 1,5 - 3 µm) dans une zone de 15 µm sous l'écorce, hyphes plus larges (x 3-4-5-(7) µm) au niveau de la moelle qui n'est pas lacuneuse.

HETEROCEPHALACRIA nov. gen.

Carpophori simplices, erecti, clavula a stipite maxime distincta. Basidiis claviformibus, breviter in crucem in summa parte septatis. Basidiosporis hyalinis, haud repetitivis, potentibus conidiosporas gignendi.
Genus clavarioideum inter Tremellales collocandum.

Typus generis: Heterocephalacria solida Berthier

Heterocephalacria solida nov. sp.

Carpophori 18 mm alti, catervatim in terra nuda vel ramis coniferarum crescentes, sicci brunnei, clavula 1,2 - 1,5 mm lata, saepe bilobata, stipitem longum atque compressum includente, plena, sed lacunosa, hymenio amphigene, cystidiis orbato. Basidiis claviformibus, summis plerumque breviter septatis, 4 robustis sterigmatis. Basidiosporis hyalinis, haud amyloideis, 7-8-(10) x 3,25-3,5(3,75) µm, appendice per obturamentum apicularem primarium separabili. Basidiosporis haud repetitivis, potentibus parvas conidiosporas (3-4 x 1,5-2 µm) gignendi, sine septatione praecedente. Stipite glabro, pleno, cortice gelata. Hyphis regularibus, haud inflatis. Septis solum prope hymenium subhymeniumque fibulatis.

Holotypus: Stockholm (S) leg. F.E et E.S Clements n° 333. Humi vel in ramis coniferarum, Minnehaha, 2600 m, Colorado (U.S.A.), 7-IX-1906.

DISCUSSION

Heterocephalacria solida, avec ses carpophores simples et capités présente de plus les caractéristiques suivantes:

- une gélification au niveau du stipe, particulièrement nette dans l'écorce.
- des boucles limitées aux cloisons des hyphes du sous-hymé-

nium et au pied des basides.

- des basides claviformes, le plus souvent courtement cloisonnées en croix à leur sommet.
- des basidiospores produisant des spores secondaires de type conidie, sans cloisonnement préalable.

Ces deux dernières caractéristiques nous conduisent à nous interroger sur la position du genre Heterocephalacria.

Avec ses forts stérigmates bien individualisés par le cloisonnement apical, la baside de H. solida n'est pas sans évoquer la baside des Dacrymycétales, qui est toutefois régulièrement bisporique et jamais cloisonnée. De plus chez les Dacrymycétales, la production de conidies par les basidiospores, qui sont également non répétitives, est très généralement précédée d'un cloisonnement.

H. solida diffère aussi des Trémellales typiques, pourtant à basides cloisonnées, car celles-ci, globuleuses et complètement cloisonnées en croix, produisent des basidiospores répétitives capables dans certains cas de germer en conidies.

En dépit de ces réserves, nous pouvons rattacher notre espèce aux Trémellales, si nous nous référons à la classification de MC NABB (1973) qui oppose les Holo aux Phragmobasidiomycetidae. Ce partage, antérieurement proposé par PATOUILLARD (1887, non 1900) et BREFELD (1887) sous d'autres vocables, respectivement Homo/Héterobasidiés et Auto/Protobasidiés, a été actualisé pour tenir compte d'espèces récentes à basides partiellement cloisonnées en croix et que MC NABB rattache aux Trémellales:
Metabourdotia (1 espèce), Tremellodendropsis + Pseudotremellodendron (5 espèces), auxquels vient s'ajouter Heteroscypha (1 espèce).

Soulignons ici que contrairement à ce que laisse supposer la définition élargie des Trémellales donnée par MC NABB il n'est pas certain que la production de spores répétitives soit le fait de toutes les espèces.
Tel serait le cas de H. solida, tout comme celui des espèces clavarioïdes chez lesquelles CORNER (1966 et 1970) n'a jamais observé ce phénomène. C'est pourquoi notamment, cet auteur, bien que reconnaissant la filiation probable de Tremellodendron (Tremellales), Tremellodendropsis et Aphelaria (Aphyllophorales, Clavariacées), hésite à verser ce genre limite dans les Trémellales.
De toute façon notre nouveau genre, vient s'ajouter à ces quelques espèces limites qui semblent être les témoins de l'évolution des Holobasidiés à partir d'ancêtres Phragmobasidiés.

REMERCIEMENTS

Nous adressons nos plus vifs remerciements au Professeur E.J.H. CORNER pour la lecture critique de cette note, à H. ROMAGNESI pour la traduction latine, ainsi qu'au Conservateur du Muséum d'Histoire Naturelle de Stockholm (S) pour le prêt du spécimen décrit.

REFERENCES

AGERER R. et OBERWINKLER F. 1979. Cyphelloide Tremellaceen. Beih. Sydowia, Ann. Mycol. ser. 2, 8: 26-32.

BAKER Gladys. 1941. Studies in the genus Physalacria. Bull. Torrey Bot. Club, 68: 265-288.

CORNER E.J.H. 1953. Addenda Clavariacea. III. Ann. Bot., n. ser , 17: 347-368.

CORNER E.J.H. 1966. The clavarioid complex of Aphelaria and Tremellodendropsis. Trans. Brit. Mycol. Soc., 49: 205-211.

CORNER E.J.H. 1970. Supplement to "a monograph of Clavaria and allied genera". Beih. Nova Hedwigia, 33: 299 p.

CRAWFORD A. 1954. Studies on New Zealand Clavariaceae. I. Trans. Roy. Soc. N. Z., 82: 617-631.

MC NABB, R.F.R. 1973. Phragmobasidiomycetidae, in AINSWORTH, G. C. et all. The fungi IV B, Acad. Press. N.Y. et London: 303-316.

OLIVE L.S. 1957. Two new genera of the Ceratobasidiaceae and their phylogenetic significance. Amer. J. Bot., 44: 429-435.

PATOUILLARD N. 1887. Les Hyménomycètes d'Europe. Klincksieck, Paris: 166 p.

PATOUILLARD N. 1900. Essai taxonomique sur les familles et genres d'Hyménomycètes. Declume, Lons-le-Saunier: 184 p.

MYCOTAXON

Vol. XII, No. 1, pp. 117-121 October-December 1980

BOTRYOBASIDIUM CHILENSE SP. NOV., A TELEOMORPH OF HAPLOTRICHUM CHILENSE

Věra Holubová-Jechová

Botanical Institute, Czechoslovak Academy of Sciences,
252 43 Průhonice near Praha, Czechoslovakia

ABSTRACT

A new species, Botryobasidium chilense Hol.-Jech., is described and illustrated from the type material of its anamorph Haplotrichum chilense (Linder) Hol.-Jech. (= Oidium chilense Linder) collected in Chile. It is closely related to Oidium ochraceum (Povah) Linder; the latter name is transfered to Haplotrichum Link.

TAXONOMIC PART

Botryobasidium chilense Hol.-Jech. sp. nov.

Carposoma resupinatum, sparse arachnoideum usque hypochnoideum, 75 - 100 µm crassum, album vel albo - cremeum. Hyphae basales 6 - 9 µm crassae, hyalinae, crassitunicatae, paulo dextrinoideae et valde cyanophilae, subhymeniales 6 - 7 µm crassae, tenuitunicatae, omnes absque fibulis; cystidia absunt. Basidia ellipsoidea vel ovoidea, 13 - 15 x 7 - 8 µm, tenuitunicata, (6-) 8 sterigmatibus 3 - 4 µm longis instructa. Basidiosporae 6 - 7.5 x 3 - 3.5 µm, ellipsoideae usque fusiformes, apiculo laterali instructae, hyalinae, tenuitunicatae, non-dextrinoideae, paulo cyanophilae.

Typus: Chile, Punta Arenas, Magallanes; March 1906,
leg. R. Thaxter (FH - Holotypus, cum anam.
Haplotricho chilensi).

Carpophores resupinate, widely effused, loosely hypochnoid, about 75 - 100 µm thick, white when fresh, somewhat whitish - ivory when dry.

Basal hyphae (5-) 6 - 9 (-10) µm wide, hyaline, thick-walled, with slightly dextrinoid and strongly cyanophilous walls; the ascending hyphae 6.5 - 7 µm wide with walls cyanophilous and undextrinoid; subhymenial hyphae 6 - 7 µm wide, thin-walled. All hyphae clampless, rarely anastomosing, without incrustation. Cystidia lacking.

Basidia ellipsoidal to ovoid, somewhat inflated and rounded at the top, narrowed toward the base, 13 - 15 µm long, 7 - 8 µm wide in the widest part, 3.5 - 4 µm wide near the base, thin-walled, with cyanophilous and slightly dextrinoid or undextrinoid walls, with (6-) 8 sterigmata, 3 - 4 µm long and 1 - 1.5 µm wide at the base.

Basidiospores usually 6 - 7.5 x 3 - 3.5 µm, ellipsoid to fusiform, slightly concave, narrowed to the apex and apiculately terminated in the top, broadly rounded at the base with a lateral and prominent basal apiculus, thin-walled, smooth, undextrinoid, slightly cyanophilous.

Anamorph: <u>Haplotrichum chilense</u> (Linder) Hol.-Jech.,
Česká Mykol. 30: 3, 1976.

Basionym: <u>Oidium chilense</u> Linder,
Lloydia 5: 196, 1942.

Colonies effused, irregular, thin, hypochnoid, loosely cottony or only scattered groups of conidiophores, whitish to slightly ochraceous, slightly ochraceous - brown or ochraceous - grey, 150 - 300 µm thick, hardly separable from the substratum.

Basal hyphae hyaline, (6-) 7 - 9 (-10) µm wide, thick-walled (up to 1 µm), prostrate and immersed in the substratum, few-branched, septate, clampless, occasionally anastomosing.

Conidiophores erect and ascending, at first unbranched, later branched in basal parts only, with ascending branches longer than the main conidiophore; hyaline, yellowish in basal parts, thick-walled (up to 1 µm), slightly constricted in the terminal septa, 130 - 275 µm long and (6-) 8.7 - 10 (-11) µm wide at the base, narrowed in terminal parts, 6 - 7.5 µm wide, terminated in one or more conidiogenous cells.

Conidiogenous cells slightly vesiculose, ellipsoid to broad ellipsoid, in short chains, or quite indistinct from the terminal part of conidiophore, hyaline or pale yellowish, with sometimes slightly granulose content, (14-) 17 - 26 (-30) x (6.5-) 7.5 - 10 µm, with 1 - 5 terminal and lateral conidiogenous teeth. Conidiogenous teeth cylindrical, short, 1 - 1.5 µm long and 2 - 3 (-4) µm wide, or developed only as slightly raised scars.

Conidia hyaline or pale yellowish, ovoid to broad ellipsoid or lemon-shaped, rounded at the terminal part and tapered, truncate or apiculate at the basal end, (11-) 13.5 - 16 (-18) x (7.5-) 9 - 11 µm, thick-walled (up to 1 µm), borne sessile or on teeth, in short, simple or branched chains; the wall of conidia finely echinulate to minutely verrucose.

Walls of basal hyphae and of mature conidia are slightly dextrinoid in Melzer's Reagent; those of basal hyphae, conidiophores and conidia are strongly cyanophilous in Cotton Blue.

Specimens studied:

1) Chile: Punta Arenas, Magallanes; III. 1906, coll. R. Thaxter (FH - Typus of Botryobasidium chilense and Haplotrichum chilense).
2) New Zealand: Westland, Granville Forest, Mount Elliott, Ahaura; on a wood chip, 2.IV. 1963, coll. S.J. Hughes (625) (DAOM 117434; only Haplotrichum anamorph).

Habitat and distribution.

Growing on dead and rotting wood. Its ecology and distribution is not clear yet, because only two records are known for the time being, one from Chile, one from New Zealand.

Remarks.

During the study of the type specimen of Haplotrichum chilense (FH), collected by R. Thaxter and determined and described by D.H. Linder (1942), also its teleomorph belonging to Botryobasidium Donk subgen. Brevibasidium John Erikss. was found. Unfortunately, the material of the teleomorph was rather infrequent and overmatured in the specimen studied. However, it was possible to find the connection between the teleomorph and the anamorph in the margin of young colonies of Botryobasidium; this connection was established between basal hyphae of both states.

Botryobasidium chilense may be a species distinguishable with some difficulty as it is rather similar to other species of Botryobasidium subgen. Brevibasidium, e. g. B. candicans John Erikss., the teleomorph of Haplotrichum capitatum (Pers.) Link, with spores more or less of the same shape and size as B. chilense, but with somewhat longer and narrower basidia. Chiefly, B. chilense is rather well-marked by its anamorph.

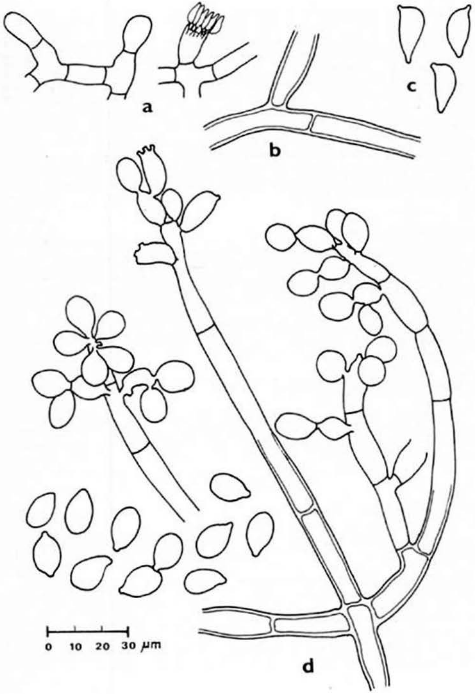


Fig. 1. Botryobasidium chilense with its anamorph Haplotrichum chilense. a) Hymenial hyphae with basidia, b) basal hypha, c) spores of B. chilense. d) Conidiophores and conidia of H. chilense.

Haplotrichum chilense seems to come close to *H. capitatum*, but has less distinct conidiogenous cells and conidiogenous teeth. *H. chilense* is very similar to *H. ochraceum* (Povah) Hol.-Jech. comb. nov. [basionym: *Monilia ochracea* Povah, Mich. Acad. Arts, Sci., Letters 13: 181 - 182, 1931, = *Oidium ochraceum* (Povah) Linder, Lloydia 5: 187, 1942]. The latter species is well distinguishable by its thin-walled and longer, (12.5-) 17.5 - 20 (-22.5) x (8-) 8.7 - 10 (-11.2) µm, lemon-shaped to fusiform conidia. *H. ochraceum* is confined to the North American continent (Maine, Massachusetts, Michigan).

Haplotrichum chilense is known from two specimens only, and therefore the variation of it is not well determined for the time being.

LITERATURE CITED

Linder, D. H. 1942. A contribution towards a monograph of the genus *Oidium* (Fungi Imperfecti). Lloydia, Cincinati, 5: 165 - 207.

MYCOTAXON

Vol. XII, No. 1, pp. 122-130 October-December 1980

REVISION AND SUBDIVISION OF HAPLOTRICHUM - ANAMORPHS OF BOTRYOBASIDIUM

VĚRA HOLUBOVÁ-JECHOVÁ

Botanical Institute, Czechoslovak Academy of Sciences,
252 43 Průhonice near Praha, Czechoslovakia

ABSTRACT

Species of Haplotrichum Link (lignicolous Hyphomycetes) are anamorphs of Botryobasidium Donk subgen. Brevibasidium John Erikss. (Corticiaceae). After a revision, the genus includes 22 species; connections to perfect states were found in 10 of them. Haplotrichum is characterized by wide basal hyphae; except for H. medium basal hyphae are without clamps. The most important features used for the subdivision of Haplotrichum are as follows: presence or absence of clamps (subgenera); ramification of conidiophores, mode of conidia production (solitary or in chains), absence or presence and colour of conidiogenous cells, existence of one or two types of conidiophores (sections); shape of conidia, quantity and shape of conidiogenous teeth, ramification of conidiophores (subsection). Colour of colonies, conidiophores and conidia are characters of species only. Features of perfect states cannot be used to subdivide Haplotrichum or to distinguish its species.

INTRODUCTION

Haplotrichum Link belongs to Deuteromycotina, class Hyphomycetes. Species of this genus are anamorphs of Botryobasidium Donk subgenus Brevibasidium John Erikss. (Corticiaceae). They are lignicolous hyphomycetes occurring on dead and rotten wood and bark of dead and fallen trunks, branches and stumps. In general, imperfect states of Basidiomycetes are mostly poorly developed and are often known in pure cultures only; on the contrary anamorphs of Botryobasidium Donk produce elegant forms, morphologically very distinct and variable on the substrate in nature and occurring often there quite separately from their teleomorphs.

The genus was monographed by Linder in 1942, who included 31 species and 1 variety in it. The result of the present revision is a new circumscription of the genus including 22 species only. Linder used in his monograph the name Oidium Link ex Fr. However, following conservation of the generic name Oidium for conidial states of Erysiphe and closely related genera accepted by the XII. International Botanical Congress in July 1975, the name Haplotrichum Link had to be chosen for the genus studied on the basis of priority (Petersen 1975, Holubová -Jechová 1975, 1976). Other important synonyms used often by mycologists for Haplotrichum Link are: Acladium Link ex Pers., Alysidium Kunze, Nematogonum Desm., Physospora Fr., and Rhinotrichum Corda etc.

The revisionary studies are based on a rich material collected in Central Europe, mainly in Czechoslovakia and Poland, and on investigation of types and rich materials from North American continent preserved in some mycological herbaria (FH, NY, BPI, DAOM).

TAXONOMIC PART

Haplotrichum Link is a rather isolated genus. Characteristic features for its delimitation are wide basal hyphae (which indicate its connection with Botryobasidium), and the development of conidia on conidiogenous cells. Conidia are blastospores produced on more or less distinct conidiogenous teeth located on conidiogenous cells, often in long chains. The production of blastospores in chains is a relatively uncommon feature in the Homobasidiomycetes. The most closely related genus is Allescheriella Hennings; its only species A. crocea (Mont.) Hughes is an anamorph of Botryobasidium croceum Lentz and its conidia are aleuriospores. However, in spite of this basic difference, Linder (1942) included Allescheriella in his Oidium.

Microchemical reactions of cell walls with Cotton Blue and with Melzer's Reagent were also used for generic delimitation of Haplotrichum. Cell walls of basal hyphae of Haplotrichum are cyanophilous in Cotton Blue as they are in Botryobasidium. Hyaline parts of conidiophores, conidiogenous cells and conidia of Haplotrichum are also mostly more or less cyanophilous. This feature - cyanophily of hyphal walls in Cotton Blue - has been used for taxonomic conclusions concerning the circumscription of the genus in this revision. Acyanophilous species included by Linder (1942) in the genus were excluded: Oidium lanosum (Cooke) Linder, O. macrosporum (Farlow ex Sacc.) Linder and O. tenellum (Berk. & Curt.) Linder, two latter belonging to Olpitrichum Atk. (Holubová-Jechová 1974).

The majority of species of Haplotrichum show a weak dextrinoid reaction of basal hyphae in Melzer's Reagent, their walls turn violet-brown quite similar as those of Botryobasidium. Some species of Haplotrichum have also strong dextrinoid reaction of the wall of conidia (e. g. H. tenerum).

The infrageneric classification of Haplotrichum.

The genus is not quite homogenous but the species are clustered in several groups. Some species are more related and form complexes of species, other form monotypic groups.

According to the presence or the absence of clamps in basal hyphae, the genus may be subdivided into two groups. One group contains 21 species without clamps, the second group only one species with clamps in basal hyphae. This character was used in the subdivision of the genus into two subgenera: subgen. Haplotrichum without clamps, and Fibulinum with clamps.

The member of subgen. Fibulinum is characteristic not only by this feature, but also usually by the occurrence of the anamorph in carpophores of the teleomorph. The teleomorph and the anamorph are not separated in this species during its ontogenetic development (as it is usual in subgen. Haplotrichum), both states developing in ± equal quantity or one or another predominating. Phylogenetically, this species seems to be the most primitive member of the genus.

The ramification of conidiophores is another significant character for the subdivision of Haplotrichum. Conidiophores are either irregularly branched on whole length in lateral branches, or simple and branched only at base, or they are branched only at apex. Another important feature characteristic only for one species (H. simile) is the presence of two types of conidiophores. The ones are short, branched, hyaline to pale coloured and thin-walled, the others are 2-4 times longer, simple, dark rusty brown and thick-walled. Both types of conidiophores bear conidiogenous cells with chains of conidia. The longer and darker conidiophores are not abundant in colonies and suggest a transition to sterile setae.

Different types of ramification of conidiophores are somewhat correlated with the shape and location of conidiogenous cells and conidiogenous teeth. For example: the conidiophores on the whole length unbranched have intercalary, not swollen usually conidiogenous cells, conidiogenous teeth scattered in the upper two- thirds of conidiophores, and conidia single, not in chains. An example is the Haplotrichum conspersum species complex. On the contrary, the conidiophores branched on the whole length have distinct terminal and lateral vesiculous conidiogenous cells, conidiogenous teeth on the conidiogenous vesicles only and conidia solitary or in short chains. An example is the Haplotrichum ramosissimum species complex.

A significant feature for classification is also the shape of conidiogenous cells which may be either very distinct, vesiculose to globose inflated or not at all conspicuous and swollen; according to their position they may be terminal, lateral or intercalary. Also the number, location and shape of conidiogenous teeth, as well as the method of conidia formation, whether they are solitary or in short or long branched chains, are important characters. The complex of all these features was used for the subdivision of subgen. Haplotrichum into sections. The sections are not equivalent by the number of species included.

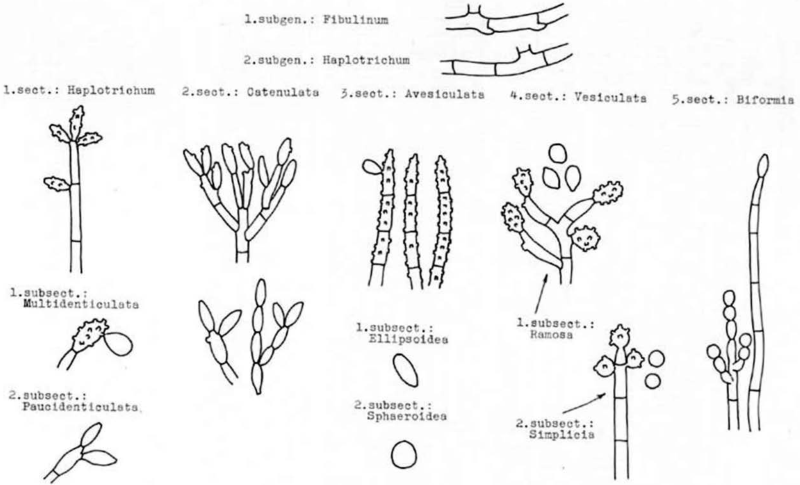
Some of the sections have even been subdivided into subsections. The shape of conidia, shape, number and location of conidiogenous teeth and also some differences in ramification of conidiophores were used as criteria for the delimitation of subsections.

The colour of conidiophores and conidia is an important character for these fungi only at the specific level. The appearance and the colour of colonies of Haplotrichum are rather constant features. Only exceptionally moist substrata are influencing this character (for example: Haplotrichum aureum has pale yellow colonies on moist substrata and dark orange yellow colonies on dry substrata). Some species of Haplotrichum may be safely determined without microscope only according to their habitus and colour of colonies, for example: Haplotrichum aureum, H. simile, H. capitatum, H. conspersum.

The genus is cosmopolitan in its distribution. Eight species occur in Europe and nearly all species occur in the North American continent or in Central and South America. Only H. ovalisporium and H. gracile are known also in Africa and H. pulchrum has been found hitherto in Australia only. According to the number of species of Haplotrichum, the centre of their abundance is in the North American continent.

Eight species collected in Czechoslovakia were studied in detail. Some of them seem to show special requirements for temperature, moisture and altitude. On the contrary, other species are ecologically very plastic. Very common species in Czechoslovakia are H. aureum, H. capitatum and H. conspersum occurring on wood and bark of deciduous trees from lowlands to the mountains. H. rubiginosum and H. simile appear to be confined to river-side forests in lowlands of warm regions. H. ellipsosporum occurs mainly in mixed and spruce-forests in colder regions from hilly country to the mountains. H. medium and H. album are rare

SUBDIVISION OF HAPLOTRICHUM LINK



species known in Czechoslovakia only from a few localities. All species collected in Czechoslovakia, except for H. album, were found in connection with their Botryobasidium teleomorph.

CLASSIFICATION OF HAPLOTRICHUM LINK

Nomen: Haplotrichum Link, in Willd., Linné Sp. Pl., ed. 4, 6 (1): 52, 1824; Fr., Syst. Mycol. 3 (in indice): 93, 1832.

Typus: H. capitatum (Pers.) Link 1824

Status perfectus: Botryobasidium Donk, Meded. ned. mycol. Vereen 18 - 20: 116, 1931.

1. subgenus: Fibulinum subgen. nov.
Typus: H. medium (Hol.-Jech.) Hol.-Jech. 1976

Hyphae basales fibulatae.
Basal hyphae with clamps.

1 sp.: H. medium (Hol.-Jech.) Hol.-Jech. 1976 anamorph of Botryobasidium medium John Erikss.

2. subgenus: Haplotrichum
Typus: H. capitatum (Pers.) Link 1824

Basal hyphae without clamps. (21 spp.)

1. sectio: Haplotrichum
Typus: H. capitatum (Pers.) Link 1824

Conidiophores unbranched or branched in basal parts only, vesiculous distinct conidiogenous cells in short chains in apical parts; conidia in chains. (3 spp.)

1. subsectio: Multidenticulata subsect. nov.
Typus: H. capitatum (Pers.) Link 1824

Pars conidiifera polyblastica, dentibus conidiiferis distinctis, numerosis praedita. Conidiogenous teeth on conidiogenous cells distinct, numerous.

1 sp.: H. capitatum (Pers.) Link 1824 anamorph of Botryobasidium candicans John Erikss.

2. subsectio: Paucidenticulata subsect. nov.
Typus: H. ochraceum (Povah) Hol.-Jech. 1980

Pars conidiifera polyblastica, dentibus conidiiferis indistinctis, paucis praedita.
Conidiogenous teeth on conidiogenous cells indistinct, not numerous.

2 sp.: H. ochraceum (Povah) Hol.-Jech. 1980,
H. chilense (Linder) Hol.-Jech. 1976
anamorph of Botryobasidium chilense
Hol.-Jech.

2. sectio: Catenulata sect. nov.
Typus: H. aureum (Pers.) Hol.-Jech. 1976

Conidiophora plus minus irregulariter ramosa; cellulae conidiogenae vesiculosae dentibus conidiiferis plus minus indistinctis, paucis praeditae; conidia in catenis longis ramosis disposita.
Conidiophores more or less irregularly branched on the whole length; vesiculous conidiogenous cells present; conidiogenous teeth more or less indistinct and less frequent; conidia in long and branched chains.

2 sp.: H. aureum (Pers.) Hol.-Jech. 1976 anamorph
of Botryobasidium aureum Parm.,
H. album (Sumstine) Hol.-Jech. 1976

3. sectio: Avesiculata sect. nov.
Typus: H. conspersum (Pers.) Hol.-Jech. 1976

Conidiophora simplicia; cellulae conidiogenae intercalares, non vesiculosae, dentibus conidiiferis numerosis praeditae; conidia solitaria.
Conidiophores unbranched on the whole length; conidiogenous cells intercalary, not vesiculously swollen; conidiogenous teeth numerous, located in the upper two-thirds of the conidiophore; conidia solitary.
(6 spp.)

1. subsectio: Ellipsoidea subsect. nov.
Typus: H. conspersum (Pers.) Hol.-Jech. 1976

Conidia ellipsoidea vel clavata.
Conidia ellipsoid or clavate.

4 spp.: H. conspersum (Pers.) Hol.-Jech. 1976
anamorph of Botryobasidium conspersum
John Erikss.,
H. ellipsosporum (Hol.-Jech.) Hol.-Jech.
1976 anamorph of Botryobasidium
ellipsosporum Hol.-Jech.,

H. magnisporum (Linder) Hol.-Jech. 1976,
H. caribense (Hol.-Jech.) Hol.-Jech. 1976

2. subsectio: *Sphaeroidea* subsect. nov.
Typus: *H. sphaerosporum* (Linder) Hol.-Jech. 1976

Conidia globosa.
Conidia globose.

2 spp.: *H. sphaerosporum* (Linder) Hol.-Jech. 1976,
H. tenerum (Sumstine) Hol.-Jech. 1976

4. sectio: *Vesiculata* sect. nov.
Typus: *H. ramosissimum* (Berk. & Curt.) Hol.-Jech. 1976

Conidiophora ramosa vel simplicia; cellulae conidiogenae terminales et laterales, distinctae, vesiculosae, dentibus conidiiferis praeditae; conidia solitaria vel in catenis brevibus disposita.
Conidiophores branched or rarely unbranched; conidiogenous cells terminal and lateral, distinct, vesiculously swollen, with conidiogenous teeth; conidia solitary or in short chains.
(9 spp.)

1. subsectio: *Ramosa* subsect. nov.
Typus: *H. ramosissimum* (Berk. & Curt.) Hol.-Jech. 1976

Conidiophora ramosa.
Conidiophores branched.

8 spp.: *H. ramosissimum* (Berk. & Curt.) Hol.-Jech. 1976,
H. curtisii (Berk.) Hol.-Jech. 1976 anamorph of *Botryobasidium curtisii* Hallenb.,
H. rubiginosum (Fr.) Hol.-Jech. 1976 anamorph of *Botryobasidium robustius* Pouz. & Hol.-Jech.,
H. linderi Hol.-Jech, 1976,
H. gracile (Linder) Hol.-Jech. 1976,
H. ovalisporium (Linder) Hol.-Jech. 1976,
H. pulchrum (Berk.) Hol.-Jech. 1976,
H. vesiculosum (Linder) Hol.-Jech. 1976

2. subsectio: *Simplicia* subsect. nov.
Typus: *H. tomentosum* (Pat.) Hol.-Jech. 1976

Conidiophora simplicia.
Conidiophores unbranched.

1 sp.: *H. tomentosum* (Pat.) Hol.-Jech. 1976 anamorph of *Botryobasidium lembosporum* (D.P.Rogers) Donk

5. sectio: Biformia sect. nov.
   Typus: H. simile (Berk.) Hol.-Jech. 1976

   Conidiophora biformia: breviora ramosa, subhyalina, tenuitunicata, numerosa; altiora simplicia, setiformia, fusca, crassitunicata, pauca.
   Two different types of conidiophores present: shorter branched, subhyaline, thin-walled, numerous; longer unbranched, setiformis, fuscous, thick-walled, less frequent.

   1 sp.: H. simile (Berk.) Hol.-Jech. 1976 anamorph of Botryobasidium simile Pouz. & Hol.-Jech.

Characters of the teleomorphs could not be used in the classification of Haplotrichum. Ten species of Botryobasidium found in connection with Haplotrichum anamorphs are very slightly differentiated morphologically and, as their characters are variable (especially the shape of basidiospores), the determination is very difficult and sometimes, without knowledge of the anamorph almost impossible.

LITERATURE CITED

Holubová-Jechová, V. 1974. A revision of the genus Olpitrichum Atk. Folia Geobot. Phytotax., Praha, 9: 425 - 432.

Holubová-Jechová, V. 1975. Problems of usage of the generic name Oidium. Folia Geobot. Phytotax., Praha, 10: 433 - 440.

Holubová-Jechová, V. 1976. Haplotrichum Link instead of Oidium Link, a necessary nomenclatural change. Česká Mykol., Praha, 30: 3 - 4.

Linder, D.H. 1942. A contribution towards a monograph of the genus Oidium (Fungi Imperfecti). Lloydia, Cincinati, 5: 165 - 207.

Petersen, R.H. 1975. Report of the Special Committee for Fungi and Lichens. Taxon, Utrecht, 24: 533 - 534.

MYCOTAXON

Vol. XII, No. 1, pp. 131-136 October-December 1980

PHAEOHYPHOMYCOSIS IN A DOG CAUSED BY *PSEUDOMICRODOCHIUM SUTTONII* SP. NOV.

LIBERO AJELLO, ARVIND A. PADHYE

Mycology Division, Center for Disease Control,
Public Health Service, U. S. Department of Health
and Human Services, Atlanta, Georgia 30333

AND

MARIE PAYNE

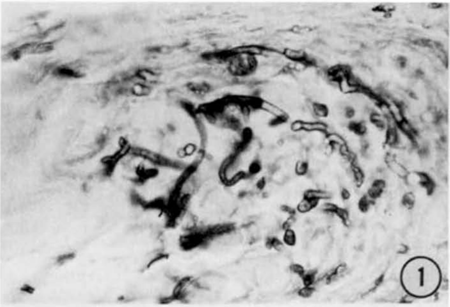
Oklahoma Animal Disease Diagnostic Laboratory,
Oklahoma State University, Stillwater, Oklahoma 74074

ABSTRACT

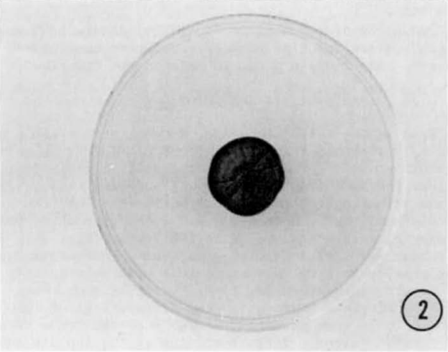
Pseudomicrodochium suttonii Ajello, Padhye et Payne, sp. nov., a new agent of phaeohyphomycosis, causing subcutaneous infection in a dog in Oklahoma is described.

INTRODUCTION

From an ear lesion in a dog, a dematiaceous mould was repeatedly isolated that was at first considered to be *Mycocentrospora acerina* (Hartig) Deighton. Histological sections prepared from the biopsy of infected tissue, when stained with the haemotoxylin and eosin stain and the periodic acid Schiff method, revealed dematiaceous hyphae and many bizarre fungal cells in the tissue (Fig. 1). The fungus was isolated in pure culture on Sabouraud dextrose agar containing chloramphenicol and cycloheximide. The culture was sent to Dr. B. C. Sutton of the Commonwealth Mycological Institute, Kew, Surrey, England, who found it to be more properly referable to the genus *Pseudomicrodochium* Sutton. Further studies of the isolate and comparison with written descriptions of the known species of *Pseudomicrodochium* led us to consider the canine isolate to be a new species of that genus.



1



2

Colonies on Sabouraud dextrose agar were slow growing, mousy grey to black, moist, glistening at first and then becoming velvety and reaching 12-13 mm in diameter after 2 weeks at 25°C. Growth on potato dextrose agar was moderate, velvety, olive-grey, raised in the center with a dark black margin, and reaching 23-25 mm in diameter. Growth at 37°C was very slow, reached a diameter of only 5-6 mm after 2 weeks.

Microscopically, the immersed mycelium was sparse, composed of branched, septate, dematiaceous hyphae. Superficial mycelium was composed of branched, septate, dematiaceous hyphae, 1.5-2.0 µm wide. Conidiophores were absent. Conidiogenous cells were produced directly from the superficial vegetative mycelium (Fig. 3). They were solitary, enteroblastic, monophialidic, discrete, lateral, determinate, cylindrical to doliiform, smooth, with an indiscrete apical collarette, 3-4 µm long, 2-2.8 µm at the base, narrowing to 1-1.2 µm diameter at the apex (Figs. 3,4). Conidia were produced at the apices of phialides, pale brown to brown in color, 2-3 septate, smooth, straight to falcate, acicular, with apex and base being attenuated and pointed, and measuring 18-30 X 1-1.2 µm (Fig. 4).

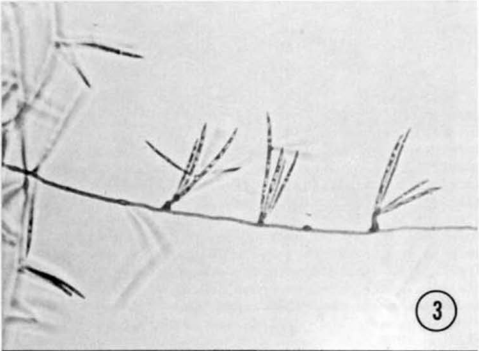
The isolate is described as a new species of *Pseudomicrodochium,* the first to be cultured on an artificial medium and is named in honor of Dr. B. C. Sutton who established the genus.

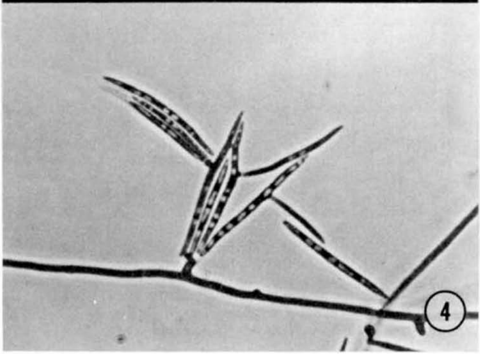
Pseudomicrodochium suttonii Ajello, Padhye et Payne, sp. nov.

Coloniae in agaro dextrose Sabouraudii tarde crescentes, pallide murinae (Ridgway Pl. Li, 15) usque intense olivaceo-griseae (Pl. Li, 23), mucidae, primum lucentes deinde velutinae, post hebdomades duas ad temperatum 25°C ad 12-13 mm attingentes; in agaro dextroso solani moderatim crescentes olivaceo-griseae (Pl. Li, 23b) ad

Fig. 1: Dematiaceous hyphae and cells of *P. suttonii* in tissue section from dog's ear, Periodic acid Schiff stain 650X

Fig. 2: Two-week-old colony of *P. suttonii* on Sabouraud dextrose agar


③


④

centrum elevatae et intense olivaceo-griseo-marginatae, ad 23-25 mm in diam. attingentes; mycelium immersum sparsum, ex hyphis dematiaceis ramosis septatis, 1.5-2.0 µm latis compositum; conidiophora carentia; cellulae conidiogenae directe ex hyphia vegetativis superficialibus enata, solitariae enteroblasticae, monophialidicae, discretae, laterales, determinatae, cylindricae vel doliiformes, glabrae, collaretta indiscreta apicali 3-4 µm longa, ad basim 2-2.8 µm lata, ad apicem ad 1-1.2 µm attenuata praeditae; conidia ad apices phialidium enata, brunneola vel brunnea, 2-3-septata glabra, recta vel falcata, acicularia, utrinque attenuata et acuminata, 18-30 X 1-1.2 µm.

Typus: cultura siccata (B-2968)

A living culture of *P. suttonii* is deposited in the Commonwealth Mycological Institute, Kew, Surrey, England, with the accession number IMI 233463. A living culture is also maintained in the Mycology Division's culture collection, Center for Disease Control, Atlanta, Georgia, with the accession number B-2968.

DISCUSSION

Pseudomicrodochium suttonii differs from the three known species of *Pseudomicrodochium;* namely, *P. aciculare, P. cylindricum* (3), and *P. candidum* (1,2) in colonial and micromorphology. The *in vitro* colony of *P. suttonii* is dematiaceous (Fig.2), but those of *P. aciculare, P. cylindricum,* and *P. candidum* on their hosts are pale salmon to glistening white(1,3). The conidia of *P. cylindricum* are straight, cylindrical, hyaline, medianly 1-septate, 15-24 X 1.5-2.0 µm. Those of *P. candidum* are also straight, cylindrical, hyaline, 2-3 septate, and measure 15-18 X 2µm. The conidia of *P. aciculare* are hyaline, medianly 1-septate, rarely 2-septate, smooth, slightly curved, acicular, with apex and base attenuated,and pointed. They measure 21.5-31.5 X 1.0 µm. On the other hand, *P. suttonii* produces pale brown to brown, 2-3 septate, smooth, straight or falcate, acicular conidia which are attenuated and

Fig. 3: Solitary,lateral, cylindrical phialides and falcate to acicular conidia of *P. suttonii* 310X
Fig. 4: Pale brown, 2-3 septate, falcate to acicular conidia of *P. suttonii* 1280X

pointed at both ends and measure 18-30 X 1-1.2 µm (Figs. 3,4).

ACKNOWLEDGEMENT

We wish to thank Dr. B. C. Sutton for examining the canine isolate, and for reviewing the manuscript. Our grateful thanks are due to Miss Edith Cash for preparation of the Latin diagnosis.

LITERATURE CITED

1. Bresadola, G. 1915. Neue Pilze aus Sachsen. Annls. Mycol. 13:104-106.
2. De Hoog, G. S. 1978. Notes on some fungicolous hyphomycetes and their relatives. Persoonia 10:33-81.
3. Sutton, B. C. 1975. Hyphomycetes on cupules of *Castanea sativa*. Trans. Br. Mycol. Soc. 64:405-426.

MYCOTAXON

Vol. XII, No. 1, pp. 137-167 October-December 1980

ON THE FAMILY TUBEUFIACEAE (PLEOSPORALES)

MARGARET E. BARR

Department of Botany, University of Massachusetts,
Amherst, Massachusetts 01003

SUMMARY

Ten genera are presently accepted in the family Tubeufiaceae. Those genera whose species are extralimital in distribution to temperate North America are considered briefly. *Rebentischia* and *Tubeufia*, with two and seven species respectively in temperate North America, are considered in more detail. *Tubeufia* is subdivided into the sections Tubeufia, Nectrioidea, Thaxteriella and Acanthostigmina; new combinations are proposed for *Tubeufia clintonii*, *T. pezizula*, and *T. scopula*.

INTRODUCTION

The family Tubeufiaceae was erected recently (Barr, 1979) to accommodate a number of pleosporaceous fungi that are typically either hypersaprobic on other fungi or on substrates previously colonized by other fungi or hyperparasitic on foliicolous fungi, or parasitic on scale insects, occasionally parasitic on living leaves. The ovoid, globose, ellipsoid or cylindric ascomata of species in the family are soft and fleshy in consistency, range in pigmentation from none (hyaline) to yellowish, brownish or pinkish to dark vinaceous brown, but not red; surfaces may be smooth or ornamented by protruding cells, hyphal appendages, or setae. The bitunicate asci are clavate or cylindric and develop from the base of the locule in narrow cellular pseudoparaphyses. Ascospores are hyaline, yellowish, or light vinaceous brown, narrowly oblong or nearly ellipsoid, short to elongate fusoid, or cylindric, and one or more commonly several septate. The conidial states known for a number of the species are hyphomycetous; sympoduloconidia are typically helicosporous or staurosporous, but dictyosporous conidia are associated in some taxa.

While fungi possessing these features have been accommodated within the Pleosporaceae ss. lat., in my opinion they form a well-defined family. Pirozynski (1977) suggested that *Tubeufia* could be grouped with *Acrospermum* in the Acrospermataceae and allied with *Cyanoderma* and *Oomyces*. The species of *Acrospermum* are not convincingly bitunicate, although Eriksson (1967) as well as Pirozynski (1977) believed that they were. Sherwood (1977), on the other hand, suggested that *Acrospermum* was more closely allied to members of the Clavicipitaceae. My interpretation of *Acrospermum* and its relatives would place the family in the Xylariales, although the taxa deviate in some respects from typical representatives of the order. The vertically elongate, light-colored ascomata of species of *Acrospermum* are superficially similar to the ovoid or cylindric ascomata of some species of *Tubeufia*. The locule in species of *Tubeufia* differs in the presence of attached pseudoparaphyses and relatively broadly oblong or cylindric, thick-walled asci with apical cytoplasmic protrusion from that in species of *Acrospermum* which contains paraphyses with free apical ends and narrowly cylindric asci with an evenly thickened apex. A transverse or oblique arrangement of peridial cells is seen in a number of fungi with vertically elongata ascomata, e.g., in species of *Acrospermum* (Eriksson, 1967), in species of *Tubeufia*, as in *T. paludosa* and *T. cylindrothecia* (see later), in the elongate beak of *Ophioceras dolichosporum* (Berk. & Curt.) Sacc. (Conway and Barr, 1977). Such an arrangement of peridium cells seems to be for support, an architectural device arrived at by some Ascomycetes that have developed similarly elongate ascomata or beaks. The diagnostic features of the centrum or locule differ in each of these taxa.

Many of the taxa of the Tubeufiaceae are tropical or otherwise extralimital in distribution. In this study the genera that I presently treat in the family are discussed. The species now known to occur in temperate North America receive a more detailed consideration. At least one additional genus probably belongs in the family, composed of species parasitic on rust sori, whose elongate ascospores are spirally twisted in the ascus (Rossman, 1977).

GENERA AND SPECIES

ALLONECTE H. Sydow, Ann. Mycol. 37: 378. 1939.

Allonecte lagerheimii (Pat.) Sydow, the sole species, is a leaf parasite known from Ecuador, whose reddish-brown ascomata penetrate the leaf epidermis by a basal foot. The peridium bears hyphal appendages and the ellipsoid ascospores are one septate (Müller and von Arx, 1962; Rossman, 1979).

BOERLAGIOMYCES Butzin, Willdenowia 8: 39. 1977.

Boerlagella Penzig & Sacc. Malpighia 11: 404. 1897, non Pierre ex Boerlage, 1891 (Sapotaceae).

Von Arx and Müller (1975) observed that the genus was closely related to *Tubeufia*. The type species, *B. velutinus* (Penzig & Sacc.) Butzin, and second species, *B. laxus* (Penzig & Sacc.) Butzin, were both described from Java on decaying wood or culms. *Boerlagiomyces laxus* may be an immature stage of *B. velutinus*. This species has dark brown, soft-walled ascomata that bear hyphal appendages and are seated in a well-developed dark subiculum. The ascospores are hyaline, elongate, narrowly clavate, and multiseptate with vertical septa in a number of the cells. *Boerlagella indica* Tilak et al. (Sydowia 24: 294. 1971) may belong in *Berlesiella* or *Dictyotrichiella* according to the description. The description and illustration of *Thaxteriellopsis lignicola* Sivanesan et al. (Kavaka 4: 39. 1976) are suggestive of *Boerlagiomyces*.

BYSSOCALLIS H. Sydow, Ann. Mycol. 25: 14. 1927.

Petrak (1931) and Pirozynski (1977) included the species of *Byssocallis* in *Puttemansia* but Rossman (1979) retained the two genera separately. Ascospores in the species of *Byssocallis* may have apiculate ends as in species of *Puttemansia* or blunt ends as in species of *Melioliphila*. Ascomata develop on meliolaceous hosts. Rossman (1979) suggested that *Byssocallis* is closely related to *Meliolophila* because of the similarity of ascospore shapes as well as the presence of an associated *Eriomycopsis* conidial state with *B. capensis* (Doidge) Rossman. The type species is *B. phoebes* H. Sydow.

LETENDRAEA Sacc. Michelia 2: 73. 1880.

Species with one-septate ascospores, thin-walled pallid ascomata and not known to possess a conidial state are placed in *Letendraea*. *Letendraea helminthicola* (Berk. & Br.) Weese ex Petch (Trans. Brit. Mycol. Soc. 21: 277. 1938), the type species, is European and not yet known from North America. Müller and von Arx (1962) and Samuels (1973) provided descriptions and illustrations of this species. *Letendraea padouk* Nicot & Parguey-Leduc (Compt. Rend. Hebd. Seances Acad. Sci. 248: 1560. 1959) is a similar but larger species from Africa. Some species described in the genus do not belong here: *L. luteola* Ell. & Ev. and *L. rhynchostoma* von Höhnel are species of *Cryptosphaeria*, *L. rickiana* Rehm is a species of *Nectria*, and *L. lasiosphaerioides* Teng is a species of *Didymotrichia*. According to descriptions, other species described in *Letendraea* are also to be removed from the genus, but I have not studied these and cannot suggest their true position at this time.

MELIOLIPHILA Speg. Bol. Acad. Ci. Cordoba 26: 344. 1924 (1923).

The species of this genus have thick-walled, opaque ascomata, clavate, blunt-ended, several-septate ascospores and associated conidial states belonging to *Eriomycopsis* Speg. They are hyperparasitic on meliolaceous taxa in tropical regions. Pirozynski (1977) redescribed the genus and illustrated several species. Rossman (1979) added other species to the genus and clarified synonymy of the type species, *Calonectria graminicola* Speg. non (Berk. & Br.) Wollenw. The earliest name for the type species is *M. volutella* (Berk. & Br.) Rossman (Mycotaxon 8: 551. 1979).

PARANECTRIELLA (P. Henn. ex Sacc.) von Höhnel, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 119: 899. 1910.

Another tropical genus of hyperparasitic fungi, *Paranectriella* differs from *Melioliphila* in small, pallid, thin-walled, translucent ascomata, appendaged ascospores, and in the *Titaea* conidial state. Pirozynski (1977) redescribed the genus and provided illustrations. Hawksworth and Pirozynski (1977) corrected citation and synonymy of the generic name, typified by *P. juruana* (P. Henn.) Piroz. (Kew Bull. 31: 598. 1977).

PODONECTRIA Petch, Trans. Brit. Mycol. Soc. 7: 146. 1921.

Species with pallid or brightly pigmented ascomata, with granular brown outer coating in some, elongate-clavate multiseptate ascospores, parasitic on scale insects, with *Tetracrium* conidial states belong in *Podonectria*. Only the type species, *P. coccicola* (Ell. & Ev.) Petch, has been collected in southern regions of temperate North America (Florida, Mississippi, Louisiana, Texas) as well as in tropical regions. Rossman (1978) monographed the genus, and described and illustrated eight species worldwide.

PUTTEMANSIA P. Henn. Hedwigia 41: 113. 1902.

The ascomata of the species of *Puttemansia* are thick walled and opaque, and are surrounded by straight or flexuous hyphal appendages. The ascospores are several septate, fusoid or clavate with apiculate or rostrate ends. Conidial states are described (Pirozynski, 1977) as species of *Titaea* Sacc. or *Guelichia* Speg. (and possibly *Spermatoloncha* Speg.) Rossman (1979) noted the association of *Tetracrium* conidia with ascocarps on lectotype material of *P. lanosa* P. Henn., the type species. Petrak (1931) first recognized that species of *Puttemansia* were not members of the Hypocreales but were "hypocreoide Dothidaceen." Pirozynski (1977) included *Annajenkinsia* Thirum. & Narasimhan (Mycologia 47: 760. 1955) as a synonym of *Puttemansia*, whereas von Arx and Müller (1975) regarded *Annajenkinsia* as a member of the Patellariaceae. According to description and illustration of *A. fungicola* Thirum. & Narasimhan, the species belongs in *Puttemansia*. Petrak (1931) and Pirozynski (1977) included the species of *Byssocallis* in *Puttemansia* but Rossman (1979) retained two separate genera.

REBENTISCHIA Karsten, Fungi Fenniae Exsiccati No. 881 (in sched.) 1869; Mycol. Fenn. 2: 14. 1873.

Ascomata at first immersed in loose outer layers of periderm or cortex of host, remaining immersed or becoming erumpent superficial, separate or few grouped, globose, somewhat depressed, or ovoid, often collabent in age, apex blunt; peridium soft and fleshy, composed of pseudoparenchymatous cells, light to dark vinaceous brown externally, toward interior of narrow compressed layers of hyaline or vinaceous-tinged cells, pigment encrusted on surface of outermost cells; surface often roughened by protruding cells or short hyphae; subiculum hyphae sparse. Asci from base of locule, bitunicate, oblong clavate, octosporous or occasionally only four maturing; pseudoparaphyses narrow cellular, occupying apical pore region. Ascospores hyaline at first, becoming light dull brown or light vinaceous brown, narrowly clavate, usually slightly curved, apex rounded, tapered to base, several septate, primary septum near base, basal cell remaining hyaline, becoming elongate and setiform, secondary septa formed in upper region, mid cells more strongly pigmented than upper cell, cells uniglobulate, wall smooth, overlapping biseriate in the ascus.

Conidial state not known with certainty. Short denticulate conidiogenous cells have been observed attached to the lower peridium or to associated light brown hyphae near base of ascomata. One collection of *R. massalongii* (Barr 6714) in culture formed small, dark brown pycnidia, 110-165 µm diam. Conidia were hyaline, ellipsoid, 5 x 2.5 µm, and were produced from small hyaline cells that lined the cavity. This seems to be an *Asteromella* spermatial state.

On woody or suffrutescent stems and branches, at times around old, partially healed cankers.

Type species: *Rebentischia pomiformis* Karst. = *R. massalongii* (Mont.) Sacc.

Von Arx and Müller (1975) synonymized *R. pomiformis* with *R. massalongii*, the earlier name, as Saccardo (1877) had suggested. A number of species have been described in the genus, although there appear to be only two valid entities, quite similar to one another, but differing in habitat and in size ranges. These may be recognized by the following characters, essentially those used by Berlese (1894, pl. XVIII, figs. 4, 5):

1. On suffrutescent stems of shrubs and vines; main body of ascospore 17-25(-30) x 4-6(-7.5) µm.........*R. unicaudata*
1. On woody branches of trees; main body of ascospore (22-) 28-38(-40) x 6-9(-10) µm..................*R. massalongii*

Müller (1950) recorded both *R. massalongii* and *R. unicaudata*, as well as *R. typhae*, from Switzerland. *Rebentischia typhae* H. Fabre (Ann. Sci. Nat. Bot., Ser. VI, 9: 88. 1878) has been removed from the genus to *Buergenerula* by von Arx (1977). Those specimens labelled *R. typhae* that I examined, e.g., Rehm Ascomyceten 1137 (NY), bore only a large variant of *Lophiostoma dacryosporum* H. Fabre, with dark brown five-(six-)septate ascospores that taper to the pallid basal cell. *Rebentischia ulmicola* Fautr. & Lamb. (Rev. Mycol. 54. 1897) (In Saccardo and Sydow, 1899) is probably identical with *R. massalongii*, and *R. thujana* Feltgen (Vorstud. Pilz. Luxemb., Nachtr. 3: 223. 1903) appears to be the same according to the description. Saccardo (1883) included *R. ranella* (Berk. & Rav.) Sacc. in his synopsis of species of *Rebentischia*. Ellis and Everhart (1892) entered this name under *Rosellinia rattus* (Schw.) Ell. & Ev., but observed that the generic position was uncertain. Although I have seen no specimens, the description of *Sphaeria ranella* Berk. & Rav. does not suggest a species of *Rebentischia*. Other species described in *Rebentischia* have not been studied, i.e., *R. taurica* Naoumov & Dobr. (Mat. Mycol. Phytopathol. Leningrad 8(2): 136. 1929), *R. brevicaudata* Guyot (Ann. Serv. Bot. Tunis. 28: 132. (1955) 1958), and *R. costi* Bat. et al. in Batista & Bezzera (Publ. Inst. Micol. Univ. Recife 385: 7. 1963). Both *R. anodendri* Tilak & R. Rao (Sydowia 21: 308. (1967) 1968) and *R. elaeodendri* Tilak & Srin. (Sydowia 24: 95. (1970) 1971) were described with muriform ascospores and do not belong in *Rebentischia*.

Rebentischia massalongii (Mont.) Sacc. Nuovo Giorn. Bot. Ital. 8: 12. 1876. Figs. 1, 2

Sphaeria massalongii Mont. Syll. Gen. Sp. Crypt. p. 237. 1856.
Rebentischia pomiformis Karst. Fungi Fenniae Exsiccati No. 881. 1869; Mycol. Fenn. 2: 97. 1873.

Ascomata globose or slightly depressed, erumpent superficial at maturity, collabent on drying, (220-)300-440(-495) µm diam, black under low magnification; peridium soft, composed of several layers of pseudoparenchymatous cells, variable in width, (10-)24-35 µm wide; surface roughened with protruding cells or short hyphae, vinaceous brown pigment encrusted on outer layers of cells. Asci 82-120 x 15-22 µm, clavate; pseudoparaphyses narrow cellular, 1.5-2.5 µm wide. Ascospores (22-)28-38(-40) x 6-9 µm, at maturity 4-(5-)septate in narrowly obovoid main body, hyaline basal cell and setiform base 7-24 µm long, cell 3.5-4.5 µm wide, tapered to 1-1.5 µm wide, apical cell hyaline or faintly pigmented, mid cells light clear vinaceous brown, contents multiguttulate young, with one or two globules per cell at maturity, wall smooth.

On woody branches or trunks, often surrounding old cankers. Europe and North America.

Material examined: EUROPE: AUSTRIA: *Salix* sp., Herb. F. v. Höhnel, Sonntagsberg, leg. Strasser; Langenschönbichl l. Tulln, 3 Jun 1905, leg. von Höhnel (both FH). FINLAND: *Acer platanoides* L., P. A. Karsten, Finland Fungi 881 (NY, part of type of *R. pomiformis*, sparse and overmature). NORTH AMERICA: USA: Maine: *Acer pensylvanicum* L., Barr 3266, 3268; *Abies balsamea* (L.) Mill., Barr 3214A, 3428 (MASS); Massachusetts: *Ulmus americana* L., Barr 6507 (MASS); *Ilex verticillata* (L.) Gray, Barr 6633 (MASS); *Robinia pseudo-acacia* L., Barr 6714 (MASS).

Rebentischia unicaudata (Berk. & Br.) Sacc. Atti Soc. Veneto-Trentini Sci. Nat. 4: 88. 1875; Syll. Fung. 2: 12. 1883. Fig. 3

Sphaeria unicaudata Berk. & Br. Ann. Mag. Nat. Hist. ser. 3, 3: 18 (373). 1859.

Ascomata globose, depressed or ovoid, often remaining partially immersed, (100-)220-330(-440) µm diam, black under low magnification; peridium soft, composed of few or several layers of pseudoparenchymatous cells, (10-)20-30 µm wide; surface roughened by protruding cells or smooth, vinaceous brown pigment encrusted on outer layers of cells. Asci (40-)60-100 x (10-)12-15(-18) µm, clavate; pseudoparaphyses narrow cellular, 1.5-2 µm wide. Ascospores 17-25(-30) x 4-6(-7.5) µm, at maturity 4-septate in narrowly obovoid main body, hyaline basal cell and setiform base 4-15 µm long, cell 4 µm wide, tapered to 1-1.5 µm wide, apical cell hyaline, mid cells light vinaceous brown, contents multiguttulate young, one or two globules per cell at maturity, wall smooth.

On suffrutescent stems and branches of shrubs and vines. Europe and North America.

Material examined: EUROPE: AUSTRIA: *Clematis*, Weese, Eumycetes sel. exs. 542 (BPI); Krypt. exs. 1921 (BPI, NY); Graz, leg. G. de Niessl (BPI); Rehm Ascomyceten 241b (FH); *Berberis* sp., Herb. F. v. Höhnel, Tumpen, Ötzthal, Tirol (FH). FINLAND: *Ribes alpinum* L., Barr 5675 (MASS). FRANCE: *Clematis*, Roumeguere, Fungi sel. exs. 4857 (NY); *Sambucus nigra* L., Roumeguere, Fungi sel. exs. 6186 (NY). HUNGARY: *Clematis*, Rehm Ascomyceten 241 (NY). SWITZERLAND: *Clematis vitalba* L., Kt. Wallis, St. Gingolph, 7 May 1962, leg. E. Müller (BPI); "15", Frauenfeld (NY). YUGOSLAVIA: *Clematis*, Fungi montenegrini, St. Monasserium, Pira, 24 Aug 1904, leg. F. Bubák (BPI). NORTH AMERICA: USA:

Massachusetts: *Rubus* sp., Barr 6224 (MASS).

TUBEUFIA Penzig & Sacc. Malpighia 11: 517. 1897.

Acanthostigmina von Höhnel, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 118: 1499. 1909.
Thaxteriella Petrak, Ann. Mycol. 22: 63. 1924.

Ascomata superficial, separate or grouped, in thin or well-developed subiculum, cylindric, ovoid or globose, in some species collabent on drying, small to medium sized, pallid, light or brightly colored or dull brownish, grayish, black or vinaceous, apex bluntly papillate, surface glabrous or pulverulent with protruding cells or short setose or bearing hyphal appendages; peridium soft and fleshy, composed of pseudoparenchymatous cells, external region hyaline, light colored, reddish brown or vinaceous brown, with pigment encrusted on surface usually, and internal region hyaline, cells more compressed, thickened at upper sides around apex. Asci from base of locule, bitunicate, oblong or clavate, usually octosporous; pseudoparaphyses narrow cellular. Ascospores hyaline, light yellowish or light brownish after discharge, elongate fusoid or clavate, inequilateral often slightly curved, several septate, not usually constricted at septa, contents guttulate becoming homogeneous and refractive in age, wall smooth, overlapping bi- or triseriate or in fascicles in the ascus. Conidial states often species of *Helicosporium* or *Helicoma*; conidiophores ± setiform, arising from superficial hyphae, conidiogenous cells denticulate, as sympodially proliferating lateral pegs; conidia hyaline or light yellowish brown, hooked or helicosporous, (one celled) several septate. Additionally, a *Monodictys* state is known for *T. amazonensis*: conidiogenous cells as lateral branches of hyphae, forming stalk cell and single conidium; conidia dark brown, elongate or irregular in shape, muriform. Samuels et al. (1979) also described an *Asteromella*-like state obtained in culture for this species. Hughes (1978) illustrated features of a species of *Tubeufia* associated with *Pendulispora venezuelanica* M. B. Ellis, a fungus that has coiled conidium initials that develop into muriform pigmented conidia.

Hypersaprobic, on decaying woody or herbaceous substrates often over old ascomata or mycelium of other ascomycetes, in tropical and temperate regions.

Type species (lectotype): *T. javanica* Penzig & Sacc. = *T. paludosa* (Crouan & Crouan) Rossman.

Tubeufia was erected (Penzig and Saccardo, 1897) to accommodate three species from Java: *T. javanica, T. coronata* and *T. anceps*, all with vertically elongate, fleshy, white or pallid ascomata and elongate fusoid ascospores. In 1909a von Höhnel described *T. helicomyces* and transferred *Ophionectria cylindrothecia* Seaver to *Tubeufia*. Seaver (1909) included *O. cylindrothecia* and *O. cerea* in his concept of *Ophionectria*. Von Höhnel (1919) discussed and distinguished a number of taxa with characters somewhat similar to those of *Tubeufia*. He separated *Ophionectria*, based on *O. trichospora* (Berk. & Br.) Sacc., from *Tubeufia*, removed *T. anceps* to *Ophionectria*, and added *T. cerea* (Berk. & Curt.) von Höhnel to *Tubeufia*, selecting *T. javanica* Penzig & Sacc. as the lectotype species. Later studies by Booth (1964) and Rossman (1977) confirmed that *O. trichospora* is a hypocreaceous fungus.

Webster (1951) demonstrated in culture the connection between *T. helicomyces* and the associated *Helicosporium* state. Booth (1964) emended the concept of *Tubeufia*, recognizing variability in shape of ascomata, as well as the occurrence in some species of short hyphal setae on the peridium. He described the *Helicosporium* states of *T. cerea* and his new species *T. rugosa*. In *Tubeufia* Booth included species with cylindric to ellipsoid ascomata -- *T. javanica, T. coronata, T. anceps, T. cylindrothecia,* and *T. nigrotuberculata* Hino & Katumoto, and species with ovoid to doliform ascomata -- *T. cerea, T. helicomyces*, and *T. rugosa*. Booth excluded *T. asclepiadis* Bat. & Garnier (Mem. Soc. Broteriana 14: 67-69. 1961) because the species has unitunicate asci and nonseptate ascospores; according to Rossman (1979) this name is a synonym of *Saccardomyces socius* P. Henn. Pirozynski (1972) transferred *T. nigrotuberculata* to *Herpotrichia*. *Tubeufia minuta* Munk (Bot. Not. 119: 179. 1966) has much tapered small ascospores, small ascomata, and perhaps is better disposed in *Herpotrichiella* (Rossman, pers. comm.). *Tubeufia corynespora* Munk (Bot. Not. 119: 189. 1966), described from Denmark and also known from West Germany (Hilber and Hilber, 1978) has dark ascomata and ascospores 50-65 x 3.5-4 µm. The species would fit in section Thaxteriella. *Tubeufia acaciae* Tilak & Kale (Sydowia 23: 11. (1969) 1970) from India has violet to red, setose or appendaged ascomata. Pirozynski (1972) described and illustrated both conidial and ascosporic states of *T. helicoma* (Phil. & Plowr.) Piroz., the older epithet for *T. rugosa*. Pirozynski also provided details on the morphology and conidial state of *Thaxteriella pezizula* (Berk. & Curt.) Petrak.

Petrak (1924) erected *Thaxteriella* for *T. corticola*, collected in Puerto Rico. Later (Petrak, 1953) he made the combination *T. pezizula*, and remarked that this species, widespread in southeastern USA, was probably identical with *T. corticola*. Pirozynski (1972) examined the part of *T. corticola* in Herb. IMI, found it to be in poor condition, but noted that it seemed to be the same as *T. pezizula*. According to the original description of *T. corticola*, it could well be a collection of *T. pezizula*. *Thaxteriella* has been separated from *Tubeufia* on the bases of dark-colored, globose, collabent ascomata seated in a well-developed subiculum versus light-colored, cylindric, ovoid or globose ascomata in a slight subiculum, and on variations in the conidial states. When the species of *Tubeufia* were compiled and compared with *Thaxteriella pezizula*, it became evident that differences between *T. pezizula* and *Tubeufia helicoma* were not of greater magnitude than those between *T. helicoma* and *T. paludosa* or *T. helicoma* and *T. cerea*. Separation of both *T. helicoma* and *T. paludosa* into *Thaxteriella* was contemplated, but the relationship between these and species of *Tubeufia* seems better expressed by arranging them in several sections within one genus. While this manuscript was in preparation, accounts of *Thaxteriella roraimensis* Samuels & Müller (1979) and three species of *Tubeufia* (Samuels et al., 1979) appeared; the discussion of these species further convinced me that the arrangement proposed here is preferable given our present knowledge of these fungi.

In 1909b, von Höhnel erected *Acanthostigmina* for *Lasiosphaeria minuta* Fuckel. He compared this species with *Acanthostigma nectrioideum* Penzig & Sacc., a species with globose-ovoid ascomata and soft brown peridium ornamented with dark setae around the apex. He decided these two were identical and made the combination *A. minuta* (Fckl.) von Höhnel. My study of specimens and slides from the Höhnel Herbarium (FH) shows that they are indeed identical, and also that North American specimens of *Acanthostigma clintonii* (Peck) Sacc. belong to the same taxon. Von Arx and Müller (1975) considered *Acanthostigmina* to be synonymous with *Tubeufia* and I agree. On the other hand, I consider that *Acanthostigmella* von Höhnel with the type species *A. genuflexa* is different from *Tubeufia* and belongs in the Herpotrichiellaceae of the Chaetothyriales (Barr, 1977).

Rossman (1977) disposed of some of the species excluded from *Ophionectria*, and provided expanded synonymy for *T. cerea* and *T. paludosa*, with the latter the earliest epithet for the type species. Additional information on a number of tropical species was provided by Rossman (1979), with transfers of species from *Calonectria*, and by Samuels et al. (1979) and Samuels and Müller (1979).

The conidial states associated with several species of *Tubeufia* are striking: often a brightly pigmented -- yellow green, olive green or bright brown -- turf of erect setiform conidiophores arises from decumbent hyphae; the conidiophores bear coiled conidia from either lateral or terminal conidiogenous cells. Linder's (1929) superb renderings of helicosporous Fungi Imperfecti include two species that he recognized with ascosporic states, *Helicosporium nematosporum* Linder with *Lasiosphaeria nematospora* Linder (= *Tubeufia helicoma*) and *Helicoma curtisii* Berk. with *Lasiosphaeria pezizula*, in addition to several species later linked with species of *Tubeufia*. Von Höhnel (1909a) noted a *Helicosporium* conidial state with *T. helicomyces* and Webster (1951) made the cultural connection of *T. helicomyces* with *Helicosporium phragmitis* von Höhnel. Hughes (1958) recognized *Helicoma muelleri* Corda, the type species of *Helicoma*, as a state of *Lasiosphaeria pezizula*, and *Helicosporium vegetum* Nees, the type species of *Helicosporium*, as a state of *Ophionectria cerea*. Booth (1964) described both the *H. vegetum* state of *T. cerea* from natural association and from culture and the *Helicosporium* state of *T. rugosa*. Pirozynski (1972) provided detailed accounts of some variations in conidial states and distinguished between *Helicoma muelleri* conidial state of *Thaxteriella pezizula*, and *Helicosporium pannosum* (Berk. & Curt.) R. T. Moore conidial state of *Tubeufia helicoma*. In *Helicoma muelleri* the conidium develops from a terminal conical denticle or two or three from sympodial succession of the terminal denticle, whereas in *Helicosporium pannosum* and other species of *Helicosporium*, the conidia develop from sympodially proliferating pegs lateral on setiform conidiophores.

The picture is not that clear, however. Many collections of species of *Tubeufia* bear associated conidial fungi that are neither *Helicoma* nor *Helicosporium*. Hughes (1978) reported a New Zealand species of *Tubeufia* associated with conidiophores and dictyosporous conidia of *Pendulispora venezuelanica* M. B. Ellis. Samuels et al. (1979) described and discussed in some detail tropical collections of *Tubeufia* *amazonensis* from which developed a *Monodictys*-like conidial state, and a *Helicomyces*-like, unicellular, hooked rather than coiled conidial state for *Tubeufia palmarum*. Certainly additional studies of collections of *Tubeufia* are required to determine not only variations in conidial states but also the limits of species. The following key to sections and species of *Tubeufia* known in temperate North America outlines my concepts from a study of temperate and some tropical material, as well as information from the literature.

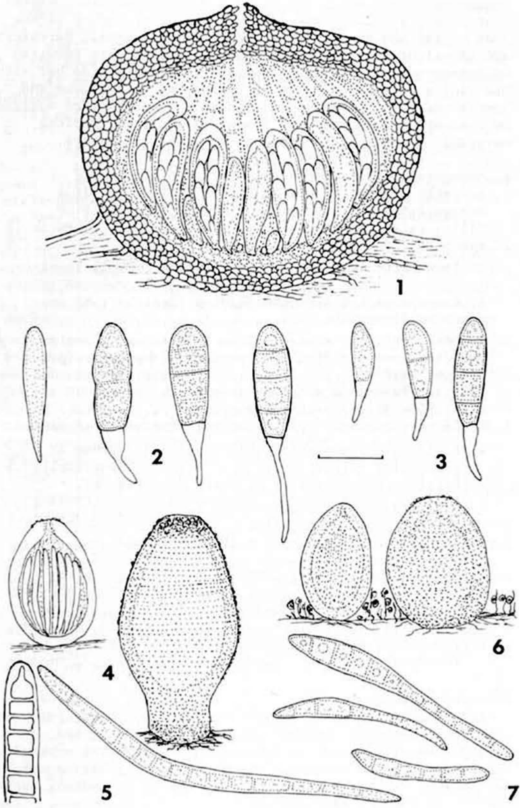
1\. Ascomata ellipsoid or cylindric, whitish, pallid or brightly pigmented, blackening on drying; peridium ornamentation when present of hyphae or protruding cells, rarely short setae..............Sect. Tubeufia..2
1\. Ascomata globose or ovoid..............................3
  2\. Ascospores 40-55(-65) x 3-5 μm, (6-)7-9-(13-)septate. *T. cylindrothecia*
  2\. Ascospores (70-)100-200(-230) x (2-)3.5-7(-8) μm, up to 35-septate.........................*T. paludosa*

3\. Ascomata brightly pigmented due to external granules; peridium ornamentation when present of hyphae or protruding cells.......................Sect. Nectrioidea
One temperate zone species; ascospores (27-)30-52 x 2.5-3.5(-4.5) μm, 7-10-(13-)septate............*T. cerea*
3\. Ascomata vinaceous, grayish or blackish brown pigmented.4
  4\. Peridium ornamentation when present of hyphae or protruding cells................Sect. Thaxteriella..5
  4\. Peridium ornamentation of dark, thick-walled, tapering setae, rarely reduced to dark protruding cells........................Sect. Acanthostigmina..6

5\. Ascospores (25-)35-60(-65) x (6.5-)8-12(-13) μm, (5-)7-9-(11-)septate........................*T. pezizula*
5\. Ascospores (52-)60-100(-130) x 4-6.5(-8) μm, up to 25-septate...............................*T. helicoma*
  6\. Ascospores (19-)32-45(-54) x (2.5-)3.5-5.5(-6) μm, 7-septate..............................*T. clintonii*
  6\. Ascospores (40-)56-80(-125) x (2-)2.5-3.5(-4.5) μm, 11-septate..............................*T. scopula*

Tubeufia sect. Tubeufia

Ascomata ellipsoid or cylindric, hyaline, white, yellowish pinkish or becoming darkened or black at maturity and on drying; peridium smooth or ornamented at apex with protruding cells or short to elongate thick-walled hyphal appendages, rarely with setae, inner region never pigmented, surface cells horizontally elongate.


1
2
3
4
5
6
7

Type species: *T. paludosa*.

In addition to *T. paludosa* and *T. cylindrothecia*, regarded as variants of one species by Rossman (1977), *T. helicomyces*, *T. pachythrix* (Rehm) Rossman, *T. stromaticola* (P. Henn.) Rossman, and the species briefly described by Hughes (1978) and associated with *Pendulispora venezuelanica*, belong in the section. The first three species are linked with *Helicosporium* conidial states (but see discussion).

Tubeufia paludosa (Crouan & Crouan) Rossman, Mycologia 69: 383. 1977. Figs. 4, 5

Nectria paludosa Crouan & Crouan, Florule du Finistere, p. 38. 1867.
Ophionectria paludosa (Crouan & Crouan) Sacc. Michelia 1: 323. 1878.
Tubeufia javanica Penzig & Sacc. Malpighia 11: 517. 1897.
Tubeufia coronata Penzig & Sacc. Malpighia 11: 517. 1897.

Ascomata vertically elongate, ellipsoid or cylindric, 165-300 μm diam, 245-330(-550) μm high, light yellowish becoming dull grayish translucent or dull brown, blackened at base; peridium soft, several layers of pseudoparenchymatous cells, 15-18 μm wide; surface glabrous, rugose with protruding cells or bearing short or elongate thick-walled, hyphal appendages, up to 45-115 μm long, 2-4 μm wide, surface cells often in horizontal rows, pigment encrusted on surface in patches. Asci (80-)140-195(-280) x 10-13(-25) μm, elongate cylindric; pseudoparaphyses narrow cellular. Ascospores elongate clavate, (70-)100-200(-230) x (2-)3.5-7(-8) μm, hyaline, pale yellowish or pinkish, often curved, up to

---

Figs. 1, 2. *Rebentischia massalongii*: 1. Ascoma in section (Barr 3266). 2. Stages in maturation of ascospores (Barr 6507). Fig. 3. *R. unicaudata*, stages in maturation of ascospores (Rehm Ascom. 241b). Figs. 4, 5. *Tubeufia paludosa*: 4. Outline of ascoma in section (Dumont PA 1709) and surface view (isolectotype of *T. javanica*) showing aspect of horizontally arranged cells and protruding pigment-encursted cells. 5. Maturing ascospore (Thaxter, Florida) and tip of mature ascospore (Dumont PA 1709). Figs. 6, 7. *T. cylindrothecia*: 6. Outline of ascomata in turf of conidiophores and conidia (Fungi of Bermuda 67). 7. Three ascospores, variation in shape and septation (Dumont CO 1725). Standard line = 60 μm for Fig. 1; 15 μm for Figs. 2, 3, 5, 7; 150 μm for Figs. 4, 6.

35-septate, not constricted at septa, cells containing numerous guttules or homogeneous, wall smooth, often thickened over tips.

On woody substrates or large monocots such as bamboo or palm, often over stromata of other ascomycetes.

Material examined: USA: Massachusetts: Barr 2839a (MASS); Florida: Coconut Grove, R. Thaxter (2 collections, FH). PANAMA: Dumont PA 1838, 1709, 1907 (NY). COLOMBIA: Dumont CO 247 (NY). VENEZUELA: Dumont VE 2993, 3139, 2426, 2577, 2657, 3147, 3974, 5052, 5258, 6462, 6644, 6955 (NY). JAVA: Tjibodas, 5.2.1897, Penzig (Höhnel Herb., FH; isolectotype of *T. javanica*).

Some of these collections grouped under *T. paludosa* may be separated eventually: Samuels et al. (1979) restrict *T. paludosa* to specimens with helicosporous conidia, and note that Dumont PA 1838 had associated *Monodictys*-like conidia and that a collection from New Zealand produced a *Monodictys*-like state. Dumont PA 1838, macroscopically similar to other collections of *T. paludosa*, is considerably larger and has differently shaped ascomata than *T. amazonensis* Samuels et al. (1979) which also has a *Monodictys*-like state. Dumont VE-3147 was associated with *Pendulispora venezuelanica*, and could be identical with the collection described from New Zealand by Hughes (1978).

Rossman's (1977) concept of *T. paludosa* encompasses material with shorter ascospores that I separate as *T. cylindrothecia*, as well as the narrow-spored *T. helicomyces* not yet seen from North America. Her synonymy for *T. paludosa* also includes *T. anceps* Penzig & Sacc. (*Ophionectria anceps* (Penzig & Sacc.) von Höhnel). The ascospores were described as 35-42 x 4-5 µm, but the asci were said to be aparaphysate in contrast to those of *T. javanica* and *T. coronata* described at the same time. Rossman (1979) reduced *Calonectria effugiens* Penzig & Sacc. (Malpighia 11: 515. 1897) to synonymy under *T. paludosa*. The ascospores are in the size range of *T. cylindrothecia*, 45-69 x 4.5-5 µm, but she noted that *Alternaria*- and *Acrodictys*-like conidia were associated, so this entity too may represent a separate species.

Tubeufia cylindrothecia (Seaver) von Höhnel, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 68: 1479. 1909. Figs. 6, 7

Ophionectria cylindrothecia Seaver, Mycologia 1: 70. 1909.

Ascomata vertically elongate, ellipsoid or elongate ovoid, (135-)165-275(-355) µm diam, (220-)275-385(-440) µm high, pale yellowish, creamy, grayish, or light translucent brownish, darkened at base; peridium soft, several layers of pseudoparenchymatous cells, 15-20 µm wide; surface glabrous or rugose with projecting cells or short setae at apex, pigment encrusted in patches on surface, surface cells often in horizontal rows. Asci (50-)85-140 x 9-15 µm, cylindric clavate; pseudoparaphyses narrow cellular. Ascospores elongate clavate or fusoid, tapering to ends, 40-55(-65) x (2.5-) 3-5 µm, often bent or curved, (5-)7-9-(13-)septate, not constricted at septa, contents with numerous guttules or one globule per cell, wall smooth.

Conidial state: *Helicosporium roseum:* Turf white or pinkish, composed of upright setiform conidiophores arising from recumbent hyphae, bearing conidiogenous cells laterally; conidial coils 30-45 µm diam, cells 2-4.5(-5.5) µm wide, several septate.

On old wood or monocot culms and leaves, often over overmature ascomycetes.

Material examined: USA: Massachusetts: Waverly, 12 Oct 1899, R. Thaxter (FH); Texas: Big Thicket Scenic Area, near Coldspring, San Jacinto Co., 26 Aug 1967, C. T. Rogerson (NY). BERMUDA: Seaver and Waterston, Fungi of Bermuda 61B, 67A, 67C, 83, 406, 408, 410C (NY); B. & J. Dodge, Aug 1911 (NY); Paget Marsh, 16 Jan 22, H. H. Whetzel (NY), same data as Bermuda Fungi (BPI). TRINIDAD: Maraval Valley, Port of Spain, 1912-13, R. Thaxter (FH); Emperor Valley, Port of Spain, 1912-13, R. Thaxter (FH). PANAMA: Valley of upper Rio Chirique Viejo, prov. Chiriqui, 1 Jul 1935, G. W. Martin (BPI, as *T. margarita* ined.). COLOMBIA: Dumont CO 1725, 1998 (NY). VENEZUELA: Dumont VE 2695 (NY).

Ophionectria cylindrothecia was described from Ohio on old corn stalks (Seaver, 1909) but I have not located the collection. Other collections determined by Seaver as this species were those from Bermuda. The collection from Texas is only tentatively assigned to *T. cylindrothecia*. Rogerson obtained the conidial state in culture, noted that conidial coils were small (10-12 µm wide) and only once or twice coiled. The aspect of ascomata and sizes of structures determined my identification.

Tubeufia sect. *Nectrioidea* Barr, sect. nov.

Ascomata globosa vel ovoidea, pigmentifera vivide; peridium hyphis vel cellulis protrudentibus ornatum.
Species typica: *T. cerea.*

Tubeufia cerea is the only species of the section recognized from temperate North America. *Tubeufia palmarum* (Torrend) Samuels et al. and *T. aurantiella* (Penz. & Sacc.) Rossman are tropical members of the section.

Samuels et al. (1979) noted that in both *T. cerea* and *T. palmarum* conidia arise from thin-walled pegs that proliferate sympodially and that no apparent scar remains on either the conidium or the conidiogenous peg after dehiscence. *Helicosporium vegetum* is the conidial state of *T. cerea*, whereas that of *T. palmarum* is *Helicomyces*-like, with conidia one celled and hooked rather than coiled.

Tubeufia cerea (Berk. & Curt.) von Höhnel, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 128: 562. 1919. Figs. 14, 15

Sphaeria cerea Berk. & Curt. Grevillea 4: 108. 1876.
Calonectria cerea (Berk. & Curt.) Sacc. Syll. Fung. 2: 551. 1883.
Ophionectria cerea (Berk. & Curt.) Ell. & Ev. North Amer. Pyrenomycetes, p. 118. 1892.
Nectria fulvida Ell. & Ev. J. Mycol. 1: 140. 1885.
Calonectria fulvida (Ell. & Ev.) Berl. & Vogl. Addit. Syll. Fung. p. 212. 1886.
Dialonectria fulvida (Ell. & Ev.) Ell. & Ev. J. Mycol. 2: 122. 1886.
Ophionectria briardi Boudier, Rev. Mycol. p. 226. 1885.
Ophionectria episphaeria Karsten, Hedwigia 28: 26. 1889.
Ophionectria everhartii Ell. & Galloway, J. Mycol. 6: 32. 1890.
Calonectria belonospora Schroet. Krypt. Flora von Schlesien 3: 261. 1894.
Ophionectria belonospora (Schroet.) Sacc. Syll. Fung. 11: 366. 1895.
Ophionectria briardi var. *longipila* Starbäck, Bot. Not. 218-219. 1898.
Ophionectria belonospora var. *unicaudata* Feltgen, Vorstud. Pilz Luxemb. Nachtr. 3: 308. 1903.
Ophionectria cupularum Kirschst. Verh. Bot. Vereins Prov. Brandenburg 48: 60. 1906.
Ophionectria anonae Rao, Sydowia 25: 72-73. 1971.

Ascomata globose or ovoid, (90-)120-160 µm diam, greenish yellow, dull yellow, yellowish brown; peridium 22-33 µm wide in upper regions, 10-12 µm wide near base, surface usually pulverulent with protruding cells or with short hyphal appendages, 22-33 µm long, pigment as crystalline granules on walls of surface cells. Asci 55-74 x 7.5-12 µm, clavate; pseudoparaphyses narrow cellular. Ascospores elongate fusoid, (27-)30-52 x 2.5-3.5(-4.5) µm, hyaline, often curved, (5-)7-10-(13-)septate, not constricted at septa, cells containing numerous guttules, finally coalescing into one globule, wall smooth.

Conidial state: *Helicosporium vegetum*: Forming bright yellowish-green turf of upright setiform conidiophores, becoming ochraceous or brownish in age; conidiogenous cells produced laterally as thin-walled pegs. Conidia coiled two or three times, multiseptate, coils 10-15(-20) µm diam, cells 1-1.5 µm wide.

On overmature stromata of other Ascomycetes, and on surrounding wood.

Material examined: NORTH AMERICA: CANADA: Newfoundland: Waghorne 755a (NY); Quebec: Barr 2160 (MASS); Ontario: London, 3 Aug 1895, J. Dearness (FH, NY). USA: Maine: Barr 3337, 3359, 3360a, 3363, 5900c (MASS); York, 14 Sep 1891, R. Thaxter (FH, NY); New Hampshire: Barr 4000a (MASS); near Loring, Chocorua, W. G. Farlow (FH); Chocorua, Sep 1906, Aug 1910, Farlow (FH); Waterville, 1 Sep 1935, J. R. Hansbrough (NY); Shelburne, Sep 1889, R. Thaxter (FH, two collections); Vermont: Barr 4465, 4475 (MASS); Massachusetts: Barr 5240, 5199, 6012, 6013 (with *T. clintonii*) (MASS); Harvard Forest, Petersham, 19 Aug 1949, C. T. Rogerson (NY); New York: Camp Arnot, SE of Cayuga, Schuyler Co., 20 Sep 1970, Rogerson & G. J. Samuels (NY); Catskill Mts., Ulster Co., 1 Aug 1974, Rogerson et al. (NY); N. side of Hinckley Reservoir, Herkimer Co., 15 Sep 72, Rogerson et al. (NY); Stony Clove, Greene Co., 12 Oct 1968, Rogerson & S. J. Smith (NY); 4 mi. E. of Maplecrest, Greene Co., 8 Sep 1972, Rogerson & Samuels (NY); trail to Lake Ann, Mt. McGregor, Saratoga Co., 10 Oct 1968, Rogerson & Smith (NY); NE end of Lake Tiorati, Orange Co., 23 Oct 75, Rogerson (NY); Twin Valleys Camp, near Wadhams, Essex Co., 9 Sep 1967, Rogerson (NY); SE of Speculator, Hamilton Co., 4 Aug 1967, Rogerson & Smith (NY); Winnie Hill, N. of Oneonta, Otsego Co., 21 Sep 1963, Rogerson (NY); woods near Tompkins Pond, Dutchess Co., 9 Oct 1965, Rogerson (NY); Ellenville Ice Chasms, Ulster Co., 14 Aug 1963, Rogerson (NY); woods near Eagle Valley, Orange Co., 28 Jun 60, Rogerson & R. H. Petersen (NY); Pack Demonstration Forest, Warren Co., 25 Sep 1971, Rogerson (NY); same data, Samuels (NY); Indian Pass Trail, Essex Co., 14 Aug 1970, Rogerson et al. (NY); West Canada Creek, Trenton Falls, Herkimer Co., 19 Sep 1969, Rogerson et al. (NY); Lake Sherman, Warren Co., 25 Sep 1971, Samuels (NY); S. J. Smith 45649, 45665 (NY ex NYS); New Jersey: Ellis & Everhart, Fungi Col. 1361 (MASS); Newfield. Oct 1885, J. B. Ellis (NY as *Nectria fulvida*;FH, type of *N. fulvida*); Newfield, 6 Jul 1890, type of *Ophionectria everhartii* (FH); Hutcheson Memorial Forest, Somerset Co., 27 Oct 1970, Rogerson et al. (NY); Michigan: Barr 5388 (MASS); Cross Village, Emmet Co., 24 Jul 1962, Rogerson (NY); Whitehouse Landing Road, Chippewa Co., 25 Jul 1967, Rogerson (NY); near Upper Falls, Tahquamenon State Park, Luce Co., 3 Aug 1964, Rogerson (NY); Rees's Bog, N. of Burt Lake, Cheboygan Co., 9 Aug 1971, Rogerson (NY); Mackinaw City, Emmet Co., 9 Aug 1971, Rogerson (NY); S. of Whitefish Bay, Hiawatha National Forest, Chippewa Co., 11 Aug 1971, Rogerson (NY); Ohio: Ellis & Everhart N.A.F. 2598 (MASS); Illinois: Allerton Park near Monticello, Piatt Co., 15 Aug 1965, Rogerson (NY); Minnesota: Cloquet Forest Research Center, St. Louis Co., 25 Aug 1972, Rogerson (NY); North Carolina: Highlands, Macon Co., 13 Aug 1961, Petersen & Rogerson (NY); Collins Creek, Swain Co., 18 Oct 1960, Rogerson (NY); Utah: Mt. Ogden Park, Ogden, Weber Co., 12 Jun 1971, Rogerson (NY). EUROPE: BELGIUM; ex IMI 68112 (NY); AUSTRIA: Rehm Ascom. 1783 (NY). USSR: Mycotheca Rossica 120 as *Ophionectria belonospora* (BPI, NY).

Tubeufia cerea is the most common north-temperate representative of the genus. This species is readily recognized under low magnification by the yellowish pulverulent ascomata that are globose with a somewhat collabent aspect. Old stromata of *Diatrype stigma* (Hoffm. ex Fries) Fries, *Graphostroma platystoma* (Schw.) Piroz., and species of *Eutypa*, *Eutypella*, and *Hypoxylon* are the most common substrates, but the species has been collected over other fungi, e.g., *Bertia moriformis* (Tode ex Fries) de Not.

The synonymy for the ascosporic state is essentially that provided by Rossman (1977) while that for the conidial state is taken from Hughes (1958). *Ophionectria palmarum* Torrend is now recognized as a species of *Tubeufia* (Samuels et al., 1979). Rossman (1979) added as probably synonymous with *T. cerea* *Calonectria aurea* Ade (Hedwigia 64: 304. 1923) (non *C. aurea* (Crouan & Crouan) Sacc., 1878).

Munk provided the first "modern" description of *T. cerea* (1957, as *Ophionectria cerea*). Both Barr (in Bigelow and Barr, 1963) and Booth (1964) made the unnecessary combination of *Tubeufia cerea*, without realizing that von Höhnel (1919) had already transferred the species. Booth described and illustrated the species in detail.

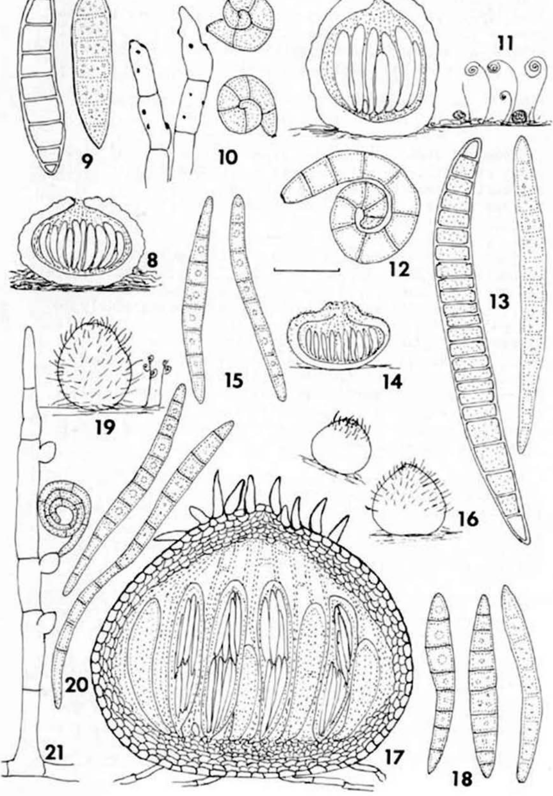
Tubeufia sect. *Thaxteriella* (Petrak) Barr, stat. nov.
Thaxteriella Petrak, Ann. Mycol. 22: 63. 1924.

Ascomata globose or ovoid, vinaceous, grayish or blackish brown pigmented; peridium smooth or ornamented with protruding cells or short thick-walled hyphae.
Type species: *Thaxteriella corticola* Petrak (= *Tubeufia pezizula*).

Tubeufia pezizula usually has a well-developed subiculum, ascomata that are collabent when dry, and produces *Helicoma* conidia. The ascospores are shorter and wider than those of *T. helicoma*, in which the subiculum is often poorly developed and the ascomata are not collabent on drying. Other species belonging in this section are *T. amazonensis* Samuels et al., *Thaxteriella roraimensis* Samuels & Müller, and probably *Tubeufia corynespora* Munk. *Thaxteriella indica* Dharme & Müller (Sydowia 23: 77-78. 1970 (1969)) probably belongs here too. This species is similar in aspect to *Tubeufia pezizula* but is larger -- the ascospores are 15-20-septate and measure 60-100 x 9-12 µm.

The *Helicoma* states of *Tubeufia pezizula* and *Thaxteriella roraimensis* bear at each conidiogenous locus a flat, refractive scar but not an obvious pore, whereas in *Tubeufia paludosa* the locus appears as a refractive, circular, cicatrized scar with a pore in the middle (Samuels and Müller, 1979; Samuels et al., 1979).

Tubeufia pezizula (Berk. & Curt.) Barr, comb. nov. Figs.8-10
Sphaeria pezizula Berk. & Curt. Grevillea 4: 106. 1876.
Lasiosphaeria pezizula (Berk. & Curt.) Sacc. Syll. Fung. 2: 195. 1883.
Herpotrichia pezizula (Berk. & Curt.) Ell. & Ev. North Amer. Pyrenomycetes p. 160. 1892.
Thaxteriella pezizula (Berk. & Curt.) Petrak, Sydowia 7: 110. 1953.
Sphaeria helicophila Cooke, Grevillea 6: 145. 1878.
Melanomma helicophilum (Cooke) Sacc. Syll. Fung. 2: 112. 1883.


9
10
11
8
12
13
15
14
19
16
20
17
21
18

Byssosphaeria helicophila (Cooke) Cooke, Grevillea 15: 123. 1887.

Thaxteriella corticola Petrak, Ann. Mycol. 22: 63. 1924.

Ascomata globose, (220-)300-450 µm diam, collabent on drying, reddish or vinaceous brown to dull grayish brown or blackish, surface dull or shining, apex with broad blunt pore area; peridium 30-50(-55) µm wide, nearly equal in width throughout, cells large, outer layers vinaceous brown, paler toward interior, surface smooth or roughened by protruding cells with encrusting pigment. Asci 100-145 x 20-32 µm, clavate, pseudoparaphyses narrowly cellular. Ascospores elongate fusoid, (25-)35-60(-65) x (4-)8-12(-13) µm, hyaline, becoming dull yellowish brown in age except end cells remaining hyaline, (5-)7-9-(11-)septate, not constricted at the septa, cell contents minutely guttulate becoming homogenous and refractive, walls smooth.

Conidial state: *Helicoma muelleri* Corda, Icon. Fung. 1: 15. 1837.

Helicosporium muelleri (Corda) Sacc. Michelia 2: 129. 1880.

Helicomyces muelleri (Corda) Pound & Clements, Bull. Minnesota Geol. Nat. Hist. Surv. 9: 659. 1896.

Helicoma curtisii Berk. Grevillea 3: 106. 1875.

Helicomyces curtisii (Berk.) Pound & Clements, Bull. Minnesota Geol. Nat. Hist. Surv. 9: 659. 1896.

Helicosporium tiliae Peck, Bull. Torrey Bot. Club 34: 103. 1907.

Figs. 8-10. *Tubeufia pezizula* (Barr 5456): 8. Outline of ascoma in dense subiculum. 9. Ascospores. 10. Tips of conidiophores and two conidia. Figs. 11-13. *T. helicoma*: 11. Outline of ascoma in turf of conidiophores and conidia (Linder 811, type of *Lasiosphaeria nematospora*). 12. Conidium (Linder 811). 13. Ascospores (left, Thaxter, Chile; right Plowright, type of *Sphaeria helicoma*). Figs. 14, 15. *T. cerea*: 14. Outline of ascoma (Barr 5240). 15. Ascospores (Barr 3337). Figs. 16-18. *T. clintonii*: 16. Outline of ascomata (upper, type of *Acanthostigma nectrioideum*, Java; lower, Peck, type of *Sphaeria clintonii*). 17. Ascoma in section (Barr 6013). 18. Ascospores (Peck, type of *Sphaeria clintonii*). Figs. 19-21. *T.scopula*: 19. Outline of ascoma (Ellis, 1880). 20. Ascospores (Peck, type of *Sphaeria scopula*). 21. Conidiophore bearing conidiogenous cells and conidium (Ellis, 1880). Standard line = 60 µm for Fig. 17; 15 µm for Figs. 9, 10, 12, 13, 15, 18, 20, 21); 150 µm for Figs. 8, 11, 14, 16, 19.

Conidiophores arising from recumbent hyphae of subiculum, brown or nearly black; conidia from terminal conidial denticle, or two or three from sympodial succession of terminal denticles; conidia coiled ca. 1½ times, hyaline or light brownish, septate, up to 20 µm wide in coil, cells. ca. 6-8 µm wide, wall smooth.

On dead woody branches or trunks, at times growing over other old Ascomycetes; collected from species of *Acer*, *Alnus*, *Berchemia*, *Castanea*, *Eugenia*, *Liquidambar*, *Populus*, *Prunus*, *Quercus*, *Tilia*, *Vitis*.

Material examined: NORTH AMERICA: CANADA: Ontario: London, J. Dearness (NY); Aurora, 1 Oct 1933, R. F. Cain (NY); USA: Maine: Barr 3568 (MASS); Kittery Point, Aug 1920, R. Thaxter (FH, NY); New Hampshire: Chocorua, Aug 1906, W. G. Farlow (FH); Shelburne, Aug 1891, Thaxter (FH); Intervale, 1901, Thaxter (FH); Massachusetts: Barr 6278 (MASS); Magnolia, July 1903, Farlow (FH); Waverly, Oct 1899, Thaxter (FH); Connecticut: W. C. Sturgis, no data (NY); New Haven, 1888-89, Thaxter (FH); West Haven, 1888-89, Thaxter (FH); New York: Michigan Hollow, near Danby, Tompkins Co., 4 Sep 1952, C. T. Rogerson (NY); New Jersey: Ellis N.A.F. 649 (MASS), 696b (MASS, NY); Ellis & Everhart Fungi Col. 1624 (MASS); Newfield, Apr 1878, 18 Apr 1878, Summer 1878 (FH), Feb 1880, 4 Nov 1887, all J. B. Ellis (NY); Michigan: Barr 5456 (MASS); Pennsylvania: Bethlehem, Oct 1880 (NY); Moshannon Dam, Center Co., 8 Oct 1939, J. W. Sinden (NY); Ohio: Morgan 611 (NY); Preston, 1887, A. P. Morgan (FH); Illinois: Metropolis, Oct 1919, C. J. Humphrey (BPI); Allerton Park near Monticello, Piatt Co., 15 Aug 1965, Rogerson (NY); South Carolina: Ellis N.A.F. 967 (MASS); Georgia: Ellis N.A.F. 696a (MASS, NY); Barr 6448, 6469 (MASS); GA numbers 7515-7523 inclusive (GA); Alabama: Auburn, 11 Jan 1896 (NY), 1 Feb 1896, F. S. Earle & L. M. Underwood (BPI, NY); Jan 1897 (BPI, NY); 16 Jan 1897 (BPI, NY); Florida: GA numbers 7524, 7525, 7526 (GA); Ravenel Fungi Amer. Exs. 196 (FH, NY); Longwood, 9 Feb 1940, C. L. Shear (BPI); Brooksville, 7 Mar 1942, Shear (NPI); Plymouth, 27 Mar 1893, Mar 1895, W. C. Sturgis (NY); Mar 1893 (FH); Louisiana: Barr 6338c (MASS); St. Martinsville, 20 Nov 1890, 19 Apr 1888, A. B. Langlois (FH); Missouri: Comm. Dr. Winter, June 1884 (NY); Rabenhorst-Winter-Pazschke, Fungi eur. 3962 (NY). BERMUDA: Expl. of Bermuda 1413-b, 1437-b, 1528 (NY). JAMAICA: 1909, A. E. Wright (FH). PUERTO RICO: West Indian Expl. 1013 (NY); Dorado, 26 July 1913, J. R. Johnston (NY). GUADELOUPE: Riviere St. Louis, 1902, P.Duss

(NY); GRENADA: Grand Etang, R. Thaxter (NY).

Pirozynski (1972) also described the fungus from Africa, and Goos (1980) reported it from Hawaii.

Linder (1929) described both the ascosporic and conidial states of *Tubeufia pezizula* (as *Lasiosphaeria pezizula* and *Helicoma curtisii*). Hughes (1958) clarified nomenclature of *Helicoma muelleri*, the type species of the genus, and included *Helicosporium tiliae* in synonymy. Pirozynski (1972) added *Helicoma curtisii* to synonymy and provided descriptions and illustrations of variation in both states of the species.

Tubeufia helicoma (Phill. & Plowr.) Pirozynski, Mycol. Pap. 129: 30. 1972. Figs. 11-13
Sphaeria helicoma Phill. & Plowr. Grevillea 6: 26. 1877.
Lasiosphaeria helicoma (Phill. & Plowr.) Sacc. Syll. Fung. 2: 192. 1883.
Lasiosphaeria nematospora Linder, Ann. Missouri Bot. Gard. 16: 289. 1929.
Tubeufia rugosa Booth, Mycol. Pap. 94: 13. 1964.

Ascomata globose or ovoid, (130-)180-385 µm diam, (150-) 208-550 µm high, light brown, grayish brown, or blackish brown, surface glabrous, pulverulent or rugulose with protruding cells, apex broadly rounded, opening by small pore; peridium of pseudoparenchymatous cells, 26-32 µm wide. Asci 120-200 x 15-25 µm, broadly cylindric, pseudoparaphyses narrow cellular, extending into apical pore region. Ascospores (52-)60-100(-130) x 4-6.5(-8) µm, hyaline or light yellowish, elongate clavate, tapering to ends, more strongly tapering to basal end, (7-)9-15-25-septate, slightly or not constricted at septa, cell contents multiguttulate, in one or two parallel fascicles in the ascus.

Conidial state: *Helicosporium pannosum* (Berk. & Curt.) R. T. Moore, Mycologia 49: 582. 1957.
Drepanospora pannosa Berk. & Curt. apud Berk. Grevillea 3: 105. 1875.
Helicosporium serpentinum Linder, Ann. Missouri Bot. Gard. 16: 288. 1929.
Helicosporium nematosporum Linder, Ann. Missouri Bot. Gard. 16: 288. 1929.
Helicosporium elinorae Linder, Ann. Missouri Bot. Gard. 16: 290. 1929.

Turf brown, conidiophores arising from recumbent hyphae; conidia coiled, coils (35-)45-60(-100) µm diam, cells 4.5-8 µm wide. Also present in some collections dark brown, muriform, globular "conidia," 32-40 µm diam, in the turf (perhaps initials of ascomata).

On dead, decaying woody branches and logs, on sawdust, and on large monocot culms.

Material examined: NORTH AMERICA: USA: Louisiana: Honey Island Swamp, near Pearl River, St. Tammany Parish, 6 Jun 1976, S. J. Hughes (rotten log) (NY, ex DAOM 155883). SOUTH AMERICA: BRITISH GUIANA: Plantation Vryheid, Demerara River, 2 Feb 1924, D. H. Linder 881 (two collections, type of *Lasiosphaeria nematospora* according to labels, FH); Reliquiae Farlowianae 842, same collection data, on sheaths of manicole palm (*Euterpe* sp.) (FH, NY); Botanic Garden, Georgetown, 4 Oct 1923, Linder 236, palm sheath (with slide, FH). CHILE: Corral, Dec 1905, 1905-1906, R. Thaxter, on decorticated wood (FH, two collections). EUROPE: ENGLAND: Sphaeriacei Britannici III, 53 (C. B. Plowright), Brandon, Nov 1876, on sawdust (isotype, NY).

Pirozynski (1972) recorded collections from Tanzania and New Zealand, while Hughes (1978) added a number of collections from New Zealand, reporting that it was a common species in that country. Goos (1980) reported the fungus from Hawaii.

Linder (1929) described the ascospores of *Lasiosphaeria nematospora* as 45-58 x 3.1-3.6 µm and 5-11-septate, but in the authentic material that I examined they measured 100-130 x 4-5 µm and were up to 25-septate. While Pirozynski included *Helicosporium elinorae* as one of the synonyms of the conidial state of *Tubeufia helicoma*, he observed that *Lasiosphaeria elinorae* is indeed a species of *Lasiosphaeria*. Pirozynski (1972) described *T. helicoma* in detail, and suggested that *Helicosporium viride* (Corda) Sacc. and its synonymous names were probably identical with *H. pannosum;* presumably also *H. indicum* P. R. Rao & D. Rao and *H. nizamabadense* P. R. Rao & D. Rao (Mycopathol. Mycol. Appl. 24: 27-34. 1964) are variants of the same fungus.

Tubeufia sect. *Acanthostigmina* (v. Höhnel) Barr, stat. nov.
Acanthostigmina v. Höhnel, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 118: 1499. 1909.

Ascomata globose or ovoid, vinaceous or dark brown pigmented; peridium ornamented with dark brownish-black setae.

Type species: *Sphaeria clintonii* Peck.

Tubeufia clintonii and *T. scopula* are similar in aspect and differ from other species in *Tubeufia* by the presence of dark setae on the ascomata. The peridium, however, is soft and vinaceous tinged, similar to peridia in species of sect. Thaxteriella. The two species are readily separated by ascospore sizes. No conidial state has been associated with certainty with *T. clintonii*, but a *Helicosporium* state, agreeing with *H. aureum*, is associated with ascomata in several collections of *T. scopula*.

Tubeufia clintonii (Peck) Barr, comb. nov. Figs. 16-18

Sphaeria clintonii Peck, Ann. Rep. New York State Mus. 30: 65. 1878 (for 1876).

Acanthostigma clintonii (Peck) Sacc. Syll. Fung. 2: 210. 1883.

Lasiosphaeria minuta Fuckel, Symb. Mycol. p. 148. 1870.

Acanthostigma minuta (Fckl.) Sacc. Syll. Fung. 2: 209. 1883.

Acanthostigmina minutum (Fckl.) v. Höhnel, Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Cl., Abt. 1, 118: 1499. 1909.

Acanthostigma nectrioideum Penzig & Sacc. Icon. Fung. Javanicorum, p. 18. 1904.

Ascomata globose or ovoid, 90-180(-240) µm diam, grouped or scattered on thin brown subiculum, with broad apex; peridium bright brown with vinaceous tinge, velvety over entire surface or around apex only with dark brown, stiff, pointed setae, (10-)30-90(-104) µm long, 4.5-6(-7.5) µm wide near base. Asci 50-90(-100) x (11-)13-20 µm, pseudoparaphyses narrow cellular. Ascospores (19-)32-45(-54) x (2.5-)3.5-5.5(-6) µm, elongate fusoid, often curved or bent, hyaline to light yellowish brown, (2-)5-7-(11-)septate, not constricted at septa, cell contents minutely guttulate, wall smooth.

Conidial state not known with certainty; a collection from New Jersey bears conidiophores from peridium of the ascomata and from basal subiculum. The conidiophores have lateral inflated cells. A few coiled conidia are present, coils ca. 30 µm diam, cells ca. 5 µm wide.

On rotting wood of deciduous trees, over old ascomycete stromata.

Material examined: NORTH AMERICA: CANADA: Quebec: Fabius 7230 (MASS); Ontario: Cattle Island, Lake Timagami, 8 Sep 1933, R. F. Cain (FH, NY). USA: New Hampshire: Shelburne, Aug 1894, W. G. Farlow (FH); Massachusetts: Barr 6013 with *T. cerea* (MASS); New York: Buffalo, Erie Co., Nov, G. W. Clinton ("Alden" in protolog) (type of *Sphaeria clintonii*, NYS); Michigan Hollow, Tompkins Co., 12 May 1947, J. Natti (NY); New Jersey: Newfield, 25 Mar 1889, J. B. Ellis (NY); Louisiana: St. Martinsville, 1 Jan 1890, A. B. Langlois (FH, Flora Ludoviciana 2243). BRITISH WEST INDIES: Grand Etang, Grenada, 1912-13, R. Thaxter (FH). SOUTH AMERICA: VENEZUELA: Dumont VE 2695 part (NY). EUROPE: Rehm Ascom. 1568; Sonntagsberg, 1906, Strasser (as *Acanthostigma minutum*,v. Höhnel Herb. in FH). ASIA: JAVA: Tjibodas, 1897, v. Höhnel (two slides in v. Höhnel Herb. in FH, as *A. nectrioideum*).

The specimens that von Höhnel (1909b) referred to in erecting *Acanthostigmina* are identical with North American collections. Although Fuckel's *Lasiosphaeria minuta* is the oldest name, the epithet cannot be utilized in *Tubeufia* because of *T. minuta* Munk (1966).

Tubeufia scopula (Cooke & Peck) Barr, comb. nov. Figs. 19-21
Sphaeria scopula Cooke & Peck, Ann. Rep. New York State Mus. 32: 51. 1880. "1879" (for 1878).
Acanthostigma scopula (Cooke & Peck) Peck, Bull. New York State Mus. 1(2): 22. 1887.
Lasiosphaeria scopula (Cooke & Peck) Sacc. Syll. Fung. 9: 852. 1891.

Ascomata globose conic or ovoid, 165-280(-385) µm diam, covered thickly with dark, nonseptate setae, 37-90 µm long, 4.5-7.5 µm wide near base; peridium vinaceous brown, relatively soft, pseudoparenchymatous, 27-32 µm wide. Asci 67-100(-130) x 11-15(-22) µm, oblong, pseudoparaphyses narrow cellular. Ascospores (40-)56-80(-125) x (2-)2.5-3.5(-4.5) µm, hyaline, elongate fusoid, often bent or slightly curved, (6-)11-(13-)septate, not constricted at septa, cell contents minutely guttulate, wall smooth.

Associated conidial state: *Helicosporium aureum* (Corda) Linder, Ann. Missouri Bot. Gard. 16: 279. 1929.
Helicomyces aureus Corda, Icon. Fung. 1: 9. 1837.
Helicosporium pilosum Ell. & Ev. Bull. Torrey Bot. Club 24: 476. 1877.
? *Helicosporium olivaceum* Peck, Ann. Rep. New York State Mus. 27: 102. 1875 (for 1873).

Turf yellowish to olivaceous green, becoming dull brown, conidiophores elongate from recumbent hyphae, 390-600 µm long, 5.5-7.5 µm wide below and tapering to 2 µm wide above; conidiogenous cells lateral, inflated and bladderlike, 5.5 x 5.5-10 µm. Conidia pale yellowish in mass, coiled three times, coil 16-25 µm wide, cells 1-2.5 µm wide.

On decorticated coniferous wood, rarely on wood of deciduous trees.

Material examined: NORTH AMERICA: USA: New York: Adirondack Mts., Aug 1878, C. H. Peck (type of *Sphaeria scopula*, NYS); Knowersville, Albany Co., July, Peck (NYS); New Jersey: Newfield, Oct 1880, J. B. Ellis (two collections, NY); Newfield, Sep 1878, Ellis (FH); 1877, Ellis (NY); Ellis N.A.F. 125 of *Helicosporium olivaceum* (MASS); Florida: Grasmere, 30 Mar 1893, W. C. Sturgis (two collections, FH, NY); Louisiana: Ellis N.A.F. 184; Langlois Flora Ludoviciana 661 (FH, NY); Alabama: Tuskegee, 26 Aug 1901, G. W. Carver (FH). EUROPE: AUSTRIA: Wiener Wald, 21 May 1903, V. Höhnel (v. Höhnel Herb. in FH).

Tubeufia scopula is usually collected on coniferous substrates. The species has larger sizes than *T. clintonii* but otherwise is closely related.

ACKNOWLEDGMENTS

I thank the curators of herbaria cited in the text for the loan of specimens in their keeping. It is a pleasure to acknowledge Amy Rossman for critical reviewing and excellent suggestions for improvement, and Clark Rogerson for his assistance in many aspects of this study.

LITERATURE CITED

Arx, J. A. von. 1977. On *Yukonia caricis* and some other Ascomycetes. Rev. Mycol. 41: 265-270.

__________, and E. Müller. 1975. A re-evaluation of the bitunicate Ascomycetes with keys to families and genera. Stud. Mycol. Baarn 9: 1-159.

Barr, M. E. 1977. *Acanthostigmella* (Herpotrichiellaceae). Mycotaxon 7: 17-23.

__________. 1979. A classification of Loculoascomycetes. Mycologia 71: 935-957.

Berlese, A. N. 1894. Icones Fungorum, Vol. 1. Abellini. iv + 243 p, CLXII pl.

Bigelow, H. E., and M. E. Barr. 1963. Contribution to the fungus flora of northeastern North America III. Rhodora 65: 289-309.

Booth, C. 1964. Studies of Pyrenomycetes: VII. Mycol. Pap. 94: 1-16.

Conway, K. E., and M. E. Barr. 1977. Classification of *Ophioceras dolichostomum*. Mycotaxon 5: 376-380.

Ellis, J. B., and B. M. Everhart. 1892. The North American Pyrenomycetes. Publ. by the authors, Newfield, N.J. 793 p, 41 pl.

Eriksson, O. 1967. Studies on graminicolous Pyrenomycetes from Fennoscandia 2. Ark. Bot. ser. 2, 6: 381-440.

Goos, R. D. 1980. Some helicosporous fungi from Hawaii. Mycologia 72: 595-610.

Hawksworth, D. L., and K. A. Pirozynski. 1977. The generic names *Paranectria* and *Paranectriella* and their synonyms. Canad. J. Bot. 55: 2555-2557.

Hilber, R., and O. Hilber. 1978. Beitrag zur Pilzflora des NSG Keilstein. Denkschr. Regensburg. Bot. Ges. 37: 9-62.

Höhnel, F. von. 1909a. Fragmente zur Mykologie IX. Mitteilung, Nr. 420. *Tubeufia Helicomyces* n. sp. Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 118: 1477-1479.

__________. 1909b. Fragmente zur Mykologie IX. Mitteilung, Nr. 436. Über *Acanthostigma nectrioideum*. Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 118: 1498-1499.

__________. 1919. Fragmente zur Mykologie XXIII.Mitteilung, Nr. 1162. *Acrospermum Adeanum* v. H. n. sp. Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 128: 559-563.

Hughes, S. J. 1958. Revisiones hyphomycetum aliquot cum appendice de nominibus rejiciendis. Canad. J. Bot. 36: 727-836.

__________. 1978. New Zealand fungi 25. Miscellaneous species. New Zealand J. Bot. 16: 311-370.

Linder, D. H. 1929. A monograph of the helicosporous Fungi Imperfecti. Ann. Missouri Bot. Gard. 16: 227-388.

Müller, E. 1950. Die schweizerischen Arten der Gattung *Leptosphaeria* und ihrer Verwandten. Sydowia 4: 185-319.

__________, and J. A. von Arx. 1962. Die Gattungen der didymosporen Pyrenomyceten. Beitr. Kryptogamenfl. Schweiz 11(2): 1-922.

Munk, A. 1957. Danish Pyrenomycetes. Dansk Bot. Ark. 17(1): 1-491.

__________. 1966. Three new species of inconspicuous Pyrenomycetes. Bot. Not. 119: 177-184.

Penzig, O., and P. A. Saccardo. 1897. Diagnoses fungorum novorum in insula Java collectorum. Malpighia 11: 387-409.

Petrak, F. 1924. Mykologische Notizen VII. Ann. Mycol. 22: 1-182.

__________. 1931. Mykologische Notizen XI. Ann. Mycol. 29: 339-397.

__________. 1953. Ein Beitrag zur Pilzflora Floridas. Sydowia 7: 103-132.

Pirozynski, K. A. 1972. Microfungi of Tanzania I & II. Mycol. Pap. 129: 1-64.

__________. 1977 (1976). Notes on hyperparasitic Sphaeriales, Hypocreales and 'hypocreoid Dothideales.' Kew Bull. 31: 595-610.

Rossman, A. Y. 1977. The genus *Ophionectria* (Euascomycetes, Hypocreales). Mycologia 60: 355-391.

__________. 1978. *Podonectria*, a genus in the Pleosporales on scale insects. Mycotaxon 7: 163-182.

__________. 1979. A preliminary account of the taxa described in *Calonectria*. Mycotaxon 8: 485-558.

Saccardo, P. A. 1877. Fungi veneti novi vel critici vel Mycologiae Venetae addendi. Michelia 1: 1-72.

__________. 1883. Sylloge fungorum, Vol. II. Patavia. 815 + lxix + 77 p.

__________, and P. Sydow. 1899. Sylloge Fungorum, Vol. XIV. Patavia. 1316 p.

Samuels, G. J. 1973. The genus *Macbridella* with notes on *Calostilbe, Herpotrichia, Phaeonectria,* and *Letendraea*. Canad. J. Bot. 51: 1275-1283.

__________, and E. Müller. 1979 (1978). Life-history studies of Brazilian Ascomycetes 2. Sydowia 31: 137-141.

__________, A. Y. Rossman, and E. Müller. 1979 (1978). Life-history studies of Brazilian Ascomycetes 6. Sydowia 31: 180-193.

Seaver, F. J. 1909. The Hypocreales of North America-I. Mycologia 1: 41-76.

Sherwood, M. A. 1977. The ostropalean fungi. Mycotaxon 5: 1-277.

Webster, J. 1951. Graminicolous Pyrenomycetes I. The conidial stage of *Tubeufia helicomyces*. Trans. Brit. Mycol. Soc. 34: 304-308.

MYCOTAXON

Vol. XII, No. 1, pp. 168-184 October-December 1980

STUDIES IN TROPICAL CORTICIACEAE (BASIDIOMYCETES) II

KURT HJORTSTAM

Målaregatan 12
S-44135 Alingsås, Sweden

and

LEIF RYVARDEN

Botanical Laboratory
University of Oslo
P.O.Box 1045, Blindern
Oslo 3, Norway

SUMMARY

Four new genera and ten new species are described from Africa or adjacent areas viz. *Brevicellicium allantosporum*, *B. molle*, *B. uncinatum*, *Dextrinodontia* with the type species *D. molliuscula*, *Fibricium coriaceum*, *F. multicystidium*, *Hypochniciellum* with the type species *Leptosporomyces ovoideus* Jülich, *Melzerodontia* with the type species *M. aculeata*, *Odontiopsis* with the type species *O. hyphodontina*, *Phlebia verruculosa*, and *Repetobasidium hastatum*. A key to known species of *Brevicellicium* is presented, and two species are reported as new to Africa viz. *Hypochniciellum ovoideum* and *Repetobasidium mirificum*.

Key to species of *Brevicellicium*

1. Spores reniform or allantoid...........*B. allantosporum*
1. Spores subglobose-globose..............................2

2. Fruitbody smooth....................................3
2. Fruitbody grandinioid to odontioid....................5

3. Fruitbody pellicular, with distinct white subiculum, known from Brazil................*B. mellinum*
3. Fruitbody not distinctly pellicular, subiculum inconspicuous 4

4. Hyphae provided with small hooks which are easily observed at the subhymenial hyphae, spores subglobose

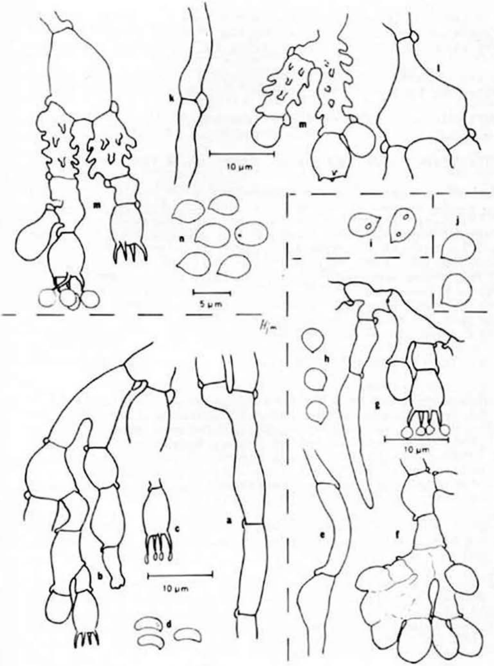


Fig. 1. Brevicellicium allantosporum, coll. Ryv. 10601. a) basal hypha b) subhymenial hyphae with basidia c) single basidium with immature spores d) spores. B. molle, coll. Ryv. 11013. e) basal hypha f) subhymenial hyphae and basidia-cluster g) basidia and cystidial element h) spores. B. exile, coll. Hjm 7536. i) spores. B. olivascens, coll. Hjm 9479. j) spores. B. uncinatum, coll. Ryv. 10023. k) basal hypha l) isodiametric hypha m) subhymenial hyphae and basidia n) spores.

or rarely globose, 3.5-4.5 x 3-3.5 um.......B. uncinatum
4. Hyphae smooth, spores more short-ellipsoid or lacrimiform, 4.5-5(-6) x 3.5-4 um...........B. exile

5. Spores generally 3.5-4(-4.5) um................B. molle
5. Spores up to 5(-5.5) um across........................6

6. Fruitbody yellowish to light greenish.......B. viridulum
6. Fruitbody whitish to cream coloured........B. olivascens

BREVICELLICIUM Larss. & Hjortst., Mycotaxon 7(1):117, 1978.

This genus was described to accomodate such species as Corticium exile Jacks. (type species) and Odontia olivascens Bres. The basic characteristics were the isodiametric subhymenial hyphae, short basidia and globose to subglobose spores. Two of the species described below include such characteristics while B. molle also has cystidia or hyphal ends. The third species B. allantosporum has the same isodiametric hyphae, but the spores are different making the species deviate somewhat. However, even the latter species with allantoid spores and B. molle with cystidial organs does not seem to change the generic description basically.

BREVICELLICIUM ALLANTOSPORUM Hjortst. & Ryv. nov.spec.

Fructificatio resupinata, effusa, laxe adnata; hymenio albido vel ravido, sub lente distincte granulato; aculeis circiter 0.1-0.2 mm longis; systemate hyphali monomitico; hyphis basalibus rectis, 3-4 um latis; hyphis subhymenialibus dilatatis, parietibus isodiametris, 7-8(-10) um latis, cum fibulis; cystidiis nullis; basidiis clavatis, 10-12 x 4 um, 4-sterigmatibus; sporis reniformibus vel allantoidibus, tenuitunicatis, 4 x 1.5-1.75 um, non-amyloidibus.

Holotypus: Africa. Tanzania. Tanga Prov. Tanga distr., Usambara Mts., Amani, alt. 800-1000 m. 18.-19. Febr. 1973. L. Ryvarden 10601 (O).

Fruitbody resupinate, effuse, loosely adnate, under a lens (50X) distinctly grandinioid with small aculei, ab. 0.1-0.2 mm, whitish to greyish-white. Hyphal system monomitic. Basal hyphae straight, 3-4 um wide, subhymenial ones isodiametric and up to 7-8(-10) um wide, all hyphae with clamps. Cystidia lacking. Basidia clavate, short, 10-12 x 4 um with four sterigmata. Spores reniform or allantoid, thin-walled, often with two oil-drops, 4 x 1.5-1.75 um, non-amyloid.

Remarks. This species is closely related to other species in the genus Brevicellicium, and the diagnostic features of the new species are the granular hymenium and the allantoid or reniform spores.

BREVICELLICIUM MOLLE Hjortst. & Ryv. nov.spec.

Fructificatio resupinata, effusa, laxe adnata; hymenio plus minusve cremeo, sub lente distincte granulato; aculeis minus 0.2 mm; systemate hyphali monomitico; hyphis basalibus rectis, parietibus fere parallelis, usque ad 4 um latis; hyphis subhymenialibus dilatatis, parietibus isodiametris, vulgo 7-8 um latis, cum fibulis; cystidiis nullis sed interdum in hymenio hyphis cystidioideis praesentibus, circiter 20-25 x 4 um; basidiis clavatis, generatim 10 x 6 um, 4-sterigmatibus; sporis oblique subglobosis, tenuitunicatis, 3.5-4 um diametro, non-amyloidibus.

Holotypus: Africa. Tanzania. Morogoro Prov. Morogoro distr., Uluguri Mts., Morning Side Res. st. c. 5 km S of Morogoro, alt. c. 1500-2100 m. 24.-26. Febr. 1973. L. Ryvarden 11013 (O).

Fruitbody resupinate, effuse, loosely adnate, under a lens (50X) grandinioid, aculei small, less than 0.2 mm, but easily observed. Hyphal system monomitic with the basal hyphae straight, up to 4 um wide, subhymenial hyphae widened, isodiametric and usually up to 7-8 um wide or more, all hyphae with clamps. Cystidia lacking, but occasionally some hyphal ends project above the basidia, ab. 20-25 x 4 um. Basidia clavate, short, in general 10 x 6 um, with 4 sterigmata. Spores oblique subglobose, thin-walled, 3.5-4 um across, non-amyloid.

Remarks. This species is easily recognized by its soft fructification, small subglobose spores and hyphal ends or cystidioles between the basidia. It is closely related to B. olivascens, but this species has less soft fructification and the spores are larger, often up to 5 um or more. Compare also the figured spores of B. exile.

BREVICELLICIUM UNCINATUM Hjortst. & Ryv. nov. spec.

Fructificatio resupinata, effusa, adnata, levis, plus minusve farinosa vel porulosa, albida vel cinerescens; systemate hyphali monomitico; hyphis basalibus distinctis sed paucis, rectis, tenuitunicatis, passim dilatatis, levibus, circiter 3 um latis; hyphis subhymenialibus item distinctis sed cellulis brevibus; parietibus isodiametris, usque 10 um latis, uncis lateralibus instructis; cystidiis nullis; basidiis subglobosis, plerumque 7-9 x 5-6 um, 4-sterigmatibus; sporis subglobosis raro globosis, tenuitunicatis, levibus, (3.5-)4-4.5 x (3-)3.5 um, neque amyloidibus neque cyanophilis.

Holotypus: Africa. Tanzania. Arusha Prov. Arusha Nat. Park. Mt. Meru E slope, road to the crater, alt. 1800-2300 m. 8. Febr. 1973. L. Ryvarden 10023 (O).

Fruitbody resupinate, effuse, closely adnate, smooth, more or less farinose, especially at the margin, becoming continuous and appears to be slightly porulose-reticulate, whitish or greyish. Hyphal system monomitic. Subicular hyphae few, fairly straight but widened near the septa, usually smooth, ab. 3 um wide. Subhymenial hyphae isodiametric and sometimes up to 10 um wide, provided with unciform outgrowths, born on sides of the hyphae. These outgrowths are very distinctive and occur frequently on the subhymenial hyphae, rarely on the basal and basidia-bearing hyphae. Cystidia lacking. Basidia subglobose, without unciform outgrowths, usually 7-9 x 5-6 um, with 4 sterigmata. Spores subglobose, thin-walled, smooth, 4-4.5 x 3.5 um, with distinct apiculus, non-amyloid and without cyanophilous reaction.

Remarks. This species seems to be closely related to other species in Brevicellicium, preferably B. olivascens but also to B. exile in its isodiametric hyphal cells. It is distinguished in having more regularly subglobose and smaller spores than in B. olivascens, where they are asymmetric and usually up to 4.5-5 um. B. uncinatum is further separated from all other species in the genus by the hook-shaped outgrowths from the hyphae, which are very distinctive and easily observed.

DEXTRINODONTIA Hjortst. & Ryv. nov.gen.

Fructificatio resupinata, effusa, valde adnata, hydnoides, mediocriter mollis; systemate hyphali dimitico; hyphis skeleticis crassitunicatis, implexis, sine ramis vel sparsim ramosis, perspicue dextrinoidibus et cyanophilis, fibulis nullis; hyphis generatoris tenuitunicatis, omnibus fibulatis; cystidiis nullis; basidiis plus minusve clavatis, terminalibus, 4-sterigmatibus; sporis tenuitunicatis, levibus, non-amyloidibus.

Typus generis: Dextrinodontia molliuscula Hjortst. & Ryv.

Fruitbody resupinate, effuse, distinctly hydnoid, fairly soft. Hyphal system dimitic. Skeletal hyphae thick-walled, sparsely ramified, clearly dextrinoid and with strong cyanophilous reaction, without clamps. Generative hyphae thin-walled, with clamps at all septa. Cystidia lacking. Basidia more or less clavate, 4-sterigmated. Spores thin-walled, smooth, non-amyloid.

Remarks. Dextrinodontia is in presence of hydnoid hymenium and with dextrinoid and cyanophilous skeletal hyphae quite different from other genera in the family Corticiaceae and in our judgement easily recognized. In general appearance the new genus approaches Fibrodontia Parm., Fibricium John Erikss., and Fibriciellum Erikss. & Ryv. but species in these genera do not have dextrinoid hyphae. Fibriciellum silvae-ryae Erikss. & Ryv. has cyanophilous skeletal hyphae but is different in other respects.
Other odontioid or hydnoid genera with dimitic hyphal system are Steccherinum and Mycoaciella. Both lack the cyanophilous and dextrinoid reaction of hyphae and the former is further separated by large and encrusted cystidia. Besides, Mycoaciella has when fresh a ceraceous consistency and becomes horny when drying.

Dextrinoid skeletal hyphae are found in Scytinostroma (Lachnocladiaceae) but any relationship to this genus seems to be far-fetched. Most of the species in Scytinostroma have a generally smooth and tough fruitbody, gloeocystidia are present in most species and also dendrohyphidia or skeletohyphidia occur.

DEXTRINODONTIA MOLLIUSCULA Hjortst. & Ryv. nov. spec.

Fructificatio resupinata, effusa, hydnoides, plus minusve mollis; colore diluto ochraceo; aculeis circiter 2 mm longis, cylindraceis vel conicis; margine fibrilloso vel saepe cum rhizomorphis praesentibus; systemate hyphali dimitico; hyphis skeleticis crassitunicatis, implexis, passim ramosis, 2 um latis, dextrinoidibus et cyanophilis, fibulis nullis; hyphis generatoris tenuitunicatis, ramosis, 2-2.5(-3) um latis, fibulatis; cystidiis nullis; basidiis plus minus-

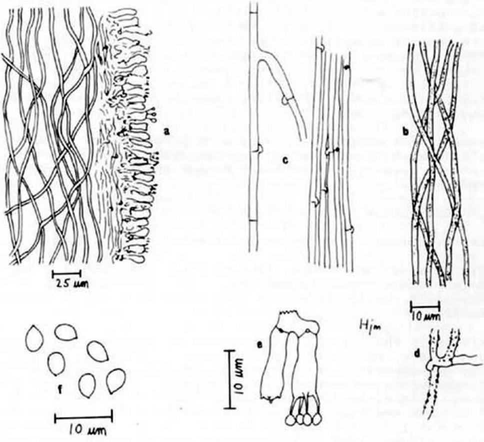


Fig. 2. Dextrinodontia molliuscula, coll. Ryv. 10236.
a) part of the aculeus b) skeletal hyphae (in Melzer's reagent) c) thin-walled generative hyphae d) encrusted subhymenial hyphae e) basidia f) spores.

ve clavatis, terminalibus, 4-sterigmatibus, plerumque 12-15 x 4 um; sporis subglobosis vel leviter dacryoidibus, tenuitunicatis, 3.5(-4) x 2.5-3 um, non-amyloidibus.

Holotypus: Africa. Tanzania. Kilimanjaro Prov. Mt. Kilimanjaro W slope, W Kilimanjaro Forest sta., alt. c. 1800 m. 10.-11. Febr. 1973. L. Ryvarden 10236 (O). Isotypus in Herb. GB. Paratypus: do. L. Ryvarden 10202 (O). Kenya. Central Prov. Mt. Elgon, Suam Forest sta., alt. c. 2100 m. 23.-24. Jan. 1973. L. Ryvarden 9223 (O).

Fruitbody resupinate, effuse, hydnoid, sometimes with flattened teeth, soft, in colour light ochraceous, aculei about 2 mm long, cylindrical or conical, margin fibrillose or distinctly rhizomorphic. Hyphal system dimitic. Skeletal hyphae thick-walled and occur both in the subiculum and intricately entangled in the central part of the aculei, rarely branched, ab. 2 um wide, dextrinoid and strongly cyanophilous, without clamps. Generative hyphae thin-walled, in the subiculum long-celled, in the subhymenial part more short-celled and somewhat encrusted, 2-2.5(-3) um, the basidia-bearing hyphae fairly short-celled and tending to be more or less isodiametric, all generative hyphae with clamps, but simple adventitious septa may occur. Cystidia lacking. Basidia more or less clavate, terminal, with 4 sterigmata, in general 12-15 x 4 um. Spores subglobose to slightly dacryoid, thin-walled, smooth, 3.5(-4) x 2.5-3 um, non-amyloid.

Remarks. The diagnostic features of this species are the soft hydnoid fructification together with dextrinoid and strongly cyanophilous skeletal hyphae which are irregularly interwoven.

FIBRICIUM CORIACEUM Hjortst. & Ryv. nov. spec.

Fibricio lapponico affini sed differt cystidiis nullis.

Holotypus: Africa. Kenya. Eastern Prov. Nyeri distr., Mt. Kenya S slope,Regati Forest sta., alt. 2200-2300 m. 2.-3. Febr. 1973. L. Ryvarden 9779 (O). Paratypus: do. L. Ryvarden 9865 (O).

Externally the new species is close to Fibricium lapponicum John Erikss. and has the same construction of the texture e.g. two-layered, with a distinct subiculum composed of fibrous skeletal hyphae and a subhymenial layer of generative hyphae. The skeletal hyphae are strongly light-refracting in KOH but are not dextrinoid or cyanophilous. The basidia are constricted and measure 30-40 x 5-6 um, with 4 sterigmata. In comparison with F. lapponicum the spores are more subcylindrical, (5.5-)6-7 x (2-)2.5(-3) um.
Fibricium coriaceum is well recognized depending on its dimitic hyphal system and with the fruitbody soft leathery and easy to separate from the substrate. The hymenium corresponds with F. lapponicum but may be more compact and have a tendency to cracking with age. The most striking

characteristic is the absence of cystidia. In F. lapponicum these are usually encrusted and can be found in all well-developed collections.

FIBRICIUM MULTICYSTIDIUM Hjortst. & Ryv. nov.spec.

Fructificatio resupinata, effusa, leviter rimosa, in sicco plus minusve cremicolor, 0.1-0.3 mm crassa; margine minuto plus minusve fibrilloso; rhizomorphis sparsis; systemate hyphali dimitico; hyphis skeleticis crassitunicatis, fibrosis, 2-2.5 um latis, fibulis nullis; hyphis generatoris tenuitunicatis, ramosis, leniter incrustatis, hyalinis, 2-2.5 (-3) um latis, cum fibulis, hyphis omnibus neque amyloidibus vel dextrinoidibus neque cyanophilis; cystidiis multis, tenuitunicatis, cylindraceis, obtusis, manifeste constrictis, circiter 70 x 7 um; in hymenio hyphae paraphysoideae praesentes; basidiis clavatis, constrictis et plerumque sinuosis, 4-sterigmatibus, 35-40(-50) x 6(-7) um; sporis ellipsoidibus, levibus, tenuitunicatis, 8-10 x 4.5-5 um, non-amyloidibus.

Holotypus: Canary Islands. Tenerife, Monte Verde near Aguamansa in the Orotava valley, mixed forest. On Erica arborea. 8.-17. Jan. 1974. L. Ryvarden 12363 (O). Isotypus in Herb. GB.

Fruitbody resupinate, effuse, slightly cracking, white to cream-coloured, 0.1-0.3 mm thick, under a lens with projecting cystidia (20-30 um), margin more or less fibrillose, rhizomorphs sparse but may be well-developed in fresh material. Hyphal system dimitic. Skeletal hyphae thick-walled, fibre-like, without clamps and ramifications, usually 2(-2.5) um wide. Subhymenium composed of thin-walled, rather narrow hyphae, slightly encrusted (easily seen in cotton-blue), 2-2.5 um wide, the basidia-bearing hyphae somewhat wider, all generative hyphae with clamps. Hyphae neither amyloid or dextrinoid nor cyanophilous. Cystidia numerous, thin-walled, more or less cylindrical with the apex obtuse, constricted, ab. 70 x 7 um, widened at the apex, without aldehyde reaction. Paraphysoid hyphae occur between the basidia and usually project slightly. Basidia clavate, more or less sinuous, 4-sterigmated, 35-40(-50) x 5-6(-7) um. Spores ellipsoid, smooth, with oily contents, thin-walled, 8-10 x 4.5-5 um, non-amyloid.

Remarks. Fibricium multicystidium has the main features of other species in Fibricium e.g. smooth hymenium, fibrous skeletal hyphae, ellipsoid spores, and cylindrical cystidia. The spores are ellipsoid as in F. lapponicum and F. rude but larger.
The species has also some resemblance to species in Hypoderma, chiefly by having oily contents in the spores, but this genus is clearly delimited by a monomitic hyphal system. Our intention was to describe this species under a new generic name, but we are after a closer examination of the opinion that it is best placed in Fibricium, even if the spore-morphology and the narrow subhymenial hyphae are dif-

ferent. It is probable that future studies in the complex of dimitic species will give more information and change the present concept.

HYPOCHNICIELLUM Hjortst. & Ryv. nov. gen.

Fructificatio resupinata, effusa, pellicularis vel membranacea; hymenio levi, byssoide; systemate hyphali monomitico; hyphis basalibus tenuitunicatis vel incrassatis, distinctis, pro parte majore rectis et uniformibus, hyalinis, fibulatis; hyphis subhymenialibus tenuitunicatis, sinuolatis, fibulatis; cystidiis nullis; basidiis parvis, plus minusve clavatis, modice constrictis, 4-sterigmatibus; sporis crassitunicatis, levibus, neque amyloidibus neque dextrinoi-

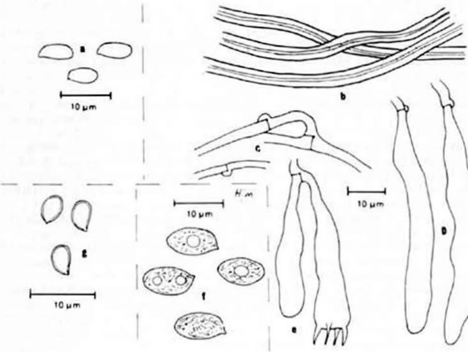


Fig. 3. Fibricium coriaceum, coll. Ryv. 9779. a) spores. F. multicystidium, coll. Ryv. 12363. b) fibrous skeletal hyphae c) generative hypha d) cystidia e) basidia f) spores. Hypochniciellum ovoideum, coll. Hjm 3121 (from Sweden). g) spores.

dibus, perspicue cyanophilis.

Typus generis: Leptosporomyces ovoideus Jülich

Fruitbody resupinate, effuse, pellicular (athelioid) or thin membranaceous, hymenium smooth, more or less byssoid. Hyphal system monomitic. Basal hyphae with walls thin to thickened, distinct, partly straight and uniform, hyaline, subhymenial hyphae thin-walled, faintly sinuate, all hyphae with clamps. Cystidia absent in the type species. Basidia fairly small, more or less clavate, moderately constricted, with 4 sterigmata. Spores thick-walled, smooth, distinctly cyanophilous, non-amyloid or dextrinoid.

Remarks. The new genus Hypochniciellum is easily separated from Athelia and Leptosporomyces by its thick-walled and cyanophilous spores. In the spore-morphology it is similar to species in Hypochnicium but well delimited by pellicular and detachable fructification with a very thin subiculum. Some other species, that may be placed in Hypochniciellum are Leucogyrophana subillaqueata (Litsch.) Jülich, L. cremeoisabellina (Litsch.) Parm., and L. mollis (Fr.) Parm. All these species are similar to H. ovoideum in the morphology of the hyphae, basidia, and spores but differs in having slight amyloid spore-reaction (greyish). Compare Eriksson and Ryvarden (1976). None of the species are hitherto known from the tropics.

HYPOCHNICIELLUM OVOIDEUM (Jülich) Hjortst. & Ryv. comb. nov.

Basionym: Leptosporomyces ovoideus Jülich, Willdenowia Beih. 7:203-204, 1972.

Fully described and figured by Jülich (1972) and by Eriksson and Ryvarden (1976).

The African collections are well-developed and similar in both macro and microscopical features to the specimens we have seen from Northern Europe.

Specimens: Africa. Kenya. Central Prov. Mt. Elgon, S of Suam River Valley to Kapchalwa Gate, alt. 2500-3100 m. 24 Jan. 1973. L. Ryvarden 9289 and 9320 (O).

MELZERODONTIA Hjortst. & Ryv. nov. gen.

Fructificatio resupinata, effusa, arcte adnata, odontioides vel grandinioides, dura, aliquantum fragilis; systemate hyphali monomitico; hyphis basalibus arcte contiguis, sed distinctis, tenuitunicatis post crassiusculis; hyphis subhymenialibus leviter contiguis, hyphis omnibus sine fibulis, cyanophilis et dextrinoidibus; cystidiis nullis; in hymenio hyphae paraphysoideae ut videtur praesentes; basidiis clavatis, 4-sterigmatibus, basaliter valde dextrinoidibus; sporis levibus, tenuitunicatis, neque amyloidibus neque dextrinoidibus.

Typus generis: <u>Melzerodontia aculeata</u> Hjortst. & Ryv.

Fruitbody distinctly odontioid or when young grandinioid, with rather small aculei. Macromorphology similar to that of species in <u>Hyphodontia</u>. Hyphal system monomitic. Basal hyphae distinct, somewhat thick-walled and densely intertwined, subhymenial ones less thick-walled and agglutinated and in comparison with the basal hyphae much more dextrinoid, all hyphae without clamps. Cystidia lacking but apparently with some few paraphysoids (or dendrohyphidia). Basidia clavate, with basal part thickened, 4-sterigmated, both dextrinoid and cyanophilous. Spores thin-walled, subcylindrical in the known species, neither dextrinoid nor amyloid.

Remarks. This new genus is easily recognized by the presence of strongly dextrinoid hyphae, especially the subhymenial ones. Also the basidial base becomes brown in Melzer's reagent. Furthermore it is well delimited by lacking clamps. In outer appearance the type species is somewhat similar to species in <u>Hyphodontia</u>, preferably <u>H. verruculosa</u> Erikss. & Hjortst. by its aculeate fructification. Since we have been unable to find a proper genus for the new species, we found it necessary to describe a new one.

MELZERODONTIA ACULEATA Hjortst. & Ryv. nov.spec.

Fructificatio resupinata, effusa, adnata, valde grandinioides vel odontioides; aculeis circiter 0.3 mm, levibus; colore infuscato; hyphis distinctis, tenuitunicatis post crassiusculis, sine fibulis, dextrinoidibus et cyanophilis, 2-3 um latis; cystidiis nullis, in hymenio hyphae paraphysoideae ut videtur praesentes; basidiis circiter 20 x 4-5 um, 4-sterigmatibus, basaliter crassiusculis, dextrinoidibus; sporis subcylindraceis, tenuitunicatis, 5-5.5(-6) x 2-2.5 um.

Holotypus: Africa.Tanzania. Tanga Prov.Tanga distr., Usambara Mts. Amani, alt. 800-1000 m. 18.-19. Febr. 1973. L. Ryvarden 10540 (O). Paratypus: do. Morogoro Prov. Morogoro distr., Uluguri Mts. Morning Side Res. sta. c. 5 km S. of Morogoro, alt. c. 1500 - 2100 m. 24.-26. Febr. 1973. L. Ryvarden 11074 (O).

Fruitbody resupinate, effuse, adnate, strongly grandinioid or odontioid with small aculei, less than 0.5 mm, nearly smooth, hymenium between the aculei somewhat cracked, in colour light brown, hard and somewhat brittle. Hyphal system monomitic, with basal hyphae distinct, somewhat thick-walled and with slight dextrinoid reaction, but strongly cyanophilous, subhymenial hyphae less thick-walled, usually strongly dextrinoid and cyanophilous, all hyphae ab. 2-3 um wide and without clamps. Cystidia lacking but a few paraphysoids (or dendrohyphidia) have been observed, slightly projecting above the basidia. Basidia clavate, thickened towards the base and basally dextrinoid and cyanophilous, 4-sterigmated, ab. 20 x 4-5 um. Spores smooth, subcylin-

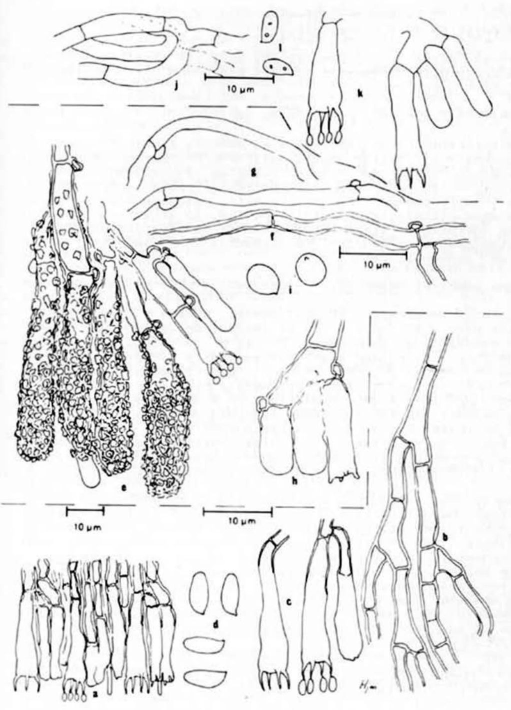


Fig. 4. Melzerodontia aculeata, coll. Ryv. 10540. a) basidial layer b) hyphae c) basidia d) spores. Odontiopsis hyphodontina, coll. Ryv. 10949. e) projecting hyphae and basidia with immature spores f) basal hypha g) thin-walled hyphae h) young basidia i) spores. Phlebia verruculosa, coll. Ryv. 10859. j) hyphae k) basidia l) spores.

drical, thin-walled, 5-5.5(-6) x 2-2.5 um, neither amyloid nor dextrinoid or cyanophilous.

Remarks. Easily recognized by its aculeate fructification and dextrinoid hyphae and basidia base, and moreover without clamps and cystidia.

ODONTIOPSIS Hjortst. & Ryv. nov. gen.

Fructificatio resupinata, effusa, adnata, distincte odontioides; aculeis fimbriatis; systemate hyphali monomitico vel subdimitico; hyphis basalibus plus minusve crassitunicatis, rectis, uniformibus, fibulatis; hyphis subhymenialibus tenuitunicatis vel crassiusculis, cellulis plus minusve brevibus, fibulatis; cystidiis nullis, in aculeis hyphoideis incrustatis dispositis; basidiis clavatis, brevibus, 4-sterigmatibus; sporis fere globosis, tenuitunicatis, levibus, non-amyloidibus.

Typus generis: Odontiopsis hyphodontina Hjortst. & Ryv.

Fruitbody resupinate, effuse, adnate, hymenium distinctly odontioid, with aculei more or less fimbriate; hyphal system monomitic or subdimitic. Hyphae of two kinds, subicular ones thick-walled and light-refracting in KOH and cotton-blue as well in Melzer's reagent, long-celled and somewhat difficult to find clamps, subhymenial hyphae more thin-walled and less light-refracting, in a dense layer next to the basidia, swelling in KOH. Cystidia lacking. Projecting and encrusted hyphal ends numerous both on the aculei and in the hymenium between the aculei. Basidia somewhat stout, short and with 4 sterigmata. Spores thin-walled, smooth, more or less globose to rarely subglobose, non-amyloid.

Remarks. This new genus typified with O. hyphodontina has several characteristics which point to different odontioid or hydnoid genera. At first, the basal hyphae, which are strongly light-refracting, both in KOH and cotton-blue, and can possibly be taken for skeletals, point towards Schizopora Velen. The subhymenial hyphae, and especially the basidia-bearing ones as well as the appearance of the basidia are somewhat similar to Hyphodontia John Erikss. or Odonticium Parm. and also to Hyphodermella Erikss. & Ryv. It has also little in common with Radulodon Ryv. e.g. the spore morphology.
It seems to be necessary to give some of the mentioned genera a wider circumscription if this species should be incorporated and therefore we propose this new genus. We are of the opinion that the genus is easily recognized, primarely by its odontioid hymenium, projecting hyphal ends, and with short and somewhat stout basidia with nearly globose spores.

ODONTIOPSIS HYPHODONTINA Hjortst. & Ryv. nov. spec.

Fructificatio resupinata, effusa, adnata; hymenio odontioides, leviter ochraceo; aculeis fimbriatis, 6-8 per mm, 0.3-0.5 mm longis; systemate hyphali monomitico vel subdimitico; hyphis basalibus crassitunicatis, rectis, hyalinis, 3-4.5(-5) um, fibulatis; hyphis subhymenialibus tenuitunicatis vel crassiusculis, 4.5(-5) um, cellulis brevibus, fibulatis; cystidiis nullis, in hymenio hyphoideis incrustatis multis; basidiis fere subclavatis, circiter 12-15 x 5 um, 4-sterigmatibus; sporis levibus, tenuitunicatis, globosis vel raro subglobosis, (4-)4.5-5 um vel 5 x 4.5 um, non-amyloidibus.

Holotypus: Africa. Tanzania. Morogoro Prov. Morogoro distr., Uluguri Mts. Morning Side Res. sta. c. 5 km S of Morogoro, alt. 1500-2100 m. 24.-26. Febr. 1973. L. Ryvarden 10949 (O).

Fruitbody resupinate, effuse, adnate, when dry somewhat loosening from the substrate, irregularly odontioid, light ochraceous, aculei fimbriate, crowded, under a lens (50X) with projecting hyphae; margin in type collection indeterminable. Hyphal system monomitic or, depending on the thick-walled basal hyphae with long intervals, subdimitic. Basal hyphae refractive (in phase-contrast microscope), hyaline, in KOH up to 5 um wide, in cotton-blue mostly 3.5-4 um, with clamps. Subhymenial hyphae short-celled, slightly thickened or swelling in KOH, ab. 4.5(-5) um wide. Cystidia lacking, but with projecting and encrusted hyphae, especially at the tip of the aculei. Basidia short-clavate, mostly 12-15 x 5 um, with 4 sterigmata. Spores thin-walled, smooth, globose to rarely subglobose, in general 4-4.5 um or 5 x 4.5 um, non-amyloid.

Remarks. The species is easily recognized by its projecting hyphal ends and globose spores. A further diagnostic feature is the basidia-bearing hyphae, which are short-celled and somewhat swelling in KOH. It should be noted that the clamps on the subhymenial hyphae are difficult to observe, probably depending on the hyphal swelling in KOH or on age.

PHLEBIA Fr. Syst. Mycol. 1:426, 1821.

A large genus with a wide circumscription and seems to contain several taxa in the tropics. It will be treated later on together with other species from Africa.
Characteristics of species in Phlebia are in most species the tuberculate, merulioid or odontioid hymenium, in having ceraceous or subgelatinous consistency, usually horny when dry, narrow basidia in a dense palisade, and thin-walled spores of various appearance. Cystidia are commonly present, smooth or encrusted.

PHLEBIA VERRUCULOSA Hjortst. & Ryv. nov. spec.

Fructificatio resupinata, effusa, adnata, cremea vel ochracea, distincte granulata vel odontioides; aculeis parvis, 10-12 per mm, circiter 0.1 mm longis; margine indeterminato; systemate hyphali monomitico; hyphis tenuitunicatis, hyalinis, 3-3.5(-4) um latis, non-fibulatis; cystidiis nullis; basidiis anguste clavatis, 15-20 x 5 um, 4-sterigmatibus, basaliter non fibulatis; sporis ellipsoidibus vel subcylindraceis, hyalinis, tenuitunicatis, 4-4.5(-5) x 2-2.5 um, non-amyloidibus.

Holotypus: Africa. Tanzania. Tanga Prov. Lushoto distr., Usambara Mts., Magamba, c. 4 km N of Lushoto, alt. 1600-2000 m. 21.-22. Febr. 1973. L. Ryvarden 10859 (O).

Fruitbody resupinate, effuse, closely adnate, distinctly grandinioid to odontioid (under a lens 50X), mostly cream-coloured, margin similar, thinning out. Hyphal system monomitic, all hyphae thin-walled (swelling slightly in KOH), ab. 3-3.5(-4) um wide, without clamps, subhymenial hyphae dense and somewhat gelatinized in KOH. Cystidia lacking. Basidia narrowly clavate, ab. 15-20 x 5 um, with four sterigmata, no clamp at the basal septum. Spores ellipsoid or indistinctly subcylindrical, 4-4.5(-5) x 2-2.5 um, thin-walled, smooth and non-amyloid.

Remarks. Only known from one collection but well delimited from other species in the genus by its small spores, clampless hyphae and by its granular fructification. The species seems to be a member of the group of non-clamped Phlebias e.g. Ph. deflectens (Karst.) Ryv. and Ph. rosea (P.Henn.) Hjortst. & Ryv. In the first species scattered clamp connexions may occur but are difficult to find mainly due to the dense texture with the hyphae gelatinized in KOH. These characteristics are less pronounced in both Ph. rosea and Ph. verruculosa.

REPETOBASIDIUM John Erikss. Symb. Bot. Ups. 16(1):67, 1958.

The genus was described to accomodate species with basidial repetition and with fructification thin. Cystidia occur, spores are thin-walled, either globose to subglobose or allantoid, non-amyloid. All species seem to be rare or, as in many cases of the more or less inconspicuous species, overlooked.

REPETOBASIDIUM HASTATUM Hjortst. & Ryv. nov. spec.

Fructificatio resupinata, effusa, adnata, aliquantum tenuis, levis sed leviter pustuliformis, porulosa, in sicco plus minusve fragilis; colore albido vel fuscescenti; margine simili; systemate hyphali monomitico; hyphis basalibus distinctis, cellulis prolatis, circiter 3 um latis; hyphis subhymenialibus item distinctis, cellulis brevibus, tenuitunicatis vel crassiusculis, generatim 6-8 um latis; hyphis omnibus fibuligeris; cystidiis numerosis, lageniformibus, (50-)70-100 um longis; basidiis subglobosis vel subclavatis, cum repetitione, circiter 17 x 8 um, 4-sterigmatibus; sporis fere globosis, 6-7 um diametro, tenuitunicatis, neque amyloidibus neque cyanophilis.

Holotypus: Africa. Tanzania. Arusha Prov. Arusha Nat. Park. Lake Kusare-Ngurdoto Crater, alt. 1500-1700 m. 7.-9. Febr. 1973. L. Ryvarden 9951 (O).

Fruitbody resupinate, effuse, adnate, rather thin, more or less smooth but usually forming small pustules, porulose, fragile when dry, whitish, becoming light brown, margin similar. Hyphal system monomitic, subicular hyphae long-celled, straight, ab. 3 um wide, hyaline, subhymenial hyphae with walls thickened, commonly up to 6-8 um wide, short-celled,all hyphae with clamps, usually very small. Cystidia numerous, lageniform, with several adventitious septa, (50-) 70-100 um long. Basidia subglobose or subclavate, apparently with repetition, ab. 17 x 8 um, with 4 sterigmata. Spores nearly globose, 6-7 um in diam., thin-walled, not amyloid or cyanophilous.

Remarks. This species seems to be well defined by its subulate and lageniform cystidia, broad subhymenial hyphae and basidia with repetition. Furthermore, the spores are globose and very distinctive.
Though the new species is known from but one collection, it is very characteristic and it seems logical to place it in Repetobasidium. In general appearance and shape of the hyphae and basidia the species comes close to other species in the genus.

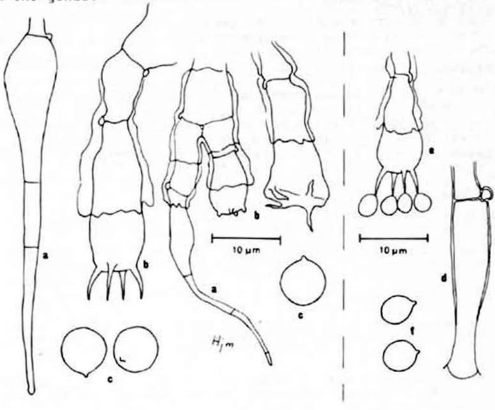


Fig. 5. Repetobasidium hastatum, coll. Ryv. 9951. a) cystidia b) basidia c) spores. R. mirificum, coll. Ryv. 10792. d) cystidium e) basidium f) spores.

REPETOBASIDIUM MIRIFICUM John Erikss. Symb. Bot. Ups. 16(1):70, 1958.

Specimen: Africa. Tanzania. Tanga Prov. Lushoto distr., Usambara Mts., Magamba c. 4 km N of Lushoto, alt. 1600-2000 m. 21.-22. Febr. 1973. L. Ryvarden 10792 (O).

Together with the preceding species the only known species in the genus from Africa. R. mirificum is new to the tropics and corresponds well with the Nordic material. The Tanzania-collection is well-developed, and the basidial repetition can easily be demonstrated. The species is a well-known taxon, especially from Northern Europe but is also reported by Oberwinkler (1965) from Central Europe (Bavaria).
Like other collections of corticiaceous fungi in the tropics, which are well-known from the temperate zone, there are always small differences in some characteristics, especially the spores size. The spores and often the basidia and hyphae also are either too small or somewhat larger than usual. This can be demonstrated also in the material of the reported species. The spores of R. mirificum in Nordic materials are usually more than 5 um across or subglobose 5-6 x 4.5-5.5 um, (cfr. the original description by John Eriksson), while Ryvarden's collection has spores 4.5 to rarely 5 um (in some cases up to 5.5um), besides they are also more regularly globose.

REFERENCES

Eriksson, John. 1958: Studies in the Heterobasidiomycetes and Homobasidiomycetes-Aphyllophorales of Muddus National Park in North Sweden. Symb. Bot. Ups. 16(1):1-172.

Eriksson, John, & Ryvarden, Leif. 1976: The Corticiaceae of North Europe. Vol.2: 60-261. Oslo.

Oberwinkler, Franz. 1965: Primitive Basidiomyceten. Sydowia, Ann. Myc. Ser.II. 19(1-3): 1-72.

MYCOTAXON

Vol. XII, No. 1, pp. 185-200 October-December 1980

CONTRIBUTION TO NEOTROPICAL CYPHELLACEOUS FUNGI - II.[1)]

DEIGLORIA GEN. NOV. (PHYSALACRIACEAE)

R. AGERER

Institut für Biologie I
Lehrstuhl Spezielle Botanik
Auf der Morgenstelle 1,
D-7400 Tübingen

Summary: The new genus *Deigloria* with four new species - *D. amoena*, *D. modesta*, *D. pulchella* and *D. pulcherrima* - is proposed; the relationship to the genus *Physalacria* as well as the deviations and similarities within the four species are discussed. *Physalacria subpeltata* is figured.

Zusammenfassung: Es wird die neue Gattung *Deigloria* mit vier neuen Arten vorgeschlagen - *D. amoena*, *D. modesta*, *D. pulchella* und *D. pulcherrima*; außerdem werden die Beziehungen zur Gattung *Physalacria* diskutiert. Die vier neuen Arten werden miteinander verglichen. *Physalacria subpeltata* wird abgebildet.

CORNER (1970) proposed the familiy *Physalacriaceae*, which SINGER (1975) rejects.[2)] Most characteristics of CORNER's family-diagnozis apply to the new genus *Deigloria*.

For the *Physalacriaceae* CORNER (1970) mentions subacerose young basidia. Two species of the new genus (*D. amoena* and *D. pulcherrima*) produce such subacerose basidioles. Another feature of the genus *Deigloria* are basidia with distinctly swollen apex and abruptly tapering sterigmata. In CORNER's figures of species of the genus *Physalacria*, however, such basidia are not drawn. However, they exist in the type species of *Physalacria* Pk. ss. Sing. sect. *Pileolina* Sing., i.e. in *P. subpeltata* Redhead (Fig. 1, and Redhead 1979).

Physalacria Pk. ss. Corner is well characterized by its

[1)] Contribution to Neotropical Cyphellaceous Fungi - I. Three New Species of *Flagelloscypha*. Mycologia 72 (5) : 908-915. 1980.

[2)] It is not the intention of the author to argue pro or contra the synonymization of Physalacriaceae with the Tricholomataceae as porposed by SINGER (1975).

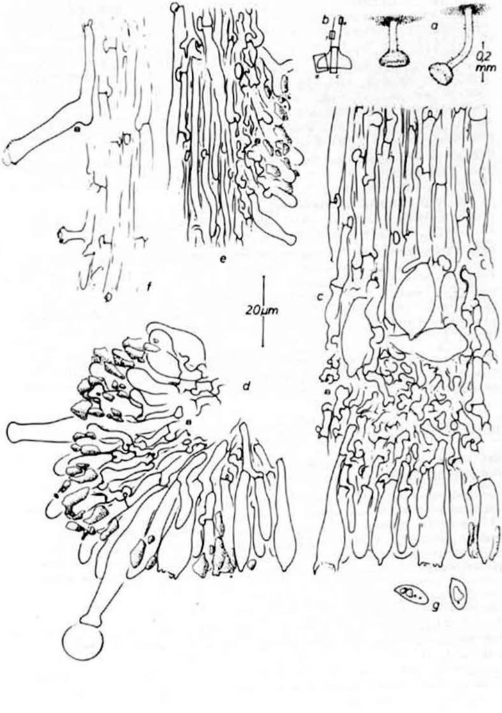
fruit-bodies. They are stalked-capitate, ageotropic, with hollow, thinwalled heads and with a hymenium covering nearly the whole head (CORNER 1950:457). In *Hormomitaria* Corner (CORNER 1950:410), another genus of the *Physalacriaceae* (fide SINGER 1976: a synonym of *Physalacria* sect. *Hormomitaria*), the head is solid and positively geotropic. *P.* sect. *Pileolina*, however, possesses Discomycete-like heads with the hymenium on the discoid surface and with a sterile exterior. *P. subpeltata* grows in culture ageotropically (REDHEAD 1979); since this species was only found by incubating palm-leaves, it is not certain, whether the fungus grows in the same manner under natural conditions. Although CORNER in his generic description indicates that species of *Physalacria* Pk. ss. Corner have a hollow head, in *P. subpeltata* the head is not hollow. Although at the upper end of the stipe there are some short, inflated cells present (fig. 1c). Because of the flat and not hollowed or (cf. SINGER 1976:311) scarcely hollowed head of *P. subpeltata* SINGER proposed an own section for this species within the genus *Physalacria* Pk. ss. Singer.

In *Deigloria* the fruit-bodies are more of less cupshaped and sometimes with a small stipe; *D. pulchella* develops a hollow stipe and some inflated hyphae in the stipe.
The oleocystidia, which mark most species of *Physalacriaceae*, differ slightly in *P. subpeltata* from those of most other species of *Physalacria* ss. Corner and *Hormomitaria* Corner. In the species drawn by CORNER (1950), the oleocystidia have a rostrate apex or are merely clavate. SINGER (1976), however, characterizes some species of this group as having oleocystidia with broadened apices. In *P. subpeltata* the oleocystidia are distictly enlarged at the apex (fig. 1d, and REDHEAD 1979). In *Deigloria* the enlarged apex produces a whorl of mostly dichotomously branched excrescences (fig. 2,3,4,5). Also in *Deigloria* as well as in *P. subpeltata* (fig. 1 d) and species of the genus *Physalacria* ss. Corner the oleocystidia mostly produce an oily globule around the apex or on it. (CORNER 1950:462,464,465). In *Deigloria* and in *P. subpeltata* this drop of exudate is not wholly soluble in alkali as CORNER indicates for species of *Physalacria*.

Two species of *Deigloria* have typical oleocystidia in the hymenium but all species show them on the sterile face of of the cup (dermato-oleocystidia). In addition to these dermato-oleocystidia, another type of cystidium can be found (both types are called 'surface-hairs' in the terminology of the cyphellologist): the second type is more

---

Fig. 1. *Physalacria subpeltata*. a. Habit of fruit-bodies. - b. Section through a fruit-body, survey. - c - f. Section through a fruit-body in detail, - c. central part of the hymenium with part of stipe, - d. edge, - e. surface of the base of the stipe, - f. surface of the middle of the stipe. - g. Spores. (All figs. from isotype, K).


b
a
a
0,2
mm
e
f
20µm
c
d
g

or less clavate or of spherical form, rostrate or with few outgrowths (broom-cells). These cystidia are encrusted with brown exudate or with hyaline crystals probably calcium-oxalate. Similar cystidia but without encrustations are described by SINGER (1976:308) in the hymenium of *P. concinna* Sydow. Hyaline crystals are sometimes present in *Physalacria* Pk. ss. Corner (*P. aggregata* Martin & Baker, fide SINGER 1976:309), they are absent in *P. subpeltata* (fig. 1 and REDHEAD 1979).

In *Physalacria* Pk. ss. Corner the hyphae are monomitic and inflated, the hymenium does not thicken and the spores are hyaline, smooth and inamyloid; all these features hold true for *P. subpeltata* and *Deigloria* spp.; in *D. amoena* and *D. pulcherrima*, however, some spores are plasmatically brownish, closely resembling old spores of some species of *Physalacria* Pk. ss. Sing. (fide SINGER 1976:305).

Summaring the above mentioned characteristics, *Deigloria* differs from *Physalacria* Pk. ss. Corner, respectively *P.* sect. *Pileolina*, in some important features:

- in cup-shaped fruit-bodies,
- two types of surface-hairs (dermatocystidia) on the same fruit-body, and oleocystidia with a whorl-like apex.

MALENÇON & BERTAULT (1975:420) figured some oleocystidia of the species *Campanella conchata* (Kühn.) Sing. One of them seems to be similar to those of the genus *Deigloria*. The ontogeny of these cystidia, however, is deviating. Furthermore the shape of spores, the gelatinous trama, a special type of acanthocystidia, epimembranary pigment and gills with sterile edge separate this species from the genus *Deigloria*.

Therefore I propose to segregate this group of fungi in a genus on their own. Because of the striking oleocystidia the genus *Deigloria* is included in the family *Physalacriaceae* Corner.

DEIGLORIA AGERER gen. nov.[3]

Differt ab *Physalacria* cupulis patinaceis vel campaniformibus oleocystidiis verticillo appendicium plus minusve dichotome lobatarum.

Cupulae patinaceae vel campaniformes, solitariae, gibbis rubris. Pili externi duobus formis: forma una (dermato-oleocystidia) elongata, verticillo appendicium plus minusve dichotome lobatarum; verticillus globosa gutta exsudati ornatus. Forma alia (cellulae scopiformes) plus minusve clavata vel rostrata vel appendicibus tenuibus paucis, incrustata exsudato brunneolo et/vel crystallis hyalinis. Pili externi not dextinoidei, interdum plasmatici-brunneoli. Hyphae tramae non gelatinosae. Cystidia in hymenio praesentia vel absentia, praesentia formae primae pilorum externorum (dermato-oleocystidia) simila. Basidia maioribus capitibus sterigmaticis conicis abrupte contractis.

---

[3] Etymology: Deus (lat.): God; gloria (lat.): glory.
Cui oculi, videat.

Sporae leves, hyalinae vel plasmatici-brunneolae, nec amyloideae nec dextrinoideae.

Typus generis: *Deigloria pulchella* Agerer.

Fruit-bodies solitary, cup- or bellshaped, with more or less densely crowded globular dark red or reddish-brown knobs. Two types of surface hairs: (1) (dermato-oleocystidia) elongated, with a whorl of nearly dichotomously lobed radiating excrescences bearing a globular drop of more or less reddish-brown exudate; (2) more or less clavate with a single beak-like or few slender outgrowths (broom-cells) encrusted with hyaline crystals and/or with brownish exudate; surface hairs non-dextrinoid; trama not gelatinous. Hymenium with or without cystidia. Basidia with a distinctly swollen apex, with conical, curved abruptly tapering sterigmata. Spores hyaline or plasmatically brownish, smooth, neither dextrinoid nor amyloid.

Type-species: *Deigloria pulchella* Agerer.

The macroscopical and microscopical characteristics of the up to now known species of the genus *Deigloria* are very conspicuous. In no description of neotropical species or others are characteristics like those of these four species mentioned.

KEY TO THE SPECIES OF DEIGLORIA

1 Hymenium with oleocystidia..2
  2 Fruit-bodies with a basal mycelial mat with red margin
    D. pulcherrima
  2 Fruit-bodies seated directly on the substrate
    D. amoena
1 Hymenium without oleocystidia.......................................3
  3 Dermato-oleocystidia crowded on the margin of the fruit-body, rare on the outer surface, second type of surface hair rostrate; spores subfalciform with a distinct beak
    D. modesta
  3 Dermato-oleocystidia more or less dense over the whole outer surface of the cup, absent on the stipe, second type of surface hair broom-cell-like; spores spindle-shaped
    D. pulchella

DEIGLORIA AMOENA AGERER spec. nov.[4]

Typus: Colombia, Dpto. Cundinamarca, Robledal, between km posts 16 - 17 from Mosquera, on the Mosquera - La Mesa Road, on indet. fern rachis, 8600 ft. Dumont & Idrobo, 21. 12. 1975 (Holotypus CO-2031 in NY).

---

[4] Etymology: amoena (lat.): beautiful

Figure 2

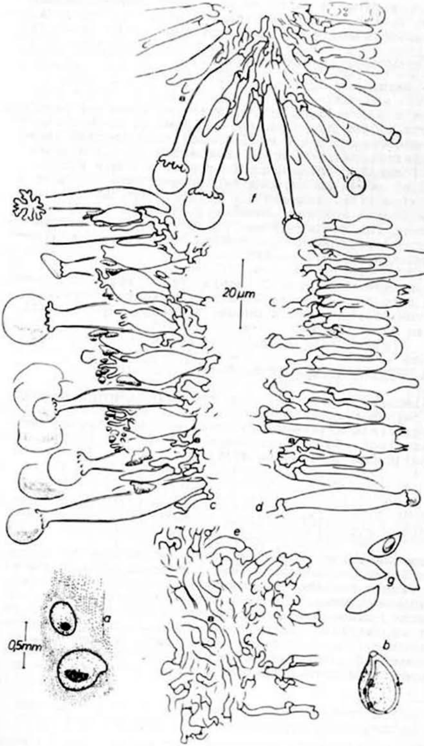
Differt ab *D. pulchella* et *D. modesta* oleocystidiis in hymenio praesentibus, ab *D. pulcherrima* storea myceliale absente et cellulis scopiformibus in margine cupulae absentibus.

Cupulae asymmetrici-patinaceae vel asymmetrici-campaniformes, stipitatae, solitariae, usque ad 0.6 mm longae et in diametro, brunneolae, gibbis atro-sanguineis (in microscopio gibbae cupreae coloratae), storea mycelialis absens. Pili externi duobus formis: forma una (dermato-oleocystidia) 30 - 45 x 5 - 8 µm, verticillo appendicium dichotome lobatarum instructa; verticillus usque ad 20 µm in diametro, globosa gutta exsudati usque ad 20 µm in diametro ornatus; forma prima pilorum externorum subcrassitunicata (tunica usque ad 0.5 µm crassa), fibuligera. Forma alia (cellulae scopiformes) usque ad 25 x 10 µm, clavata, saepe substipitata, fibuligera, appendicibus 2 - 5, usque ad 7 µm longis et ca. 1 µm in diametro, incrustatis exsudato brunneolo; in margine cupularum non appendicibus instructa sed rostrata. Pili externi hyalini, interdum plasmatici-subbrunneoli. Hyphae tramae non agglutinatae, fibuligerae, 1.5 - 3.5 µm in diametro. Hymenium albidum, guttis exsudati atro-sanguinei exornatum (in microscopio exsudatum cupreum coloratum). Oleocystidia dermato-oleocystidia similia, 30 - 40 x 5 - 8 µm, fibuligera, verticillo usque ad 10 µm in diametro, gutta exsudati globosa, ad 10 µm in diametro ornato. Basidia maioribus capitibus, (28) 32 - 37 (40) x 7 - 8 (9) µm, fibuligera, 4-sterigmatica, sterigmatibus conicis abrupte contractis. Basidiola subacerosa praesentia. Sporae asymmetrici-ellipticae vel subnaviculares, interdum plasmatici-brunneolae, 10 - 11 x 4.5 - 5 µm, ca. 10.5 µm longae, proportio sporarum ca. 2.2; nec amyloideae nec dextrinoideae.

Fruit-bodies asymmetrically cup- or bellshaped, with a short stipe, solitary, up to 0.6 mm high and in diam., brownish coloured with garnet-red, globular knobs of exudate, without a basal mycelial mat. Two types of surface hairs: (1) (dermato-oleocystidia) 30 - 45 x 5 - 8 µm with a whorl of nearly dichotomously lobed radiating excrescences up to 20 µm in diam., apex with a globular drop of exudate up to 20 µm in diam., in transmitting light copper coloured; surface hairs slightly thickwalled, walls up to 0.5 µm thick, with clamps at the base; (2) (broom-cells) up to 25 - 10 µm, clavate, often with a small stipe, clamped at the base, the apex with 2 - 5 outgrowths up to 7 µm long and about 1 µm in diam., on the margin of the fruit-body only rostrate, encrusted with brownish exudate. Surface hairs sometimes slightly plasmatically brownish. Hyphae of the trama not agglutinated, 1.5 - 3.5 µm in diam. with clamps. Hymenium whitish with dark red globules of exudate. Oleocystidia with the same shape as the dermato-oleocystidia, 30 - 40 x 5 - 8 µm, whorl up to 10 µm in diam., with a globular drop of copper-coloured exudate, up to 10 µm in diam., with clamps at the base. Basidia with a

---

Fig. 2. *Deigloria amoena*. a. Habit of fruit-bodies. - b. Section through a fruit-body, survey. - c - f. Section through a fruit-body in detail, - c. outer surface from the middle, - d. hymenium from the midth, - f. trama from the middle, - f. edge. - g. Spores (All figs. from holotype CO-2031, NY).


f
20 µm
c
d
e
g
a
0,5mm
b

distinctly swollen apex, (24) 30 - 35 (40) x 7 - 9 (10.5) µm[5] with four conical curved abruptly tapering sterigmata, clamped at the base. Basidioles subcerose. Spores asymmetrically ellipsoid to slightly naviculate, 10 - 12 (13) x 4.5 - 5.5 µm, hyaline or slightly plasmatically brownish, on the average 10.5 - 11.7 µm long, with sporefactor 2.1 - 2.3; neither amyloid nor dextrinoid.

Substrate: fern.

Discussion: Just as *Deigloria pulcherrima* develops oleocystidia in the hymenium so too does *D. amoena*. However, the oleocystidia are smaller and this species lacks the characteristically mycelial mat which *D. pulcherrima* (fig. 5b,e) exhibits; the second type of surface hair (broom-cells) seems to be somewhat bigger than those of *D. pulcherrima* (fig. 2c vs. 5d). Moreover the basidia of *D. pulcherrima* are smaller. Another difference is found on the margin of the fruit-bodies: *D. pulcherrima* develops typical broom-cells (fig. 5c) whereas *D. amoena* only develops rostrate cells (fig. 2f).

Further specimen examined: Colombia, Dpto. Valle del Cauca, ca. 83 km from Buga, on the Buga - Buenaventura Road, on indet. leaves (fern?), 380 m Dumont & Molina, 30. 8. 1976 (CO-7563 in NY).

DEIGLORIA MODESTA AGERER spec. nov. [6]

Typus: Colombia, Dpto. Chocó, on the Quibdó-Medellin Road, at a point ca. 155 km from the intersection with the Medellin - Ansermanuevo Road, ca. 1800 ft, on indet. fern leaf, Dumont, Carpenter & Sherwood, 10. 8. 1976 (Holotypus CO-6020 in NY).

Figure 3

Differt ab *D. amoena* et *D. pulcherrima* oleocystidiis in hymenio absentibus, ab *D. pulchella* cupulis non profundis, cellulis rostratis crystallis hyalinis incrustatis, stipite non excavato.

Cupulae subpatinaceae, stipitatae, solitariae, usque ad 0.3 mm longae et usque ad 0.6 mm in diametro, albidae, tomentosae, gibbis sanguineis ornatae in margine cupularum frequenter, extrinsecus rariter (in microscopio gibbae ochraceae coloratae); storea mycelialis absens. Pili externi duobus formis: forma una (dermato-oleocystidia) 28 - 48 x (5) 6.5 - 8 µm, verticillo appendicium dichotome lobatarum instructa; verticillus usque ad 10 µm in diametro, globosa gutta exsudati usque ad 15 µm in diametro ornatus; forma prima pilorum externorum paulo subcrassitunicata, fibuligera. Forma alia (cellulae rostratae) 15 - 28

---

[5] In the Latin diagnozis only the measurements of the type are described, in the English description all specimens are taken into account.

[6] Etymology: modesta (lat.): modest

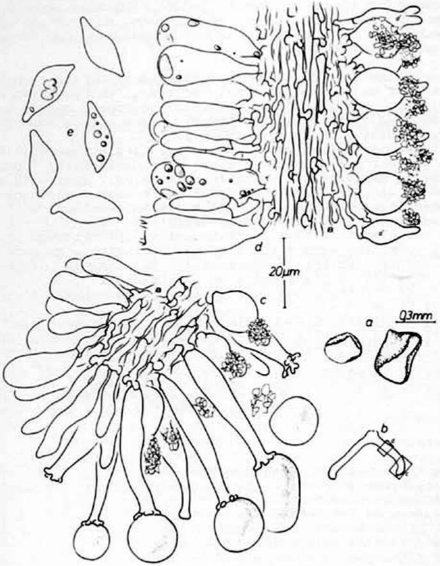


Fig. 3. *Deigloria modesta*. a. Habit of fruit-bodies. - b. Section through a fruit-body, survey. - c. Section through a fruit-body, detail of the middle. - e. Spores. (All figs. from holotype, CO-6020, NY).

x 6.5 - 11.5 µm, clavata, rostrata, fibuligera, interdum substipitata appendicibus 1 - 2, incrustatis crystallis hyalinis, in HCl rapide solventibus. Pili externi hyalini, interdum plasmatici-subbrunneoli. Hyphae tramae non agglutinatae, fibuligerae, (1.5) 2 - 3.5 (4.5) µm in diametro. Hymenium albidum, guttae exsudatae absentes. Basidia maioribus capitibus, 28 - 32 x 12 - 13 µm, fibuligera, 4-sterigmatica, sterigmatibus conicis abrupte contractis. Basidiola subacerosa absentia. Sporae subfalcisporae-similis vel subnaviculares, 16.5 - 20 x 7 - 8.5 µm hyalinae, ca. 18.5 µm longae; porportio sporarum ca. 2.4; nec amyloideae nec dextrinoideae.

Fruit-bodies shallow, cupshaped with distinct stipe, up to 0.3mm high and 0.6 mm in diam., solitary, whitish with a reddish brown margin, finely hairy or pruinose, margin with crowded red globular knobs, however, rare on the outer surface, without a basal mycelial mat.
Two types of surface hairs: (1) (dermato-oleocystidia) 28 - 48 x (5) 6.5 - 8 µm, with a whorl of dichotomously lobed radiating excrescences up to 10 µm in diam., apex with a globular drop of exudate up to 15 µm in diam., in transmitting light reddish brown, slightly thickwalled, with clamps at the base. (2) (broom-cells) 15 - 28 x 6.5 - 11.5 µm, clavate with a rostrate apical end, clamped at the base, sometimes with a small stipe, encrusted with somewhat angular hyaline in hydrochloric acid rapidly dissolving crystals. Surface hairs not dextrinoid.
Hyphae of the trama not agglutinated, with clamps, (1.5) 2 - 3.5 (4.5) µm in diam.
Hymenium whitish, without oleocystidia and without red drops. Basidia with a swollen apex, 28 - 32 x 12 - 13 µm, with four sterigmata, clamped at the base. Without basidioles.
Spores subfalciform with a distinct beak, 15.5 - 19 (20) x (5.5) 6.5 - 8 (8.5) µm, hyaline, on the average 16.5 - 18.5 µm long, sporefactor about 2.4 - 2.6; neither amyloid nor dextrinoid.

Substrate: fern

Discussion: Both *Deigloria modesta* and *D. pulchella* lack hymenial oleocystidia, however, several characteristics distinguish *D. modesta* from *D. pulchella*.
The cupshaped fruit-bodies are shallow (fig. 3 a, b), those of *D. pulchella* are much deeper (fig. 4 a, b). The stipe of *D. pulchella* is hollow (fig. 4 b), that of *D. modesta* is solid (fig. 3b). The dermato-oleocystidia are crowded in *D. modesta* on the margin of the cup and are rare on the outside (fig. 3 c, d), in *D. pulchella* they grow more or less densely over the whole exterior (fig. 4 c, d). While the dermato-oleocystidia of both species correspond, the broom-cells deviate markedly: in *D. modesta* they are clavate with a rostrate apex and hyaline encrustations (fig. 3 d), in *D. pulchella* they possess a few thin excrescences and the cells are encrusted with brownish exudate (fig. 4 c, d), (hyaline crystals appear only on the stipe (fig. 4 f)); these outgrowths and the cells bearing them are thinwalled in *D. modesta* (fig. 3 d), but slightly thickwalled in

D. pulchella (fig. 4 c, d, f). The spores show apparent deviations too: the spores of *D. modesta* are subfalciform with a distinct beak (fig. 3 e) unlike those of *D. pulchella*, which are spindle-shaped (fig. 4 g).

Further specimen examined: Colombia, Dpto. Cundinamarca Vicinity km post 40 from Zipaquirá, on the Zipaquirá - Pacho Road, on indet. fern-rachis, ca. 2500 m, Dumont, Carpenter, Sherwood & Molina, 9. 6. 1976 (CO-4327, NY).

DEIGLORIA PULCHELLA AGERER spec. nov,.[7]

Typus: Colombia, Dpto. Cundinamarca ca. 28 km from Mosquera, on the Mosquera - La Mesa Road, ca. 6000 ft., on indet. herbaceous stem, Dumont & Luteyn, 3. 1. 1976 (Holotypus CO-2051, NY).

Figure 4

Differt ab *D. amoena* et *D. pulcherrima* oleocystidiis in hymenio absentibus, ab *D. modesta* cupulis profundis et stipite excavato et cellulis scopiformibus.

Cupulae campaniformes, stipitatae, solitariae, usque ad 1 mm longae, brunneolae, gibbis atro-sanguineis (in microscopio gibbae subbrunneolae coloratae), storea mycelialis absens. Pili externi duobus formis: forma una (dermato-oleocystidia) 38 - 48 x 6 - 8 µm, verticillo appendicium dichotome lobatarum instructa; verticillus usque ad 10 µm in diametro, globosa gutta exsudati usque ad 15 µm in diametro ornatus; forma prima pilorum externorum crassitunicata (tunica usque ad 1 µm crassa), fibuligera, ex strato inferiore tramae oriens. Forma alia (cellulae scopiformes) 18 - 23 x 11 - 15 µm, subcrassitunicata, clavata, interdum subglobosa, saepe substipitata, fibuligera, appendicibus 1 - 7, usque ad 10 µm longis et ca. 1 µm in diametro, incrustatis exsudato brunneolo; in stipitis tantum cellulae scopiformes praesentes, appendicibus usque ad 20 µm longis, incrustatis crystallis hyalinis angulatis, in HCl rapide solventibus. Pili externi hyalini, interdum plasmatici-brunneoli. Hyphae tramae subagglutinatae, fibuligerae, 2 - 4.5 (6) µm in diametro; hyphae stipitis tenere textae, usque ad 10 µm in diametro, in spatio inter hyphas crystallis hyalinis aggregatis, stipes in centro excavatus. Hymenium albidum, guttae exsudatae absentes. Basidia maioribus capitibus, 26.5 - 30.5 x (8) 10.5 - 12 µm, fibuligera, 4-sterigmatica, sterigmatibus conicis abrupte contractis. Basidiola subacerosa absentes. Sporae fusiformes, 16 - 17.5 (18.5) x 5.5 - 6.5 µm, hyalinae, ca. 17 µm longae, proportio sporarum ca. 2.8; nec amyloideae nec dextrinoideae.

Fruit-bodies bell-shaped with a distinct stipe, up to 1 mm high, solitary, surface warty, brownish with garnet-red globular knobs, without basal mycelial mat. Two types of surface hairs: (1) (dermato-oleocystidia) 38 - 48 x 6 - 8 µm, with a whorl up to 10 µm in diam. of dichotomously lobed radiating excrescences; apex with a globular drop of exudate up to 15 µm in diam., in transmitting light brownish,

---

[7] Etymology: pulchella (lat.): pretty

thickwalled (with walls up to 1 µm thick), with clamps at the base, arising from a deeper tramal layer. (2) (broom-cells) 18 - 23 x 11 - 13 µm, with thick walls, clavate, sometimes almost globose; often with a small stipe, clamped at the base, the apex with 1 - 7 thickwalled outgrowths up to 10 µm long and about 1 µm in diam., encrusted with brownish exudate, on and in the stipe only with hyaline angular crystals rapidly dissolving in hydrochloric acid, the stipe only with broom-cells with outgrowths up to 20 µm long. Surface hairs not dextrinoid, sometimes plasmatically brownish, hyphae of the trama slightly agglutinated, with clamps, 2 - 4.5 (6) µm in diam.; hyphae of the stipe loosely woven, inflated, up to 10 µm in diam., with hyaline crystals in the interstices, stipe centrally hollow. Hymenium whitish, without oleocystidia and without exudate. Basidia with a swollen apex, 26.5 - 30.5 x 10.5 - 12 µm, four conical curved abruptly tapering sterigmata, clamped at the base. Without subacerose basidioles. Spores spindle-shaped 16 - 17.5 (18.5) x 5.5 - 6.5 µm, hyaline, on the average about 16.9 µm long, sporefactor about 2.8; neither amyloid nor dextrinoid.

Substrate: herbaceous stem

Discussion: The difference with *D. modesta* are discussed under that species.

DEIGLORIA PULCHERRIMA AGERER spec. nov. [8)]

Typus: Colombia, Dpto. Cundinamarca, Road between Mosquera and La Mesa, W of Bogota, km 16, on fern, 2650 m, Oberwinkler, Dumont, Ryvarden & Buriticá, 8. 6. 1978 (Holotypus FO 26464, TUB).

Figure 5

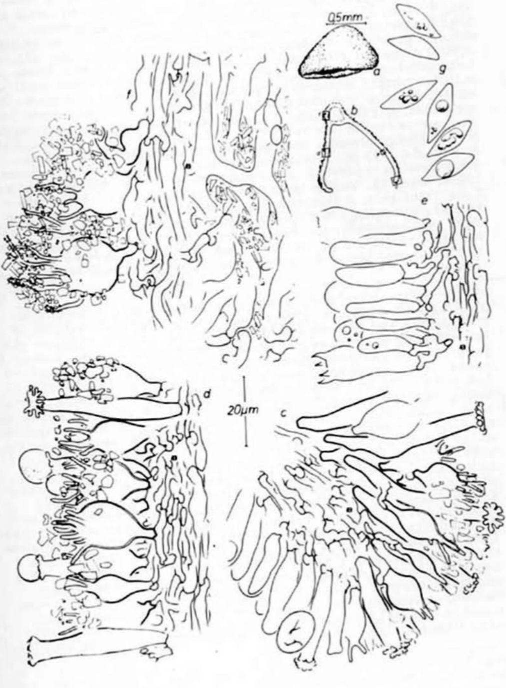
Differt ab *D. modesta* et *D. pulchella* oleocystidiis in hymenio praesentibus, ab *D. amoena* storea myceliale et cellulis scopiformibus in marginis praesentibus.

Cupulae patinaceae vel campaniformes, non stipitatae, usque ad 0.8 mm longae et in diametro, sitae in storea myceliale margine sanguinea usque ad 0.4 mm in diametro; cupulae cineraceae, pulveraceae, gibbis atro-sanguineis (in microscopio gibbae ferrugineae coloratae), in margine nitide atro-sanguineae. Pili externi duobus formis: forma una (dermato-olecystidia) (25) 35 - 70 (120) x 6.5 - 10 (12) µm, verti-

---

8) Etymology: pulcherrima (lat.): magnificient

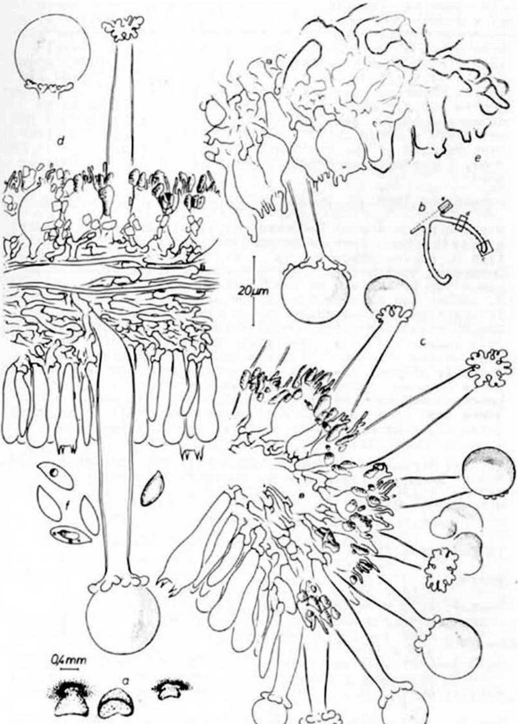
Fig. 4. *Deigloria pulchella*. - a. Habit of a fruit-body. - b. Section through a fruit-body, survey. - c - f. Sections through a fruit-body in detail, - c. edge -d. outer surface from the middle, - e. hymenium from the middle, - f. Wall of the stipe. - g. Spores. (All figs. from holotype, CO-2051, NY).


0.5mm
a
b
g
e
f
c
d
20µm
c

cillus usque ad 20 µm in diametro, globosa gutta exsudati usque ad 30 µm in diametro ornatus; forma prima pilorum externorum subcrassitunicata (tunica usque ad 0.5 (1) µm crassa), fibuligera, ex strato inferiore tramae oriens. Forma alia (cellulae scopiformes) usque ad 18.5 x 16 µm, clavata, interdum subglobosa, saepe substipitata, fibuligera, appendicibus 1 - 6, usque ad 7 µm longis et ca. 1 µm in diametro, incrustatis exsudato brunneolo et crystallis hyalinis angulatis; crystalli hyalini frequenter extrinsecus cupulae. Utraeque formae pilorum externorum in storea myceliale sitae; margine storea mycelialis cellulae tunicis ochraceis, crassitunicatae, interdum verrucatae. Pili externi hyalini, interdum plasmatici-subbrunneoli. Hyphae tramae non agglutinatae, fibuligerae, 1.5 - 3.5 (6) µm in diametro. Hymenium albidum, guttis exsudati atro-sanguinei instructum (in microscopio gibbae ferrugineae coloratae). Oleocystidia dermato-oleocystidia similia, 40 - 70 x 6 - 12 µm, fibuligera, verticillo usque ad 16 µm in diametro, gutta exsudati globosa 30 µm in diametro ornato, ex strato inferiore tramae orientia. Basidia maioribus capitibus 23.5 - 26.5 (28) x 6 - 7 µm, fibuligera, 4-sterigmatica, sterigmatibus conicis abrupte contractis. Basidiola subacerosa praesentia. Sporae asymmetrici-ellipticae vel asymmetrici-ovoideae, 9.5 - 11.5 x 4 - 5 (5.5) µm, hyalinae vel saepe plasmatici-brunneolae, saepe in exsudato inclusae, ca. 10.5 µm longae, proportio sporarum ca. 2.3; nec amyloideae nec dextrinoideae.

Fruit-bodies cup- or bellshaped, stipeless, up to 0.8 mm high and in diam., sitting in a white mycelial mat, with a distinct red margin, up to 0.4 mm in diam.; surface greyish powdery with distinctly dark red-brown knobs, toward the margin dark reddish-brown and shiny. Two types of surface hairs: (1) (dermato-oleocystidia) (25) 35 - 70 (120) x 6.5 - 10 (12) µm, with a whorl of nearly dichotomously lobed radiating excrescences, apex up to 20 µm in diam. with a globular drop of exudate up to 30 µm in diam., in transmitting light reddish-brown, slightly thick-walled, (with walls up to 0.5 (1) µm thick, with clamps at the base, arising from a deeper tramal layer. (2) (broom-cells) up to 18.5 x 16 µm, clavate, sometimes almost globose, often with a small stipe, clamped at the base, the apex with 1 - 6 outgrowths up to 7 µm long and about 1 µm in diam., encrusted with brownish exudate or with slightly angular hyaline crystals found mostly in the middle of the outer surface of the fruit-body (causing the greyish tinge); two types of surface hairs present in the basal mycelial mat; the margin of the mat with cells exhibiting membranary brownish tinged walls (causing the reddish margin), thick walled, sometimes warty. Surface hairs sometimes plasmatically brownish. Hyphae of the trama not agglutinated, with clamps, 1.5 - 3.5 (6) µm in diam. Hymenium whitish

Fig. 5. *Deigloria pulcherrima*. - a. Habit of fruit-bodies. - b. Section through a fruit-body; survey. - c. Section through a fruit-body, detail of the edge. - d. Section through a fruit-body, detail from the middle. - e. Section through the basal mycelial mat of the fruit-body, detail of the edge. - f. Spores. (All figs. from holotype, FO 26464, TUB).


d
e
b
20µm
c
f
0,4mm
a

with dark red globules. Oleocystidia with the same shape as the dermato-oleocystidia, 40 - 70 x 6 - 12 µm, whorl up to 16 µm in diam. with globular drop of reddish-brown exudate up to 30 µm in diam. arising from a deeper tramal layer, with clamps at the base. Basidia with swollen apex, 23.5 - 26.5 (28) x 6 - 7 µm, with four conical curved abruptly tapering sterigmata, clamped at the base. With subacerose basidioles. Spores asymmetrically ellipsoid to asymmetrically ovoid, 9.5 - 11.5 x 4 - 5 (5.5) µm, hyaline or mostly plasmatically brownish, often embedded in brownish exudate of the oleocystidia, on the average 10 - 11 µm long, sporefactor about 2.3; neither amyloid nor dextrinoid.

Substrate: fern

Discussion: The basal mycelial mat of *D. pulcherrima* is the best feature to distinguish it macroscopically from *D. amoena* (fig. 2 b vs. 4 b). Moreover *D. pulcherrima* possesses together with dermato-oleocystidia broom-cells almost up to the rim of the fruit-body (fig. 5 c), whereas *D. amoena* has in addition to the dermato-oleocystidia merely rostrate surface hairs on the rim of the cup (fig. 2 f). The mycelial mat differs well from a normal subicular layer (cf. Agerer 1973:416). Deviating from a subiculum this part of the fruit-body forms a definite border with differently shaped, coloured cells. This line can be seen under a lens as a more or less red rim around the white patch. Sometimes the marginal cells bear few warts and it seems that these cells are pigmented parietally. The other deviating microscopically features are discussed under *D. amoena.*

Further specimen examinded: Colombia, Dpto. Antioquia, Caldas of Medellin, forest above Hacienda Himalya, 1750 - 1800 m, Oberwinkler, Dumont & Ryvarden, 25.- 26. 6. 1978 (FO 27421, TUB).

LITERATURE CITED

Agerer, R. (1973) - *Rectipilus.* Eine neue Gattung cyphelloider Pilze. Persoonia 7: 389 - 463.

Corner, E. J.H. (1950) - A Monograph of *Clavaria* and Allied *Genera.* Reprint 1967, Dawsons of Pall Mall.

- (1970) - Supplement to "A Monograph of *Clavaria* and Allied *Genera.*" Cramer. Lehre.

Malençon, G. & R. Bertault (1975) - Flore des Champignons Superieures du Maroc II. Rabat.

Singer, R. (1975) - Agaricales in Modern Taxonomy. Cramer, Vaduz.

- (1976) - Marasmieae (Basidiomycetes-Tricholomataceae). Flora Neotropica. Monograph 17.

Redhead, S. A. (1979) - *Physalacria subpeltata* sp. nov. from Hawaii. Mycotaxon 10 (1) : 46 - 48.

MYCOTAXON

Vol. XII, No. 1, pp. 201-218 October-December 1980

NOTES ON THE ORIGINAL SPECIES OF CERCOSPORINA

BY B.C. SUTTON

Commonwealth Mycological Institute, Kew, Surrey

AND

N. PONS

C.I.A.R.C.O., Estacion Experimental de Araure,
Araure, Venezuela

Abstract

The history of *Cercosporina* Speg. and its typification is discussed. Based on the lectotype species *C.asparagicola* Speg. it becomes a later synonym of *Cercospora* Fres. Notes on the status and identity of the thirteen original *Cercosporina* species are provided.

The following study arose out of an attempt to determine the generic relationships of *Cercospora pachyderma* Syd., an unusual fungus with distoseptate hyaline cicatrized conidia that is incorrectly placed in *Cercospora*. The name was transferred to *Cercosporina* Speg. by Saccardo in Trotter (1931) but there has been some confusion over the nomenclatural and taxonomic status of this genus. The name *Cercosporina* was introduced by Spegazzini (1910) who at that time assigned thirteen species to it. None was designated as the type species. Subsequently more than one hundred species have been added to the genus although some were later removed to *Cercospora* Fres., *Cercosporidium* Earle or *Pseudocercospora* Speg. by different mycologists. On the whole *Cercosporina* has not been a fashionable genus and except for the sporadic description of new species, few recent additions have been made to it. Apart from its introduction by Spegazzini (1910) only Saccardo in Trotter (1931) and Miura (1928) have substantially enlarged the genus. On the other hand Clements & Shear (1931), Vassiljevsky & Karakulin (1937) and Chupp (1954) have regarded *Cercosporina* as a synonym of *Cercospora*.

The generic description ran 'Biogena foliicola caespitulosa; caespituli erumpentes ex hyphis olivaceis apice denticulatis simplicibus efformati; conidia vermicularia pluri-septata hyalina. Genus a *Cercosporella* hyphis olivaceis, a *Cercospora* conidiis hyalinis recedens.' By modern standards such criteria for distinguishing a genus in the Deuteromycotina are inadequate, for no information is given on conidiogenesis, conidiophore or conidial morphology. In the *Cercospora* complex it is particularly important to have details of conidiogenous loci, growth of the conidiogenous cells before and after conidial production and conidial pigmentation and scar production. It is therefore difficult to conceive what Spegazzini had in mind as characterizing his genus, particularly when his comment about its differences from *Cercospora* are taken into consideration. *Cercospora*, as typified by *C.apii* Fres., is known to have hyaline conidia, whereas Spegazzini distinguished his new genus *Cercosporina* from *Cercospora* because it had hyaline conidia! Chupp (1954) clearly exposed this error, and it is highlighted by the removal of *Cercospora apii* to *Cercosporina* by Miura (1928).

Clements & Shear (1931) listed *Cercosporina asparagicola* Speg. as the type species, presumably because this was the first one listed by Spegazzini in the genus. This should serve as the lectotype species unless there are cogent arguments against it. Clements & Shear (1931) provided no reasoning for their decision, and the generic diagnosis was sufficiently vague as to allow any one of the thirteen original taxa to be selected. Examination of Spegazzini's material shows that all but two of the original species are true *Cercospora* species. The implied lectotypification is accepted.

Vassiljevsky & Karakulin (1937) transferred the name *Cercosporina asparagicola* to *Cercospora*, and Chupp (1954) placed the name in synonymy with the well-known common species *Cercospora asparagi* Sacc. Both authors formally reduced *Cercosporina* to synonymy with *Cercospora*, a decision which is endorsed here as a result of the examination of Spegazzini's *Cercosporina* type collections. Consequently *Cercosporina* is not available to accommodate *Cercospora pachyderma* Syd. and alternative generic names must be examined before the species is satisfactorily placed.

Notes on Spegazzini's *Cercosporina* species

1) *C. asparagicola* Speg., *An. Mus. nac. B.Aires* 20: 424 (1910).

The type collection was in very poor condition and neither conidiophores nor conidia were found. The typical lesions, normally attributable to *Cercospora asparagi* Sacc. were present with immature caespitular stromata. The symptoms alone suggest that the synonymy proposed by Chupp (1954) and accepted by Viegas (1961) is correct. Spegazzini's illustration on the packet shows caespitulose, flexuose, nodulose conidiophores but no distinct scars. In fact the loci depicted are very similar to those found in *Pseudocercospora*. A single conidium was figured with a distinct thickened basal scar which is inconsistent with *Pseudocercospora*.

Accepted name:-

Cercospora asparagi Sacc., *Michelia* 1: 88 (1878).
Cercosporina asparagicola Speg., *ibid.*
Cercospora asparagicola (Speg.) Vassiljevsky apud Vassiljevsky & Karakulin, Fungi Imperfecti Parasitici. Pars.I. Hyphomycetes (Moscow): 296 (1937).

Material examined:-

On *Asparagus officinalis*, La Plata, Argentina, C. Spegazzini 4966, 6 May 1906, holotype *C. asparagicola* ex LPS (IMI 247001); Boyomo, Cuba, R. Urtiaga 954, 14 Sept. 1967, IMI 129568; Limuru, Kenya, N.K. Patel 3422, Nov. 1968, IMI 136463; *Asparagus plumosus*, Ho Chung, Hong Kong, R.I. Leather CB 438, 13 Dec. 1966, IMI 125811; Tafo, Ghana, S.J. Hughes 1354, 18 June 1949, IMI 39885; *Asparagus* sp., Limbe, Malawi, W.T.H. Peregrine SIB 250, 25 Mar. 1968, IMI 132447; Malawi, M.A. Siddiqui SIB 1076, 13 June 1970, IMI 149564; Brunei, W.T.H. Peregrine SIB 250, IMI 154080; Ruwa, Zimbabwe, A.Rothwell MR 25272, 13 Mar. 1974, IMI 183512; Salisbury, Zimbabwe, A. Rothwell MR 23885, 24 Jan. 1971, IMI 156389; Lusaka, Zambia, A. Angus M 1470, 16 Apr. 1962, IMI 95808; Ho Chung, Hong Kong, R.I. Leather CB 273, 28 June 1966, IMI 122024.

2) *C. caracallae* Speg., *An. Mus. nac. B. Aires* 20: 425 (1910).

The type showed hypophyllous caespituli and conidiophores 50-85 x 5-6 m that are very geniculate towards the apices with many thickened scars. The latter were figured clearly by Spegazzini in illustrations accompanying the material but not by Chupp (1954). Few conidia were present: they were comparatively short, hyaline, and with the typical basal thickened scar, and measured up to 50 m long x 3.5 m at the widest part.

This species is a good *Cercospora* and previous mycologists have arrived at the same conclusion. Vassiljevsky apud Vassiljevsky & Karakulin (1937), Greene (1944), Chupp and Viegas (1945) and again Chupp (1954) have each independently transferred the name to *Cercospora*. The conidiophores seem to be too short and closely geniculate for typical *C. canescens* Ell. & Mart. which is known from a wide host range within the Leguminosae, so for the moment the species is maintained as distinct.

Accepted name:-

Cercospora caracallae (Speg.) Vassiljevsky apud Vassiljevsky & Karakulin, Fungi Imperfecti Parasitici. Pars. I. Hyphomycetes (Moscow): 294 (1937).
Cercosporina caracallae Speg., *ibid.*
Cercospora caracallae (Speg.) Greene, *Trans. Wisc. Sci. Arts Lett.* 35: 132 (1944).
Cercospora caracallae (Speg.) Chupp **apud** Viegas, *Bol. Soc. Bras. agron.* 8: 15 (1945).
Cercospora caracallae (Speg.) Chupp, A Monograph of the Fungus Genus Cercospora: 289 (1954).

Material examined:-

On *Phaseolus caracalla,* Tucuman, Argentina, C. Spegazzini 4049, 14 Apr. 1906, holotype *C. caracallae* ex LPS (IMI 120631).

3) *C. daturicola* Speg., *An. Mus. nac. B. Aires* 20: 425 (1910).

The type was in poor condition and no intact conidia could be found. Nevertheless, the bases were thickened, each with a distinctive scar. Such pieces of conidia that were found corresponded with Spegazzini's illustrations accompanying the type packet. Conidiophores were much shorter, 35-50 m long, than in other conspecific material in herb.

IMI, and showed only 1-2 cicatrized scars.

The name was transferred to *Cercospora* by Vassiljevsky apud Vassiljevsky & Karakulin (1937) and later by Ray (1944) with *Cercospora abchazica* Siem. in synonymy. Chupp (1954) accepted the conclusions of Ray, but the latter did not examine the holotype and Chupp does not state whether he did or did not. Notes filed with material in herb. IMI by Mr. F.C. Deighton suggest that *C. daturicola* is scarcely distinct from either *C. apii* or *C. nicotianae* Ell. & Ev.

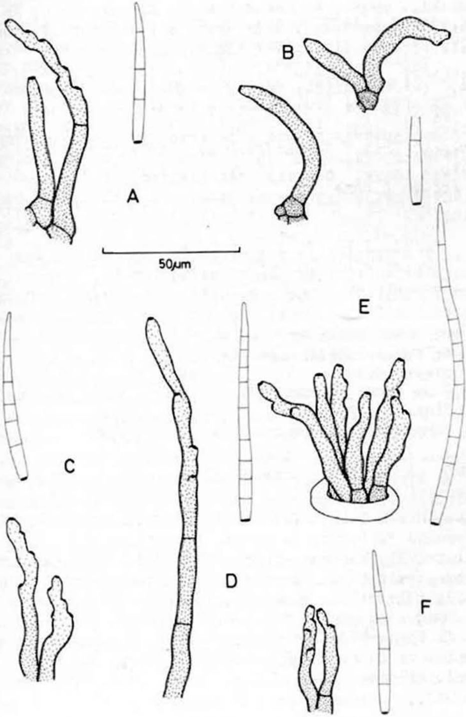
Accepted name:-

Cercospora daturicola (Speg.) Vassiljevsky apud Vassiljevsky & Karakulin, Fungi Imperfecti Parasitici. Pars. I. Hyphomycetes (Moscow): 347 (1937).
Cercosporina daturicola Speg., *ibid.*
Cercospora daturicola (Speg.) Ray, *Mycologia* 36: 175 (1944).

Material examined:-

On *Datura stramonium*, La Plata, Argentina, C. Spegazzini 12.774, Apr. 1904, holotype *C. daturicola* ex LPS (IMI 247003); Rajpur, India, Choudhury 13, Dec. 1967, IMI 132066; Kanpur, India, B.K. Singh, 18 Sept. 1963, IMI 103833 b; *Datura fatuosa*, Presidency Coll., Calcutta, India, M. Mandal C-1306, 15 Sept. 1967, IMI 136034; Mandalay, Burma, M. Thaung 4, 26

Fig. 1. A, *Cercospora caracallae* (IMI 120631), conidiophores and conidium; B, *C. daturicola* (IMI 247003), conidiophores and base of a broken conidium; C, *C. hydrangeae* (IMI 247005), conidiophores and conidium; D, *C. sphaeralceicola* (IMI 247011), conidiophore and conidium; E, *C. elongata* (IMI 247004), fascicle of conidiophores and conidium; F, *C. tetragoniae* (IMI 247013), conidiophores and conidium.


A
B
50μm
C
D
E
F

Nov. 1971, IMI 163008; *Datura suaveolens*, Ibadan, Nigeria, A.G. Bailey 407, 21 Nov. 1959, IMI 83825; Lusaka, Zambia, A. Angus M 1455, 15 Apr. 1962, IMI 95797a; *Datura* sp., Surya Binayak, Nepal, S.M. Shah 775, 13 Sept. 1967, IMI 132297.

4) *C. elongata* (Pk) Speg., *An. Mus. nac. B. Aires* 20: 425 (1910).

Conidiophores in the type were hypophyllous, fasciculate, short, up to 55 m long, with up to 3 cicatrized scars. Conidia were hyaline, filiform, 65-130 x 4-4.5 m, 3-8 septate, each with a thickened basal scar.

The species is a typical *Cercospora* and was accepted as such by Marchionatto (1946), Viegas (1961) and Chupp (1954) who suggested an enlarged synonymy, including *Cercosporina scabiosicola* (Rangel) Rangel (*Cercospora scabiosicola* Rangel), *Cercospora knautiae* Siem. and *C. dipsaci* Hollos.

Accepted name:-

Cercospora elongata Pk, *Ann. Rep. N.Y. St. Mus. Nat. Hist.* 33: 29 (1880).

Cercosporina elongata (Pk) Speg., *ibid.*

Material examined:-

On *Dipsacus sylvestris*, Jamesville, N.Y., U.S.A., holotype *C. elongata* ex NYS (IMI 247004); Columbus, Ohio, U.S.A., W.A. Kellerman, 25 July 1902, IMI 16358; *Dipsacus fullorum*, La Plata, Argentina, J.C. Lindquist 26316, 30 Mar. 1955, IMI 63156; *Dipsacus laciniatus*, Paltineni, Romania, O. Constaninescu, 27 July 1959, IMI 151108; Muntenia, Romania, T. Savulescu & C. Sandu, 29 Aug. 1931, IMI 8651 (*Herb. Myc. Rom.* fasci IX no 443); Moldova, Romania, T. Savulescu & C. Sandu, 28 Aug. 1933, IMI 8652 (*Herb. Myc. Rom.* fasc. XIV no 654).

5) *C. hydrangeicola* Speg., *Ann. Mus. nac. B. Aires* 20: 426 (1910).

The type collection from LPS was extremely meagre and poor, and the stromata found had only broken fascicles of conidiophores with no conidia. A later collection from the same locality (IMI 63155) is much better material and shows distinct leaf lesions, epiphyllous fascicles of conidiophores with cicatrized geniculate conidiogenous loci and hyaline filiform septate conidia each with a cicatrized scar at the base. This clearly places the fungus in *Cercospora* and Vassiljevsky apud Vassiljevsky & Karakulin (1937) actually transferred the name to this genus. Chupp (1954) placed the name as a synonym of *Cercospora hydrangeae* Ell. & Ev. and although he cited the type collection he did not state having seen it. The synonymy also included *Cercospora hydrangeana* Tharp and *C. arborescentis* Tehon & Daniels but Chupp did not give any explanation supporting his conclusions. *C. hydrangeana* had been transferred by Saccardo in Trotter (1931) to *Cercosporina*.

Accepted name pro tem:-

Cercospora hydrangeae Ell. & Ev., *J. Mycol.* 8: 71 (1902).

Cercosporina hydrangeicola Speg., *ibid.*

Cercospora hydrangeicola (Speg.) Vassiljevsky apud Vassiljevsky & Karakulin, Fungi Imperfecti Parasitici. Pars. I. Hyphomycetes (Moscow): 347 (1937).

Material examined:-

On *Hydrangea hortensis*, La Plata, Argentina, C. Spegazzini 4050, 8 May 1909, holotype *C. hydrangeicola* ex LPS (IMI 247005); La Plata, Argentina, J.C. Lindquist 13804, 9 May 1947, IMI 63155; Ho Chung, Hong Kong, R.I. Leather CB 75, 18 Feb. 1966, IMI 118490; *Hydrangea macrophylla*, Sabah, Malaysia, P.S.W. Liu PP 1319/60, 1973, IMI 175770; *Hydrangea opuloides*, Njala, Sierra Leone, F.C. Deighton M 665, 7 Dec. 1934, IMI 8441; Njala, Sierra Leone, F.C. Deighton M 2289, 17 May 1940, IMI 8442; *Hydrangea angustisepala*, Sozan, Formosa, W. Yamamoto, 3 Nov. 1933, IMI 8451; *Hydrangea* sp., Lake Gdns, Kuala Lumpur, Malaysia, A. Johnston 303, 18 Mar. 1949, IMI 35607; Brunei, W.T.H. Peregrine SIB 74, 1970, IMI 150101; Zimbabwe, A. Rothwell MR 12847,1955, IMI 59541; Ibadan, Nigeria, A.G. Bailey 513, 28 Apr. 1960, IMI 83818; N. Borneo, T.H. Williams PP 120/60, 1961, IMI 86630; Salisbury, Zimbabwe, A. Rothwell MR 18200, 15 Jan. 1963, IMI 98928c.

6) *C. jatrophicola* Speg., *Ann. Mus. nac. B. Aires* 20: 426 (1910).

No fungus corresponding to Spegazzini's description was found on the holotype collection, and since his illustration's on the packet neither show prominent cicatrized scars on the conidiophores nor on the bases of the conidia it is difficult to assess if this species belongs in *Cercospora* or one of its segregates.

Chupp (1954) transferred the name to *Cercospora* and kept the species distinct from *C. jatrophae* Atk. and *C. jatropharum* Speg., but he had not seen the holotype and therefore based his account on a specimen identified as the species from Texas, U.S.A. *Cercospora jatrophae-curcas* Yen has already been transferred to *Pseudocercospora*, and material in herb. IMI indicates that *C. jatropharum* belongs in the same genus. A true *Cercospora* on *Jatropha gossypiifolia* (IMI 149467) is known to occur in Venezuela so it is quite possible that Spegazzini's species may be either a *Cercospora* or a *Pseudocercospora*.

Material examined:-

On *Jatropha macrocarpa*, Tucuman, Argentina, C. Spegazzini 4766, 11 Apr. 1906, holotype *C. jatrophicola* ex LPS (IMI 247006).

7) *C. mate* Speg., *An. Mus. nac. B. Aires* 20: 426 (1910).

When Spegazzini introduced this name two collections were cited, one from San Ignacio by J. Torre and the other from Santa Ana by B. Zamboni. Torre's collection has been examined and unfortunately no fungus corresponding to the Spegazzini account was found on it. Even though it is labelled 'Tipo' on the packet it seems inadvisable to select this a lectotype collection for the species. The Zamboni collection has not been seen but if it is fertile and corresponds to Spegazzini's account it would provide a suitable lectotype collection.

Spegazzini's illustrations in the packet show consistently curved conidia that are 2-3 septate, tapered towards the apices, apparently unthickened and not necessarily truncate at the bases. Conidiomata are pulvinate and superficial with simple conidiophores lacking geniculations and producing apical conidia. This fungus does not appear to be correctly placed in *Cercospora* but lack of more detailed information precludes a more confident identification. Marchionatto (1946) did not examine either syntype but transferred the name to *Cercospora* and maintained it separate from *Cercospora ilicicola* Maubl. (syn. *Cercosporina ilicicola* (Maubl.) Sacc.) which produces similar symptoms but larger conidiophores and conidia. Chupp (1954) also separated the species by differences in sizes of the stromata.

Until such time as the species is lectotypified the name remains of doubtful application.

Material examined:-
On *Ilex paraginayensis*, Misiones, San Agnacio, Argentina, J. Torre, July 1908, ex LPS (IMI 247007).

8) *C. physalidicola* Speg., *An. Mus. nac. B. Aires* 20: 427 (1910).

No mature conidia were found on the type, only long conidiophores which have 1-3 cicatrized scars and are geniculate in the way that true *Cercospora* species are known to be. Spegazzini's illustrations with the specimen show 2-4 septate conidia but with no notice-able scar at the base.

Vassiljevsky apud Vassiljevsky & Karakulin (1937) transferred the name of the species to *Cercospora* but in doing so made a later homonym of *C. physalidicola* Ell. & Barth. (as 'physalicola', Ellis & Bartholomew, 1896) and *C. physalidicola* Speg. (Spegazzini, 1899). *Cercospora physalidis* Ell. is accepted by Viegas (1946), Chupp (1954 and in herb. IMI as the name for the common species on *Physalis* which is of world-wide distribution. *Cercospora physalidicola* Ell. & Barth. was treated as a synonym by both authors. *Cercospora physalidis* Ell. was transferred to *Cercosporina* by both Spegazzini (1910) and Miura (1928) and distinguished from *Cercosporina physalidicola* by Spegazzini (1910) who considered all dimensions of the two species to be different. If *C. physalidicola* is indeed a true *Cercospora*, as seems likely, then it requires a new name because the epithet '*physalidicola*' is pre-empted in *Cercospora*. If it is not distinct from *C. physalidis* then it becomes a synonym of the latter name. A more complete type study is required to elucidate the position.

Material examined:-

On *Physalis viscosa*, Marmol, B. Aires, Argentina, C. Spegazzini 12517, 16 May 1905, holotype *C. physalidicola* ex LPS (IMI 247008).

9) *C. ricinella* (Sacc. & Berk.) Speg., *An. Mus. nac. B. Aires* 20: 429 (1910).

This species is well-documented by Chupp (1954) who accepted the fungus in *Cercospora* and suggested a synonymy based on type studies. *Cercospora ricini* Speg. and *C. albido-maculans* Wint. were included as synonyms. Chupp noted that the species was recorded from nearly every part of the world where the host is grown.

Examination of the type shows that the fungus is correctly placed in *Cercospora*.

Accepted name:-

Cercospora ricinella Sacc. & Berk., *Atti Ist. Ven. Sci. Lett. Art.* 3: 721 (1885).
Cercosporina ricinella (Sacc. & Berk.) Speg., *ibid.*

Material examined:-

On *Ricinus communis*, Logan, Qd, Australia, 1883, herb. B. Scortichini, holotype *C. ricinella* ex FAD (IMI 247009); 70 collections in IMI on *Ricinus communis* from Barbados, Haiti, Jamaica, Trinidad, Dominica, Cuba, Venezuela, Sudan, Ghana, Kenya, Nigeria, Zambia, Uganda, Malawi, Sierra Leone, Tanzania, Ethiopia, Yemen, Mauritius, Sri Lanka, India, Pakistan, Nepal, Papua New Guinea, Burma, Malaysia, New Caledonia, W. Samoa, Sarawak, Formosa.

10) *C. sensitivae* Speg., *An. Mus. nac. B. Aires* 20: 427 (1910).

The holotype did not bear any fungus corresponding to the original description. Spegazzini's illustrations on the packet show acicular, curved, guttulate, septate conidia lacking any definite scar at the base. The conidiophores are quite anomalous. Grouped in pulvinate masses, they are unequally 1 septate, the lower cell smaller than the upper one, obovoid and obtuse at the apex. Conidia are shown developing singly from the tips of the conidiophores. Such illustrations suggest that the species may be based on discordant elements, the described conidia belonging to one species and the conidiophores to another.

Chupp (1954) did not study the holotype, but, based on examination of a collection from Columbia which agreed with Spegazzini's account he transferred the name of the species to *Cercospora* and this was later accepted by Viegas (1961). In *C. pudicae* Yen (syn. *Ramularia mimosae* Stev. & Dalbey) the conidiophores are short and apparently similar to those in *C. sensitivae* but the species is a good *Cercospora* with cicatrized, geniculate scars, and had these been present in *C. sensitivae* Spegazzini would most surely have illustrated them.

It seems quite possible that the species is based on discordant elements but since the holotype is too poor to confirm this, the name is treated as a nomen dubium.

Material examined:-

On *Mimosa sensitiva,* Salta, Oran, Argentina, C. Spegazzini 12499, Jan. 1906, holotype of *C. sensitivae* ex LPS (IMI 247010).

11) *C. sphaeralceicola* Speg., *An. Mus. nac. B. Aires* 20: 427 (1910).

The holotype bore very little of the fungus but it was possible to confirm that the species belongs in *Cercospora.* Most conidiophores were effete but they showed cicatrized, geniculate scars typical of the genus. A single separate conidiophore measured 140 m long x 5 m wide, 1-2 septate and had 4 scars. One conidium was found. It was 78 x 4 m, 9 septate, hyaline, filiform, tapered to an acute apex and with a cicatrized scar at the base. Chupp (1954) transferred the name of the species to *Cercospora.* This was accepted by Viegas (1961) and confirmed in this study.

Accepted name:-

Cercospora sphaeralceicola (Speg.) Chupp, A Monograph of the Fungus Genus Cercospora: 377 (1954).
Cercosporina sphaeralceicola Speg., *ibid.*

Material examined:-

On *Sphaeralcea patagonica,* La Plata, Argentina, 5 Nov. 1904, C. Spegazzini 4051, holotype of *C. sphaeralceicola* ex LPS (IMI 247011).

12) *C. stenolobiicola* Speg., *An. Mus. nac. B. Aires* 20: 428 (1910).

No fungus corresponding to the original account was found on the holotype but Spegazzini's illustrations on the packet show long denticulate to geniculate olive brown conidiophores and hyaline, septate, guttulate conidia tapered to the apices. Neither conidiophores nor conidia are illustrated with cicatrized scars. This combination of features makes it difficult to place the species in either *Cercospora* or *Pseudocercospora.*

Chupp (1954) transferred the name of the species to *Cercospora* and although he does report having examined the type it is not clear if his description is based on that collection or others mentioned as originating from Argentina and Venezuela.

Of the similar fungi known on *Tecoma* (syn. *Stenolobium*) in herb. IMI, *Cercospora sordida* Sacc. has been transferred to *Pseudoseptoria* by Deighton (1976), *Cercospora tecomicola* Yen belongs more correctly in *Cercoseptoria* Petrak, and *Cercospora tecomae* Chupp & Viegas remains an acceptable species of *Cercospora.* If Chupp is correct in placing *C. stenolobiicola* in *Cercospora,* it must be very close indeed to *C. tecomae,* and if the two fungi prove to be the same then the epithet *'stenolobiicola'* has priority.

Accepted name:-

Cercospora stenolobiicola (Speg.) Chupp, A Monograph of the Fungus Genus Cercospora: 88 (1954).
Cercosporina stenolobiicola Speg., *ibid.*

Material examined:-

On *Stenolobium stans (=Tecoma stans)*, Tucuman, Argentina, 13 Apr. 1906, C. Spegazzini 4045, holotype *C. stenolobiicola* ex LPS (IMI 247012).

13) *C. tetragoniae* Speg., *An. Mus. nac. B. Aires* 20: 429 (1910).

The type showed epiphyllous caespituli and fairly short conidiophores, up to 40 m long x 3.5-4 m wide, that are geniculate towards the apices with 2-4 cicatrized scars. The filiform hyaline, tapered conidia are 4-5 septate, each with a cicatrized basal scar. These observations are in accord with the original account and the illustration on the holotype packet and place the fungus in *Cercospora*.

The name of this species has been transferred separately to *Cercospora* by Vassiljevsky apud Vassiljevsky & Karakulin (1937), Chupp apud Viegas (1945) and Chupp (1954). Notes filed with material in herb. IMI by Mr. Deighton suggest that if this species is to be kept distinct from *C. apii* then *C. tetragoniae* is its correct name.

Accepted name:-

Cercospora tetragoniae (Speg.) Vassiljevsky apud Vassiljevsky & Karakulin, Fungi Imperfecti Parasitici. Pars. I. Hyphomycetes (Moscow): 221 (1937).
Cercosporina tetragoniae Speg., *ibid.*
Cercospora tetragoniae (Speg.) Chupp apud Viegas, *Bol. Soc. Bras. agron.* 8: 54 (1945).
Cercospora tetragoniae (Speg.) Chupp, A Monograph of the Fungus Genus Cercospora: 27 (1954).

Material examined:-

On *Tetragonia expansa*, La Plata, Argentina, C. Spegazzini 16153, 18 Nov. 1909, holotype *C. tetragoniae* ex LPS (IMI 247013); Brunei, W.T.H. Peregrine SIB 1016, 1972, IMI 167100; Njala, Sierra Leone, F.C. Deighton M 2715, 3 June 1949, IMI 37285; Cameron Highlands, Malaya, A. Johnston 372, 21 July 1949, IMI 37788; Lyamungu, Moshi, Tanzania, B.B. Wallace, Jan. 1945, IMI 1269; Nairobi, Kenya, R.M. Nattrass 1683, Dec. 1951, IMI 78907; Namalere, Kampala, Uganda, C.L.A. Leakey 00697, Apr. 1963, IMI 102828; Choma, Zambia, E.A. Riley 538, 18 Dec. 1954, IMI 59203.

The authors are grateful to the curators of herb. LPS, NYS and PAD for lending the type material that made this study possible.

REFERENCES

CHUPP, C. (1954). A Monograph of the Fungus Genus Cercospora: 1-667. C. Chupp: Ithaca, NY.

CLEMENTS, F.C. & SHEAR, C.L. (1931). The Genera of Fungi: 1-496. Hafner; NY.

DEIGHTON, F.C. (1976). Studies on *Cercospora* and allied genera. VI. *Pseudocercospora* Speg., *Pantospora* Cif. and *Cercoseptoria* Petr. *Mycol. Pap., C.M.I.* 140: 1-168.

ELLIS, J.B. & BARTHOLOMEW, E. (1896). New Kansas Fungi. *Erythea* 4: 28.

GREENE, H.C. (1944). Notes on Wisconsin parasitic fungi. III. *Trans. Wisc. Acad. Sci. Arts Lett.* 35: 113-135.

MARCHIONATTO, J.B. (1946). Sobre algunas especies de *Cercospora* parasitas de las plantas. *Inst. Sanid. Veg., B. Aires* Ser. A, 2 (21): 1-9.

MIURA, M. (1928). Flora of Manchuria and East Mongolia Pt.III Cryptogams, Fungi: 406-549. South Manchuria Railway Co-Agriculture. Bureau of Industrial Dept. (Industrial Materials no. 27).

RAY, W.W. (1944). Notes on Oklahoma Cercosporae-III. *Mycologia* 36: 172-176.

SPEGAZZINI, C. (1899). Fungi argentini novi vel critici. *An. Mus. nac. B. Aires* ser. 2, 6: 81-365.

SPEGAZZINI, C. (1910). Mycetes Argentinenses. *An. Mus. nac. B. Aires* ser. 3., 20: 329-467.

TROTTER, A. (1931). Saccardo's *Syll. fung.* 25: 1-1093. Padua

VASSILJEVSKY, N.I. & KARAKULIN, B.P. (1937). Fungi Imperfecti Parasitici. Pars. I Hyphomycetes: 1-517. Moscow & Leningrad: U.S.S.R.

VIEGAS, A.P. (1945). Alguns fungos de Brasil. Cercosporae. *Bol. Soc. Bras. Agron.* 8: 1-160.

VIEGAS, A.P. (1961). Indice de fungos da America do Sul: 1-921. Campinas: Brazil.

MYCOTAXON

Vol. XII, No. 1, pp. 219-224 October-December 1980

MYROTHECIUM TONGAENSE ANAM.-SP. NOV.

FRANK DICOSMO, JOHN MICHAELIDES AND BRYCE KENDRICK

Department of Biology
University of Waterloo
Waterloo, Ontario, Canada N2L 3G1

ABSTRACT

Myrothecium tongaense anam.-sp. nov. is described from the calcified green alga Halimeda from Tonga.

INTRODUCTION

While visiting the island of Lifuka in the Kingdom of Tonga, one of us (B.K.) recently collected a dead thallus of a siphonaceous chlorophyte Halimeda sp. which bore conidiomata of a species of Myrothecium. Comparison with the other species of Myrothecium has shown it to be a new species.

TAXONOMIC PART

Tulloch (1972) accepted 13 anamorph-species in the anamorph-genus Myrothecium Tode ex Fries. The genus is characterized by setose or non-setose "....cupulate, sporodochial or synnematal...." conidiomata with a palisade of conidiophores terminating in a dense hymenium of "....hyaline or darkened,..." phialides. The hymenium is often bordered by a slightly to strongly involute margin composed of branched, septate, straight or slightly coiled, smooth-walled to roughened, septate hyphae. The subhymenium may be either textura intricata or textura porrecta and may arise from a basal stroma of textura angularis. The hyaline to pale green conidia (dark green to black in mass) vary in shape from "ellipsoid" to "rod-shaped" and are either smooth-walled or may bear striations. In some species, the conidia bear mucilaginous apical appendages (Thompson & Simmens 1962, Tulloch 1972).

Species of Myrothecium have been recovered from soil (Barron 1968) and from many plant species (Tulloch 1972). This is the first report of a Myrothecium sp. occurring on an alga. We were able to isolate the fungus in pure culture; loosely organized but otherwise characteristic conidiomata develop after approximately 15 days at 24°C on PDA.

Myrothecium tongaense Kendrick, DiCosmo & Michaelides anam.-sp. nov.

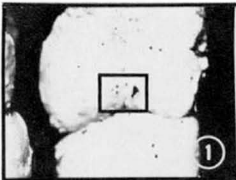
Hyphae immersae, ramosae, septatae, hyalinae, laevigatae, 2-3.5 µm lat.

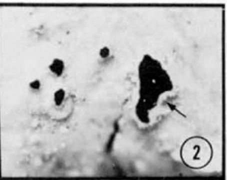
Conidiomata sporodochia, dissita vel gregaria, irregularia, ebrunea, 60-300 µm lat. Margo involuta 10-15 µm lat., bene evoluta ex textura intricata orientes ex hyphae spirales convolutas ostendentes, ramosae, septatae, hyalinae, verruculosae. Subhymenium ex texturam porrectam hyalinis facientibus, mutatum versus partem fertilem in texturam intricatam; stroma basale non bene evolutis ex textura angularis orientes. Conidiophorae ex textura intracata orientes, ramosae, septatae, hyalinae, laevigatae, 80-100 x 2.5-3 (-3.5) µm. Cellulae conidiogenae phialides, subcylindricae, pallide viridi, verruculosae, 9-17 x 1.5-2.5 (-3) ($\bar{x}$=13x2) µm, colli bene evolutae. Conidia blasticophialidica oblonga vel ellipsoidea, ad apicem truncata, ad basim decrescentia et truncata, 5-7 x 2(-2.5) ($\bar{x}$=6x2) µm; ratio mediano long./lat. = 3:1, in masse nigra.

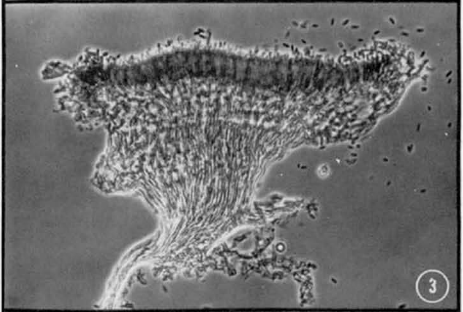
Myrothecium tongaense Kendrick, DiCosmo & Michaelides anam.-sp. nov. Figs. 1-10

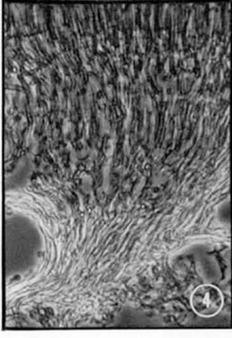
Immersed mycelium composed of branched, septate, hyaline, smooth-walled hyphae 2-3.5 µm diam.

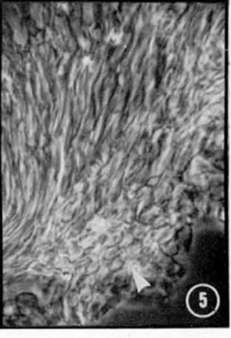
Figs. 1-10. Myrothecium tongaense. 1. Habit on Halimeda sp. x 5. 2. Conidiomata from rectangle in Fig. 1; arrow indicates fringe of marginal hyphae. X25. 3. Vertical section of conidioma. X300. 4. Tissue types of the conidioma. X480 (see text). 5. Detail of base of conidioma, arrowhead indicates the textura angularis. X1200.

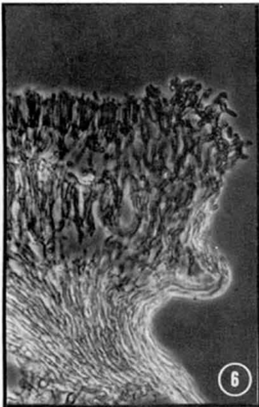

1


2

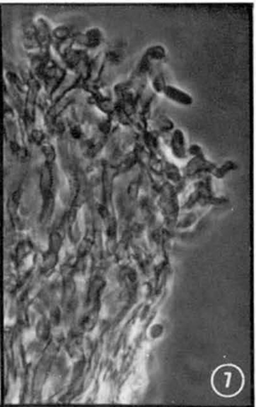

3


4

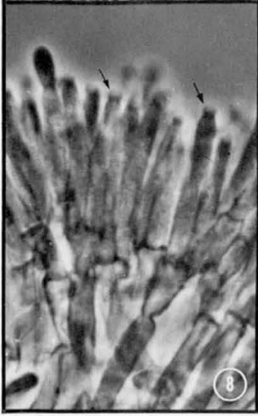

5



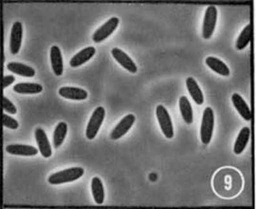
⑥



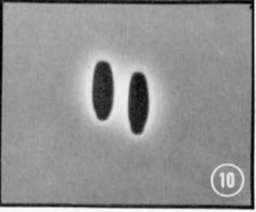
⑦



⑧



⑨



⑩

Conidiomata sporodochial, scattered to gregarious, irregular in outline, 60-300 µm diam. Margin well developed, slightly involute, of textura intricata, 10-15 µm wide, composed of branched, septate, hyaline, verruculose, loosely coiled and twisted hyphae. Subhymenium of hyaline textura intricata above becoming hyaline textura porrecta below ultimately resting on a poorly developed basal stroma of textura angularis (Figs. 3-5). Conidiophores arising from the subhymenium, branched, septate, hyaline, smooth-walled, 80-100 x 2.5-3 (-3.5) µm terminating in a dense conidial hymenium. Conidiogenous cells phialides, subcylindrical, pale green, verruculose, 9-17 x 1.5-2.5 (-3) ($\bar{x}$=13x2) µm, with a prominent collarette. Conidia blastic-phialidic, oblong-ellipsoid, apex truncate, base constricted and truncate, pale green, smooth-walled, 5-7 x 2(-2.5) ($\bar{x}$=6x2) µm, mean length/width ratio=3:1, collecting in blackish masses.

Habitat: on calcified portions of a dead thallus of Halimeda sp.

Specimen examined: Holotype, DAOM 176764, B. Kendrick, Pangai, Lifuka, Ha'apai Group, Kingdom of Tonga, 1980-V-1; WAT, microscopic preparations derived from holotype; WAT, cultures on PDA and Sabouraud's nutrient agar derived from conidial inoculations from holotype.

Myrothecium tongaense is similar in morphology to M. cinctum (Corda) Sacc., M. roridum Tode ex Fries and M. verrucaria (Alb. & Schw.) Ditm. ex Fr., but easily distinguished from all three of these. The conidial walls of M. tongaense lack the dark longitudinal striations characteristic of M. cinctum. Conidia of M. tongaense also lack the mucilaginous apical appendage seen in M. verrucaria. M. roridum is most similar to M. tongaense; however the "....rod shaped or narrowly ellipsoid, rarely slightly ovoid...." conidia (Tulloch 1972) of M. roridum are easily distinguished from the oblong-ellipsoid conidia with truncate bases and apices of M. tongaense. In addition, the marginal hyphae of M. roridum are smooth-walled, while those of M. tongaense are verruculose.

Figs. 6-10. 6. Vertical section of conidioma X480.
7. Marginal hyphae. X1200. 8. Conidiogenous cells, arrows indicate collarettes. X2000. 9. Conidia. X1200.
10. Conidia X2000.

ACKNOWLEDGMENTS

We are grateful to Dr. G.L. Barron of the University of Guelph for critically reading the manuscript. Financial support, in the form of a Guggenheim Fellowship and a Natural Sciences and Engineering Research Council of Canada research grant to B. Kendrick, and a Natural Sciences and Engineering Research Council of Canada Postgraduate Scholarship to Frank DiCosmo, is gratefully acknowledged.

Literature Cited

Barron, G.L. 1968. The genera of Hyphomycetes from soil. Williams & Wilkins Co., Baltimore. 364 pp.

Thompson, K.V.A. & Simmens, S.C. 1962. Appendages on the spores of *Myrothecium verrucaria*. Nature 193: 196-197.

Tulloch, M. 1972. The genus *Myrothecium* Tode ex Fr. Mycol. Pap. 130, 42 pp.

MYCOTAXON

Vol. XII, No. 1, pp. 225-234 October-December 1980

NOTES ON *PSEUDOCOLUS FUSIFORMIS*

RICHARD L. BLANTON[1] AND WILLIAM R. BURK[2]

Department of Botany[1] and John N. Couch Library[2]
University of North Carolina
Chapel Hill, North Carolina 27514 USA

Until recently, *Pseudocolus fusiformis* (Ed. Fischer) Lloyd has been encountered rarely, and then, only in few numbers. Blanton (1976) reported large numbers of basidiocarps in the Chapel Hill (Orange Co., North Carolina) area in the fall of 1975. Each successive fall in Chapel Hill, *P. fusiformis* has reappeared with an extended range and in greater numbers until the fall of 1979, when more than 1,000 sporocarps appeared. Such a large number of fruiting bodies collected in one location is not hitherto known from the literature. Previous descriptions of collections were based upon one to a few dozen specimens. The large number of fruiting bodies permitted a re-examination of measurements and characteristics of this stinkhorn. The taxonomy of the Phallales in general and the Clathraceae in particular is in a confused state because of the lack of specimens and developmental studies. Large fruitings such as this one provide the opportunity to study the variability in the species and, in this case, reaffirmed the reduction to synonymy of eight of the specific names suggested for the genus (Blanton, 1976; Burk, 1978). This paper compares the measurements of the latest collection to those described in the literature, extends the synonymy, expands the distribution, and discusses the ecology of *P. fusiformis*. Specimens are deposited in MICH, NCU and NY.*

In late September to October 1979, *P. fusiformis* appeared in several sites of the North Carolina Botanical Garden in Chapel Hill. A total of 940 basidiocarps and about 250 eggs were collected and preserved. Two hundred and fifty fresh, mature basidiocarps in excellent condition were measured to determine arm length, stipe length, and total length. In addition, the number of arms in the receptacle was noted and the ratio of arm to stipe length was calculated. Summary statistics of the basidiocarps' dimensions are presented in Table I, Part A. This collection will hereafter be referred to as the NC collection.

---

*Abbreviations from: P.K. Holmgren & W. Keuken. Index herbariorum: Part 1, The herbaria of the world. 6th ed. Oosthoek, Scheltema & Holkema, Utrecht; 1974. vii, 397 p.

Table I. North Carolina Collection Measurements of *Pseudocolus fusiformis*

	Range	Mean	Standard Deviation
A. Basidiocarps (250 specimens)			
Total Length	32-90 mm	51.8 mm	± 10.2 mm
Stipe Length	3-31 mm	12.7 mm	± 4.9 mm
Arm Length	22-66 mm	39.2 mm	± 8.5 mm
Arm/Stipe Ratio	1-13	3.6	± 1.7
B. Spores (500 spores; 10 each from 50 specimens)			
Width	(1.08-)1.44-1.80(-2.16) µm	1.69 µm	± 0.18 µm
Length	(3.24-)3.60-4.32(-5.04) µm	4.00 µm	± 0.89 µm
Length/Width Ratio	(1.6-)1.8-3(-4.7)	2.4	± 0.13

Fertile glebal samples from fifty dried basidiocarps were mounted in water and examined with a 100X oil immersion objective. Ten spores from each sample were measured. The ratio of spore length to spore width was calculated. These measurements and calculations are summarized in Table I, Part B.

The first report of *P. fusiformis* (cited as *Colus fusiformis*) in the literature was by Eduard Fischer (1890). Since then there have been over 40 published papers reporting occurrences of this clathroid. The most significant of these reports are summarized in Table II. Table II includes the name used by the author (there have been 13 synonyms for *P. fusiformis*), the measurements (when cited) for number of arms, arm length, stipe length, total basidiocarp length, volva color and dimensions, and spore dimensions and cites the reference. Site of occurrence and the nature of the substrate are also included. This information is included here not only to compare the NC collection to those in the literature, but also to provide workers interested in the species with collection information that is often difficult to find.

Measurements from the NC collection as summarized in Table I did not differ significantly from those reported in the literature (Table II). *Pseudocolus fusiformis* has commonly been reported to have three arms and occasionally as many as six; of the 250 specimens counted from the NC collection 45 had four arms. The arm length to stipe length ratio is an interesting measurement since it has been cited to distinguish species in the genus (Cunningham, 1942). Clearly the ratio is variable from the arms and stipe being equal in length to the arms being 13 times as long as the stipe. Blanton (1976) reported specimens with a stipe longer than the arms. From the large NC population it is clear that this character is not valid for distinguishing species. The color of the arms in the NC collection was generally light reddish-orange. Recently, basidiocarps of this clathroid have been collected during the summer in Chapel Hill. These basidiocarps tended to be smaller and more intense reddish-orange.

Sporocarps of *P. fusiformis* usually bear three to four arms. However, in the fall of 1979, a small collection from a yard in Chapel Hill, NC, yielded two specimens with two arms (Fig. 1). The arms were united apically, but basally the stipe was reduced to a short collar of tissue. Anomalous fruiting bodies growing on bamboo in Japan were reported by Endo & Yokoyama (1935). A few specimens had five or six arms, while others had two stipes.

Spore measurements may also be highly variable. The NC collection spore dimensions are similar to those in the literature. Only *P. garciae* (Möll.) Lloyd has a lower limit spore width as narrow as that of the NC collection. The spores of *P. fusiformis* are most often cited as elliptical.

Table II. *Pseudocolus* in the literature

Name Used	Number of Arms	Length of Arms (mm)	Stipe Length (mm)	Total Length (mm)	Volva (mm)	Spores (um)	Substrate	Place and Date Collected	Reference
Anthurus javanicus (Penz.) G.H. Cunn.	3-4	20-30	6-25	18-65	white to pale brown, 14-18 X 7-11	3.5-4.5 X 1.5-2		Batavia, Goenoeng Salak, X/21; Priangan, Tjibodas, IV/30, Java	Boedijn 1932
	3-4		short	20-60	white, greyish, 15	3-4.5 X 1.5-2			Cunningham 1942
	3-(4)	25	20	45-53	dark grey, 15-20 X 13-14	3.5-5 X 1.2-1.7	soil in green-house under *Chaemerops humilis*	Prague, Czech., 26/III/58	Poner 1959
				16-50	15 X 12	3.0-4.5 X 1.5-2.0	leaf litter of oak forest, and slope in oak forest	near Vladivostok, U.S.S.R., 17/IX/51, 31/VII/54, & 4/VII/55	Sosin 1960
A. trifidus Harmand, Hariot & Patouillard	3	50						Japan	Harmond, Hariot & Patouillard 1902
Colus garciae Möll.	3			50	grey-white, 12(diam.)	5 X 1-1.5	on ground in shaded woodland, in humus	Garcia, Brazil, 30/X/92, XI/92, & I/93	Möller 1895
C. javanicus Penz.	3	25	20	45	dark brown			Tjibodas, Java, III/97	Penzig 1899
C. schellenbergiae Sumst.	(2)-3	17-68	6-37		white or dirty brown, 10-17(diam.)	4-5(5.5) X 1.5-2	rotten log rotten wood & humus	Summit, N.J., 27/VII/38; Ridley Park, Penn., 4/VIII/48	Coker & Rebell 1949
	3-4	27-52	7-32		white or dark brown, 20-28 X 14-20	3.5-4.5 X 2	soil with decaying material	Taipei, Taiwan, III/33	Sawada 1933
	3	30-60			dark brown, 20-30(diam.)	4.5-5.5 X 2-2.5	soil in yard	Pittsburgh, Penn., VII/15	Sumstine 1916

Pseudocolus fusiformis (Fisch.) Lloyd	3(-4)	(10)15-45(-50)	10-35	(25-)30-60(-70)	white to greyish white 5-25(diam.)	3.75-5 X 1.75-2.25	sawdust, soil, burned-over areas, & paths	Chapel Hill, N.C., Fall 1975	Blanton 1976
P. jaczewskii IU. Voronov	3	2-3 times longer than stipe	10-15		white, changing to greyish	4.7 X 2	ground under *Eucalyptus amygdalina* Lab. & in bamboo grove	South Colchis, U.S.S.R., 31/VIII/17	Voronov 1918
P. javanicus (Penz.) Lloyd	3	30	up to 15 beyond volva	15-47	brown, ovoid, 6-8(width)	4-5 X 2.5-3	on bamboo wood	Tirtasari, Tjinjiroean, Java, 1917	Bernard 1921a
	3-4		6-25	18-65	brown, sometimes almost white	4-5.5 X 15.-2.5	on rotting bamboo	Tjiater, Java, 18/XII/19	Bernard 1921b
	3-6				white, 35-43		on ground under bamboo	Miyazaki University (Japan), 27/IX/- 6/X/34	Endo & Yokoyama 1935
	3		1/2 total length including volva	40-50	white then becoming dark 10-15 X 10	3-4 X 1.5-2	ground in woods	Hahashima, Okimura-Kuwanokiyama, Japan, 18/XI/36	Ito & Imai 1937
	3	20			16 X 12	3.4-3.7 X 1.7-2.1	at trunk of *Nothofagus montana*	Tierra del Fuego, near Lago Fagnano, Argent., 19/II/50	Wright 1960
P. rothae (Fisch.) Lloyd	3	23-42	sometimes very short	40-60	white, globose	5 X 2	on organic soil in forest	Sendai, Honshu, Japan, 11/X/14 & 18/X/16	Yasuda 1916
P. schellenbergiae (Sumst.) Johnson	3(-6)		short, up to 65	45-70 (-80)	white, 15-20 X 10-15	4.5-5 X 2.2-2.5	in forest	Hokkaido, Honshu, Kyushu, Formosa, Sakhalin, Fall	Ito 1959
	3	25 (excluding volva)		55	17(height)		under tree	Nam-San, Seoul, S. Korea, 4/VI/39	Sato 1940

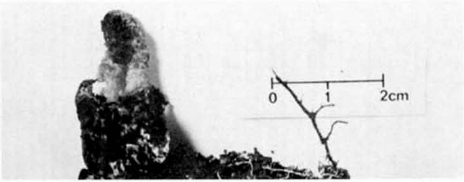


Figure 1. Two-armed specimen of *P. fusiformis*.

The NC fruiting of *P. fusiformis* occurred in three habitats: in the open on old woodchip mulch and thick grass, in a deciduous forest along paths on humus, and in the open in gardens on leaf mulch and humus. Most of the basidiocarps were collected from the open area where fruiting was caespitose. In the forest the basidiocarps were solitary to scattered, and in the garden solitary and very large.

Growing in association with the caespitose population on wood chip mulch was a large population of *Cyathus stercoreus* (Schw.) DeToni. Recently Flegler (1979) has successfully cultured *C. stercoreus*. Since both of these Gasteromycetes were found growing on the same substrate, it seemed possible that the *C. stercoreus* medium could be used to cultivate *P. fusiformis*. Attempts to maintain a tissue culture to start such a culture failed as did attempts to cultivate the mycelium in a crude soil culture.

Previous collections of *P. fusiformis* have been made in similar habitats and substrates to this NC collection, but during the summer as well as the fall. In Chapel Hill, this species was collected in July 1980, the first recorded summer occurrence. One basidiocarp appeared on an old, well-rotted tree stump about 30 cm off the ground. In 1977, Dr. L.F. Grand (personal communication) found eight three-armed specimens of *P. fusiformis* on rotted yellow poplar logs in Chatham Co., North Carolina. Table II summarizes the dates of occurrence, habitats, associations, and substrates of many of the reported *Pseudocolus* spp. fruitings.

Figure 2 shows the sites of occurrence of *P. fusiformis* as reported by Burk (1976, 1978). To the cited stations two should be added: North Vietnam [Kiet, 1975; cited as *Anthurus javanicus* (Penz.) G.H. Cunn.] and Alabama (Parker & Jenkins, 1979; cited as *Clathrus columnatus*).

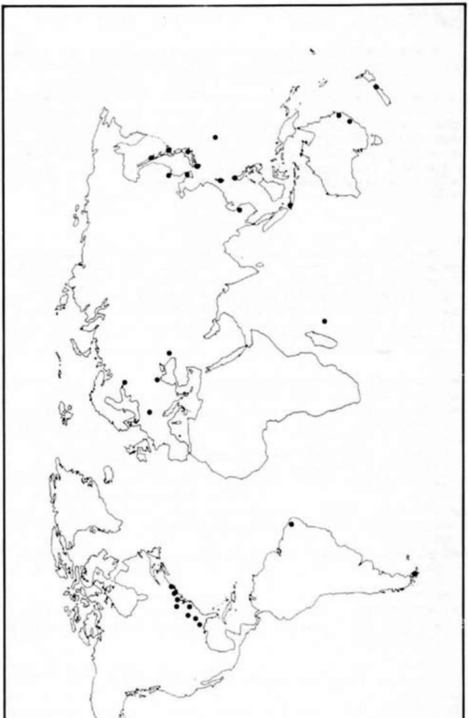


Figure 2. World Distribution of *Pseudocolus fusiformis*

To the synonyms listed by Blanton (1976) and Burk (1978) should be added:

= *Pseudocolus javanicus* f. *schellenbergiae* Ito & Imai,
Trans. Sapporo Nat. Hist. Soc. 15: 3.

This name is reduced to synonymy based upon the literature description in which the authors stated that their form differs only in color from *Colus schellenbergiae* Sumst., a synonym of *P. fusiformis*. In this species color varies from yellow to orange-red; therefore the fact that part of the Ito and Imai population has maize-yellow arms does not justify the establishment of a new form.

ACKNOWLEDGMENTS

The authors thank Anna E. Birkner for Fig. 1, Susan Sizemore for Fig. 2, Dr. Larry F. Grand for reviewing the manuscript, and Yasukyuki Hiratsuka, Mrs. H. Sirianni, Noriyoshi Kondo, Paulette Taylor, Scarlet Reslova, Alexandra Filippenko, and Amey Miller for their help in translating various references. Richard L. Blanton is an NSF Graduate Research Fellow.

LITERATURE CITED

Bernard, C. 1921a. Quelques remarques sur des phalloidées javanaises. Ann. Jard. Bot. Buitenzorg 31: 37-44.

___. 1921b. Une très rare phalloidée, *Pseudocolus javanicus* (Penzig) Lloyd. Ann. Jard. Bot. Buitenzorg 31: 93-102.

Blanton, R.L. 1976. *Pseudocolus fusiformis*, new to North Carolina. Mycologia 68: 1235-1239.

Boedijn, K.B. 1932. The Phallineae of the Netherlands East Indies. Bull. Jard. Bot. Buitenzorg Sér. 3, 12: 71-103.

Burk, W.R. 1976. *Pseudocolus javanicus* in Connecticut and its distribution in the United States. Mycotaxon 3: 373-376.

___. 1978. *Pseudocolus fusiformis*: synonymy and distributional records. Mycologia 70: 900-905.

Coker, W.C. & G.C. Rebell. 1949. *Colus schellenbergiae* again. Mycologia 41: 280-282.

Cunningham, G.H. [pref. 1942]. The Gasteromycetes of Australia and New Zealand. Printed privately by J. McIndoe, Dunedin, N.Z. xv, 236 p.

Endo, S. & M. Yokoyama. 1935. [Monstrosity of sankotake]. Bot. & Zool. 3: 473-474.

Fischer, E. 1890. Untersuchungen zur vergleichenden Entwicklungsgeschichte und Systematik der Phalloideen. Neue Denkschr. Allg. Schweiz. Ges. Gesammten Naturwiss. 32: 1-103.

Flegler, S.L. 1979. An improved method for production of *Cyathus stercoreus* fruit bodies in culture. Mycologia 71: 625-627.

Harmand, J., P. Hariot, and N. Patouillard. 1902. Liste des champignons récoltés au Japon. Bull. Mus. Hist. Nat. (Paris) 8: 129-133.

Ito, S. 1959. Mycological flora of Japan. Basidiomycetes. Agaricales, Gasteromycetales. Yokendo, Tokyo. Vol. 2(5).

___ & S. Imai. 1937. Fungi of the Bonin Islands. I. Trans. Sapporo Nat. Hist. Soc. 15: 1-12.

Kiet, T.T. 1975. Einige Charakteristika der Grosspilzflora Nord-Vietnams. Feddes Repert. 86: 113-117.

Möller, A. 1895. Brasilische Pilzblumen. (Botanische Mittheilungen aus den Tropen, Heft 7). G. Fischer, Jena. vii, 152 p.

Parker, L. & D.T. Jenkins. 1979. Mushrooms: a separate kingdom. Oxmoor House, Birmingham, Ala. ix, 101 p.

Penzig, O. 1899. Ueber javanische Phalloideen. Ann Jard. Bot. Buitenzorg 16: 133-173.

Poner, K. 1959. Kvetnatec javanský-*Anthurus javanicus* (Penz.) G.H. Cunn. nalezen v Praze. Der Fund des *Anthurus javanicus* (Penz.) G.H. Cunn. in Prag. Ceská Mykol. 13: 85-86.

Sato, T. 1940. [*Pseudocolus schellenbergiae* found in Nanzan, Keijô, Korea]. J. Jap. Bot. 16: 309.

Sawada, K. 1933. Notes on Japanese species of *Colus*. Trans. Tottori Soc. Agric. Sci. 4: 166-173.

Sosin, P.E. 1960. [Novye i interesnye vidy Gasteromycetes Dal'nego Vostoka]. De speciebus novis et curiosis Gasteromycetum ex Oriente extremo. Bot. Mater. Otd. Sporov. Rast. Bot. Inst. Komarova Akad. Nauk SSSR 13: 207-214.

Sumstine, D.R. 1916. A new species of *Colus* from Pennsylvania. Mycologia 8: 183-184.

Voronov, IU. 1918. [Novyi predstavitel' sem. Clathraceae iz iuzhnoi Kolkhidy (*Pseudocolus Jaczewskii* G. Woron, n. sp.)]. On a new clathroid from the South Colchis (*Pseudocolus Jaczewskii* G. Woron. n. sp.). Izv. Kavkaz. Muz. 11: 196-203.

Wright, J.E. 1960. Notas sobre faloideas Sud y Centroamericanas. Lilloa 30: 339-359.

Yasuda, A. 1916. [On Ikaritake, a new Japanese name, *Pseudocolus rothae* (Fisch.)]. Bot. Mag. (Tokyo) 30: 298.

MYCOTAXON

Vol. XII, No. 1, pp. 235-240 October-December 1980

THREE NEW SECTIONS IN THE GENUS *NAEMATOLOMA* AND A DESCRIPTION OF A NEW TROPICAL SPECIES

by

Gastón Guzmán
Escuela Nacional de Ciencias Biológicas
Instituto Politécnico Nacional
México, D.F.

Naematoloma Karsten according to Singer (1975) has a subcellular hypodermiun with subglobose hyphae and usually chrysocystidia with a yellow or hyaline hyghly refractive amorphous central body (observed in KOH or NH_4OH solutions). The spores are generally subelliptic and melleous or yellowish brown.

Singer (1975) considered *Psilocybe* (Fr.) Kumm. different from *Naematoloma* because its hypodermium is not well differentiated and never subcellular, and chrysocystidia may or may not be present. *Stropharia* (Fr.) Quél. has chrysocystidia, but differs from *Naematoloma* in that it lacks a subcellular hypodermium and has an annulate stipe (*Naematoloma* is not annulate). Smith (1979) considered these three genera in *Psilocybe* *sensu* *lato*, following Quélet (1886) who considered *Stropharia*, *Psilocybe* and *Naematoloma* in the genera *Geophila* or *Dryophila*.

However in studying *Psilocybe* (a recently completed monograph) this author found the hypodermium subcellular in some species and with elongated hyphae in others. On the other hand, taking into consideration that *Agaricus squamosus* Pers. ex Fr., because it lacks of chrysocystidia, is considered by Orton (1969) to be a *Psilocybe* in spite of its subcellular hypodermium, and also taking in consideration that several species of *Psilocybe* without chrysocystidia have a subcellular hypodermium, e. g., *P. hoogshagenii* Heim, *P. uxpanapensis* Guzmán, *P. subaeruginosa* Clel., *P. coprophila* (Bull. ex Fr.) Kumm., and *P. atrobrunnea* (Lasch) Gill., this author considers that the structure of the hypodermium is not a valid character to separate *Psilocybe* from *Naematoloma*, but the presence or absence of chrysocystidia is a valid feature to separate both genera. Accordingly, *Psilocybe* lacks chrysocystidia, with or without a subcellular hypodermium; thus, all species of *Psilocybe* with chrysocystidia (Singer, 1975) are excluded.

Singer (1973; 1975) placed those species of *Psilocybe* with chrysocystidia in the Section *Chrysocystidiatae* Sing., of which *P. chrysocystidiata* Sing. is the type. But, this author has found that the type of *P. chrysocystidiata* from Bolivia (at BAFC) has typical chrysocystidia with a yellow inclusion, and it has small, subelliptic and pale brownish spores. The hypodermium is not subcellular and the habitat is lignicolous. Because of these features, this author considers the species a *Pholiota*, but since there is only one small specimen not so well preserved and without a spore print available, *Psilocybe chrysocystidiata* Sing. is considered a doubtful species.

In the present paper the genus *Naematoloma* is considered to be characterized by chrysocystidia (hyaline cystidia with hyaline, opaque or yellowish amorphous or striate granular contents, or yellow cystidia with opaque contents) and a subcellular hypodermium or a hypodermium with elongated hyphae.

Smith (1951) divided *Naematoloma* into only two sections: *Tenacia* and *Fascicularia*. Both have a subcellular, differentiated hypodermium, and yellow to orange-brown pigment incrusted hyphal walls. The chrysocystidia are common in all the species. Singer (1975) divided *Naematoloma* into four sections: Sect. *Naematoloma*, Sect. *Cyanoloma* Sing., Sect. *Stropholoma* Sing., and Sect. *Psilocybioides* Sing., of which Sect. *Stropholoma* Sing. is the only one without chrysocystidia. *N. squamosa* (Pers. ex Fr.) Sing. is the type species. This section corresponds to Orton's (1969) *Psilocybe* Sect. *Squamosae* Orton, with *Psilocybe squamosa* (Pers. ex Fr.) Orton as the type.

The Sections of *Naematoloma* accepted in this report are: Sect. *Naematoloma* (with *N. sublaterium* (Fr.) Karst. as the type), Sect. *Cyanoloma* Sing. (with *N. popperianum* Sing. as the type), and Sect. *Psilocyboides* Sing. (with *N. dispersum* Karst. as the type).

But in order to treat those species of *Psilocybe* with chrysocystidia in the genus *Naematoloma* three new sections in *Naematoloma*, two of them without a subcellular hypodermium, are described below.

Sect. *Neocaledoniae* Guzmán, sect. nov.

Chrysocystidiis, hypodermio subcelluloso vel hypharum parallele. Sporis rhombeis. Caerulescentes. Typus: *Naematoloma neocaledonica* (Guzmán & Horak) Guzmán.

Only two species are placed in this section:

Naematoloma neocaledonica (Guzmán & Horak) Guzmán, comb. nov., = *Psilocybe neocaledonica* Guzmán & Horak, Sydowia 31: 53, 1978. Species known only from New Caledonia (Guzmán & Horak, 1978).

Naematoloma naematoliformis (Guzmán) Guzmán, comb.

nov., = *Psilocybe naematoliformis* Guzmán, Beih. Sydowia 8: 172, 1979. Species known only from a tropical rain forest in southeastern Mexico (Guzmán, 1979).

Key to the species

1a. Hypodermium with elongate hyphae. Pleurocystidia 22-28 x 11-14.5 µm. Cheilocystidia 17-27 x 4-6.5 µm, usually not branched ____________________ *N. neocaledonica*

1b. Hypodermium with subglobose hyphae. Pleurocystidia 15-29 x 5.5-8.8 µm. Cheilocystidia 12-28 x 5.5-7.7 µm, usually branched irregularly ______ *N. naematoliformis*

Sect. *Rhombisporae* Guzmán, sect. nov.

Chrysocystidiis, hypodermio hypharum parallele. Sporis rhombeis parvis (-5 µm). Haud caerulecentes. Typus: *Naematoloma rhombisporae* Guzmán.

Only two species:

Naematoloma aequatoriae (Sing.) Guzmán, comb. nov., = *Psilocybe aequatoriae* Sing., Nov. Hedwigia 29: 59, 1978. Species known only from Ecuador (Singer, 1978) (see discussion of *N. rhombispora* Guzmán, below).

Naematoloma rhombispora Guzmán, sp. nov.

Pileus rufobrunneus brunneousque, 11-12 mm latus, campanulatus vel subpapillatus, pellucidus striatus, hygrophanus. Lammellis subadnates concolor pileo. Stipes 30-35 x 1 mm, fuscus apicem versus basin versus pallescens, fibrillis albis tectis. Sporis 3.8-4.4 (-4.9) x 3.3-3.8 x 2.7-3.3 µm, subrhombicis. Pleurocystidiis et cheilocystidiis 16.5-27.5 x 9-11 µm, globoso fusoideis vel fusoideo--vesiculosis. Hypodermium hypharum parallele, haud subcellularis. Ad terram vel ligno putrido in sylva subtropica, Mexico, Oaxaca, prope San Bartolome Ayautla, Leg. Jacobs 46 (Typus ENCB).

Pileus 11-12 mm in diam., campanulate to subpapillate, smooth but translucent striate at the margin when humid, reddish brown to brownish, hygrophanous, surface somewhat shiny, moist, not viscid. Lamellae subadnate to **slightly** decurrent, narrow and close, concolorous with pileus or near lilac-brown. Stipe 30-35 x 1 um, central, cylindric, hollow, somewhat flexuous, fibrous, brownish, covered with buff colored appressed fibrils, fuscous at the apex, darkening downward to bay colored. Context concolorous with the surface or somewhat paler.

Spores 3.8-4.4 (-4.9) x 3.3-3.8 x 2.7-3.3 µm, subrhombic in face view, subelliptic in side view, thick walled, brownish in KOH. Basidia 4-spored, hyaline. Pleurocystidia and cheilocystidia 16.5-27.5 x 9-11 µm, globose-fusoid to fusoid-vesiculose, hyaline or more frequently with opaque striate or **granular contents, with thin or thick walls** (up to 0.8 µm). Subhymenium subcellular, with orangish brown pigment incrusting the walls. Trama parallel, with hyaline to irregularly yellowish brown pigment on the walls. Epicutis with subgelatinous thin parallel hyaline hyphae. Hypodermium of hyaline to brown yellowish elongated hyphae, 5-14 um diam., more or less parallel to the surface. Clamp connections present.

Habitat. Gregarious on soil or rotten wood, in a coffee plantation in a subtropical forest at 800 m elevation.

Studied material. MEXICO: State of Oaxaca, near San Bartolome Ayautla, Jun. 20, 1978, J. Jacobs 46 (Type, ENCB).

A species close to *N. aequatoriae* (Sing.) Guzmán but differs in the pleurocystidia and cheilocystidia (see the key, below).

Key to the species

1a. Pleurocystidia and cheilocystidia similar in form, both hyaline to striate or granulose, 16.5-27 x 9-11 µm, **globose-fusoid or fusoid-vesiculose, mucronate or** not ______ *N. rhombispora*

1b. Pleurocystidia quite different in form from cheilocystidia, the former are vesiculose-ventricose, mucronate or not, the later are sinuate-obtuse or **subampullaceous** or cylindric or subclavate. Pleurocystidia with granular contents or with an amorphous internal body, 13-19 x 8-9 um. Cheilocystidia hyaline, 15-27 x 5-7.5 µm ______ *N. aequatoriae*

Sect. *Cokeriana* Guzmán, sect. nov.

Chrysocystidiis, hypodermio hypharum parallele. Sporis subellipsoidis. Haud caerulescentes. Typus *Naematoloma cokeriana* (Smith & Hesler) Guzmán.

Species considered in this Section are:

Naematoloma cokeriana (Smith & Hesler) Guzmán, comb. nov., = *Psilocybe cokeriana* Smith & Hesler, Jour. Elisha Mitchell Sc. Soc. 62: 193, 1946. The study of the type

(Hesler 3952 in MICH from U.S.A.) shows a fungus with chrysocystidia and a non-cellular hypodermium. Smith & Hesler (1946) related this species to Naematoloma but Singer (in Singer & Digilio, 1951) considered it as Deconica cokeriana (Smith & Hesler) Sing.

Naematoloma alnetorum (Sing.) Guzmán, comb. nov., = Deconica alnetorum Sing., Lilloa 25: 332, 1951. A species very close to Naematoloma cokeriana (Smith & Hesler) Guzmán. The type (Singer T-955 in BAFC from Argentina) shows a fungus with typical chrysocystidia and a hypodermium of parallel hyphae. Singer (1959) considered this fungus to be Psilocybe alnetorum (Sing.) Sing. Guzmán (1978) reported it from Ecuador.

Key to the species

1a. Spores (4.4-) 5.5-6.6 (-7.7) x 3.3-4.4 x 3.3-3.8 µm. Cheilocystidia lageniform ____________ N. cokeriana

1b. Spores (5.5-) 6.6-7.7 (-8.8) x 4.4-4.9 (-5.5) x 4-5 µm. Cheilocystidia ampullaceous ____________ N. alnetorum

Key to the Sections of
the genus Naematoloma

1a. Spores rhombic ____________ 2

1b. Spores subelliptic ____________ 3

2a. Bluing species. Solitary or gregarious on soil or rotten wood. Hypodermium subcellular or with elongated hyphae ____________ Sect. Neocaledoniae

2b. Species not blueing. Solitary or gregarious on soil or rotten wood. Hypodermium with elongated hyphae ____________ Sect. Rhombisporae

3a. Bluing species. Solitary on soil. Hypodermium subcellular ____________ Sect. Cyanoloma

3b. Species not blueing ____________ 4

4a. Spores up to 10 µm long. Frequently on mosses. Hypodermium subcellular ____________ Sect. Psilocyboides

4b. Spores less than 10 µm long ____________ 5

5a. Hypodermium subcellular. Cespitose or fasciculate on wood (or if apparently on soil, the stipe has a pseudorhiza ____________ Sect. Naematoloma

5b. Hypodermium not subcellular. Solitary or subgregarious on wood or soil; stipe without pseudorhiza ____________ Sect. Cokeriana

Aknowledgements

The author expresses his thanks to Dr. Arthur L. Welden from Tulane University, for reading the manuscript and improving the English text. He also **gives thanks to Dr. A.H.** Smith, Dr. R. Singer, Dr. J. Wright, Dr. E. Horak and Dr. R. Watling, as well as to J. Jacobs, P. Vergeer and P. Stamets for the loan of specimens, and discussion of this paper. The Director and Curators of BAFC, MICH, and NY Herbaria kindly sent type specimens for study. This paper was financed in part by COFAA of the Instituto Politécnico Nacional, and CONACYT of Mexico City. Ricardo Valenzuela Garza, **assistant to** the author from the University of Nuevo León, helped in some microscopic observations and critical discussions.

Literature Cited

Guzmán, G., 1978. The species of Psilocybe known from Central and South America. Mycotaxon 7: 225-255.

__________, 1979. Observations on the evolution of Psilocybe and description of four new hallucinogenic species from Mexican tropical forests. Beih. Sydowia 8: 168-181.

__________ and E. Horak, 1978. New species of Psilocybe from Papua, New Guinea, New Caledonia and New Zealand. Sydowia 31: 44-54.

Orton, P.D., 1969. Notes on British Agarics, III. Not. Roy. Bot. Gard. 29: 75-127.

Quélet, L., 1886. Enchiridion fungorum in Europa media et praesertim in Gallia vigentium. Doin, Paris.

Singer, R., 1959. New and interesting species of Basidiomycetes. Mycologia 51: 578-594.

__________, 1973. Diagnoses fungorus novorum agaricalum, III. Sydowia 7: 1-106.

__________, 1975. The Agaricales in modern taxonomy. Cramer, Vaduz.

__________, 1978. Interesting and new species **of Basidiomycetes** from Ecuador, II. Nova Hedwigia 29: 1-98.

__________ and A.P.L. Digilio, 1951. Pródromo de la flora agaricina argentina. Lilloa 25: 5-461.

Smith, A.H., 1951. The North American species of Naematoloma. Mycologia 43: 467-521.

__________, 1979. Generic relationships within the Strophariaceae of the Agaricales. Taxon 28: 19-21.

__________ and L.R. Hesler, 1946. New and unsual dark-spored agarics from North America. Jour. Elisha Mitchell Sc. Soc. 62: 177-200.

MYCOTAXON

Vol. XII, No. 1, pp. 241-248 October-December 1980

NOTES ON HYPHOMYCETES. XXXVIII. *SEPEDONIUM AMPULLOSPORUM* AND *SIBIRINA LUTEA* SP. NOV.

G. Morgan-Jones
Department of Botany, Plant Pathology and Microbiology,
Auburn University Agricultural Experiment Station,
Auburn University, Alabama 36849, U.S.A.

and

Dennis J. Gray
Department of Botany,
North Carolina State University,
Raleigh, North Carolina 27650, U.S.A.

ABSTRACT

Sepedonium ampullosporum Damon and *Sibirina lutea* Morgan-Jones and Gray, a new species, are described from collections made in North Carolina.

INTRODUCTION

In two previous papers in this series (Morgan-Jones and Gray, 1979; Gray and Morgan-Jones, 1980) fourteen species of mycoparasitic or fungicolous hyphomycetes that inhabit carpophores of higher fungi were described. Eleven of these had been collected in Alabama, of which four were new species. Exploration of this highly specialized ecological niche in North Carolina has yielded material of two further species. One, occurring commonly on boletes in the vicinity of Raleigh, has been determined to be *Sepedonium ampullosporum* Damon. The other, growing profusely over an aborted clavarioid carpophore, has proven to be yet another undescribed species of *Sibirina* Arnold [two new taxa were added to this genus by Gray and Morgan-Jones, 1980].

Since the original treatment of *Sepedonium ampullosporum* (Damon, 1952) is not entirely adequate by modern standards, description and illustration of it are provided herein together with the new *Sibirina*, for which the name *Sibirina lutea* Morgan-Jones and Gray is proposed.

TAXONOMIC PART

Sepedonium ampullosporum Damon, Mycologia 44: 91, 1952 (Fig. 1, Plate 1, A-E).

Colonies widely effuse, at first thin and white, then becoming somewhat floccose with age and turning golden yellow to orange as abundant chlamydospores are produced. Colonies on PDA thin, spreading rapidly (up to 25mm per 24h at 25°C), at first producing conidia of two types, followed by chlamydospores. Mycelium mostly superficial, partly immersed in the carpophore, composed of branched, cylindrical, flexuous, hyaline to pale yellow, smooth or verruculose when old, 3.5 - 5.5µm wide hyphae. Chlamydospores formed terminally on vegetative hyphae or laterally on short branches, solitary, dry, acrogenous, spherical, thick-walled, golden yellow, distinctly tuberculate, 15 - 20µm in diameter. Conidiophores polymorphic, micronematous or semimacronematous, straight or flexuous, hyaline, smooth or minutely echinulate or verruculose, hyaline, as unmodified attenuated terminal elements of hyphae or of lateral branches; or branched, candelabra-like, bearing terminal groups of two or three conidiogenous cells. Conidiogenous cells monophialidic, polymorphic, long cylindrical and attenuating gradually towards the apex, 32 - 35 X 3 - 3.5 µm; or, if in groups, short, more or less cylindrical, attenuating very slightly towards the apex, 20 - 35 X 3 -4 µm. Conidia enteroblastic, produced at the tips of the phialides, polymorphic, hyaline, smooth, non-septate; those produced on candelabra-like conidiophores ovate, distinctly papillate at the apex, subtruncate at the base, 19 - 20 X 5 - 6µm wide in the broadest part; those produced on undifferentiated conidiophores narrowly ellipsoid, obtuse at each end, 16 - 24 X 5.5 - 6µm.

On carpophores of Basidiomycetes; Europe, Japan, North and South America.

Collection examined: on *Boletus* sp., Raleigh, Wake County, North Carolina, September 20, 1979, D.J. Gray, AUA.

S. ampullosporum can be distinguished from *S. mycophilum* (Pers) Nees, the type species of *Sepedonium* Link, in several respects.

The wall projections which give the chlamydospores their tuberculate appearance are appreciably larger and more variable in shape and size in *S. ampullosporum* than in *S. mycophilum* (Plate 1E-F), [*S. mycophilum* collection on *Boletus* sp., Auburn, Lee County, Alabama, August 11, 1977, G. Morgan-Jones, AUA]. They are also more widely and less evenly spaced in *S. ampullosporum*.

The conidial elements of the two species also differ significantly. There is no polymorphic conidial condition in *S. mycophilum* equivalent to that of *S. ampullosporum* and the morphology of the papillate conidia of the latter is distinctive.

Studies of conidiogenesis in culture chambers modified

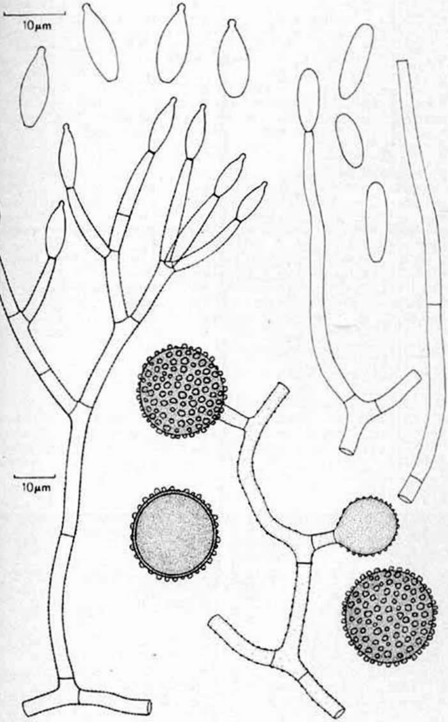


FIGURE 1. *Sepedonium ampullosporum*

after Cole et al. (1969) have indicated that the papillate conidia are produced singly and solitarily from each of their respective conidiogenous cells and are rather slow developing. During the time taken for one such conidium to be produced and mature, up to four conidia of the ellipsoid type are produced from a single conidiogenous cell. Both types of conidia are produced simultaneously in culture chambers; chlamydospore production follows. Damon (1952) suggested that conditions of low moisture were favourable for the production of the papillate type whereas conditions of high relative humidity favoured the production of the ellipsoid type. Our studies have not confirmed this distinction.

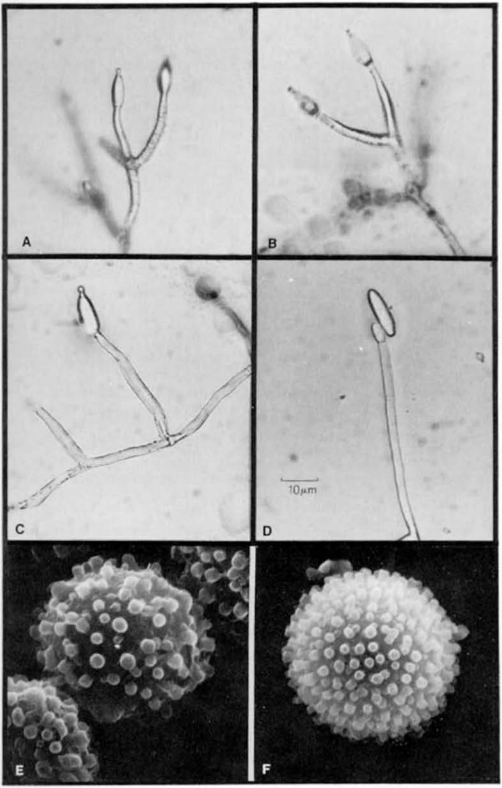
S. ampullosporum was originally described from collections made on *Boletus bicolor* Peck and *Strobilomyces floccopus* (Vahl. ex Fr.)Karst. in Rhode Island and North Carolina, together with material from São Paulo, Brazil [the fungus had been described earlier by Viégas (1945) from Brazil under the name *Sepedonium chrysospermum* Link ex Fr. (*S. mycophilum*)] and a culture obtained from the Centraalbureau voor Schimmelcultures, Baarn, which Damon (1952) cites as type for the name. It has been reported from Japan by Tubaki (1955) and Matsushima (1975). Although it appears to be common in North Carolina it has not been collected in Alabama, where *S. mycophilum* occurs frequently on *Boletus* spp.

Sibirina lutea sp. nov. (Fig. 2).

Coloniae effusae, floccosae, albidae vel luteae. Mycelium effusum, partim superficiale, partim in substrato immersum, ex hyphis ramosis, septatis, hyalinis, levibus, 3 - 6μm crassis compositum. Conidiophora semimacronemata, mononemata, erecta, recta vel flexuosa, simplicia, septata, hyalina, laevia, usque ad 450μm longa, 3 - 5μm crassa. Cellae conidiogenae monophialidicae, determinatae, discretae, subulatae, hyalinae, 3-11 in verticillio disposae, 30 - 37 X 3 - 5μm. Conidia obovata vel fusiformia, uniseptata, leviter curvata, laevia, hyalina, 17 - 20 X 5.5 - 6μm.

Ad carposomata (?) Clavariae, Schenk Forest, Raleigh, Wake County, North Carolina, October 12, 1979, D.J. Gray, AUA, holotypus.

PLATE 1. A-C. *Sepedonium ampullosporum*, papillate conidia; D. *S. ampullosporum*, ellipsoid conidia; E. *S. ampullosporum*, chlamydospore (SEM X4,500);F. *S. mycophilum*, chlamydospore (SEM X5,000).


A
B
C
D
10µm
E
F

Colonies on PDA at first whitish, thin, then becoming densely lanose to floccose, cream to yellowish, buff when old, growing in diameter at a rate of 12 to 16mm per 24h at 25°C, reverse yellowish brown. Colonies on host substrate effuse, dense, becoming matted, at first white, then becoming yellow. Mycelium mostly superficial, partly immersed in the substratum, composed of cylindrical, flexuous, branched, hyaline, septate, smooth-walled, 3 - 6µm wide hyphae. Conidiophores semimacronematous, mononematous, straight or flexuous, hyaline, smooth, septate, simple or branched, bearing verticils of up to 12 conidiogenous cells terminally and intercalarly, up to 450µm long, 3 - 5µm wide. Conidiogenous cells monophialidic, discrete, arranged verticillately, determinate, subulate, attenuating gradually towards the apex, 30 - 37 X 3 - 5µm, tapering to 1 - 1.5µm wide at the tip. Conidia produced at the tips of the phialides, obovate to broadly fusiform, hyaline, 1-septate, slightly curved, 17 - 20 X 5.5 - 6µm, obtuse at the apex, narrowly truncate to slightly papillate at the base.

On carpophores of a clavarioid basidiomycete; North America.

Collection examined: Schenk Forest, Raleigh, Wake County, North Carolina, October 12, 1979, D.J. Gray, AUA, type.

Sibirina lutea, although similar, differs from *S. fungicola* Arnold, the type species of *Sibirina*, in several respects. Its cultural characteristics, particularly pigmentation, are at variance. The dimensions of its conidiogenous cells and conidia, although overlapping those of *S. fungicola*, also distinguish the two, those of *S. lutea* being consistently somewhat broader. The species are also easily separated on the basis of conidium morphology, the broadly fusiform, slightly curved conidia of *S. lutea* being distinctive.

Although de Hoog (1978) has questioned the validity of maintaining *Sibirina* as a separate entity from *Cladobotryum* Nees ex Steudel and has added a species to the latter genus, *C. curvatum* de Hoog and Gams, which possesses the characteristics of *Sibirina*, a conservative attitude is being adopted here. We concede, however, that ultimately a reappraisal of generic concepts in this complex must be undertaken, particularly if the aspirations of Kendrick (1980) for condensation of genera are to be subscribed to.

ACKNOWLEDGMENT

We thank Mr. Michael W. Folsom for the scanning electron micrographs and Dr. Emory G. Simmons, University of Massachusetts, for reviewing the manuscript.

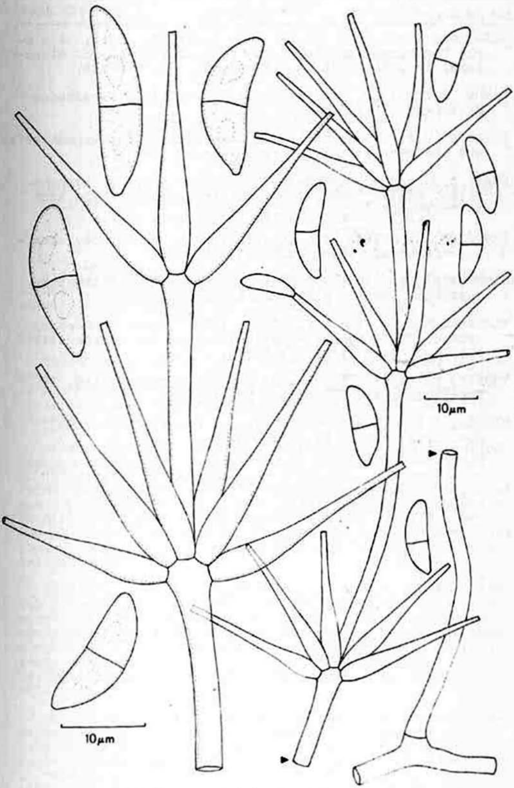


FIGURE 2. *Sibirina lutea*

REFERENCES

COLE, G.T., T.R. NAG RAG and W.B. KENDRICK. 1969. A simple technique for time-lapse photomicrography of microfungi in plate culture. Mycologia 61: 726-730.

DAMON, S.C. 1952. Two noteworthy species of *Sepedonium*. Mycologia 44: 86-96.

DE HOOG, G.S. 1978. Notes on some fungicolous Hyphomycetes and their relatives. Persoonia 10: 33-81.

GRAY, D.J. and G. MORGAN-JONES. 1980. Notes on Hyphomycetes. XXXIV. Some mycoparasitic species. Mycotaxon 10: 375-404.

KENDRICK, B. 1980. The generic concept in Hyphomycetes - a reappraisal. Mycotaxon 11: 339-364.

MATSUSHIMA, T. 1975. Icones microfungorum a Matsushima lectorum. Kobe. Published by the author.

MORGAN-JONES, G. and D.J. GRAY. 1979. Notes on Hyphomycetes. XXVII. *Mycogone psilocybina*, a new mycoparasitic species. Mycotaxon 8: 144-148.

TUBAKI, K. 1955. Studies on Japanese Hyphomycetes. II. Fungicolous group. Nagaoa 5: 11-40.

VIEGAS, A.P. 1945. Fungos aliquot brasiliensis. Bol. Soc. Bras. Agron. 8: 161-173.

MYCOTAXON

Vol. XII, No. 1, pp. 249-252 October-December 1980

NOTES ON HYPHOMYCETES. XXXIX.
CYLINDROTRICHUM CURVATUM SP. NOV.

G. Morgan-Jones

Department of Botany, Plant Pathology and Microbiology,
Auburn University Agricultural Experiment Station,
Auburn University, Alabama 36849, U.S.A.

ABSTRACT

Cylindrotrichum curvatum Morgan-Jones, a new species, is described and illustrated from a collection made on carpophores of *Stereum* sp. in Alabama.

INTRODUCTION

There has, in recent years, been a minor assault on the genus *Cylindrotrichum* Bonorden with the result that a total of eight species are presently accepted in it. Seven of these have been added during the course of the last five years.

Of Bonorden's original four species only one, *C. oligospermum* (Corda) Bon., which was chosen by Hughes (1958) as lectotype for the genus, is included. The remaining three names are excluded for varying reasons. *C. inflatum* Bon. is a synonym of *Menispora cylindrosperma* Corda while both *C. album* Bon. and *C. repens* Bon. are regarded as *nomina dubia* since absence of authentic material precludes their proper typification and they are therefore of uncertain application.

Species concepts in this genus, as in the closely similar *Chloridium* Link ex Fr. (the two genera are separated merely by the presence or absence of conidium septation), are based on relatively minor differences in conidiophore morphology and shape and size of conidia. This, of necessity, because of the simplicity of the organisms. In *Cylindrotrichum* degree of conidium septation is an added criterion.

Matsushima (1975) described *Cylindrotrichum proliferum* Matsushima and *C. triseptatum* Matsushima from the same locality in Kagoshima prefecture, Japan. The former was isolated from woodland soil and the latter was collected on dead bark of an unidentified broadleaf tree. Ellis (1976) established the name *C. triseptatum* Ellis for a fungus found on dead leaves of *Glyceria maxima* S. Wats. in England [Morgan-Jones (1977) subsequently established the name *C. ellisii* Morgan-Jones for it, *C. triseptatum* Ellis being illegitimate on account of its status as a homonym of *C. triseptatum* Matsushima]. Gams and Holubová-Jechová (1976) transferred *Acrotheca zignoëllae* Höhnel to *Cylindrotrichum* and added two new species, *C. hennebertii* W. Gams and Hol.-Jech., and *C. clavatum* W. Gams, to it. These three species occur on dead wood of various trees. Morgan-Jones (1977) described *C. oblongisporum* Morgan-Jones from a collection made on dead wood in Alabama.

Of the species described to date several are almost identical. *C. proliferum* and *C. zignoëllae*, in particular, appear to be extremely close, both possessing monophialidic conidiogenous cells and conidia of similar morphology and dimensions. They might well be conspecific. *C. hennebertii* differs in having polyphialidic conidiogenous cells while *C. clavatum* is distinguished by its clavate conidia.

Material of a *Cylindrotrichum* has been collected on old carpophores of *Stereum* sp. in Alabama. Although overlapping several other species in conidium dimensions the organism is readily distinguishable by the morphology of its conidia. It is described as a new species herein.

TAXONOMIC PART

Cylindrotrichum curvatum sp. nov. (Fig. 1).

Coloniae effusae, brunneae vel griseo-brunneae, pilosae. Mycelium plerumque in substrato immersum, ex hyphis ramosis, septatis, subhyalinis vel pallide brunneis, laevibus, 1.5-2.5μm crassis compositum. Setae steriles absunt. Conidiophora macronemata, mononemata, solitaria vel interdum fasciculata, erecta, simplicia, recta vel leniter flexuosa, septata, brunnea vel pallide brunnea, apicem versus pallidiora, laevia, ex basibus bulbosis, usque ad 140 m longa, 4-5μm crassa, basi interdum ad 12μm inflata, apicem versus 1.5-2μm crassa. Cellae conidiogenae monophialidicae vel polyphialidicae, in conidiophoris integratae, terminales, cylindricae, cum collis minutis. Conidia ellipsoidea vel allantoidea, hyalina, laevia, leniter curvata, plerumque guttulata, 1-septata, 10-14 X 2.5-4μm.

Ad carposomata Sterei, off Rt. 50, 5 miles south of Lafayette, Chambers County, Alabama, July 26, 1979, G. Morgan-Jones, AUA, holotypus.

Colonies effuse, brown to greyish brown, hairy. Mycelium mostly immersed in the substratum, composed of branched, septate, subhyaline to pale brown, smooth, 1.5-2.5μm wide hyphae. Sterile setae absent. Conidiophores macronematous, mononematous, solitary or sometimes in

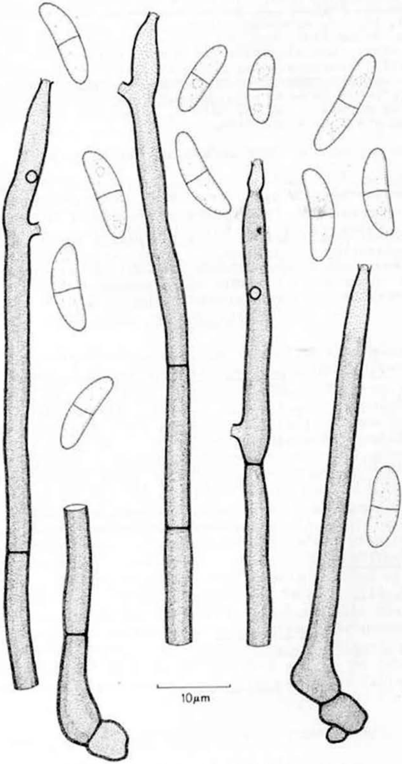


FIGURE 1. *Cylindrotrichum curvatum*

fascicles of a few, erect, simple, straight or slightly flexuous, septate, brown to pale brown, paler towards the apex, smooth, somewhat bulbous at the base, up to 140µm long, 4-5µm wide, swollen to 12µm at the base, apex 1.5-2µm wide. Conidiogenous cells monophialidic or, more frequently, polyphialidic, integrated, terminal, cylindrical, with up to 3 openings, each bearing a minute but easily discernible collarette. Conidia ellipsoid or allantoid, gently curved, hyaline, smooth, frequently guttulate, 1-septate, 10-14 X 2.5-4µm.

On carpophores of *Stereum* sp.; North America.

Collection examined: on *Stereum* sp., off Rt. 50, 5 miles south of Lafayette, Chambers County, Alabama, July 26, 1979, G. Morgan-Jones, AUA, holotype.

C. curvatum resembles *C. oligospermum* and *C. hennebertii* in possessing polyphialides. These are not, in terms of number of conidiogenous loci, as well developed as in the other two species however. *C. curvatum* is also easily differentiated from both species by its curved conidia.

REFERENCES

ELLIS, M.B. 1976. More dematiaceous hyphomycetes. Commonwealth Mycological Institute, Kew.

GAMS, W. and V. HOLUBOVÁ-JECHOVÁ. 1976. *Chloridium* and some other dematiaceous hyphomycetes growing on decaying wood. Studies in Mycology 13. Centraalbureau voor Schimmelcultures, Baarn.

MATSUSHIMA, T. 1975. Icones microfungorum a Matsushima lectorum. Kobe. Published by the author.

MORGAN-JONES, G. 1977. Notes on Hyphomycetes. XVIII. *Chaetoblastophorum ingramii* gen. et sp. nov., and *Cylindrotrichum oblongisporum* sp. nov. Mycotaxon 5: 484-490.

MYCOTAXON

Vol. XII, No. 1, pp. 253-254 October-December 1980

VALIDATION OF THE NAME OF THE YEAST SPOROBOLOMYCES HOLSATICUS WINDISCH

D. YARROW[1] and JACK W. FELL[2]

[1]Yeast Division of the Centraalbureau voor Schimmelcultures
Laboratory of Microbiology, University of Technology
Julianalaan 67a, 2628 BC Delft, The Netherlands

[2]Rosenstiel School of Marine and Atmospheric Sciences
University of Miami
4600 Rickenbacker Causeway
Miami, Florida USA

Windisch (1949) described in German a new species which he named Sporobolomyces holsaticus. Although the species has been accepted by Lodder and Kreger-van Rij (1952) and by Phaff (1970), perusal of Windisch's publication revealed that he had neglected to provide a description in Latin. According to Article 36 of the International Code of Botanical Nomenclature, the name of a new taxon published on or after 1 January 1935 must have a description in Latin. In order to retain the taxon in a forthcoming review of the genus, the name is validated with the Latin description presented below.

The validly published name Sporobolomyces coralliformis Tubaki, which was listed as a synonym of S. holsaticus by Phaff (1970), would, if Phaff's classification were accepted, be the correct name of this taxon. However, the type of strain of S. coralliformis is sexually compatible with strains of Sporobolomyces salmonicolor (Fisher et Brebeck) Kluyver et van Niel and is no longer considered conspecific with S. holsaticus (Fell et Tallman, in prep.).

Sporobolomyces holsaticus Windisch ex Yarrow et Fell sp. nov.

In cultura in agaro maltoso post 7 dies ad 25°C cellulae ovoidae vel longo-ovoidae 5-28 x 2-4 µm, singulae vel binnae. Mycelium septatum abundat. Color persicinus vel salmoneus. Ballistosporae asymmetricae.

Fermentatio: nulla.

Galactosum, sucrosum, maltosum, cellobiosum, trehalosum, D-xylosum, L-arabinosum, ribitolum, D-mannitolum assimilantur neque lactosum, L-rhamnosum, erythritolum, inositolum.

Kalii nitratum assimilatur.

Typus: CBS 1522 conservatur in Centraalbureau voor Schimmelcultures, Delft.

ACKNOWLEDGEMENT

Research by J.W. Fell is supported by the National Science Foundation, Systematic Biology Program.

LITERATURE CITED

Lodder, J. and N.J.W. Kreger-van Rij, 1952. The Yeasts, A Taxonomic Study. N. Holland Publ. Co., Amsterdam, Holland.

Phaff, H.J., 1970. The genus Sporidiobolus Kluyver & van Niel. In J. Lodder (ed.), The Yeasts, A Taxonomic Study. N. Holland Publ. Co., Amsterdam and London, p. 831-862.

Windisch, S., 1949. Sporobolomyces holsaticus n. sp. Arch. Mikrobiol. 14: 287.

MYCOTAXON

Vol. XII, No. 1, pp. 255-277 October-December 1980

SCLEROTINIACEAE XVI.

ON HELOTIUM RUFO-CORNEUM AND HELOTIUM FRATERNUM

KENT P. DUMONT

The New York Botanical Garden, Bronx, New York 10458

SUMMARY

Two species previously referred to *Helotium*, *H. rufo-corneum* and *H. fraternum*, are redescribed and illustrated, and discussions on morphological and geographical variation are presented. Four species and a variety, *H. subserotinum*, *H. fuscopurpureum*, *Lanzia flavo-aurantia*, *H. miniatum* and *H. camerunense* var. *brasiliensis* are treated as synonyms of *H. rufo-corneum*; three additional species, *H. camerunense*, *H. aurantio-rubrum*, and *H. sloaneae* are treated as possible synonyms. *Helotium fraternum* is transferred to *Poculum* and *H. rufo-corneum* to *Lanzia*.

During the course of field work in the tropics and subtropics of Asia and throughout the neotropics, my colleagues and I have made several hundred collections of inoperculate discomycetes growing on leaf matter and woody substrata. Although much has been published by R. W. G. Dennis, R. P. Korf, W. C. Denison, and D. H. Pfister in recent years on the discomycete flora of the tropical regions, the inoperculate discomycetes are still poorly known.

Recently we have published (Carpenter & Dumont, 1978; Dumont & Carpenter, 1981; Carpenter, 1980) the findings on some of the more common species of the Leotiaceae found in the neotropics; an additional paper (Dumont, 1980) presents the results of a preliminary reinvestigation on the species of *Helotium* and *Hymenoscyphus* reported from the neotropics. However, it was not until the completion of these studies that I was able to identify and name satisfactorily a very common pantropical species originally thought by several workers to be a species of *Helotium* or *Hymenoscyphus*. In fact, at the onset of the work of identifying more than two hundred field collections, it was assumed that more than one taxon was involved, since the specimens being studied were from the new world and old world tropics and because they occurred on a wide variety of substrata.

The purpose of this paper is to redescribe and illustrate this common tropical species, to discuss the names encountered while trying to identify the fungus, and to comment on the importance of the extensive geographical and morphological-anatomical variations found. It is rare that so many collections of a single species are available for study, and it is for this reason that I have been able to place several species into synonymy and to understand, in part, some of the confusing anatomical variation. *Helotium fraternum* is also included in the present work since it was studied as a possible name for the species under consideration, and found also to be a member of the Sclerotiniaceae.

The methods employed in the present study are the same as those reported by Dumont, (1971).

1. *Helotium rufo-corneum* Berkeley & Broome, J. Linn. Soc., Bot. 14: 108. 1873. FIGS. 1-3.

≡ *Hymenoscyphus rufocorneus* (Berkeley & Broome) Dennis, Persoonia 3: 62. 1964.
= *Helotium subserotinum* P. Hennings & Nyman, Monsunia 1: 33. 1900.
  ≡ *Hymenoscyphus subserotinus* (P. Hennings) Dennis, Persoonia 3: 74. 1964.
= *Helotium fuscopurpureum* Rehm, Hedwigia 39: 94. 1900.
  ≡ *Hymenoscyphus fuscopurpureus* (Rehm) Dennis, Persoonia 3: 74. 1964.
= *Lanzia flavo-aurantia* P. Hennings, Hedwigia 41: 26. 1902.
  ≡ *Helotium flavo-aurantium* (P. Hennings) Rick, Brotéria, Sér. Bot. 25: 115. 1931.
= *Helotium miniatum* Patouillard in Duss, Enumération Champ. Guadeloupe & Martinique p. 65. 1903.
  ≡ *Hymenoscyphus miniatus* (Patouillard in Duss) Dennis, Persoonia 3: 74. 1964.
= *Helotium camerunense* P. Hennings var. *brasiliensis* Rick, Brotéria, Sér. Bot. 25: 114. 1931.
= ?*Helotium camerunense* P. Hennings, Bot. Jahrb. Syst. 22: 73. 1895.
  ≡ *Hymenoscyphus camerunensis* (P. Hennings) Dennis, Persoonia 3: 74. 1964.
= ?*Helotium aurantio-rubrum* Bresadola, Hedwigia 35: 295. 1896.
= ?*Helotium sloaneae* Patouillard, Bull. Soc. Mycol. France 16: 183. 1900.

Stroma — Substratal, variable, on the host leaf visible as blackened areas of the petiole and midveins and less commonly as irregular, black lines delimiting small, irregular areas of the leaf blade near the midvein; on the host wood difficult to observe or visible as diffuse black areas beneath the bark and as irregular, black lines in the wood or thin barks; the blackened areas in section composed of an incomplete rind of cells with differentially pigmented walls and epidermoid to irregular in face view; rind cells also present on the base of the stipe of the apothecium; not known in culture.

Macroconidial state — unknown, presumed absent.

Microconidial state — unknown.

Apothecial morphology — Apothecia variable, solitary with 1(-3) arising from each petiole in association with and from blackened areas of the substrate or on woody substrate arising scattered or in groups of 4-5, stipitate, 0.5-3(-5)mm in diam, and 0.5-2(-5)mm high, when fresh disc slightly concave, slightly convex or flat, drying cupulate to flat, and rehydrating flat to slightly cupulate. Hymenium when fresh generally yellow-orange to red-orange, occasionally with vinaceous tint, drying dark yellow-orange to reddish-orange, or less commonly dark vinaceous, rehydrating lighter; margin when fresh, dry, and rehydrated concolorous with the hymenium; receptacle when fresh, dry, and rehydrated generally lighter than the hymenium and light yellow-orange, dark flesh-colored, cream or less commonly concolorous with the hymenium; stipe when fresh, dry, and rehydrated in the upper portion, generally concolorous with the lower portion of the receptacle, becoming obviously blackened toward the base of the stipe, cylindrical or slightly broader above and tapering to the base, 0.25-3(-4)mm long and to ca 0.5mm wide; apothecia in 2% KOH emitting a light yellow, yellow-brown or rusty dye.

Apothecial anatomy — Asci 8-spored, (90-)120-180(-200)x(8-)10-16(-20) µm, produced from croziers, long cylindrical-clavate, gradually tapering toward the base and there becoming slightly expanded to form a small foot or truncate, wall 0.5-3(-5)µm thick enlarged at the subtruncate to papillate apex and there 2-4(-6)µm thick; pore J+, the walls staining generally faint blue, intense blue, more intense toward the base of the pore, or visible only as two basal or two apical dots in Melzer's reagent. Ascospores extremely variable, (20-)24-36(-60)x(2.5-)3-6(-8)µm, biseriate throughout, biseriate above and uniseriate below or obliquely uniseriate, hyaline, smooth, nonseptate, ends generally pointed, in outline generally inequilateral, frequently flattened on one surface, frequently slightly sigmoid and curved unequally and generally bent below midpoint of spore, anterior end generally broader than posterior, posterior end frequently becoming drawn out to a fine point, anterior end (and less commonly posterior end) frequently becoming "flared" and variously modified; guttules filling the spore, anterior ones generally larger than posterior ones, spherical, elongate or irregularly shaped, individually separated by a narrow band of cytoplasm (occasionally giving the false impression of a septate spore). Paraphyses generally exceeding the asci and frequently completely surrounding the apices of the asci, internally hyaline or rarely light yellow-brown, branching at the base of the asci and toward the middle, septate, filiform, becoming slightly expanded at the apex and there (1-)2-3(-5)µm wide, walls thin, smooth and hyaline. Subhymenium not well differentiated from the medullary excipulum, hyaline to faint light brown, consisting of hyphae narrower and more tightly interwoven than the medullary excipulum, the individual hyphae hyaline, 1-4µm wide, the walls thin to ca 1µm thick, hyaline and smooth. Medullary excipulum well developed, obconical, non-refractive, hyaline, consisting of septate, branched, loosely interwoven to subparallel hyphae 2-5(-8)µm wide, the walls thin, non-refractive, hyaline and smooth. Ectal excipulum: inner ectal excipulum well defined and generally well differentiated from the outer ectal excipulum and grading into the medullary excipulum, entire layer non-refractive to occasionally slightly refractive (due to thickened cell walls and lacking a gelatinous matrix), 8-15µm wide toward the margin and ca 15-30µm wide toward the stipe, consisting of tightly compact, parallel to slightly interwoven, hyaline or light brown hyphae 2-3(-5)µm wide, the walls thin, generally non-refractive, hyaline and smooth. Outer ectal excipulum generally non-refractive, non-gelatinized, occasionally refractive due to thick walls, entire layer hyaline, ca 15-30µm broad toward the margin and 10-40µm toward the stipe, consisting predominantly of textura prismatica with the individual hyphae extending parallel or at a low angle to the surface of the apothecium, the individual cells toward

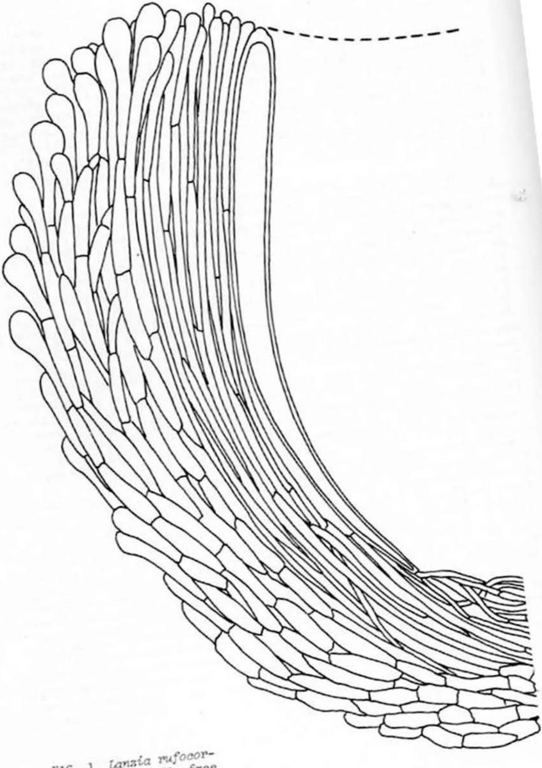


FIG. 1. *Lanzia rufocornea*, Dumont-PA 71, free hand drawing, x 1,000. Median longitudinal section of an apothecium through margin.

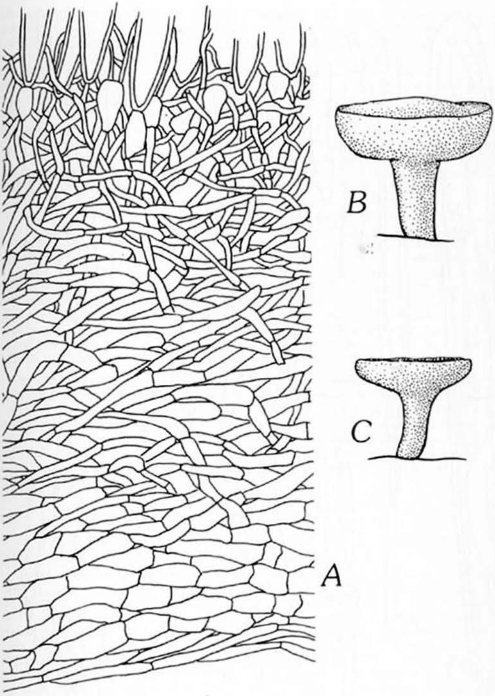


FIG. 2. *Lanzia rufocornea*, free hand drawings. A. Median longitudinal section through an apothecium at approximately midpoint between margin and stipe, Dumont-PA 71, x 1,000. B, C. Habit sketches of apothecia on the substrate; B, Dumont-PA 71, C, Dumont-PA 103, both x ca 50.

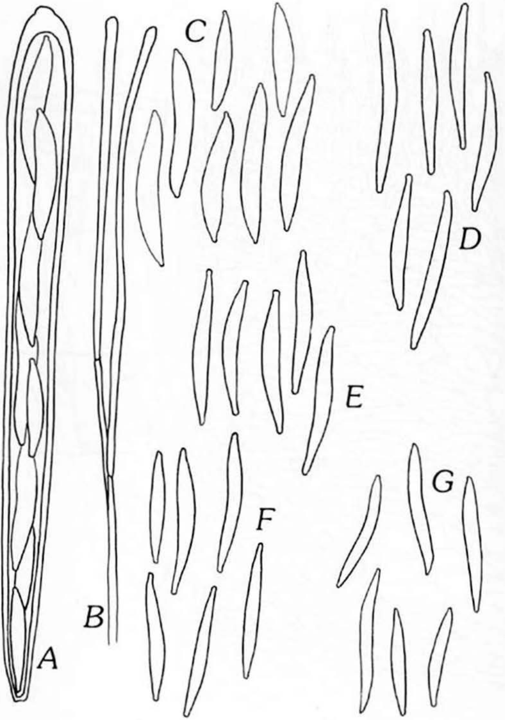


FIG. 3. *Lanzia rufocornea*, free hand drawings, x 1,000. A. An ascus with 8 ascospores, Dumont-PA 71. B. A branching paraphysis, Dumont-PA 71. C.-G. Ascospores; C, Dumont-PA 71, D, CUP-SA 2900, E, CUP-SA 3031, F, CUP-SA 3164, G, Dumont-PA 52.

the margin 8-21x4-8µm to 9-45x5-11µm toward the stipe, the walls thin and non-refractive to thick and refractive, hyaline and smooth; in poorly preserved material the individual cells collapsing and appearing narrow, and when walls thick, resulting in a highly refractive excipulum easily mistaken for a gelatinous matrix. Outer covering layer present, consisting of 1-3 hyphal layers and 2-6µm wide, the individual hyphae extending parallel to the surface of the apothecium, overlapping, and hyaline to light brown, the walls generally thin, hyaline and smooth or rarely roughened; toward the margin the apically free cells occasionally becoming expanded as in the margin. Margin well developed, occasionally broader at the tips of the asci than at the bases, entire zone hyaline or very light brown, constructed similarly to the apothecial flanks below, the individual cells smaller, the apical cells generally becoming slightly to obviously expanded and 4-10(-14)µm wide. Stipe in the upper portion constructed similarly to the lower portion of the apothecial flank; at approximately midpoint to the outside a zone of narrow, hyaline to light yellow-brown, 2-5µm wide hyphae with thin, smooth walls, to the inside a zone of parallel, hyaline to light brown hyphae with brick shaped cells with walls thin to thick, hyaline to brown, smooth to roughened and grading into longer and narrower cells in the central core; at the very base composed of narrow, tightly interwoven hyphae with rind cells to the outside. Hairs present or absent, more evident on the stipe and especially toward the base, hyaline to light brown, septate, 4-32µm long, 3-7µm wide at the apex, 3-7 µm at the basal septum, the walls thin or thick, hyaline to light brown, smooth or less commonly roughened.

Habitat: Commonly found on leaves and leaf parts and wood, branches, branchlets and twigs, less commonly encountered on herbaceous stems and roots. Leaf part: *Rhus succedanea*, *Distylium racemosum*, *Cecropia peltata*, *Eugenia borinquensis*, ?*Eugenia jambos*, *Eugenia* sp., *Miconia pachyphylla*, *Sloanea* sp., *Clusia* sp., *Alchornea* sp., Malvaceae, Leguminosae. Woody part: *Stachyurus praecox*, *Fagus* sp., *Castanopsis cuspidata* var. *sieboldii*, *Distylium racemosum*, *Psychotria manillensis*, *Quercus induta*. Roots of *Aucuba japonica*, *Cryptomeria japonica*.

Etymology of the specific epithet: refers to the color and possibly shape and/or consistency of the apothecium.

Holotype: Sri Lanka (specific locality not given), on dead wood, (date not given), G. H. K. Thwaites 282 (K).

Types of designated synonyms: Neotype (designated here) of *Helotium subserotinum* Hennings & Nyman: Indonesia, Java, Tjibodas, along trail up Mt. Gedeh, 5 Jan 1967, K. P. Dumont & Nurta (CUP-SA 3031, isoneotype NY); Lectotype (designated here) of *Helotium fuscopurpureum*: Brazil, Serra dos Orgaos, Ad lignum vetustum, E. Ule 2500 (S); Holotype of *Lanzia flavoaurantia*: Brazil, Sta. Catharina, near Blumenau, Holz, 26 Nov 1891, A. Möller 259 (S, ex herb Sydow - in the event that there are additional portions of this collection of which I am unaware, I designate this one as the lectotype.). Holotype of *Helotium miniatum*: Guadeloupe, Pointe Noire, sur l'ecorce pourrie d'un Caccaoyer, (date unknown), Duss 608 (FH). Presumed holotype of *Helotium cameruense* Hennings var. *brasiliensis* Rick: Brazil, São Leopoldo, on wood, (date not given), Rick (NY).

Illustrations: Dennis, Kew Bull. 1954: 328, fig. 37, 1954 (as *Helotium miniatum*). Dennis, Kew Bull. 1954: 329, fig. 38, 1954 (as *Helotium fuscopurpureum*). Dennis, Persoonia 3: 63, fig. 44, 1964 (as *Hymenoscyphus rufocorneus*). Penzig & Saccardo, Icones Fung. Javan. pl. XLV, fig. 3, 1904 (as *Helotium subserotinum*).

Specimens examined:

ASIA. JAPAN: Honshu, Kyoto Pref., between Kiyomizu Temple and Maruyama Park, Kyoto, on twigs, 23 Oct 1957, S. Imai, T. Hongo & R. P. Korf (CUP-JA 190); Kyushu, Miyazaki Pref., Shiratori Mt., near Iinomachi, Kirishima National Park, on twigs, 3 Nov 1957, S. Imai et al (CUP-JA 393); Honshu, Chiba Pref., Mt. Kiyosumi, on root of *Aucuba japonica*, 14 Apr 1958, S. Imai, Y. Kobayasi, D. Shimizu, K. Aoshima, K. Tubaki & R. P. Korf (CUP-JA 1010); Honshu, Chiba Pref., Mt. Kiyosumi, on twigs, 15 Apr 1958, S. Imai, Y. Kobayasi, D. Shimizu, K. Aoshima, K. Tubaki & R. P. Korf (CUP-JA 1023); Honshu, Asakawa Experimental Forest, Tokyo, on twig of *Stachyurus praecox*, 20 Apr 1958, K. Aoshima (CUP-JA 1053); Honshu, Tokyo, Mt. Takao, on root of *Cryptomeria japonica*, 4 Aug 1958, K. Tubaki 10030=40-2 (CUP-JA 1257); Yonezawa, Inego, on bark of *Fagus crenata*, 16 Aug 1958, K. Tubaki s.n., (CUP-JA 1266); Yonezawa, Inego, on bark of unknown tree, 16 Aug 1958, K. Tubaki 10061 (CUP-JA 1267); Yonezawa, Inego, on twig of *Fagus* sp., 17 Aug 1958, K. Tubaki 10054 (CUP-JA 1269); Honshu, Nara Pref., woods between Shinyakushi-ji and Kasuga-taisha, Nara, on branch, 24 Aug 1959, R. P. Korf (CUP-JA 1388); Honshu, Nara Pref., woods between Shinyakushi-ji and Kasuga-taisha, Nara, on exposed roots along a brook, 24 Aug 1959, R. P. Korf (CUP-JA 1389); Honshu, Nara Pref., woods between Shinyakushi-ji and Kasuga-taisha, Nara, on twig, 24 Aug 1959, R. P. Korf (CUP-JA 1407); Shikoku, Kochi Pref., along brook 1 km W of Ochi-machi, elev ca 75 m, on twigs of *Castanopsis cuspidata* var. *sieboldii*, 25 Aug 1959, I. Ito, T. Wada, K. & R. P. Korf (CUP-JA 1412); Shikoku, Kochi Pref., along creek N of Yokokura-jinja, Ochi-machi, elev ca 75 m, on twig, 25 Aug 1959, I. Ito, T. Wada, K. & R. P. Korf (CUP-JA 1416); Shikoku, Kochi Pref., along creek N of Yokokura-jinja, Ochi-machi, elev ca 75 m, on twig, 25 Aug 1959, I. Ito, T. Wada, K. & R. P. Korf (CUP-JA 1419); Shikoku, Kochi Pref., along creek N of Yokokura-jinja, elev ca 75 m, on twig, 25 Aug 1959, I. Ito, T. Wada, K. & R. P. Korf (CUP-JA 1421); Shikoku, Kochi Pref., along creek N of Yokokura-jinja, Ochi-machi, elev ca 75 m, on twigs, 25 Aug 1959, I. Ito, T. Wada, K. & R. P. Korf (CUP-JA 1433); Shikoku, Kochi Pref., along creek N of Yokokura-jinja, Ochi-machi, elev ca 75 m, on twigs, 25 Aug 1959, I. Ito, T. Wada, K. & R. P. Korf (CUP-JA 1436); Shikoku, Kochi Pref., along creek N of Yokokura-jinja, Ochi-machi, elev ca 75 m, on twigs, 25 Aug 1959, I. Ito, T. Wada, K. & R. P. Korf (CUP-JA 1438); Shikoku, Kochi Pref., along creek N of Yokokura-jinja, Ochi-machi, elev ca 75 m, on twigs, 25 Aug 1959, I. Ito, T. Wada, K. & R. P. Korf (CUP-JA 1439); Shikoku, Kochi Pref., along creek N of Yokokura-jinja, Ochi-machi, elev ca 75 m, on twigs of *Castanopsis cuspidata* var. *sieboldii*, 25 Aug 1959, I. Ito, T. Wada, K. & R. P. Korf (CUP-JA 1442); Shikoku, Kochi Pref., along brooks between Sugimoto-jinja & Ontake-jinja, Yokokura-yama, elev ca 700 m, on twig, 26 Aug 1959, I. Ito, T. Wada, K. & R. P. Korf (CUP-JA 1482); Kyushu, Hida-gun, Oita-ken, Kita-mameda, Hida-machi, substrate not given, 27 Jul 1920, N. Nakayama (CUP-JA 1579); Kyushu, Miyoshi-mura, Hida-gun, Oita-ken, substrate not given, 10 Jul 1921, N. Nakayama (CUP-JA 1604); Honshu, Tokyo, Takaozan, substrate not given, 6 Sep 1936, R. Imazeki (CUP-JA 1614); Honshu, Tottori-shi, Tottori-ken, substrate not given, 8 Oct 1922, M. Tsuda (CUP-JA 1628); Ehime-ken, Shikoku, substrate not given, Aug 1916, Komatsuzaki (CUP-JA 1634); Yaku Island, valley S of RR bridge Yokotani, 3 km W of Ambo, Kagoshima-ken, on twig, 18 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 1909); Yaku Island, valley S of RR bridge Yokotani, 3 km W of Ambo, Kagoshima-ken, on twig, 18 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 1913); Yaku Island, valley S of RR bridge Yokotani, 3 km W of Ambo, Kagoshima-ken, on twig, 18 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 1921); Yaku Island, valley S of RR bridge Yokotani, 3 km W of Ambo, Kagoshima-ken, on twig, 18 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 1925); Yaku Island, valley S of RR bridge Yokotani, 3 km W of Ambo, Kagoshima-ken, on twig, 18 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 1927); Yaku Island, valley S of RR bridge Yokotani, 3 km W of Ambo, Kagoshima-ken, on twig, 18 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 1931); Yaku Island, valley S of RR bridge Yokotani, 3 km W of Ambo, Kagoshima-ken, on twig, 18 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 1943); Yaku Island, woods 1-3 km NW of Kosugidani, Kagoshima, on twigs, 19 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 1989); Yaku Island, Suzukawa Valley, near Onoaida, Kagoshima-ken, on branchlet, 22 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 2061); Yaku Island, Suzukawa Valley, near Onoaida, Kagoshima-ken, on wood of branchlet, 22 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 2064); Yaku Island, Takinogawa Valley, ca 5 km N of Nagata, Kagoshima-ken, on twig, 23 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 2096); Yaku Island, 2-4 km S of Nagata, along Nagata River Valley, Kagoshima-ken, on twigs, 25 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 2106); Yaku Island, 2-4 km S of Nagata, along Nagata River Valley, Kagoshima-ken, on twigs, 25 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 2107); Yaku Island, 2-4 km S of Nagata, along Nagata River Valley, Kagoshima-ken, on twigs, 25 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 2108); Yaku Island, 2-4 km S of Nagata, along Nagata River Valley, Kagoshima-ken, on twigs, 25 Oct 1961, Y. Kobayasi, Indoh, K. Tubaki, Soneda, Furukawa & R. P. Korf (CUP-JA 2109); Yaku Island, near roadside between Yoshida and Shisenohana, Kagoshima-ken, on twigs, 26 Oct 1961, Y. Kobayasi & R. P. Korf (CUP-JA 2114); Yaku Island, in woods at side tributary, stream of Ambo River, ca 1 km W of Ambo, Kagoshima-ken, on twigs, 29 Oct 1961, Y. Kobayasi, Indoh & R. P. Korf (CUP-JA 2144); Honshu, Nanzenji Temple, Kyoto, on twig, 4 Nov 1963, M. Hamada, T. Hongo, K. Tubaki & R. P. Korf (CUP-JA 2828); Honshu, Shiga Pref., grounds of Mii Temple, Otsu, on twig, 5 Nov 1963, T. Hongo, K. Tubaki, T. Kusaka, Y. Shidei & R. P. Korf (CUP-JA 2837); Honshu, Shiga Pref., grounds of Mii Temple, Otsu, on twigs, 5 Nov 1963, M. Hamada, T. Hongo, K. Tubaki, K. T. & R. P. Korf (CUP-JA 2854); Okinawa, Yonaha-Daku, above Okuma, Kunigami-son, 400-475 m, on twigs of *Distylium racemosum*, 18 Mar 1966, R. P. Korf, K. P. Dumont, Z. Koja & K. Kuroshima (CUP-JA 3083); Okinawa, Izumi Botanical Gardens, Motola-cho, on twig of *Distylium racemosum*, 19 Mar 1966, R. P. Korf, K. P. Dumont, Z. Koja & K. Kuroshima (CUP-JA 3109); Okinawa, near top of Katsuudake, Yabu-son, on petiole of *Distylium racemosum*, 20 Mar 1966, R. P. Korf, K. P. Dumont & K. Kuroshima (CUP-JA 3164); Ryukyus, Ishigaki Island, Azanakasuji, Arakawa, rotted branchlet of *Psychotria manillensis*, 20 Mar 1969, R. P. Korf et al. (CUP-JA 3216); Ryukyus Islands, Iriomote Island, along trail near Dai-Ni Futamata, Urauchi River, base of petiole of *Rhus succedanea*, 6 Apr 1969, R. P. Korf, C. Ogimi, K. Kuroshima, T. Nakamine & M. Shimoji (CUP-JA 3323); Ryukyus Islands, Iriomote Island, along trail near Dai-Ni Futamata, Urauchi River, on petiole of *Distylium racemosum*, 6 Apr 1969, R. P. Korf, C. Ogimi, K. Kuroshima, T. Nakamine & S. Shimoji (CUP-JA 3339); Ryukyus Islands, Iriomote Island, along trail near Dai-Ni Futamata, Urauchi River, on petioles of *Distylium racemosum*, 7 Apr 1969, K. Kuroshima & T. Nakamine (CUP-JA 3347); Ryukyus Islands, Iriomote Island, along trail near Dai-Ni Futamata, Urauchi River, on rotted wood of *Castanopsis cuspidata* var. *sieboldii*, 7 Apr 1969, K. Kuroshima & T. Nakamine (CUP-JA 3348); Ryukyus Islands, Iriomote Island, upper end of Nakama River, near Ohara, ca 10 m, on petioles of *Distylium racemosum*, 9 Apr 1969, R. P. Korf, K. Kuroshima, T. Nakamine, C. Ogimi & M. Shimoji (CUP-JA 3359); Okinawa, Yona Demonstration Forest, Yona, ca 750 m, on twig of *Castanopsis cuspidata* var. *sieboldii*, 18 Apr 1969, R. P. Korf, C. Ogimi & S. Kuniyoshi (CUP-JA 3426). CHINA: Ta-mu, Fukien, on fallen twigs, 17 Aug 1933, S. C. Teng 2008 (CUP-CH 41). TAIWAN: Chi-sing San, on twig of unknown species, 7 Dec 1975, Liou Sham-che (CUP 54938, ex F. of Taiwan 143); Wo-Zea, on twig of unknown species, 25 Jul 1975, Liou Sham-che (CUP 54944, ex F. of Taiwan 400). PHILIPPINES: Luzon, along trail up Mt. Makiling from Pansol side, Pansol, on twig in leaf litter, 9 Apr 1966, K. P. Dumont & I. J. Dogma (CUP-SA 913); Luzon, Go-Go Hill, Mt. Bonahao from the Sariaya side, on downed branch, 14 Apr 1966, K. P. Dumont, P. Zamora & B. Hernaeiz (CUP-SA 954); Luzon, Go-Go Hill, Mt. Bonahao from the Sariaya side, on downed branch, 14 Apr 1966, K. P. Dumont, P. Zamora & B. Hernaeiz (CUP-SA 955); Luzon, along the Lag Nas River, Mt. Bonahao, below ca 1900 m, on twigs, 17 Apr 1966, K. P. Dumont, P. Zamora & B. Hernaeiz (CUP-SA 1032); Negros, in vicinity of Barrio Matikil, Sitio Nagaro, on twigs, 6 Jul 1966, K. P. Dumont & D. R. Reynolds (CUP-SA 1115); Negros, in vicinity of Barrio Matikil, Sitio Nagaro, on twigs, 6 Jul 1966, K. P. Dumont & D. R. Reynolds (CUP-SA 1135); Negros, in vicinity of Barrio Matikil, Sitio Nagaro, on twigs, 8 Jul 1966, K. P. Dumont & D. R. Reynolds (CUP-SA 1196); Negros, vicinity of Barrio Matikil, Sitio Nagaro, on twigs, 9 Jul 1966, K. P. Dumont & D. R. Reynolds (CUP-SA 1215); Luzon, below Mud Springs, along road from Forestry Campus up Mt. Makiling, Los Baños, on twig, 29 Jul 1966, K. P. Dumont (CUP-SA 1307); Luzon, in vicinity of Mud Springs, Mt. Makiling, Los Baños, on twig, 30 Jul 1966, K. P. Dumont (CUP-SA 1351); Luzon, along trail leading up Mt. Makiling from the Quarry, on compound petiole, 8 Aug 1966, K. P. Dumont & B. Hernaeiz (CUP-SA 1382); Luzon, along road leading from Forestry Campus to Mud Springs, Mt. Makiling, Los Baños, on wood, 3 Sep 1966, K. P. Dumont et al. (CUP-SA 1682); Palawan, Inagawan Subcolony Penal Institute, km 54 from Puerta Princesa, on leaves, 7 Oct 1966, K. P. Dumont & J. V. Pancho (CUP-SA 1877); Sulu, Tawi Tawi, in vicinity of Sulu National Agricultural School, Tarawakin, on twig, 14 Oct 1966, K. P. Dumont & J. V. Pancho (CUP-SA 1896); Sulu, Tawi Tawi, S of campus of Sulu National Agricultural School, Tarawakin, on twig, 16 Oct 1966, K. P. Dumont, J. V. Pancho & Nebab (CUP-SA 1961); Luzon, Quezon National Park, Antinaonan, Quezon, on twig, 12 Nov 1966, K. P. Dumont (CUP-SA 2319); Luzon, in vicinity of University of Philippines Land Grant, km 97, 14 km past Siniloan towards Infanta, on twig, 17 Nov 1966, K. P. Dumont (CUP-SA 2342); Luzon, in vicinity of University of Philippines Land Grant, km 97, 14 km past Siniloan towards Infanta, on twig, 17 Nov 1966, K. P. Dumont (CUP-SA 2347); Luzon, in vicinity of Bulusan Lake, Bulusan, Sorsogon, on twig, 22 Nov 1966, K. P. Dumont (CUP-SA 2376); Luzon, in vicinity of Mud Springs, Mt. Makiling, Los Baños, on twig, 10 Dec 1966, K. P. Dumont (CUP-SA 2457). MALAYSIA: Ginting Highlands, Pahang, on petiole, 26 Dec 1967, K. P. Dumont & B. Stone (CUP-SA 2748). INDONESIA, JAVA: Mountain Garden & Jungle, Tjibodas, on twig, 8 Dec 1961, M. A. Rifai, R. Nasution & R. P. Korf (CUP-SA 54); Mountain Garden & Jungle, Tjibodas, on twig, 8 Dec 1961, M. A. Nasution & R. P. Korf (CUP-SA 77); jungle trail between Tjibodas and Tjibeureum Waterfall, on twig, 9 Dec 1961, M. A. Rifai, R. Nasution, Nurta & R. P. Korf (CUP-SA 87); jungle trail between Tjibodas and Tjibeureum Waterfall, on twig, 9 Dec 1961, M. A. Rifai, R. Nastion, Nurta & R. P. Korf (CUP-SA 112); jungle near Tjibodas, on twig, 10 Dec 1961, M. A. Rifai, R. Nasution & R. P. Korf (CUP-SA 150); along Tjiwalen River, Tjibodas, on twig, 11 Dec 1961, M. A. Rifai & R. P. Korf (CUP-SA 169); jungle trail between Tjibodas and Tjibeureum Waterfall, on twig of *Quercus induta*, 16 Dec 1961, M. A. Rifai &

R. P. Korf (CUP-SA 282); near pond, Tjibodas, on twig, 25 Dec 1961, M. A. Rifai & R. P. Korf (CUP-SA 419); along Tjiwalen River, near beginning of trail to Tjibeureum, Tjibodas, on twigs, 28 Dec 1961, M. A. Rifai & R. P. Korf (CUP-SA 495); Nature Reserve, Tjibodas, on twig of *Castanopsis* sp., 3 Jan 1967, K. P. Dumont & Nurta (CUP-SA 2950); along trail up Mt. Gedeh, Tjibodas, on twig, 4 Jan 1967, K. P. Dumont & Wirawan (CUP-SA 3000); along trail up Mt. Gedeh, Tjibodas, on twig, 6 Jan 1967, K. P. Dumont & Wirawan (CUP-SA 3069); along trail above falls, Mt. Gedeh, Tjibodas, on mossy branch, 7 Jan 1967, K. P. Dumont & Wirawan (CUP-SA 3137). SRI LANKA: Gannrouwa, Peradeniya, Central Farms, on twigs and petiole, 11 Jan 1967, K. P. Dumont & Peter (CUP-SA 3155); Corbet's Gap, Rangala, Central Prov., on leaf, 13 Jan 1967, K. P. Dumont & Peter (CUP-SA 3222); Mt. Pedro, Nuwara Eliya, on twig, 15 Jan 1967, K. P. Dumont & Peter (CUP-SA 3292).

NORTH AMERICA. JAMAICA: along trail to Silver Hill Gap, near Woodcutter's Gap, vicinity of Newcastle, Portland Parish, on large herbaceous stem, 9 Jan 1971, R. P. Korf, J. R. Dixon, K. P. Dumont, R. W. Erb, D. H. Pfister, D. R. Reynolds, A. Y. Rossman & G. J. Samuels (CUP-MJ 125); along trail between Woodcutter's Gap and ruins of Major Waillin's House, Portland Parish, on petioles, 9 Jan 1971, R. P. Korf, J. R. Dixon, K. P. Dumont, R. W. Erb, D. H. Pfister, D. R. Reynolds, A. Y. Rossman & G. J. Samuels (CUP-MJ 143); along Lady's Mile Trail to just S of Woodcutter's Gap, vicinity of St. Andrew Parish & Portland Parish, on petioles of ?*Eugenia* sp., 9 Jan 1971, R. P. Korf, J. R. Dixon, K. P. Dumont, R. W. Erb, D. H. Pfister, D. R. Reynolds, A. Y. Rossman & G. J. Samuels (CUP-MJ 157); along Lady's Mile Trail to just S of Woodcutter's Gap, vicinity of St. Andrew Parish & Portland Parish, on petioles of ?*Eugenia* sp., 9 Jan 1971, R. P. Korf, J. R. Dixon, K. P. Dumont, R. W. Erb, D. H. Pfister, D. R. Reynolds, A. Y. Rossman & G. J. Samuels (CUP-MJ 161); vicinity of Dick's Pond, W of Hardwar Gap, near Holywell Recreational Area and Wag Water River, St. Andrew Parish, ca 2800-3000 ft, on leaves, 10 Jan 1971, R. P. Korf, J. R. Dixon, K. P. Dumont, R. W. Erb, D. H. Pfister, D. R. Reynolds, A. Y. Rossman & G. J. Samuels (CUP-MJ 243); along Lady's Mile Trail to just S of Woodcutter's Gap, vicinity of St. Andrew Parish & Portland Parish, on petioles of ?*Eugenia* sp., 9 Jan 1971, R. P. Korf, J. R. Dixon, K. P. Dumont, R. W. Erb, D. H. Pfister, D. R. Reynolds, A. Y. Rossman & G. J. Samuels (CUP-MJ 319); along Lady's Mile Trail to just S of Woodcutter's Gap, vicinity of St. Andrew Parish & Portland Parish, on petioles of ?*Eugenia* sp., 9 Jan 1971, R. P. Korf, J. R. Dixon, K. P. Dumont, R. W. Erb, D. H. Pfister, D. R. Reynolds, A. Y. Rossman & G. J. Samuels (CUP-MJ 335); trail between Barrett's Gap and Corn Puss Gap, St. Thomas Parish, on petioles, 15 Jan 1971, R. P. Korf, J. R. Dixon, K. P. Dumont, R. W. Erb, D. H. Pfister, D. R. Reynolds, A. Y. Rossman & G. J. Samuels (CUP-MJ 504); trail between Barrett's Gap and Corn Puss Gap, St. Thomas Parish, on petioles, 15 Jan 1971, R. P. Korf, J. R. Dixon, K. P. Dumont, R. W. Erb, D. H. Pfister, D. R. Reynolds, A. Y. Rossman & G. J. Samuels (CUP-MJ 548); trail from Whitfield Hall to Portland Gap to Blue Mt., border of St. Thomas and Portland Parishes, on petiole, 17 Jan 1971, R. P. Korf, J. R. Dixon, K. P. Dumont, R. W. Erb, D. H. Pfister, D. R. Reynolds, A. Y. Rossman & G. J. Samuels (CUP-MJ 583); trail between Freetown and Wag Water River, near Hardwar Gap, St. Andrew Parish, on petioles, 18 Jan 1971, R. P. Korf, J. R. Dixon, K. P. Dumont, R. W. Erb, D. H. Pfister, D. R. Reynolds, A. Y. Rossman & G. J. Samuels (CUP-MJ 612). PUERTO RICO: near Pico del Oeste, in elfin forest, El Yunque, 1000 m, on leaf bases of *Eugenia* sp., 4 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, J. H. Haines, D. H. Pfister, A. Y. Rossman, A. Sanchez & L. E. Skog (CUP-PR 3803); trail to El Toro, near km 13.5 on Rte 191, El Yunque, ca 750 m, on midribs, veins and rarely petioles of *Cecropia peltatum*, 5 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, J. H. Haines, D. H. Pfister, A. Y. Rossman, A. Sanchez & L. E. Skog (CUP-PR 3814); trail to El Toro, near km 13.5, Rte 191, El Yunque, ca 750 m, on leaves of *Eugenia borinquensis*, 5 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, J. H. Haines, D. H. Pfister, A. Y. Rossman, A. Sanchez & L. E. Skog (CUP-PR 3816); trail to El Toro, near km 13.5, Rte 191, El Yunque, ca 750 m, on leaves of *Miconia pachyphylla*, 5 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, J. H. Haines, D. H. Pfister, A. Y. Rossman, A. Sanchez & L. E. Skog (CUP-PR 3832); near Pico del Este, in cloud forest, El Yunque, 1000 m, 8 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, J. H. Haines, D. H. Pfister, A. Y. Rossman, A. Sanchez & L. E. Skog (CUP-PR 3912); near Pico del Este, on petioles of *Eugenia* sp., 8 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, J. H. Haines, D. H. Pfister, A. Y. Rossman, A. Sanchez & L. E. Skog (CUP-PR 3913). DOMINICA: woods and roadside near the Bee House, Springfield Estate, 7 mi from Roseau, 1200 ft, on stem, 21 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 70); Dom-Can lumbering area, W of Pont Casse, St. Paul Parish, 700 ft, on petiole of *Sloanea* sp., 22 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 90); Dom-Can lumbering area, W of Pont Casse, St. Paul Parish, 700 ft, on petiole of ?*Eugenia jambos*, 22 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 92); Dom-Can lumbering area, W of Pont Casse, St. Paul Parish, 700 ft, on twig, 22 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 95); Dom-Can lumbering area, W of Pont Casse, St. Paul Parish, 700 ft, on petioles and midribs of *Clusia* or *Coccoloba*, 22 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 97); Dom-Can lumbering area, W of Pont Casse, St. Paul Parish, 700 ft, on unidentified petioles, 22 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 98); Dom-Can lumbering area, W of Pont Casse, St. Paul Parish, 700 ft, on twig, 22 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 99); Dom-Can lumbering area, W of Pont Casse, St. Paul Parish, 700 ft, on twig, 22 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 101); Dom-Can lumbering area, along Layou River, St. Joseph Parish, 600 ft, on twigs, 22 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 127); Dom-Can lumbering area, along Layou River, St. Joseph Parish, 600 ft, on twigs, 22 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 129); Dom-Can lumbering area, along Layou River, St. Joseph Parish, 600 ft, on petioles, 22 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 134); woods near Pont Casse, St. Paul Parish, ca 2000 ft, on petioles and midveins of *Miconia* sp., 26 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 173); woods near Pont Casse, St. Paul Parish, ca 2000 ft, on petioles of *Clusia* sp., 26 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 181); woods near Pont Casse, St. Paul Parish, ca 2000 ft, on petiole of *Miconia* sp., 26 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 182); woods near Pont Casse, St. Paul Parish, ca 2000 ft, on twig, 26 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 183); woods near Pont Casse, St. Paul Parish, ca 2000 ft, on twig, 26 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 206); woods and orchards near Bee House, Springfield Plantation, 4 mi from Roseau, ca 1200 ft, on petiole base, 27 Jun 1970, R. P. Korf, J. B.

Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 254); along road near Pont Casse, St. Paul Parish, on twig, 29 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 297); along road near Pont Casse, St. Paul Parish, on twig, 27 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 309); along road near Pont Casse, St. Paul Parish, on petiole and midrib of leaf, 29 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 310); along road near Pont Casse, St. Paul Parish, on petiole of large compound leaf, 29 Jun 1970, R. P. Korf, J. B. Benson, J. R. Dixon, D. H. Pfister, A. Y. Rossman & L. E. Skog (CUP-DO 311). GUADELOUPE: Parc Tropicale, Les Mamelles, on twigs, 19 Jul 1974, D. H. Pfister 571 (FH); Plateau Dimba, along S side of Ravine Roche, on petioles and bases of indet. leaves, 20 Jul 1973, D. H. Pfister 576 (FH); along road D-23, 37 km from Basse Terre, Guadeloupe National Forest, ca 500 m, on petiole of member of Melastomataceae, 5 Jan 1974, D. H. Pfister, S. E. Carpenter & M. A. Sherwood 878 (FH); Les Mamelles, Guadeloupe National Forest, on petioles of member of Leguminosae, 5 Jan 1974, D. H. Pfister, S. E. Carpenter & M. A. Sherwood 880 (FH); Grande Etang, above Bonanier, 400-416 m, on petiole, 6 Jan 1974, D. H. Pfister, S. E. Carpenter & M. A. Sherwood 981 (FH); Grande Etang, above Bonanier, 400-416 m, on very wet herbaceous stem, under vine covering exposed lake edge, 6 Jan 1974, D. H. Pfister, S. E. Carpenter & M. A. Sherwood 1010 (FH); approach to Victor Hughes Trail, Grand Matouba, on stump, 8 Jan 1974, D. H. Pfister, S. E. Carpenter & M. A. Sherwood 1120 (FH); Parc Tropicale, on fallen leaf petioles, 10 Jan 1974, D. H. Pfister, S. E. Carpenter & M. A. Sherwood 1218 (FH). PANAMA: Prov. Panama, summit of Cerro Jefe, ca 23 km N of Pan American Highway, on indet. leaf, 11 Jun 1975, K. P. Dumont, S. E. & S. M. Carpenter & S. Mori PA-52 (NY); Prov. Panama, summit of Cerro Jefe, ca 23 km N of Pan American Highway, on twig, 11 Jun 1975, K. P. Dumont, S. E. & S. M. Carpenter & S. Mori PA-71 (NY); Prov. Panama, summit of Cerro Jefe, ca 23 km N of Pan American Highway, on leaves, 11 Jun 1975, K. P. Dumont, S. E. & S. M. Carpenter & S. Mori PA-95 (NY); Prov. Panama, summit of Cerro Jefe, ca 23 km N of Pan American Highway, on petiole, 11 Jun 1975, K. P. Dumont, S. E. & S. M. Carpenter & S. Mori PA-103 (NY); Prov. Cocle, from base of Cerro Pilón to summit, 5 km NE of El Valle, ca 2200-3000 ft, on petiole, 14 Jun 1975, K. P. Dumont, S. E. & S. M. Carpenter & S. Mori PA-252 (NY); Prov. Cocle, from base of Cerro Pilón to summit, 5 km NE of El Valle, ca 2200-3000 ft, on petiole, 14 Jun 1975, K. P. Dumont, S. E. & S. M. Carpenter & S. Mori PA-267 (NY); Prov. Cocle, from base of Cerro Pilón to summit, 5 km NE of El Valle, ca 2200-3000 ft, on petiole, 14 Jun 1975, K. P. Dumont, S. E. & S. M. Carpenter & S. Mori PA-276 (NY); Prov. Cocle, vicinity of La Mesa, 2.5 km N of El Valle, ca 2100 ft, 14 Jun 1975, K. P. Dumont, S. E. & S. M. Carpenter & S. Mori PA-321 (NY); Prov. Veraguas, along road from Sta. Fe to Calovebora, Atlantic slope, vicinity Rio Caloveborita, ca 16 km from Sta. Fe, ca 1000-2500 ft, on indet. leaf, 18 Jun 1975, K. P. Dumont, S. E. & S. M. Carpenter & S. Mori PA-604 (NY); Prov. Panama, 10-12 km N of Pan American Highway, on the El Llano-Cartí Rd, on leaf, 28 Jun 1975, K. P. Dumont, S. E. & S. M. Carpenter & S. Mori PA-1215 (NY); Prov. Panama, 10-12 km N of Pan American Highway, on the El Llano-Cartí Rd, on branch, 28 Jun 1975, K. P. Dumont, S. E. & S. M. Carpenter & S. Mori PA-1264 (NY); Prov. Panama, vicinity Alto de Pacora, 26-31 km N of Pan American Highway, on old road to Mandinga, ca 2100-2200 ft, on petiole, 30 Jun 1975, K. P. Dumont, S. E. Carpenter & S. Mori PA-1546 (NY); Prov. Panama, vicinity Alto de Pacora, 26-31 km N of Pan American Highway, on old road to Mandinga, ca 2100-2200 ft, on petiole, 30 Jun 1975, K. P. Dumont, S. E. Carpenter & S. Mori PA-1554 (NY); Prov. Panama, vicinity of Alto de Pacora, 26-31 km N of Pan

American Highway, on old road to Mandinga, ca 2100-2200 ft, on petiole, 30 Jun 1975, K. P. Dumont, S. E. Carpenter & S. Mori PA-1574 (NY); Prov. Panama, vicinity Alto de Pacora, 26-31 km N of Pan American Highway, on old road to Mandinga, 2100-2200 ft, on petiole, 30 Jun 1975, K. P. Dumont, S. E. Carpenter & S. Mori PA-1600 (NY). MEXICO: Serro de La Martinica, S de Banderilla, Vera Cruz, 1500 m, on twigs, 25 Sep 1975, G. Guzmán 12460 (ex ENCB, NY).

SOUTH AMERICA. COLOMBIA: Dpto. Antioquia, Buenos Aires, Providencia, Anorí, Rio Anorí, on plant debris, 5 Jul 1974, K. P. Dumont, J. H. Haines, L. F. Velásquez & R. Fonnegra CO-543 (COL, NY); Dpto. Antioquia, Buenos Aires, Providencia, Anorí, Rio Anorí, on leaf blade, 5 Jul 1974, K. P. Dumont, J. H. Haines, L. F. Velásquez & R. Fonnegra CO-570 (COL, NY); Dpto. Valle, vicinity Pance, above Rio Pance, on leaf of *Alchornea* sp., 12 Jul 1974, K. P. Dumont, J. H. Haines, J. M. Idrobo & L. F. Velásquez CO-1053 (COL, NY); Dpto. Cauca, Finca A. Castro, ca 5 km W of Popayan, road between Popayan and El Tambo, on leaf, 14 Jul 1974, K. P. Dumont, J. H. Haines, J. M. Idrobo & L. F. Velásquez CO-1301 (COL, NY); ca 13 mi from Florencia, on the Florencia-Doncello Rd, Intendencia Caquetá, ca 1200 ft, on leaf, 17 Jan 1976, K. P. Dumont, P. Buriticá, J. L. Luteyn & L. A. Molina CO-2896 (COL, NY); ca 13 mi from Florencia, on the Florencia-Doncello Rd, Intendencia Caquetá, ca 1200 ft, on leaf, 17 Jan 1976, K. P. Dumont, P. Buriticá, J. L. Luteyn & L. A. Molina CO-2933 (COL, NY); ca 43 mi from Florencia, on the Florencia-Doncello Rd, Intendencia Caquetá, ca 1400 ft, on leaf, 17 Jan 1976, K. P. Dumont, P. Buriticá, J. L. Luteyn & L. A. Molina CO-2939 (COL, NY); Dpto. Nariño, vicinity km post 90 from Pasto, on the Pasto-Mocoa Rd, on branch, 26 Jan 1976, K. P. Dumont, P. Buriticá, L. A. Molina & J. L. Luteyn CO-3686 (COL, NY); Dpto. Nariño, vicinity km posts 129-130 from Pasto, on the Pasto-Tumaco Rd, ca 4200 ft, on leaves, 20 Jan 1976, K. P. Dumont, P. Buriticá, J. L. Luteyn & L. A. Molina CO-3943 (COL, NY); Dpto. Boyacá, vicinity km post 115, on the Chocontá-Aguaclara Rd, ca 4000 ft, on petiole of leaf, 10 Jun 1976, K. P. Dumont, S. E. Carpenter, M. A. Sherwood & L. A. Molina CO-4662 (COL, NY); Dpto. Boyacá, vicinity km post 115, on the Chocontá-Aguaclara Rd, ca 4000 ft, on petiole of leaf, 10 Jun 1976, K. P. Dumont, S. E. Carpenter, M. A. Sherwood & L. A. Molina CO-4703 (COL, NY); Dpto. Boyacá, ca 21 km from Aguazul, on the Aguazul-Sogamoso Rd, ca 2700 ft, on petiole of leaf, 14 Jun 1976, K. P. Dumont, S. E. Carpenter, M. A. Sherwood & L. A. Molina CO-5252 (COL, NY); Dpto. Boyacá, ca 21 km from Aguazul, on the Aguazul-Sogamoso Rd, ca 2700 ft, on leaf, 14 Jun 1976, K. P. Dumont, S. E. Carpenter, M. A. Sherwood & L. A. Molina CO-5254 (COL, NY); Dpto. Boyacá, ca 21 km from Aguazul, on the Aguazul-Sogamoso Rd, ca 2700 ft, on leaves, 14 Jun 1976, K. P. Dumont, S. E. Carpenter, M. A. Sherwood & L. A. Molina CO-5283 (COL, NY); Dpto. Chocó, ca 7 km from Quibdó, on the Quibdó-Istmina Rd, ca 200 ft, on leaf, K. P. Dumont, S. E. Carpenter & M. A. Sherwood CO-5632 (COL, NY); Dpto. Antioquia, ca 123 km from Medellín, on the Medellín-Pto. Valdivia Rd, ca 7400 ft, on leaves, 13 Aug 1976, K. P. Dumont, S. E. Carpenter & M. A. Sherwood CO-6411 (COL, NY). GUATEMALA: towards base woods on Guatemala Rte 17, between Tactic and Chilasco, near Union, on bark, 3 Aug 1973, A. L. Welden 3350 (NO, NY). VENEZUELA: Edo. Sucre, trail between Manacal and Los Pocitos, NW of Irapa, on unidentified root, 10 Jul 1972, K. P. Dumont, R. F. Cain, G. J. Samuels, G. Morillo & J. Farfan VE-4573 (NY); Edo. Sucre, trail between Manacal and Los Pocitos, NW of Irapa, on leaf, 10 Jul 1972, K. P. Dumont, R. F. Cain, G. J. Samuels, G. Morillo & J. Farfan VE-4599 (NY); Edo. Sucre, trail between Los Pocitos and Cerro Humo, NW of Irapa, on petiole, 12 Jul 1972, K. P. Dumont, R. F. Cain, G. J. Samuels, G. Morillo & J. Farfan VE-4799 (NY); Edo. Sucre, trail from Los Pocitos through La Roma to town of Rio Grande Arriba, on leaf, 13 Jul 1972, K. P.

Dumont, G. J. Samuels, G. Morillo & J. Farfan VE-5026 (NY); Edo. Bolivar, trail up N facing slope of Uei-Tepui, from old military camp "Ciento Vienticinco", ca 118 km S of El Dorado, on road between El Dorado and Sta. Elena, on leaf, 5 Aug 1972, K. P. Dumont, R. F. Cain, G. J. Samuels & C. Blanco VE-7016 (NY); Edo. Bolivar, trail up N facing slope of Uei-Tepui, from old military camp "Ciento Vienticinco", ca 118 km S of El Dorado, on road between El Dorado and Sta. Elena, on leaf, 5 Aug 1972, K. P. Dumont, R. F. Cain, G. J. Samuels & C. Blanco VE-7039 (NY); Edo. Bolivar, km 116-117 S of El Dorado, on road between El Dorado and Sta. Elena, on leaf, 6 Aug 1972, K. P. Dumont, R. F. Cain, G. J. Samuels & C. Blanco VE-7082 (NY); Edo. Bolivar, km 116-117 S of El Dorado, on road between El Dorado and Sta. Elena, on twig, 6 Aug 1972, K. P. Dumont, R. F. Cain, G. J. Samuels & C. Blanco VE-7133 (NY); Edo. Bolivar, km 110-111 S of El Dorado, on road between El Dorado and Sta. Elena, on leaf, 6 Aug 1972, K. P. Dumont, R. F. Cain, G. J. Samuels & C. Blanco VE-7159 (NY); Edo. Bolivar, km 110-111 S of El Dorado, on road between El Dorado and Sta. Elena, on wood, 6 Aug 1972, K. P. Dumont, R. F. Cain, G. J. Samuels & C. Blanco VE-7162 (NY). ECUADOR: Prov. Pichincha, ca 49 km SW of Chillogallo, on old road to Sto. Domingo, ca 7200 ft, on twig, 17 Jul 1975, K. P. Dumont, S. E. Carpenter & P. Buriticá EC 280 (NY).

NOTES. *Helotium rufo-corneum* is a widely distributed species, occurring throughout the subtropics and tropics of Asia and from Mexico through Brazil in the neotropics. In many regards it is the most variable species in the Sclerotiniaceae which I have thus far studied. Part of this variation may be due to its wide distribution and to its growth on a variety of substrata, such as woody hosts, leaf parts, and herbaceous stems. I have placed four species and one variety into synonymy with *H. rufo-corneum* and have suggested that an additional three may also represent this taxon. The proliferation in names is a result of previous workers describing new species from collections which in reality merely represented morphological variants, and it is only through having examined more than 200 collections in this study that I have been able to observe some of this extreme variation and to recognize these collections as extremes of a continuum. It is further possible that, because the species is so widespread and because it is brightly colored, more names remain to be found in the literature. It is not unlikely that a name older than *Helotium rufo-corneum* may be discovered.

Perhaps the most noteworthy variation in this species is the size of the ascospores, which measure from 20-60µm long amongst collections. Even in a single ascus variation is diverse, and I have seen ascospores in one collection (CUP-JA 1439), for example, in which apparently normal, healthy spores measured 25 x 4µm in the apical region of the ascus and 41 x 3.5µm in the basal portion. The width of the ascospores in this species is also variable and was found to be 2.5-8.0µm amongst collections. Within the groups of inoperculate discomycetes with which I am most familiar, the Sclerotiniaceae and certain groups in the Leotiaceae, a variation in length of 50-75% is common, 100% is rare, and the 300% found in *H. rufo-corneum* is exceptional. I have been unable to correlate the variation in ascospore size with any additional morphological or anatomical feature, and have only noted that in general the ascospores from collections on wood are more robust and broader than those from collections on leaves. However, I have seen many broad ascospores from foliicolous collections and narrow spores from lignicolous collections. It is also interesting to note that in collections from wood there seems to be a higher proportion of misshapen and seemingly aberrant spores than in collections from leaves. Another variable character observed in the ascospore is the "flaring" of the tips of the ascospore. In many collections the flaring is totally absent, while in others it is present in most of the spores. In some ascospores the flaring is obvious, while in others from the same collection or even within the same ascus, it is difficult to detect (Fig. 3).

In general, the external coloration of the apothecia in *H. rufo-corneum* is relatively consistent, but I have noted a few collections occurring on wood in which the apothecia have a purplish or vinaceous tint or cast. These apothecia also tend to be slightly larger than those of other collections. It is also in these collections that I have observed the broadest and most misshapen ascospores. It is possible that the frequent differences in the width of the ascospores between collections on wood and leaves and the differences in coloration are nutritional, as no other meaningful variation in the anatomy and morphology has been detected.

Although I have observed considerable variation in many features in this species and have studied several collections which could be distinguished from other collections, I have observed a gradation from these extremes to the more common situation to other variations. In view of the apparent lack of consistent variation and lack of correlation of variable features, I do not feel warranted in recognizing more than one species. Nor do I consider it wise to recognize infraspecific taxa for any of these variants, since I do see this gradation or continuum of variation from one extreme to the other.

Dumont and Carpenter (1981) also noted unusually large anatomical and morphological variation in their study of *Hymenoscyphus caudatus* and related species from the neotropics. They too had many recent field collections of each species from which to gather data. It is becoming evident that a wide range of anatomical and morphological variation in tropical species occurs perhaps more than in temperate species, and that the amount of variation in each species is dependent on the number of collections being studied.

In *H. rufo-corneum* there are several cohesive, although sometimes variable, characters present. The dry apothecia emit a yellowish brown to rusty brown dye in 2% KOH. The apically free cells in the margin are characteristically expanded, the apothecial coloration is generally orange to red-orange, and the general shape of the apothecium is relatively consistent. Although the flared ascospore tip is not present in all collections, it is present in the majority of them. I know this feature from no other species in the Leotiaceae or Sclerotiniaceae.

Helotium subserotinum Hennings & Nyman was described from a Nyman collection from Tjibodas, Java. I have been unable to locate type or authentic material of this species and designate herewith CUP-SA 3031 as the NEOTYPE specimen for this species. The specimen was chosen for the following reasons: it was collected in the type locality, it agrees with the original description, and the collection contains several apothecia. The portion of the specimen deposited at CUP is considered the NEOTYPE and the small fragment deposited in NY the isoneotype. Dennis (1964) transferred the species to *Hymenoscyphus*, a decision with which I do not agree. I have compared the neotype collection with the holotype collection of *Helotium rufo-corneum* and find them to be synonymous. *Helotium rufo-corneum* was described before *H. subserotinum*.

Helotium fuscopurpureum Rehm was described as occurring on wood in south Brazil by Rehm (1900). In the original description Rehm cited Ule 2500 as the single collection studied, and it is thus the holotype collection. He further indicated that a portion of the original collection was deposited in the Pazchke Herbarium, and Friederischsen (1973) indicated that a portion of Ule 2500 was also deposited at HB. I herewith designate the portion deposited at S as the lectotype specimen for *H. fuscopurpureum*, since it agrees with the original description, and is the specimen upon which Rehm based his description; it contains his handwritten notes used in preparing the original description. I have not attempted to examine the isolectotype portions deposited at either HB or the Pazchke Herbarium. Dennis (1964) transferred the species to *Hymenoscyphus*; however, I have compared the Ule 2500 with the holotype of *H. rufo-corneum* and conclude that they are synonymous. *H. rufo-corneum* has priority.

Lanzia flavo-aurantia was described from south Brazil by Hennings (1902) as occurring on wood, and the species was transferred to *Helotium* by Rick (1931). I have examined the holotype of this species, Möller 259 deposited at S, and have compared it with the holotype of *H. rufo-corneum* and conclude that they represent the same species. The latter name has priority.

Helotium miniatum was described on *Theobroma* from Guadeloupe by Duss (1903). Dennis (1954) suggested that this species could be synonymous with *H. aurantio-rubrum* Bresadola. He described and illustrated the type of *H. miniatum* (Duss 608), demonstrating the slightly flared ascospore tips, the expanded marginal apical cells, and discussed the yellow dye emitted in 2% KOH. Dennis (1964) transferred the species to *Hymenoscyphus*, a decision with which I do not concur. I have compared Duss 608 with the holotype of *H. rufo-corneum* and conclude that they represent the same species; the latter name has priority.

Helotium camerunense was described by Hennings (1895) from West Africa as occurring on twigs. Dennis (1958) reported the species from Bolivia and apparently based on his knowledge of these collections, not of the type, transferred the species to *Hymenoscyphus* (Dennis, 1964). I have been unable to locate the type specimen of *H. camerunense*, but based on the original description I feel that the species may be the same as *H.*

rufo-corneum. A final decision can be made only after the original type is located or a neotype designated. Dumont & Carpenter (1980) studied the collections upon which the Dennis report was made from Bolivia and found them to represent *Hymenoscyphus sclerogenus* (Berk. & Curtis) Dennis.

Helotium sloaneae was described by Patouillard (1900) from Guadeloupe as occurring on "pétioles pourissant de Sloanea Massoni," but Duss (1903) reported the species from Guadeloupe on "rameaux pourrissants d'un *Sloanea Massoni*." As Dennis (1954) mentioned, the type cannot now be located at FH or PC. The original description of *H. sloaneae* is suggestive of *Helotium rufo-corneum*. It is not uncommon to find collections of *H. rufo-corneum* with ascospores to 7 or 8μm wide, but very rare to find them from collections on petioles. The ascospore measurements for *H. sloaneae* in the original description were given as "30-37x7-8", which would fall within my concept of *H. rufo-corneum*. A final decision on the taxonomic position of this species can be made only after the holotype is located or a neotype is designated. I choose not to select a neotype from the material of Pfister (cited above) from Guadeloupe, because the ascospores in these collections are narrower than those reported in the original description.

Rick (1931) described *Helotium camerunense* Henn. var. *brasiliensis* Rick. In the original description he gave no data for the specimen upon which the description was based, and I have been unable to locate a specimen from the Rick herbarium at PACA which might be this collection. Nor have I been able to locate this specimen at any other herbarium, but there is a collection at NY from the Bresadola herbarium which could be this type. The specimen was collected in São Leopoldo, Brazil on wood by Rick, and the handwriting appears to be that of Rick. Rick did send many collections to Bresadola for identification, and it is possible that he did not keep a portion in his own herbarium. This specimen represents the presumed holotype, and bears the number "27=17!" I have examined this specimen, and I conclude that it represents another collection of *H. rufo-corneum*. I thus place this variety into taxonomic synonymy with *H. rufo-corneum*.

Although Dennis and other workers have placed *Helotium rufo-corneum* in the Leotiaceae, I have found that the species produces a stroma and is thus referred to the Sclerotiniaceae. The species is a member of the genus *Lanzia* which is characterized by 1) the production of a substratal stroma; 2) the presence of an ectal excipulum composed of a textura prismatica; 3) lack of a gelatinous matrix in the ectal excipulum; and 4) hyaline ascospores. I thus propose the formal transfer here as follows:

Lanzia rufocornea (Berkeley & Broome) Dumont, comb. nov.

≡ *Helotium rufo-corneum* Berkeley & Broome, J. Linn. Soc., Bot. 14: 108. 1873.

Due to the lack of information on the microanatomy of many species in *Lanzia*, I am uncertain as to which species *Lanzia rufocornea* is most closely related. Because of the generally large size of the ascospores, there are a few other species in the Sclerotiniaceae with which *L. rufocornea* could be confused. In *Ciboria peckiana* the apothecia are characteristically brown, do not emit dye in KOH and the ectal excipulum is composed of small celled textura prismatica giving rise to globose cells. In *Poculum mahoniae* there are two types of paraphyses present, the ascospores frequently contain oily resinous contents, and the ectal excipulum is composed of hyphae in a gel. In *P. juglandis* the ectal excipulum is also composed of hyphae in a gel. Collections on leaves could be confused with primarily two species. *Helotium fastidiosum* has many features in common with *L. rufocornea*, but in the majority of the ascospores the apices are hooked as in *Hymenoscyphus serotinus*. *Helotium fastidiosum* lacks the stroma of *Lanzia rufocornea* and is a good *Hymenoscyphus*. In *Helotium fraternum* the ascospores are (17-)19-21(-23)x3-5µm, have internal red-brown oily contents, and the ectal excipulum is composed of hyphae in a gel. It also is Sclerotiniaceous, and a complete description, illustrations, and discussion are provided here.

2. *Helotium fraternum* Peck, Annual Rep. New York State Mus. 32: 47. 1880 ('1879'). FIGS. 4, 5.

≡ *Hymenoscyphus fraternus* (Peck) Dennis, Persoonia 3: 76. 1964.

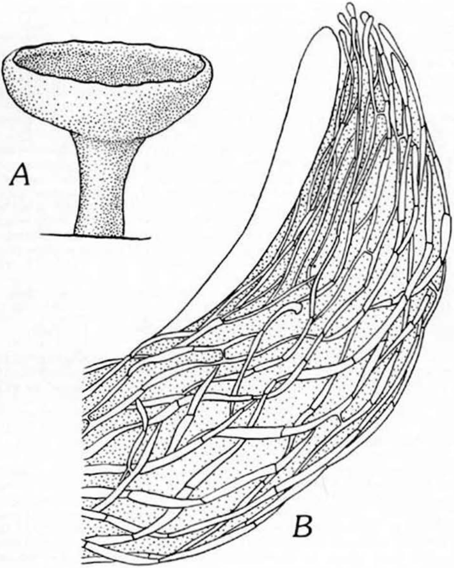
Stroma — Substratal, variable, visible on the host as irregular black patches or poorly developed black lines on petioles; the blackened areas composed of epidermoid to irregular cells in face view; not known in culture.

Macroconidial state — Unknown, presumed absent.

Microconidial state — Unknown.

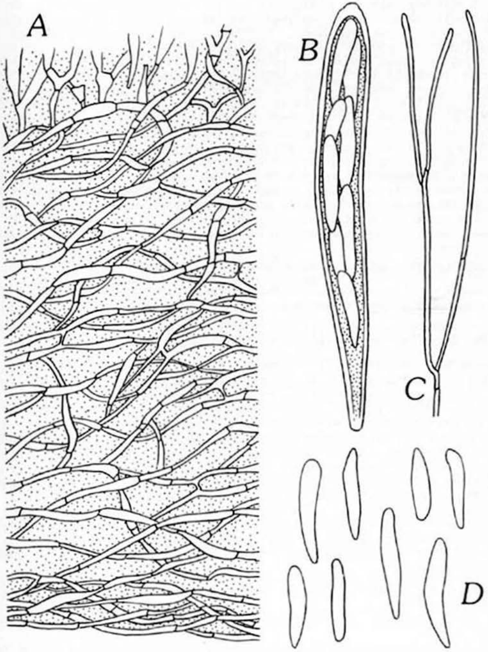
Apothecial morphology — Apothecia variable, solitary to gregarious, arising in association or from blackened areas of the host petiole, stipitate, 1-2mm in diam, 1-2(-3)mm high, when fresh disc at first subglobose, flat with maturity, drying slightly concave, rehydrating flat to slightly convex. Hymenium when fresh waxy yellow to ochraceous orange, drying dark reddish brown to nearly black, rehydrating lighter and giving off a slight rusty dye with tint of red in 2% KOH; margin when fresh, dry, and rehydrated concolorous with the receptacle; receptacle when fresh pale yellow to off-white, drying darker and grayish to flesh color, rehydrating lighter, but darker than hymenium; stipe above concolorous with the lower portion of the receptacle when fresh, dry, and rehydrated, becoming darker below and frequently black at the base.

Apothecial anatomy — Asci 8-spored (70-)80-100x(9-)10-12(-13)µm, produced from small croziers, long cylindric-clavate, gradually tapering to the base and there truncate, rounded or rarely forming a small foot, wall to ca 1µm wide, enlarged at the subpapillate to papillate apex and there 2-4µm thick; pore J+, visible as two dark blue lines or two apical dots in Melzer's reagent. Ascospores (16-)19-23(-24)x(3-)4-5µm, uniseriate to biseriate, generally pigmented light orange-yellow to red-orange by oily resinous contents, smooth, aseptate, ellipsoid, ends generally rounded, in outline inequilateral or less commonly equilateral, generally flattened somewhat on one surface, anterior end generally broader than posterior, frequently curved (occasionally above the middle of the ascospore), occasionally producing a slight beak, internal contents of spores difficult to



↑FIG. 4. *Poculum fraternum*, holotype ex NYS, free hand drawings. A. Habit sketch of an apothecium, x ca 50. B. Median longitudinal section of an apothecium through margin, x 1,000.

→FIG. 5. *Poculum fraternum*, holotype ex NYS, free hand drawings, x 1,000. A. Median longitudinal section through an apothecium at approximately midpoint between margin and stipe. B. An ascus with 8 ascospores. C. A branching paraphysis. D. 8 ascospores drawn after discharge from ascus.


A
B
C
D

observe owing to the oily, spumose material present, but probably with 2-several, spherical to irregular guttules. Paraphyses equal to or slightly exceeding the asci, with internal contents similar to ascospores, but darker, branching at the base of the ascus and toward the middle, filiform, slightly expanded at the apex and there 2-3μm wide, sparingly septate, walls thin or rarely slightly thickened, smooth, and hyaline (pigmentation is in the cytoplasm). Subhymenium not a well differentiated layer, grading into the medullary excipulum below. Medullary excipulum composed of hyphae similar to those of the ectal excipulum, in the center of the receptacle the hyphae interwoven and becoming more parallel in the flanks. Ectal excipulum: not differentiated into definite regions, relatively consistent from the margin to the stipe, to outside 1-2 layers of narrow hyphae with cells frequently containing oily material as in the paraphyses, to the inside the hyphae slightly interwoven, imbedded in a copious gel, widely spaced, individually 3-4(-5)μm, the walls indistinguishable from the gelatinous matrix, but presumed to be hyaline and smooth. Margin constructed similarly to the receptacle, but with less space between the individual hyphae. Stipe constructed similarly to the receptacle, no hairs or apically free hyphae observed; at the base of the stipe a layer of rind cells frequently observed, the cells irregular to epidermoid in outline and with differentially pigmented walls as seen in cross section.

Habitat: On petioles of *Acer* spp.

Etymology of the specific epithet: suggesting a relationship to another species, which according to Peck (1880) was *Helotium fastidiosum*.

Holotype: U.S.A., New York, Adirondack Mountains, on fallen maple petioles, July (year not given), C. H. Peck (NYS).

Illustrations: White, Mycologia 34: 158, fig. 4; 166, fig. 14, 1942.

Additional specimens examined: U.S.A., New York, Mt. Elba, fallen maple petioles, July (year not given), C. H. Peck (NYS).

NOTES. *Helotium fraternum* was described by Peck (1880) from New York state as occurring on petioles of *Acer*. White (1942) accepted its placement in *Helotium*, while Dennis (1964) transferred it to *Hymenoscyphus*. Based on the presence of a stroma produced by this species, I conclude that the species belongs in the Sclerotiniaceae, rather than the Helotiaceae (Leotiaceae) as indicated by previous workers. In view of the fact that the ectal excipulum of the apothecium is composed of hyphae embedded in a gel, I have concluded that the species is best placed in *Poculum* Vel. I thus propose the formal transfer as follows:

Poculum fraternum (Peck) Dumont, comb. nov.

≡ *Helotium fraternum* Peck, Annual Rep. New York State Mus. 32: 47. 1879 (1880).

Poculum fraternum appears to be most closely related to two foliicolous species of *Poculum*, *P. mahoniae* and *P. juglandis*. In *P. fraternum* the ascospores, frequently the paraphyses, and the hyphae of the outer covering layer contain oily, resinous, orange to brown-orange, red-orange matter, but in *P. juglandis* this substance is lacking. Oily resinous matter is present in both *P. mahoniae* and *P. fraternum*, and the two are most easily separated on their respective sterile tissues. In *P. mahoniae* the individual hyphae are composed of small brick-shaped cells which are tightly compact and with little gel, whereas in *P. fraternum* the individual hyphae are long and narrow and embedded in a copious gel, as in *P. juglandis*.

Acknowledgements

The author wishes to thank the hundreds of collaborators throughout the world who have made the field work in this study possible. It is unfortunate that each cannot be named individually. To the directors of the institutions who have loaned specimens from their respective institutions, I express my appreciation. The funding for the recent field work has been provided by the National Science Foundation grant GB 28593ff. The drawings have been prepared by Bobbi Angell.

LITERATURE CITED

Carpenter, S. E. 1980. Monograph of *Crocicreas* (Ascomycetes, Helotiales, Leotiaceae). Mem. New York Bot. Gard. 32: 1- (in press).

____ & K. P. Dumont. 1978. Los Hongos de Colombia-IV. *Bisporella triseptata* and its allies in Colombia. Caldasia 12(58): 339-348.

Dumont, K. P. 1971. Sclerotiniaceae II. *Lambertella*. Mem. New York Bot. Gard. 22(1): 1-178.

____ & S. E. Carpenter. 1981. Leotiaceae IV: Los Hongos de Colombia-VII. *Hymenoscyphus caudatus* and related species from Colombia and adjacent regions. Caldasia (in press).

Dennis, R. W. G. 1954. Some inoperculate discomycetes of tropical America. Kew Bull. 1954: 289-348.

____. 1958. Bolivian Helotiales collected by Dr. R. Singer. Kew Bull. 13: 458-467.

____. 1964. Remarks on the genus *Hymenoscyphus* S. F. Gray, with observations on sundry species referred by Saccardo and others to the genera *Helotium*, *Pezizella* or *Phialea*. Persoonia 3: 29-80.

Duss, R.-P. 1903. Enumération méthodique des Champignons recueillis a La Guadeloupe & à La Martinique. Lons-Le-Saunier, France. 94 pp.

Friederichsen, I. 1973. Liste der Pilze der Kolleltion E. Ule aus Brasilien (1883-1903) im Herbarium Hamburgense. Mitt. Staatsinst. Allg. Bot. Hamburg 14: 95-134.

Hennings, P. 1895. Fungi camerunenses. I. Bot. Jahrb. Syst. 22: 72-111.

____. 1902. Fungi blumenavienses II. a cl. Alfr. Möller lecti. Hedwigia 41: 1-33.

Patouillard, N. 1900. Champignons de la Guadeloupe, recueillis par le R.-P. Duss. Bull. Soc. Mycol. France 16: 175-188, pl. VII.

Peck, C. H. 1880. Report of the botanist. Annual Rep. New York State Mus. 32: 17-72. (1879).

Rehm, H. 1900. Beiträge zur Pilzflora von Südamerika. VIII. Discomycates. Gesammelt von Herrn E. Ule in Brasilien. Hedwigia 39: 80-99, pl. IV-VI.

Rick, J. 1931. Monographia Pezizinearum Riograndensium. Brotéria, Sér. Bot. 25: 35-46, 77-98, 99-122.

White, W. L. 1942. Studies in the genus *Helotium*. I. A review of the species described by Peck. Mycologia 34: 154-179.

MYCOTAXON

Vol. XII, No. 1, pp. 278-280 October-December 1980

ADDITIONS TO THE FUNGUS FLORA OF BERMUDA I: A NEW SPECIES OF LACHNELLULA ON PITTOSPORUM

LINDA M. KOHN

Department of Botany, Clemson University, Clemson SC 29631
and Plant Pathology Herbarium
Cornell University, Ithaca, NY 14853*

INTRODUCTION

Despite the attention paid to the discomycete flora of Bermuda by Whetzel, White, Seaver, and others (see Waterston, **1947**), as yet little is known about the Trichoscyphelloideae of the islands. A recent mycological exploration in which the author took part has yielded several discomycetes new to science, among them an apparently undescribed species of Lachnellula occurring on Pittosporum undulatum.

While some authors (Dharne, **1965**) restrict the circumscription of the genus to saprophytes on and parasites of conifers, I prefer to follow Nannfeldt (**1932**) and Dennis (**1962**) in stressing microanatomical affinities, noting in particular both the ectal excipulum, composed here of heavily gelatinized textura oblita, and the hyaline, coarsely granulate, extremely profuse hairs so characteristic of Lachnellula. With its orange-yellow hymenium, characteristic hairs and excipular structure, and frequent association with the cut edges of living wood, this species shows clear affinities in Lachnellula yet cannot be accommodated in any previously described species. Preliminary cultural studies have not disclosed a conidial anamorph.

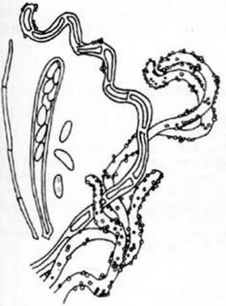
TAXONOMIC PART

Lachnellula pittospori Kohn, sp. nov.

Apothecia gregaria vel fasciculata, sessilia, hymenio rehydrato vitelli-

---

* Reprints through this address.



Lachnellula pittospori, paraphysis, ascus, 3 ascospores, hairs (one in optical section), drawn from the **holotype** with the aid of a drawing tube, reproduced at ×1000

no, receptaculi parietibus pilis albis dense vestitis; receptaculum ad 750 µm in diam., situ affixionis parum angustatum. Excipulum medullare ex textura intricata hyalina formatum, interdum in gelatina contentum, cellulis 1-2 µm latis. Excipulum ectale ex textura oblita hyalina intertexta formatum, in gelatina contentum, cellulis 3-5 µm latis, exterioribus extensis pilos formantibus. Pili ex cellulis excipularibus enati, hyalini, septati, interdum ramosi, grosse granulosi, ad 100 µm longi, 2-3 µm lati, secundum latera in tegetem densam intertexti, extremitatibus (pilorum) liberis, crispatis, as marginem saepe erecti. Asci clavati, ad basem angustati, ex uncis enati, 8-spori, 40-48 × 3-5 µm, apice parum incrassato, pori canalis pariete J— cum/sine usu KOH antecedente. Ascospori uni- vel biseriati, hyalini, fusiformi-ellipsoidei, juventute biguttulati, 5-8 × 1.5-2 µm. Paraphyses simplices, filiformes, septatae, ascos parum (3-5 µm) excedentes, 1 µm latae.

Apothecia gregarious to fasciculate, sessile, hymenium egg-yolk yellow upon rehydration, walls of receptacle densely clothed with white hairs; receptacle up to 750 µm in diam, tapering slightly at site of attachment. **Medullary excipulum** of hyaline textura intricata, sometimes bound in gel, cells 1-2 µm broad. **Ectal excipulum** of interwoven, hyaline textura oblita, bound in gel, with outermost cells turning out to form hairs, cells 3-5 µm broad. **Hairs** arising from excipular cells, hyaline, septate, occasionally branching, coarsely granulate, along flanks interwoven in a dense mat terminating as curled, free ends, at margin often erect, up to 100 µm long, 2-3 µm broad. **Asci** clavate, tapered at the base, arising from croziers, 8-spored, 40-48 × 3-5 µm, slightly thickened at the apex, pore channel wall J— both with and without KOH pretreatment. **Ascospores** uniseriate or biseriate, hyaline, fusiform-ellipsoid, biguttulate in youth, 5-8 × 1.5-2 µm. **Paraphyses** simple, filiform, septate, slightly exceeding the asci by 3-5 µm, 1 µm broad.

Habitat: on cut edges of stumps, pruned branches, etc. of Pittosporum undulatum.

Type Locality: Paget Parish, near Paget Marsh.

Holotype: R.P. Korf, leader, A.J. Caesar, S.E. Clark, S.C. Gruff, L.M. Kohn, G.R. Ramsey, D.L. Rist, A.Y. Rossman, J. Wymore, L.A. Wymore & J.E. Yuen, on cut end of girdled trunk of Pittosporum undulatum, Paget Parish, near Paget Marsh, Bermuda, U.K., 19.i.1980, CUP-BE **39**.

Paratypes: R.P. Korf et al., on ?Pittosporum or ?allspice, Paget Parish, Paget Marsh, Bermuda, 19.i.1980, CUP-BE **56**; R.P. Korf et al., on cut edge of stump of Pittosporum undulatum, Paget Parish, near Paget Marsh, Bermuda, 19.i.1980, CUP-BE **64**.

ACKNOWLEDGEMENTS

Both the expedition to Bermuda and the subsequent studies reported here were made possible through funds from the Anna E. Jenkins bequest to the Plant Pathology Herbarium, Cornell University. The hospitality and assistance of Dr. Idwal Hughes and Dr. David Wingate in Bermuda greatly facilitated the field studies on which this report is based. Dr. William J. Dress, Bailey Hortorium, kindly helped with the Latin diagnosis, and Robert Dirig, Bailey Hortorium, inked the drawings.

LITERATURE CITED

DENNIS, R.W.G. 1962. A reassessment of Belonidium Mont. & Dur. Persoonia **2**: 171-191.

DHARNE, C.G. 1965. Taxonomic investigations on the discomycetous genus Lachnellula Karst. Phytopathol. Z. **53**: 101-144.

NANNFELDT, J.A. 1932. Studien über die Morphologie und Systematik der nicht-lichenisierten inoperculaten Discomyceten. Nova Acta Regiae Soc. Sci. Upsal. iv **8**(2): 1-368.

WATERSTON, J.M. 1947. The Fungi of Bermuda. Bull. Dept. Agric. Bermuda **23**: 1-305.

MYCOTAXON

Vol. XII, No. 1, pp. 281-286 October-December 1980

TYPE STUDIES IN THE CLAVARIACEAE. VI.

FOUR PIVOTAL TYPES FROM THE PACIFIC TROPICS.

RONALD H. PETERSEN

Botany Department, University of Tennessee,
Knoxville, Tennessee 37916

Abstract

Type specimens of *Clavaria alcicornis*, *C. amoena*, *C. phoenicea* and *C. spiralis* are described and their proper taxonomic placement discussed.

Until the major compilation on clavarioid fungi by Corner (1950), the tropical taxa had been largely overlooked by the mycological community, which resided chiefly in the North Temperate zone. Recently, however, distribution patterns of such taxa have been shown to encompass temperate areas, making reconsideration necessary. Moreover, nomenclaturally, several names for such organisms predate those coined for fungi collected in temperate areas, making the names for some tropical taxa correct for their temperate analogs. The type specimens described here represent such taxa and names and so have become important to an understanding of the clavarioid fungi as a whole.

Clavaria alcicornis Zollinger & Moritzi. 1844. Natuur-Geneesk. Arch. Neerl.-Indië, p. 382.

Holotype: L - herb. Zollinger, "*Ad terram prope Tjikoya*", iii.184 . Plantae Javanicae no. 1125 [!]: merotype: FH [!].

Some years ago I (Petersen, 1967) reported that tramal hyphae and basidia were clamped on the FH portion of the type, but that no basidiospores were observed. On the original material at L, of which I had no knowledge in 1967, I can find no clamps on hyphae or basidia. The tramal hyphae are slightly inflated, thin-walled, simple-septate (occasionally apparently secondarily septate), short-celled and now adherent in sheets. The hymenium will not support observation, for the basidia are so gelatinized as to be shapeless, except for a rare apex protruding from the hymenial surface. One basidium was seen to be 4-sterigmate. A fruitbody is shown in Fig. 1.

Numerous basidiospores were present on the L material, however. They (Fig. 2) were 5.9-6.7 x 3.3-4.1 µm ($\underline{E}$ = 1.60-1.80; $\underline{E}^m$ = 1.69; $\underline{L}^m$ = 6.25 µm). Such spores, found in a taxon with clamps, would lead one to *Clavaria* subg. *Clavulinopsis* or to *Ramariopsis*, but the construction of the trama was unlike that found in either genus, especially the relatively short cells with occasional secondary septa. Both characters, together with the very thin-walled spores, lead directly to *Clavaria zollingeri*, a branched *Clavaria*. I am of the firm belief that the specimen represents a rosy form of that taxon.

Is there a rosy "*Clavulinopsis*" in tropical Asia? Fawcett (1939) described *C. pallidorosea*, but I have been unable to locate an adequate type, and her description does not permit accurate placement of the taxon. Van Overeem's (1923) treatment of *C. alcicornis* was not entirely true to the original description, and I have not examined his specimens under that name.

Clavaria amoena Zollinger & Moritzi. 1844. Natuur-Geneesk. Arch. Neerl.-Indië 1: 380.

Holotype: PC - herb. Léveillé, ex Plantae Javanicae cl. Zollinger lecta, no. 107.z, Tjikoya, ii.1843.

The specimen consists of two slender (up to 27 x 1.5 mm), simple fruitbodies (Fig. 3) joined at the base, arising from a very small mycelial pad. Fruitbodies now dull dark orange. Stipe portion (lower 2-4 mm) glassy, glabrous; club portion hardly thicker, smooth, dull.

Basidia up to 47 µm long, clavate, clamped; sterigmata four, rarely abnormally long and stout. Tramal hyphae clamped, parallel.

Spores (Fig. 4) 5.9-7.0 x 4.1-4.4 µm ($\underline{E}$ = 1.33-1.58; $\underline{E}^m$ = 1.47; $\underline{L}^m$ = 6.45 µm), ovoid to ellipsoid, usually flattened adaxially, smooth, thin-walled, hyaline (singly), usually uniguttulate; apiculus of moderate size, eccentric.

Corner (1950, 1970) assumed the identity of this name from the golden color attributed to the fruitbodies ("pulcherrime aurea" of Zollinger & Moritzi). Encountering a taxon with fasciculate, golden fruitbodies, he used this name, but attributed to it nearly spherical spores. Under this concept, the round-spored taxon was treated by Petersen (1968, 1971, 1980) with decreasing enthusiasm, but on other bases than examination of the type.

Interestingly, the type was annotated by Léveillé as *Clavaria helvola* Pers. That taxon exhibits warted-angular spores.

In my opinion, this specimen clearly represents a common Pacific tropical taxon which has passed under several names. A partial synonymy can be offered as follows:

Clavaria amoena Zollinger & Moritzi (ibid) [!]

≡ *Clavulinopsis amoena* (Zoll. & Mor.) Corner. 1950. Ann. Bot. Mem. 1: 352.

≡ *Clavulinopsis aurantio-cinnabarina* f. *amoena* (Zoll. & Mor.) Petersen. 1968. Mycologia Mem. 2: 25.

= *Clavaria aurantia* Cooke & Massee in Cooke. 1887. Grevillea 16: 33. [!]

= *Clavaria luteo-tenerrima* van Overeem. 1923. Bull. Jard. Bot. Buitenzorg III 5(4): 269. [!]

≡ *Clavulinopsis luteo-tenerrima* (v. Over.) Corner. 1950. Ann. Bot. Mem. 1: 377.

The nomenclatural fate of the taxon with gold colored fruitbodies and round spores has been taken up elsewhere (Petersen, 1980). The concept would now seem without a name, but if my conclusions are correct, this *anomie* may not be tragic.

In addition to exhibiting ellipsoid spores, the fruitbodies of the type arise from a mycelial pad, invariable for the types of all the above names.

Clavaria phoenicea Zollinger & Moritzi. 1844. Natuur-Geneesk. Arch. Neerl.-Indië 1: 381.

Holotype: PC - herb. Léveillé, ex Plantae Javanicae cl. Zollinger lecta, no. 1064, vic. Tjikoya, i-iii.1843.

Specimen a single fascicle of more than 14 individual, simple fruitbodies (Fig. 5) up to 25 x 3 mm, adherent at their bases but not arising from a mycelial pad; color now orange-brown; stipe and club portions now indistinguishable.

Basidia approximately 45 x 6 µm, clavate, clamped, golden-refringent under phase contrast; contents foamy; sterigmata not observed. Tramal hyphae of two types: a) up to 12 µm diam, clamped; wall up to 1 µm thick; b) up to 2.2 µm diam, clamped, thin-walled, copiously branched at almost 90° angles.

Spores (Fig. 6) 5.6-5.9 x 4.8-5.6 µm ($\underline{E}$ = 1.07-1.15; $\underline{E^m}$ = 1.10; $\underline{L^m}$ = 5.8 µm), spherical to subspherical, hyaline; wall thin; contents homegeneous; apiculus small, papillate.

This name represents a round-spored taxon with purple-red fruitbodies. Corner (1950, 1970) synonymized it with *Clavulinopsis miniata* (Berk.) Corner, and it is surely an older name for *Clavulinopsis miniata* var. *sanguinea* Corner (1950: 381, 694, pl. 7, fig. 3). Reid (1975) examined type material of *Clavaria miniata* in more detail than I, and found only ellipsoidal spores, not spherical as assumed by Corner (1950, 1970) and reported by me (Petersen, 1968) from the type. Both my notes and drawings indicate a paucity of probable basidiospores and a plethora of extraneous forms, and I gladly rely on the more complete data by Reid, especially for the specimen ex herb. Hooker. I agree with Reid that the round-spored organism widely called *C. miniata* must be furnished another name, and *C. phoenicea* is the oldest found to date. Because I now consider the taxon best placed in *Clavaria* (not *Clavulinopsis*, cf. Petersen, 1978), no new combination is required.

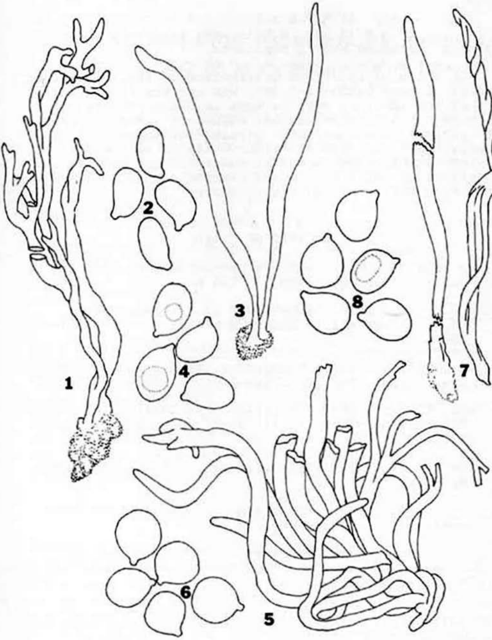
The type of *C. miniata* is a specimen of *C. aurantia* var. *macrospora* Petersen (1980), which also occurs in Africa. Although Berkeley's epithet is older, the younger name has priority at the varietal rank, so again no new combination is required.

Clavaria spiralis Junghuhn. 1838. Verh. Bot. gen. Kunst. Wetensch. 17(3): 32.

Type: L - herb. Junghuhn, Kebo-Koening, Java, May, leg. Junghuhn, s.n.

Fruitbodies (Fig. 7) at least 4, up to 8 cm high, up to 5 mm broad, simple, narrowly fusiform in the shape of a single club of *Ramariopsis fusiformis*. Stipe portion pale, perhaps whitish, minutely furfuraceous where exposed, involving some soil, but without a basal pad or mat. Club opaque, now split longitudinally and twisted in a spiral pattern (? in drying); apex narrowly rounded.

Tramal hyphae hyaline, thin-walled, clamped, loosely



Figs. 1, 2. *Clavaria alcicornis*. 1. Fruitbody. 2. Spores. Figs. 3, 4. *Clavaria amoena*. 3. Fruitbodies. 4. Spores. Figs. 5, 6. *Clavaria phoenicea*. 5. Fruitbodies. 6. Spores. Figs. 7, 8. *Clavaria spiralis*. 7. Fruitbodies. 8. Spores.

parallel; gloeoplerous hyphae occasional, not inflated. Basidia 60-70 x 7.5-9 µm, clavate, clamped, (2)-4-sterigmate.

Spores (Fig. 8) 5.9-6.7 x 5.1-5.9 µm ($\underline{E}$ = 1.06-1.21; $\underline{E}^m$ = 1.15; $\underline{L}^m$ = 6.15 µm), subglobose, thin-walled; contents granular; apiculus short, papillate.

In spite of incorrect attribution of fruitbody color (white), Corner (1950: 388-390) was correct in his perception of the taxon in what he knew as *Clavulinopsis*. Junghuhn (ibid.) twice stated "sulphurea", and accompanied the specimen with some paint streaks now impossible to interpret but not showing either white or yellow colors. In view of later developments, however, most of Corner's conjecture on color ranges and taxonomic placement must be taken with different names throughout.

LITERATURE CITED

Corner, E.J.H. 1950. A monograph of *Clavaria* and allied genera. Ann. Bot. Mem. 1: 740 p.

____________. 1970. Supplement of "A monograph of *Clavaria* and allied genera". Beih. Nova Hedwigia 33: 299 p.

Fawcett, S.G.M. 1939. Studies on the Australian Clavariaceae. Proc. Roy. Soc. Victoria 51: 265-280.

Overeem, C. van. 1923. Beiträge zur Pilzflora von Niederländischen Indien. Bull. Jard. Bot. Buitenzorg 5: 247-293.

Petersen, R.H. 1967. Type studies in the Clavariaceae. Sydowia 21: 105-122.

____________. 1968. The genus *Clavulinopsis* in North America. Mycologia Mem. 2: 39 p.

____________. 1971. Notes on clavarioid fungi. X. Addendum to *Clavulinopsis* in North America. Persoonia 6: 219-229.

____________. 1978. Notes on clavarioid fungi. XV. A realignment of *Clavaria*, *Clavulinopsis* and *Ramariopsis*. Mycologia 70: 660-671.

____________. 1980. Notes on clavarioid fungi. XVII. *Clavulinopsis* taxa in southeastern Australia. Sydowia (in press).

Reid, D.A. 1975. Type studies of the larger Basidiomycetes described from southern Africa. Contr. Bolus Herb. 7: 255 p.

MYCOTAXON

Vol. XII, No. 1, 287-306 October-December 1980

PRELIMINARY STUDIES IN THE GENERA RUHLANDIELLA, SPHAEROSOMA, AND SPHAEROZONE (ORDER PEZIZALES)

HENRY DISSING

Institut for Sporeplanter, Københavns Universitet
Ø. Farimagsgade 2D, DK-1353 København K, Denmark

and

RICHARD P. KORF

Plant Pathology Herbarium, Cornell University
Ithaca, New York 14853, USA

ABSTRACT

The genera Ruhlandiella Hennings descr. emend., Sphaerosoma Klotzsch, and Sphaerozone Zobel are circumscribed. Ruhlandiella berolinensis Henn. descr. emend., Sphaerosoma fuscescens Klotzsch, and Sphaerozone ostiolatum (Tul. & Tul.) Setchell are described. A survey and a key are given for genera of the family Pezizaceae which have globose, hyaline to brownish ascospores and amyloid asci.

INTRODUCTION

During a study of the genus Boudiera Cooke, a number of additional taxa from the genera Sphaerosoma Klotzsch and Plicaria Fuck. emend. Boudier were also examined (Dissing and Schumacher, 1979). In the same period material collected in the Canary Islands was only tentatively named Ruhlandiella hesperia Setchell by Korf (Discomycete Flora of Macaronesia labels, unpublished), because the status of the genus Ruhlandiella Hennings was at that time uncertain. After preliminary discussions at Cornell University in 1977 the authors decided to take up studies of types and other authentic collections of species in the above genera, i.e., species with globose spores and with pulvinate to globose fruitbodies. A grant from the University of Copenhagen to the junior author made preliminary investigations in Copenhagen possible. The genus Boudiera was circumscribed with 6 species (Dissing and Schumacher, 1979) and in the present paper a survey is given for the monotypic genera Ruhlandiella Hennings descr. emend. and Sphaerozone Zobel, and for Sphaerosoma Klotzsch with two species.

Some discoid to cupulate species related to the genus Plicaria are treated elsewhere by Dissing and Pfister (1981), who erect the genus Scabropezia for species intermediate between Plicaria and Pachyphloeus Tul. A possible relationship among these genera is shown in FIG. 1.

It seems natural to place genera with globose, hyaline to pale brownish spores and amyloid asci in the family Pezizaceae (Korf, 1972), irrespective of whether violent discharge occurs (cfr. Trappe, 1979); the genus Sphaerosoma, also treated here, has nonamlyoid asci and is considered a member of the family Pyronemataceae (see below, page 297).

The main distinguishing characters among the taxa dealt with are summarized in the following key.

KEY TO THE GENERA TREATED

1. Asci J+ 2
1. Asci J- 7

   2. Fruitbodies pulvinate to subglobose 3
   2. Fruitbodies disc-shaped to cupulate 6

3. Asci irregularly disposed in one or more cavities in the subglobose fruitbody ....**Pachyphloeus**
3. Asci in a distinct hymenium together with paraphyses 4

   4. Asci protruding at maturity; inner and outer excipula distinguishable ....**Boudiera**
   4. Asci exceeded by the paraphyses at maturity; excipulum of one type of cell 5

5. Asci evanescent; paraphyses with a gelatinous sheath ....**Ruhlandiella**
5. Asci persistent; paraphyses without a gelatinous sheath ....**Sphaerozone**

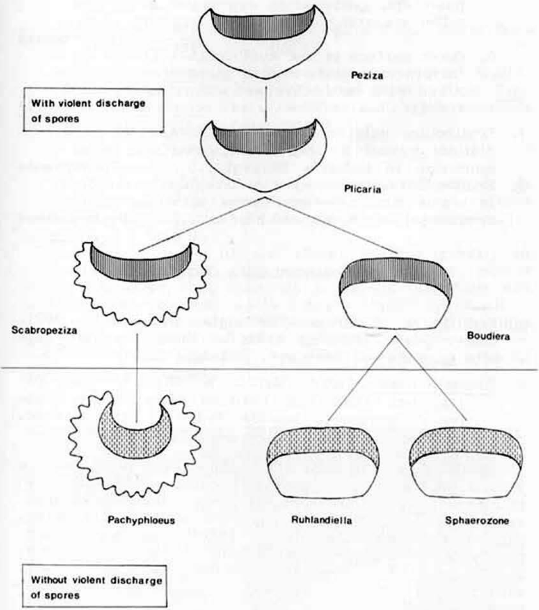


FIGURE 1. Possible relationships among genera of the family Pezizaceae with globose spores and amyloid asci. Genera with violent discharge of spores (above the line) as well as genera without such discharge (below the line) are included.

The genus Plicaria, with globose spores, is considered intermediate between Peziza, with ovoid spores, and Scabropezia and Boudiera, with globose spores. Emphasis on characters of the anatomy and morphology of the fruitbodies implies two different lines of further development. Types of fruitbodies schematic.

6. Outer surface of the apothecium prominently pustulate, composed of aggregates of globose cells; occurring on soil and decaying wood. **Scabropezia**
6. Outer surface of the apothecium glabrous or furfuraceous, composed of globose cells intermixed with broad hyphae; occurring on burnt areas .... **Plicaria**

7. Fruitbodies pulvinate; asci and paraphyses in a distinct hymenium; spores with dextrinoid ornamentation in Melzer's Reagent .... **Sphaerosoma**
7. Fruitbodies subglobose; asci irregularly disposed in one or more cavities; spores with cyanophilic ornamentation in cotton blue .... **Pachyphloeus**

THE GENUS RUHLANDIELLA (PEZIZACEAE)

RUHLANDIELLA Hennings, Hedwigia **42**: (24). 1903, descr. emend. Dissing & Korf. Monotype: Ruhlandiella berolinensis Hennings, Hedwigia **42**: (24). 1903.

= Tremellodiscus Lloyd, Mycol. Writings **7**: 1363, pl. 344, fig. 3260. 1925 (without description). Monotype: Spragueola mucida Rodway, Pap. & Proc. Roy. Soc. Tasmania **1919**: 114, pl. 26. 1920.

Fruitbodies pulvinate to brain-like. Excipulum of globose to angular, thick-walled cells. Asci cylindrical to clavate, weakly amyloid all over, without operculum; ascus wall evanescent. Paraphyses septate, branching, with a conspicuous gelatinous sheath; paraphyses distinctly exceeding asci in length. Ascospores globose, at first bi- to tri-seriate, hyaline, later uniseriate, with a pale brownish, strongly cyanophilic ornamentation.

ACCEPTED SPECIES

1. RUHLANDIELLA BEROLINENSIS Hennings, Hedwigia **42**: (24). 1903, descr. emend. Dissing & Korf. N type specimen: Mycoflora of Macaronesia 1. (CUP); isoneotype (C); additional isoneotyp to be issued in Korf & Gruff, Discomycetes Exsi cati No. 84.

= Ruhlandiella hesperia Setchell, Univ. Calif. Publ. Bot. **4**: 116. 1910.

≡ Sphaerosoma hesperium (Setchell) Seaver, North Amer. Cup-fungi (Oper.) 51. 1928.

= Spragueola mucida Rodway, Pap. & Proc. Royal Soc. Tasmania 1919: 114. 1920.

≡ Tremellodiscus mucidus (Rodway) Lloyd, Mycol. Writings 7: 1363. 1925 (the generic name Tremellodiscus not validly published, without diagnosis or description).

FIGS. 1-5.

Fruitbodies (0.5-) 1-3 cm broad, hemisphaeric to subglobose, with a convoluted to brain-like surface with irregular cavities inside, consistency rather cartilaginous, not brittle.

Excipulum up to 700 μm thick, varying greatly in thickness. Individual cells rounded to angular, mostly 35-100 μm diam, but cells up to 125-150 μm diam are seen in some sections; walls 2-4 μm thick, cyanophilic, with circular connections between the cells; no distinction between inner and outer excipula, but towards the base the cells generally smaller. Colorless anchoring hyphae 5-8 μm broad.

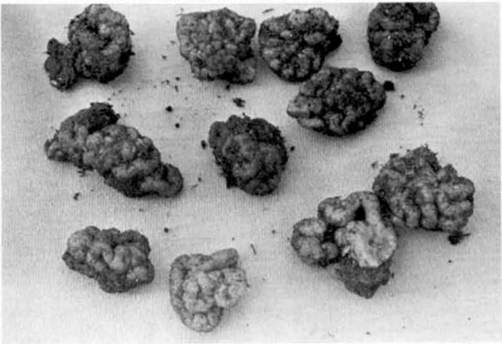


FIGURE 2. Ruhlandiella berolinensis.
Fresh fruitbodies. Mycoflora of Macaronesia 1230 (Neotype). × 1.

Subhymenium varying, up to 120 µm thick; individual cells smaller than in the excipulum, towards the hymenium often forming small clusters.

Young asci broadly cylindrical, up to 320 µm long, 26-33 µm broad, thin-walled, weakly amyloid all over, and with strongly dextrinoid contents; as the spores mature the ascus wall seems to disappear.

Paraphyses 2.5-3.5 µm broad, gradually thickened above to 10-17 µm, with a characteristic, 3-4 µm broad gelatinous sheath, septate, branching from the base where they develop from cells not covered by a sheath (FIG. 5c); sometimes with backward pointing side branches, mostly curved above, 380-420 µm long, exceeding the asci by 60-100 µm.

Ascospores globose, 17.2-18.8-20.5 µm broad, exclu-

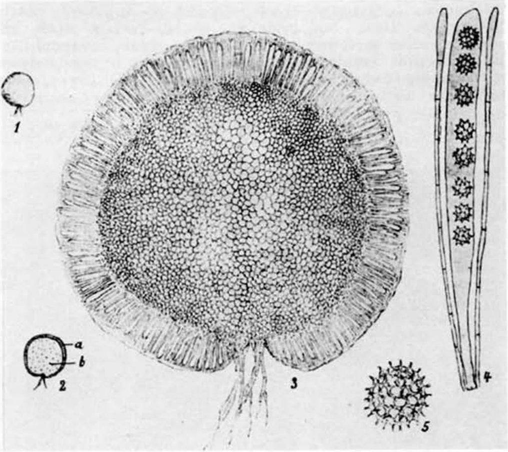


FIGURE 3. Ruhlandiella berolinensis. Reproduced from Hennings (1903), slightly reduced. 1. Fruitbody, natural size. 2. Section of fruitbody, a. hymenium, b. excipulum. 3. Section, magnified. 4. Ascus with paraphyses. 5. Spore, magnified.

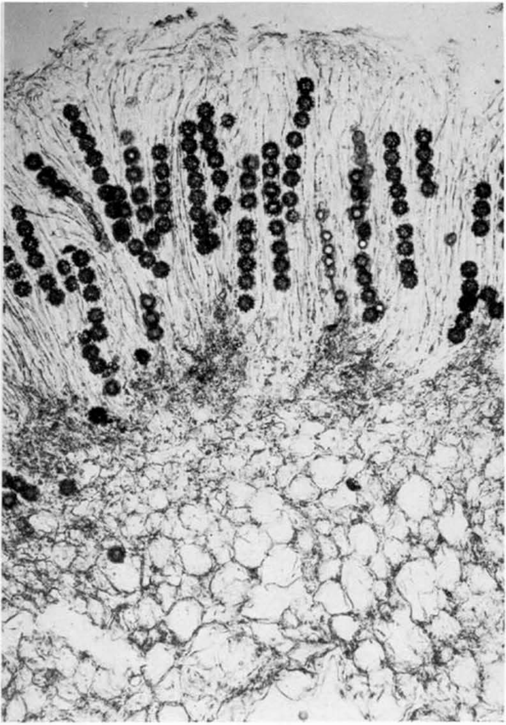


FIGURE 4. Ruhlandiella berolinensis.
Section in cotton blue, MM 1230 (Neotype). x 162.

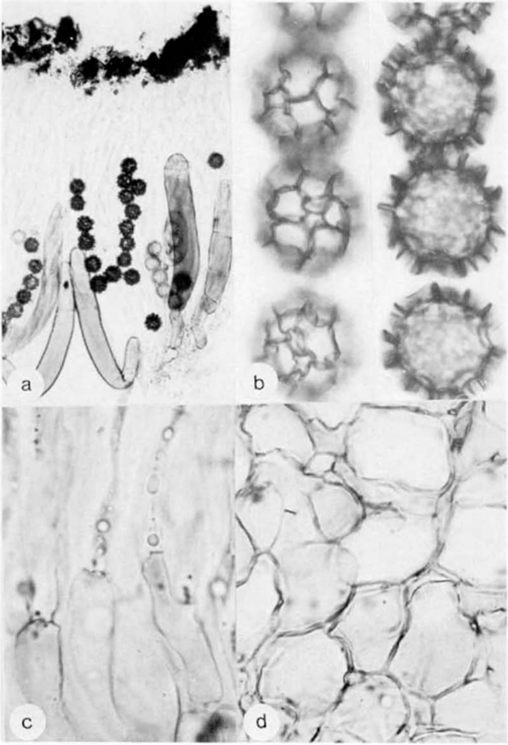


FIGURE 5. Ruhlandiella berolinensis. a. Upper part of hymenium, in Melzer's Reagent; only young asci with visible walls; paraphyses considerably exceeding the asci and the mature spores. b. Mature

sive of the ornamentation which is 3.2-4.0 µm high. Spores at first bi- to tri-seriate, hyaline, with one guttule, rarely with a de Bary bubble, smooth, later reticulate, becoming brownish, finally uniseriate, deeply reticulate-areolate, reticulation irregular, with sharp ridges, areolae 3-6 µm broad, the ornamentation strongly cyanophilic in cotton blue, staining yellowish-brown in Melzer's Reagent.

MATERIAL EXAMINED:

U.S.A.: California, Berkeley, ad terram sub foliis Eucalyptus, ii.1903, N. L. Gardner (holotype of *Ruhlandiella hesperia*, UC **123152**).

MACARONESIA: Canary Islands, Tenerife, burn site along road in Eucalyptus grove at km mark 14, Bosque de la Esperanza, 29.xii.1976, R. P. Korf, R. Fogel, G. L. Hennebert, L. M. Kohn (Mycoflora of Macaronesia **1230**, Neotype of *Ruhlandiella berolinensis* designated here, CUP; isoneotype, C).

AUSTRALIA: Tasmania, vii.1921, L. Rodway [authentic material of *Spragueola mucida*, redet. C. G. Lloyd as *Tremellodiscus mucidus* (BPI-Lloyd **15488**, CUP **58186** [slide])].

DISCUSSION:

The directors of the herbaria in Botanischer Garten und Botanisches Museum, Berlin-Dahlem (B) and in the Botanic Institutes of the Polish Academy of Sciences, Krakow (KRAM) have kindly informed us that there is no material left of *Ruhlandiella berolinensis*. The ample Macaronesian material has therefore been selected to serve as **neotype**.

For a long time we found it difficult to come to a definite opinion on Hennings's taxon, and we thought it difficult to imagine that it could be identical with Setchell's *R. hesperia*. Several important characters are lacking in Hennings's description, viz., that the asci are amyloid, and the omission of mention or illustration (cfr. FIG. 3) of the characteristic gelatinous

spores, in cotton blue. c. Paraphysis bases with a conspicuous gelatinous sheath, arising from non-sheathed subhymenial cells below, with firm walls, in water. d. Excipular cells, in water. a-d, MM **1230** (Neotype). a, × 162; b-c, × 1085; d, × 455.

sheath on the paraphyses.

When Lloyd's description of *Tremellodiscus mucidus* was rediscovered (by RPK) and authentic material of this taxon proved to be identical with *R. hesperia*, the range of distribution of this species was suddenly extended from California and the Canary Islands to cover also Australia. Both the Californian and the Canary Islands collections had been taken in association with *Eucalyptus*, an Australian tree not native to either area.

Though Hennings's collection had been taken in a Berlin greenhouse, it was very probably with plants imported living from Australia ("Neuholländerhaus" !). After a careful re-reading of Hennings's description, and perhaps especially after an examination of his drawings (FIG. 3), in which the paraphyses are shown much longer than the asci (in FIG. 3, 3, but erroneously shown equalling the asci in FIG. 3, 4), we decided that it is by no means impossible that *R. berolinensis* and *R. hesperia* are identical. It is also important to remember that Rouppert (1910), after having studied the original material of *R. berolinensis* (loc. cit., p. 86) concluded it was identical with *Sphaerosoma fuscescens* (in his sense, i.e., with amyloid asci). Rouppert also emphasized that the spores are reticulate, not "reticulato-verrucoso," "netzig-warzig," as described by Hennings.

We assume that the current world-wide distribution of *Ruhlandiella berolinensis* reflects the movement of living higher plants from Australasia by man's intervention, whereby this discomycete was introduced.

Five years after Hennings described *Ruhlandiella*, he (Hennings, 1908) described another, even tinier, hemisphaeric discomycete in another, monotypic new genus, *Exogone*, which he placed close to *Ruhlandiella*. Ever since von Höhnel (1911) treated *Exogone* as a synonym of *Agyrium*, without even examining any material, it has apparently never been considered seriously. We disagree with von Höhnel's conclusions, and suspect that this is indeed a member of the Pezizales, for no *Agyrium* would have marked ascospores, nor spores of such dimensions. What *Exogone* really is remains a mystery: it has biseriate ascospores (but so does *Ruhlandiella* in youth). If Hennings once again failed to apply an iodine test (no reaction or lack thereof is mentioned in the description), and if he again missed noting a gel sheath around the paraphyses, it could represent a second species of Ruhlandiella. We are attempting to discover if any of the type material of Exogone kaiseriana Hennings still exists; if such material can be discovered, we shall comment further in another paper.

Peziza whitei (Gilkey) Trappe also has paraphyses embedded in a gelatinous sheath. Very well-preserved material was most generously provided by G. Beaton from Australia [Australia, Victoria, entrance to Erskine Falls, track near Lorne, 14.vii.1976, K. & G. Beaton **217b** (C, FH)]. Characters of the spores and the two-layered excipulum revealed a clearly non-congeneric taxon. Trappe (**1975**) has discussed the nomenclature of that species.

THE GENUS SPHAEROSOMA (PYRONEMATACEAE)

SPHAEROSOMA Klotzsch in A. Dietrich, Flora regni borussici **7**: pl. 467. 1839. Monotype: Sphaerosoma fuscescens Klotzsch in A. Dietr., loc. cit.

≡ Sphaerozosma Corda, Anleit. Stud. Mykol. 109. 1842 (lapsus calami?) non Sphaerozosma Corda 1835 (Desmidiaceae: pre-starting-point). Monotype: Sphaerosoma fuscescens Klotzsch in A. Dietr., Fl. boruss. **7**: pl. 467. 1839.

≡ Sphaerosoma Klotzsch subg. Eusphaerosoma Rouppert, Bull. Int. Acad. Sci. Cracovie, Cl. Sci. Math. **1909**: 81. 1910. Type (implied): Sphaerosoma fuscescens Klotzsch in A. Dietr., loc. cit. (misapplied).

ACCEPTED SPECIES

1. SPHAEROSOMA FUSCESCENS Klotzsch in A. Dietr., Fl. boruss. **7**: pl. 467. 1839.

≡ Sphaerozosma fuscescens (Klotzsch) Zobel in Corda (ut "Klotzsch"), Icon. fung. **6**: 52. 1854.

MISAPPLICATIONS: Sphaerozosma fuscescens sensu Zobel et Corda, Icon. fung. **6**: 52, pl. 11, fig. 100. 1854 = Sphaerozone ostiolatum (Tul. & Tul.) Setchell; Sphaerosoma fuscescens sensu Schroeter in Cohn, Krypt.-Fl. Schlesiens **3**(2)[i]: 31. 1893 = Sphaerozone ostiolatum (Tul. & Tul.) Setchell;

Sphaerosoma fuscescens sensu Rouppert, Bull. Int. Acad. Sci. Cracovie, Cl. Sci. Math. **1909**: 84-87. 1910 (p.p.? asci amyloid) = Ruhlandiella berolinensis Hennings; Sphaerosoma fuscescens sensu Korf (**1972**, **1973**) (asci amyloid) = Ruhlandiella berolinensis Hennings.

FIGS. 1, 6.

Fruitbodies subglobose, without margin; hymenial surface even or convoluted; at first whitish all over, later brownish.

Excipulum in rehydrated material composed of globose to angular, thick-walled cells 15-30 µm broad. In neither 5% aqueous KOH nor 25% NH_4OH was it possible to make the cells swell up to their natural size or shape.

Hymenium 330-380 µm high; asci normally 8-spored, 26-33 µm broad, cylindrical to clavate, rounded above, gradually narrowing below, non-amyloid, contents dextrinoid in Melzer's Reagent.

Paraphyses septate, straight, only slightly enlarged above to 5-6 µm broad, exceeding or equalling the asci in length, without a gelatinous sheath.

Ascospores at first bi- to tri-seriate, smooth, when mature colorless, uniseriate, globose, 17.2-19.8 µm in diam exclusive of the 2-3 µm high ornamentation of delicate, irregular, angular meshes of the reticulum which is strongly dextrinoid in Melzer's Reagent but only weakly cyanophilic in cotton blue, areolae mostly 2-4 µm diam. Spores with one large, central guttule; de Bary bubbles not observed.

MATERIAL EXAMINED:

GERMANY: Berlin, Grünewald, Botanical Garden, on soil between Calluna vulgaris and Pyrola spp., autumn (holotype K; isotype, S-Sydow).

DISCUSSION:

Gamundí (**1976**) studied material of Sphaerosoma fuscescens from Kew (K), and found the ascus to be non-amyloid in Melzer's Reagent. Our studies of the same material from Kew (RPK) and from Stockholm (HD) confirm Gamundí's observations. No amyloid reaction can be seen even if the material is pre-treated in strong solutions of KOH or NH_4OH (cfr. Kohn & Korf, **1975**; Nannfeldt, **1976**).

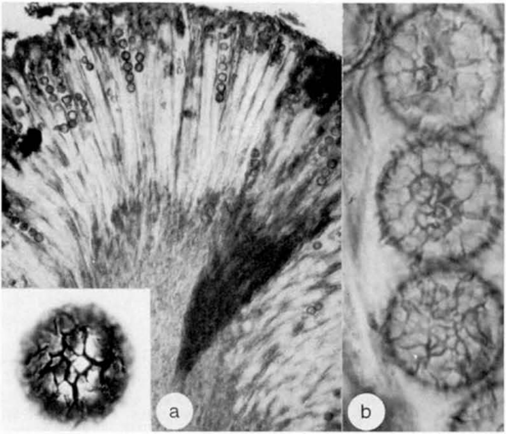


FIGURE 6. Sphaerosoma fuscescens. a. Section, in cotton blue, with persistent asci of about the same length as the paraphyses; because of the poor condition of the material, no details of the excipulum are revealed; insert: spore in cotton blue. b. Spores, in Melzer's Reagent. a, from isotype (S), × 114, insert × 1085; b, from the holotype (K), × 2150.

Korf (1972, 1973) followed the concept of Rouppert (1910), who considered Sphaerosoma a genus with amyloid asci. Consequently Korf placed the genus in the family Ascobolaceae, a disposition which cannot be supported now. His placement of Svrcekia Kub. in synonymy is also thus incorrect, for it, too, has amyloid asci.

Gamundí (1976) provisionally considered the genus to be a member of the Humariaceae, tribe Otideeae, because it "... shows certain affinities with Barlaeina and Jafneadelphus." We suggest a similar arrangement with *Sphaerosoma* replacing the generic name *Sphaerozone* in Korf's (1972, 1973) classifications, in the family Pyronemataceae Corda emend. Korf, subfamily Ascodesmidoideae Brumm. emend. Korf.

It should be borne in mind, however, that both Gamundí and we have only examined tiny fragments of a very old fruitbody, probably poisoned with mercuric chloride, and therefore studies of fresh material are needed before the true systematic position of this genus can be evaluated. Because of the condition of the material studied, we have not been able to determine whether opercula are present or not in the asci.

We feel, however, that the cylindric asci, normally with 8 uniformly sized ascospores, and normally with strongly dextrinoid contents, indicate a forcible discharge of ascospores, i.e., the presence of an operculum. The straight, septate, non-clavate paraphyses not or only slightly exceeding the asci may further support our view.

The generic name *Sphaerozosma* Corda 1842 must be considered an obligate nomenclatural synonym (if, indeed, it is not merely a slip of the pen). In 1854 Corda again used the name *Sphaerozosma* (Corda, 1854: pl. 11, fig. 100), and at the base of the illustration lists "*Sph. fuscescens*." Let it be noted that we consider this plate unquestionably illustrates *Sphaerozone ostiolatum* (Tul. & Tul.) Setchell, which we do not consider congeneric with *Sphaerosoma fuscescens*. Whether the 1854 plate represents another lapsus calami is unclear. Zobel, who prepared the text material for this volume, reintroduced the generic name *Sphaerozosma* Corda, and referred to the sole species as "*Sphaerozosma fuscescens* Klotzsch". We have adopted the authority as "(Klotzsch) Zobel in Corda" in our synonymy, acknowledging here that if the "*Sph.*" of Corda's plate is *Sphaerozosma* and not *Sphaerosoma*, the correct author citation should perhaps be *Sphaerozosma fuscescens* (Klotzsch) Corda for this obligate synonym. In any case, it is certain that Corda's later misidentification has been the cause of much of the confusion in the literature in the application of the generic names *Sphaerosoma*, *Sphaerozosma*, and *Sphaerozone*.

Rouppert (1910) divided the genus into two subgenera on the basis of spore color. *Sphaerosoma* subg. *Eusphaerosoma* included hyaline-spored species, some with amyloid asci (including his misidentified material of S. fuscescens), one with non-amyloid asci. Sphaerosoma subg. Tulasnia included a single, brown-spored species which we now refer to Sphaerozone (below).

Gamundí (**1976**) considered the type specimen of Sphaerosoma fuscescens cited above to be a "neotype," probably because the packet data is fragmentary.

2. SPHAEROSOMA TRISPORA McLennan & Cookson, Proc. Roy. Soc. Victoria **38**: 73. 1926.

Gamundí (**1976**) studied this species and considered it congeneric with Sphaerosoma fuscescens.

EXCLUDED SPECIES

3. SPHAEROSOMA OSTIOLATUM Tul. & Tul. 1851 = Sphaerozone ostiolatum, see p. 303.

4. SPHAEROSOMA FRAGILE Hesse 1885 = Sphaerozone ostiolatum, see p. 303.

5. SPHAEROSOMA JANCZEWSKIANUM Rouppert, Bull. Int. Acad. Sci. Cracovie, Cl. Sci. Math. **1908**: 649. 1909.

MATERIAL EXAMINED:

Two slides, according to notes on the envelope collected and identified by Rouppert, no locality, no date, presumed holotype (KRAM **2467**).

DISCUSSION:

The ovoid, delicately echinulate spores (see also Rouppert, loc. cit., fig. 6) together with the "jaune orange" colors of the fruitbodies indicate a species close to if not identical with Lamprospora ovalispora (Svrček & Kub.) Eckbl.

6. SPHAEROSOMA TASMANICA Rodway, Pap. & Proc. Roy. Soc. Tasmania **1919**: 115. 1920.

MATERIAL EXAMINED:

AUSTRALIA: Tasmania, Cascade Estate, Hobart, vii. 1919 (Holotype, HO; isotype (slide), CUP 48858).

Excipulum two-layered; asci operculate, non-amyloid even after rehydration in 10% aqueous KOH; ascospores ellipsoid, with irregularly disposed warts or spines, or with longitudinal ridges; ornamentation cyanophilic in cotton blue.

DISCUSSION:

Like Burdsall (**1968**: 521), we have no opinion on the true relationships of this interesting species, but characters of the spores and asci may indicate a relationship to the genus Dingleya Trappe (Trappe, **1979**: 331).

7. SPHAEROSOMA ALVEOLATUM McLennan & Cookson, Proc. Roy. Soc. Victoria **35**: 153. 1923.

DISCUSSION:

S. alveolatum has, according to the description, amyloid asci. Gamundí (**1976**: 347) considered it as belonging to the genus Plicaria, whereas Dissing & Schumacher (**1979**: 103) referred it to the genus Boudiera.

8. SPHAEROSOMA HESPERIUM (Setchell) Seaver 1928 = Ruhlandiella berolinensis, see p. 290.

9. SPHAEROSOMA VIOLACEUM Svrček, Stud. Bot. Čechoslov. **10**: 155. 1949.

DISCUSSION:

According to the description the asci are amyloid. The description and illustrations (loc. cit., figs. 1-3) indicate a taxon close to Sphaerozone ostiolatum.

THE GENUS SPHAEROZONE (PEZIZACEAE)

SPHAEROZONE Zobel in Corda, Icon. fung. **6**: 53. 1854. Monotype: Sphaerosoma ostiolatum Tul. & Tul. ≡ Sphaerozone tulasnei Zobel.

≡ Sphaerosoma Klotzsch subg. Tulasnia Rouppert, Bull. Int. Acad. Sci. Cracovie, Cl. Sci. Math. **1909**: 81. 1910. Monotype: Sphaerosoma ostiolatum Tul. & Tul.

MISAPPLICATIONS: Sphaerozone sensu Korf, Mycologia **64**: 982. 1972; in Ainsworth, et al., The Fungi **4A**: 270. 1973 (asci non-amyloid); sensu Beaton & Weste, Trans. Brit. Mycol. Soc. **71**: 164. 1978 (asci non-amyloid, ascospores ellipsoid).

ACCEPTED SPECIES

1. SPHAEROZONE OSTIOLATUM (Tulasne & Tulasne) Setchell, Univ. Calif. Publ. Bot. **4**: 114. 1910.

≡ Sphaerosoma ostiolatum Tul. & Tul., Fungi Hypogei 184, pl. 19, fig. 1. 1851.

≡ Sphaerozone tulasnei Zobel in Corda, Icon. fung. **6**: 53. 1854 (gratuitous name change).

= Sphaerosoma fragile Hesse, Jahrb. Wiss. Bot. **16**: 251, pl. 6, fig. 1-6. 1885.

FIGS. 1, 7, 8.

Fruitbodies brownish, globose, gibbous to convolute, with a more or less distinct opening leading into a central cavity.

Excipulum of globose to angular cells, most of which are 15-50 µm broad with 1.0-2.5 µm thick walls; not possible to distinguish between the inner and outer excipulum, nor is a subhymenium distinguishable.

Hymenium, as measured from the bases of the deepest asci to the apices of the paraphyses 420-475 µm high. Asci persistent, 280-325 µm long, 24-34 µm broad, weakly amyloid the whole length, attenuate above, with a forked base; no operculum seen.

Paraphyses straight, septate, with weakly cyanophilic contents, exceeding the asci by 30-60 µm, varying greatly, sometimes indistinguishable from the excipular cells, 8-30 µm broad above, often branching below where they are 5-14 µm broad.

Ascospores globose, 16.5-20.0 µm broad exclusive of the ornamentation of irregular, blunt or angular warts 3.0-6.0 µm high; spores at first hyaline, irregularly disposed, later reddish brown, uniseriate; mostly 5-7 spores develop in each ascus, but asci with only 1 or 2 normal spores are also seen; de Bary bubbles rarely developed.

MATERIAL EXAMINED:

GREAT BRITAIN: Near Bristol, without date, but "M.

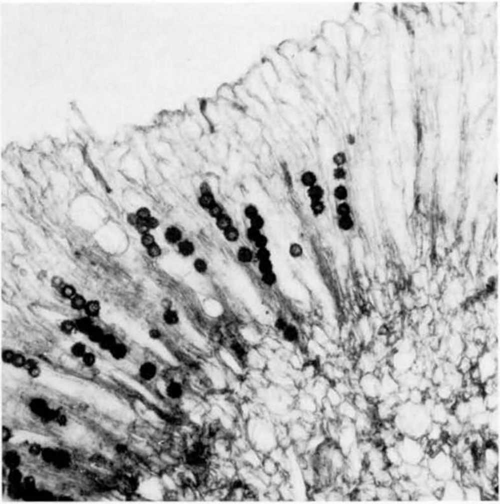


FIGURE 7. Sphaerozone ostiolatum. Section in cotton blue, hymenium not definitely delimited from excipulum, clavate paraphyses strongly exceeding the asci which contain an irregular number of spores. Ade s.n. (S-Rehm), X 162.

Broome dedit 21 janv. 47" is added with a pencil on the small envelope (presumed holotype, PC).

GERMANY: Zwischen Laub im Hartwald bei Brückenau, 16.x.1912, Ade s.n., ut Sphaerosoma fragile (S-Rehm).

DISCUSSION:

The presumed holotype of Sphaerozone ostiolatum consists of several brownish, tiny fragments less than 1.5 mm broad. The above description is primarily based on Ade's collection labelled Sphaerosoma fragile. The ascospores are identical in the two collections, and all microscopic characters beautifully match Tulasne's

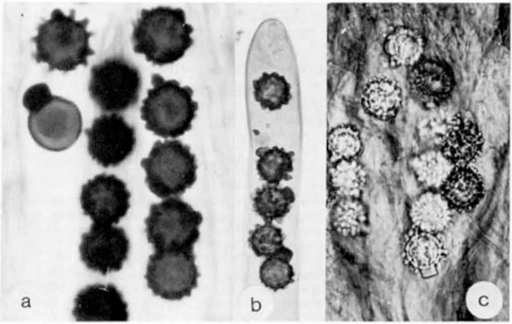


FIGURE 8. Sphaerozone ostiolatum. a. Ascospores, in cotton blue. b. Ascus, with 5 irregular spores, in cotton blue. c. Ascospores in Melzer's Reagent. a-b, Ade s.n. (S-Rehm); c, presumed holotype (PC). a, × 650; b-c, × 455.

attractive illustrations (loc. cit.). The director of the Instytut Botaniczny, Uniwersytetu Wrocklawskiego, Wrocklaw (WRSL) has kindly informed us that there is no material left of Sphaerosoma fuscescens Klotzsch sensu Schroeter, but Schroeter's (1893) description leaves no doubt that what he had was Sphaerozone ostiolatum instead. Discovery of an amyloid ascus reaction in Sphaerozone, for which no evidence was previously reported in the literature, makes Korf's (1972, 1973) treatments of the genus as having non-amyloid asci an error which cannot be maintained.

EXCLUDED SPECIES

2. SPHAEROZONE ELLIPSOSPORUM Cribb, Univ. Queensland Dept. Bot. Pap. 4: 36. 1960.

Cribb (1960) did not indicate whether the asci are amyloid or not, and no reaction was mentioned by Beaton and Weste (1978) when they examined the tiny remaining fragments of an isotype specimen. The ellipsoid spores will exclude this from Sphaerozone in our sense.

3. SPHAEROZONE ECHINULATUM Beaton in Beaton & Weste, Trans. Brit. Mycol. Soc. 71: 165. 1978.

This ellipsoid-spored species with nonamyloid asci must be excluded from *Sphaerozone* as now defined. The assignment to that genus presumably follows Korf's (1972, 1973) misapplication of the generic name.

ACKNOWLEDGEMENTS

A grant from the University of Copenhagen to the junior author contributed to making this cooperative project possible. He also acknowledges financial assistance of NSF Grant DEB75-23557, which permitted collection of the neotype specimen of *Ruhlandiella berolinensis*. The curators of the following herbaria kindly arranged for the loan of important material: National Fungus Collections, Beltsville (BPI); Botanical Museum and Herbarium, Copenhagen University (C); Plant Pathology Herbarium, Cornell University (CUP); Farlow Herbarium of Cryptogamic Botany, Harvard University (FH); Royal Botanic Gardens, Kew (K); Herbarium of Botanic Institutes of the Polish Academy of Sciences, Krakov (KRAM); Museum National d'Histoire Naturelle, Laboratoire de Cryptogamie, Paris (PC); Swedish Museum of Natural History, Stockholm (S); Herbarium of the University of California, Berkeley (UC). G. Beaton provided important material from his private herbarium. D.H. Pfister, T. Schumacher, and Å. Strid made pertinent suggestions during preparation of this paper. Lene Christiansen, Niels Henry Larsen, and Karin Vestberg gave valuable technical assistance. We highly appreciate their cooperation.

LITERATURE CITED

Beaton, G. & G. Weste. 1978. The genus Sphaerozone. Trans. Brit. Mycol. Soc. **71**: 164-167.

Burdsall, H. H., Jr. 1968. A revision of the genus Hydnocystis (Tuberales) and of the hypogeous species of Geopora (Pezizales). Mycologia **60**: 496-525.

Corda, A. C. J. 1854. Icones fungorum hucusque cognitorum, vol. 6 [J. B. Zobel, ed.]. Praha.

Cribb, J. W. 1960. Two new species of subterranean Ascomycetes from Queensland. Univ. Queensland Dept. Bot. Pap. **4**: 33-37.

Dissing, H. & D. H. Pfister. 1981. Scabropezia, a new genus of Pezizaceae (Pezizales). Nordic J. Bot. **1**: (in press).

Dissing, H. & T. Schumacher. 1979. Preliminary studies in the genus Boudiera, taxonomy and ecology. Norw. J. Bot. **26**: 99-109.

Gamundí, I. J. 1976. Acerca de los géneros Boudiera Cooke y Sphaerosoma Klotzsch (Fungi, Pezizales). Sydowia **28**: 339-351. ('1975')

Hennings, P. 1903. Ruhlandiella berolinensis P. Henn. n. gen. et n. sp., eine neue deutsche Rhizinacee. Hedwigia **42**: (22)-(24).

Hennings, P. 1908. Exogone Kaiseriana P. Henn. n. gen. et. n. sp. Verh. Bot. Vereins Prov. Brandenburg **50**: 129-131.

Höhnel, F. von. 1911. Fragmente zur Mykologie (XIII Mitteilung, Nr. 642 bis 718). Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl., Abt. 1, **120**: 379-484.

Kohn, L. M. & R. P. Korf. 1975. Variation in Ascomycete iodine reactions: KOH pretreatment explored. Mycotaxon **3**: 165-172.

Korf, R. P. 1972. Synoptic key to the genera of the Pezizales. Mycologia **64**: 936-994.

Korf, R. P. 1973. Discomycetes and Tuberales. *In* Ainsworth, G. C., F. K. Sparrow, & A. S. Sussman [eds.], The Fungi: An advanced treatise **4A**: 249-319. New York & London.

Nannfeldt, J. A. 1976. Iodine reactions in ascus plugs and their taxonomic significance. Trans. Brit. Mycol. Soc. **67**: 283-287.

Rouppert, C. 1910. Revision du genre Sphaerosoma. Bull. Int. Acad. Sci. Cracovie, Cl. Sci. Math. **1909**: 75-94, pl. 2-3.

Schroeter, J. 1893. Die Pilze Schlesiens. *In* Cohn, F. J. [ed.], Kryptogamen-Flora von Schlesien 3(2)[i]: 1-128. Breslau.

Trappe, J. M. 1975. Generic synonyms in the Tuberales. Mycotaxon **2**: 109-122.

Trappe, J. M. 1979. The orders, families, and genera of hypogeous Ascomycotina (truffles and their relatives). Mycotaxon **9**: 297-340.

MYCOTAXON

Vol. XII, No. 1, pp. 307-311 October-December 1980

REVUE DES LIVRES

par

G.L. HENNEBERT
*Book Review Editor, Croix du Sud 3, Louvain-la-Neuve
B-1348 Belgium*

THE WHOLE FUNGUS, THE SEXUAL-ASEXUAL SYNTHESIS. KANANASKIS II, Proceedings of the Second International Mycological Conference held at the Environmental Sciences Centre of the University of Calgary, Kananaskis, Alberta, Canada, September 3-13, 1977, par W. B. KENDRICK, éditeur, publié par le National Museum of Natural Sciences, National Museums of Canada et la National Kananaskis Foundation, 793 p., illustré, en 2 vols., quarto, couv. papier, 1979. Distribué par l'éditeur, W.B. Kendrick, Dept. of Biology, Univ. of Waterloo, Canada N2L 3GL. Prix $ 20.-.

Kananaskis II, seconde conférence mycologique organisée par W.B. Kendrick, huit années après la première conférence, Kananaskis I, tenue en 1969, a réuni autour de la table 24 mycologues dans le but de faire le point sur ces cent années, depuis la découverte du pléomorphisme des champignons par les Tulasnes, d'étude des champignons imparfaits et parfaits et ainsi redécouvrir le champignon dans son entité, *the whole fungus*, pléomorphe, le classer et le dénommer.

Kananaskis I (voir W.B. Kendrick, *Taxonomy of the Fungi Imperfecti*, 1971, Toronto Univ. Press), n'avait considéré que les 'champignons imparfaits' et avait atteint une haute convergence de vue sur la terminologie descriptive et la classification de leur conidiogénèse. Dès lors le pléomorphisme devait apparaître, non plus seulement comme une caractéristique troublante de ces organismes, mais comme une réalité fondamentale, extrêmement riche, et qui n'avait rien d'imparfait. Ce qualificatif, que par tradition nous leur donnions, apparut bientôt comme déplacé sinon outrageant. L'imperfection est d'avantage le fait de nos connaissances. Des termes nouveaux, proposés par Hennebert et Weresub (Mycotaxon, 6:207-211,1977), furent adoptés par la Session de nomenclature du Second Congrès international de Mycologie de Tampa, 1977: *anamorphe* pour *forme imparfaite*, *téléomorphe* pour *forme parfaite*, *holomorphe* pour le champignon dans son entièreté. Kananaskis II, qui se réunit immédiatement après le Congrès de Tampa, adopta d'emblée l'usage de ces termes. La republication de l'article mentionné et une revue du pléomorphisme des champignons depuis sa découverte par les Tulasnes, par L.K. Weresub et K.A. Pirozynski, constituent ainsi les premiers chapitres de l'ouvrage.

Les treize chapitres suivants du volume 1 et les premiers du volume 2 traitent des Ascomycètes, les suivants du volume 2 des Basidiomycètes et des Zygomycètes. Le pléomorphisme des champignons, dont l'origine remonte aux ères géologiques, a produit des types multiples de conidiogénèse et des structures variées de conidiome, dont la signification taxonomique apparaît avec évidence dans une taxonomie synthétique (holomorphique) des divers groupes de champignons. C'est ce qui ressort de chacune des études particulières présentées, chacune dans son style propre, à la Conférence. (N.B. une étude, sur les formes conidiennes des Discomycètes, par Hennebert & Bellemère est manquante et a été publiée dans Rev. Mycol.,43:259, 1979).

C'est à tel point que les anamorphes aident le taxonomiste à ajuster sa taxonomie des téléomorphes, tout comme l'appartenance des anamorphes à tel ou tel groupe de téléomorphes l'avait poussé à affiner leurs critères de différenciation. Mais l'intégration des deux taxonomies soulève le grand problème de la garantie de vérité à donner aux connections entre anamorphes et téléomorphes. Ce problème a été envisagé aussi par Kananaskis II.

W.B. Kendrick, et des membres de la Conférence, ont contribué un ensemble de listes, couvrant quelques 170 pages, des très nombreuses connections aujourdhui publiées entre anamorphes et téléomorphes d'Ascomycètes et de Basidiomycètes. Ces listes, sans doute encore incomplètes, sont les plus étendues publiées à ce jour. Elles illustrent fort bien le travail qui est à faire encore. En effet, trop souvent par le passé,l' association de formes fut prise pour une relation ontogénique et publiée sans une démonstration expérimentale. Aussi faudra-t-il, en chaque cas, s'assurer du label de vérité par une analyse critique de la littérature originale, d'ailleurs chaque fois mentionnée, ou par de nouvelles observations. En outre il s'avèrera nécessaire de vérifier ou même ajuster la nomenclature utilisée. Enfin de reconnaître, décrire et dénommer tant d' anamorphes restées indéterminées.

Enfin, l'ouvrage n'est pas qu'une suite de chapitres juxtaposés.Il est au contraire un ensemble vivant, où apparaît,à travers les discussions et les dialogues, la pensée de chacun. C'est aussi un ensemble bien lié par le "mot du Président".

W.B. Kendrick sera apprécié pour la production d'un ouvrage de cette qualité et de ce format. C'est une pièce importante de la bibliothèque de tout mycologue, qu'il soit introduit ou débutant.

XII INTERNATIONAL BOTANICAL CONGRESS, LENINGRAD, 3-10 JULY, 1975. PROCEEDINGS, par D.V. LEBEDEV, édit., 209 p., ill., couv. papier, 14 x 21, 1979.Academy of Sciences of the USSR, Leningrad NAUKA, Komarov Botanical Institute. Prix 1 p. 20 K.
LIST OF PARTICIPANTS, par D.V. LEBEDEV, édit., 248 p., 1979,Idem. Prix 95 K.

Le volume des *Proceedings* contient l'organisation et le programme du Congrès, le compte-rendu de la Session d'ouverture, les textes des conférences du Symposium général sur la conservation du monde végétal, le compte-rendu de la Session plénière de clôture, y compris les résolutions et enfin le compte-rendu des 18 Sections du Congrès.Des Sections 2 à 18, seuls les titres des communications sont relatés. Par contre, la Section 1, qui est la Session de Nomenclature, qui eut lieu du 30 juin au 4 juillet 1975, est entièrement relatée, des pages 129 à 187. Le compte-rendu donne le résultat des votes sur chacune des propositions d'amendement du Code International de Nomenclature Botanique, ainsi que les commentaires, et les annexes habituelles.

MARASMIEAE (BASIDIOMYCETES - TRICHOLOMATACEAE), par Rolf SINGER, Monographie n° 17 de Flora Neotropica, 348 p., 118 figs., octavo, couv. papier, 1976. Publication de l'Organization for Flora Neotropica, The New York Botanical Garden, Bronx, New York 10458. $ 25.-

La tribu des *Marasmieae*, sous-tribus des *Crinipellinae* et des *Marasmiinae*, les seules considérées ici, de la famille des Trocholomatacées, comprend des genres fort bien représentés dans les Tropiques et les

Néotropiques. Les *Oudemansiellinae* ont été traitées antérieurement par l'auteur (1962, 1964, 1973). L'auteur, qui a déja publié une monographie des genres *Marasmius* (1965), *Crinipellis* et *Chaetocalathus* (1942), une étude de Marasmiinées cyphelloïdes(1960) et des études préliminaires sur les Marasmiinées d'Amériques du Sud (1942, 1965), ne reprend ici que les espèces néotropicales de ces deux sous-tribus de Marasmiinées. Ces espèces appartiennent aux genres *Crinipellis* (41 espèces), *Chaetocalathus* (6), *Marasmius* (233), *Gloiocephala* (22), *Lachnella* (4), *Amyloflagellula*, *Flagelloscypha*, *Physalacria* (9), *Manuripia*, *Epicnaphus*, *Hymenogloea* et *Rimbachia*. Un portait et une notice biographique de l'auteur est ajoutée à l'ouvrage.

TRAVAUX DEDIES A GEORGES VIENNOT-BOURGIN, par la Société Française de Phytopathologie, avec préface de Jacques DELAGE, 416 p., ill., portrait de G. VIENNOT-BOURGIN, octavo, couv. papier, 1977. Institut National Agronomique, Laboratoire de Pathologie végétale, 16 rue Claude Bernard, 75005 Paris. Prix FF. 200.-

Orné en couverture de dessins de spores de 28 espèces de Micromycètes par G. Viennot-Bourgin, cette ouvrage a été composé et offert en hommage au Professeur G. Viennot-Bourgin, pour ses 50 années de recherche et d'enseignement de la pathologie végétale, à l'Institut National Agronomique de Paris. 37 contributions scientifiques y sont réunies. Elles traitent de mycologie systématique, de phytopathologie, y compris la bactériologie et la virologie, de microbiologie du sol et aussi de mycologie médicale et de mycophagie. En préface, une biographie du Maître, suivie d'une liste des 125 taxa fongiques qu'il décrivit de 1926 à 1976, ainsi que celle des genres et espèces de micromycètes qui lui furent dédiés. De plus, 8 espèces de champignons sont décrites comme nouvelles, dont trois encore lui sont dédiées: *Uromyces viennot-bourginii* Ankister et al., *Hamaspora viennotii* Durrieu, *Venturia viennotii* Morelet, *Ascobolus egyptiacus* Mouchacca, *Cortinarius pardinipes* Romagnesi, *C. earinus* Romagnesi, *C. hinnuleolus* Romagnesi et *Ustilago paspalidicola* Zambettakis.

LES DISCOMYCETES DE FRANCE D'APRES LA CLASSIFICATION DE BOUDIER, par L. J. GRELET, réimpression 1979, viii + 709 p., ill., couv. papier, octavo, Bulletin de la Société Botanique du Centre-Ouest (France), nouv. série, n° special 3. Editeur responsable R. Daunas, "Le Clos de la Lande" Saint-Sulpice-de-Royan, F-17200 Royan, France. Prix FF 260.-.

L'oeuvre de l'Abbé Grelet, dont la réimpression était tant souhaitée, comprend la description de pas moins de 190 genres et de 1285 espèces et variétés de Discomycètes, observés et décrits sur des récoltes de l'auteur ou reçues par lui. La taxonomie de Grelet est celle de Boudier. Avec la Flore analytique des Champignons supérieurs de Kühner et Romagnesi et les Hyménomycètes de France de Bourdot et Galzin, le Boudier n'étant pas à la disposition de chacun, les Discomycètes de France de l'Abbé Grelet constituent un des piliers de la mycologie française. Publié en trente parties successives dans le Bulletin de la Société Botanique du Centre-Ouest puis dans la Revue de Mycologie de 1932 à 1959, il est agréable de disposer aujourdhui de cet ensemble en un seul volume fort bien édité. De plus, un index alphabétique des noms et épithètes latines y a été ajouté. Il faut apprécier les efforts de la Société Botanique du Centre-Ouest de la France et de son Président, M.R. Daunas, à qui est dû la parution de ce livre de grande utilité.

ANNUAL REPORTS OF THE STATE BOTANIST 1868 - 1912. Volume I (1868-1877), par Charles Horton PECK, réimpression 1980, éditée par L. VOGELENZANG, avec notice biographique de C.H. Peck par R.H. Petersen, 720 p., ill., avec 1 microfiche des 7 pls. coul., octavo, relié, toilé, 1980. Boerhaavepress, p.o.box 1051, NL-2302BB Leiden Nederland. Prix du Vol. 1 Dfl. 320.-.

La réimpression de la majeure partie de l'oeuvre de Peck que constituent les *Annual Reports of the State Botanist*, couvrira 6 volumes de la même importance que le présent volume, chacun de 600 à 720 pages et incluant de 27 à 62 planches, les planches en couleurs étant reprises sur microfiches de haute qualité. Le second volume paraîtra en 1981.
la réimpression est excellente, les figures au trait sont sans fracture; la reliure est bonne et de bonne toile. Ce premier volume couvre les années 1868 à 1877. Dès 1868, Peck enfin appointé pour un salaire minimal comme botaniste chargé du relevé de la flore de l'Etat de New York à Albany, explora intensément la flore mycologique de la région, la moins connue alors, et décrivit 2700 taxa nouveaux de champignons. Il monographia 28 des 50 genres d'agaricales alors couramment acceptés. Il constitua aussi à Albany un herbier mycologique qui en 1920 comprenait 33.600 specimens de champignons. Dans son introduction, R.H. Petersen montre bien la difficile convergence des intérêts de l'Administration et de ceux du scientifique que fut Charles Peck... au point de voir ses locaux occupés. De même, les *Annual Reports* étant des documents officiels devant être approuvés par la législature de l'Etat de New York, tout étant déjà imprimés, mais leur distribution étant différée, la date de leur publication effective, au sens du Code, était pour le moins incertaine.
R.H. Petersen réussit heureusement, grâce à une recherche à travers la littérature de l'époque, à préciser davantage la date de publication des 48 *Annual Reports* de Charles Peck. Ainsi présentée, l'oeuvre de Peck prend toute sa valeur et son importance.

RECOGNITION AND CONTROL OF PESTS AND DISEASES OF FARM CROPS, par E. GRAM, P. BOVIEN et C. STAPEL, texte de Frank HOPE, 167 p., 120 pls. col., octavo, relié, toilé, 1980. Blandford Press Ltd, Link House, West Street, Poole, Dorset BH15 1LL, UK. Prix £ 15.-.

Ce livre est une mise à jour du *Recognition of Diseases and Pests ofFarm Crops*, des mêmes auteurs, que publiait en trois langues la maison Blandford en 1969. Les 120 planches dessinées en couleurs ou photographiées représentent 700 maladies et dégâts de plantes cultivées. Chaque planche porte sa légende. En outre, le texte qui suit les planches donne un commentaire sur chacune d'elle, précisant les caractéristiques de la maladie, de son agent et des symptômes, comme la cause des dégâts, et les moyens de lutte. La pomme de terre, la betterave et les céréales y reçoivent une particulière attention. Ce livre rendra de grands services aux phytopathologistes et aux praticiens, comme aide-mémoire dans l'identification. Cette édition n'est qu'en anglais.

THE EUKARYOTIC MICROBIAL CELL, par G.W. GOODAY, D. LLOYD et A.P.J. TRINCI, édit., Thiertieth Symposium of the Society for General Microbiology, Univ. of Cambridge, March 1980, viii + 439 p., illust., Publication de la Society for General Microbiology, Cambridge Univ. Press, Trumpington Street, Cambridge CB2 1RP UK. Prix £ 25.-.

La Société de Microbiologie Générale s'est consacrée cette fois à une réflexion sur les récents développements dans l'étude de la structure et de la fonction des organelles cellulaires des microorganismes eukaryotes, champignons, algues et protozoaires, comme elle le fit en 1978 pour les prokaryotes dans *Relations between structure and function in the prokaryotic cell*, Symposium n° 25, Cambridge, Univ. Press. Sans doute l'attention de nombreux biologistes et biochimistes s'est portée sur ces organismes comme modèles de laboratoire; cependant ces microorganismes méritent d'être étudiés pour eux-mêmes, eu égard à leur importance dans l'équilibre vital de la nature, dans la production alimentaire, pharmaceutique et biochimique, autant que par les altérations, les pollutions et les pathogénies qu'ils causent. Ce volume de 13 chapitres aborde donc successivement les chromosomes (R. Morris) et les mécanismes de la division nucléaire (J.D. Doyer et K. Vickerman), la membrane plasmatique et sa réaction aux antibiotiques (D. Kerridge), la fonction mitochondriale (D. Lloyd et G. Turner), de l'hydrogénosome (M. Müller) et des chloroplastes algaux (J. Raven), la formation et l'extension de la membrane fongique, primaire et secondaire, en relation avec la biosynthèse de la chitine (chitosomes) et d'autres polysaccharides (G.W. Gooday et A. Trinci), l'actomyosine dans la mobilité (E. Korn) la fonction des cils (M. Holwill)et la génétique des algues et levures (U. Goodenugh); enfin les mycovirus, et la régulation de la fructification chez Dictyostelium. Le livre est une heureuse synthèse des dix dernières années de recherche dont il fournit quelques 85 pages de références bibliographiques. Il permettra une information rapide et actuelle de tous ceux qui s'intéressent de près ou de loin à la physiologie et la culture de ces organismes.

PLANT DISEASES ATTRIBUTED TO BOTRYODIPLODIA THEOBROMAE PAT. par E. PUNITHALINGAM, Bibliotheca Mycologica, J. Cramer ed., Band 71, 123 p., 9 pls., 22 x 14, couv. papier, 1980. Ed. J. Cramer, FL-9490 Vaduz. Prix DM 30.- (24.-).

Il s'agit d'une compilation de la littérature phytopathologique impliquant *Botryodiplodia theobromae* dans des phénomènes pathologiques observés sur 37 plantes hôtes différentes. Près de 300 références bibliographiques ont été consultées.La synthèse des données est présentées par plante hôte. L'auteur ne prend pas parti dans les cas douteux. Une introduction explique la longue synonymie du champignon par sa grande variabilité.

MICRO-MORPHOLOGICAL STUDIES OF SOFT ROT FUNGI IN WOOD, par A.S. ZAINAL, in Bibliotheca Mycologica, J. Cramer ed., vol. 70, 177 p. 179 figs. (en 22 pls.), 22 x 14, couv. papier, 1980. Ed. J. Cramer, FL-9490 Vaduz. Prix DM 60.- (48.-).

L'auteur démontre l'existence de cavités intrapariétales due à la pénétration et l'action enzymatique de *Phialophora fastigiata* dans les fibres du bois de *Betula* sp. et de *Pinus sylvestris*. La présence de lignine n'inhibe pas l'action des enzymes cellullolytiques du champignon, mais la masque et la retarde seulement. La perforation et la digestion des différentes couches des parois des vaisseaux, des fibres et du parenchyme du bois sont abondamment illustrées par photographies au SEM et TEM.
Le texte consiste essentiellement dans une revue de la littérature, un exposé des méthodes de culture et de microscopie et l'explication des figures, suivie de discussions trop souvent peu claires. On relèvera des erreurs, ne fût-ce que l'écriture "3 mm3 wood blocks" pour des cubes de bois de 3x3x3 mm. La présentation de ce travail eut beaucoup gagné à être revue par quelques spécialistes avant publication.

MYCOTAXON

Vol. XII, No. 1, p. 312 October-December 1980

NOTICE

CHANGE OF DATE OF MSA GOLDEN JUBILEE

The 50th Anniversary meeting of the Mycological Society of America will be held **August 16-21, 1981** at Indiana University, Bloomington, Indiana, USA, in conjunction with AIBS. It was previously announced that meeting dates would be August 9-14, but these dates were changed by the president of Indiana University.

The Anniversary program will include nine symposia, three invited lecturers, a banquet, contributed papers and exhibits. You are cordially invited to attend.

Jack D. Rogers, Chairman
MSA Golden Anniversary Committee

[Editorial note: the new dates conflict with those of the XIII International Botanical Congress in Sydney, Australia, particularly for the Nomenclature Sessions August 17-20. MYCOTAXON's Managing Editor has had to relinquish appointment as master of ceremonies at the anniversary banquet in view of his commitment to attend the nomenclature sessions at Sydney. Not all university presidents are equally appreciated by him!]

CO-EDITORS OF MYCOTAXON

G. L. HENNEBERT
FRENCH LANGUAGE EDITOR
& BOOK REVIEW EDITOR

UCL, Place Croix du Sud 3
B-1348 Louvain-la-Neuve, Belgium

RICHARD P. KORF
ENGLISH LANGUAGE EDITOR
& MANAGING EDITOR

P.O. Box 264
Ithaca, NY 14850, USA

MYCOTAXON is a quarterly journal devoted to all phases of mycological and lichenological taxonomy and nomenclature. It seeks to publish all papers within 4 months of acceptance, using photo-offset lithography. All articles are reviewed by specialists prior to acceptance. Publication is open to all persons. Papers may be in French or English, summaries in any language.

SUBSCRIPTION INFORMATION

Each issue of MYCOTAXON may vary in number of pages. Each volume, beginning with volume 3, consists of at least 512 pages, and consists of an irregular number of quarterly issues depending upon the amount of copy received from authors. Subscriptions are on a **per volume** basis, **not** on an annual basis. If only one bill during each year is a requirement, please pay for 2 volumes, which will normally cover at least one year's issues. Personal subscriptions are available at a substantially reduced subscription rate for **individuals** who agree not to deposit their copies in another library than their own within 3 years of receipt. Prices for each volume, beginning with volume 3, are:

REGULAR (multiuser)	$40.00 US
PERSONAL (individual)	$17.50 US

(Vols. 1 & 2 are available at **half** the above rates per volume)

(**Complete runs**, vol. 1 through the latest completed volume, are subject to a 10% discount for new subscribers; old subscribers who wish to **complete** their sets may also purchase the missing volumes at a 10% discount)

MYCOTAXON may also be obtained on a journal exchange basis. This may be arranged with journals, institutions, or individuals who have difficulty in obtaining foreign currencies. For details, write to a Co-Editor.

AVAILABILITY IN MICROFORM, AND TEAR SHEET SERVICES FOR ARTICLES

MYCOTAXON is also available in microfiche and microfilm from University Microfilms, 300 North Zeeb Road, Ann Arbor, MI 48106, from whom prices may be obtained.

Tear sheets of individual articles appearing in MYCOTAXON may be obtained through the Original Article Tear Sheet Service of The Institute for Scientific Information, 3501 Market Street, University City Science Center, Philadelphia, PA 19104, from whom prices may be obtained.

EDITORIAL SERVICES AND INFORMATION FOR PROSPECTIVE AUTHORS

Authors prepare their own **camera-ready** copy after having received comments from pre-submission reviewers. Detailed **Instructions to Authors** appeared in MYCOTAXON **1**: 3-12. 1974, and **6**: 370. 1977. A copy of each will be sent upon request to one of the Co-Editors.

We are able to provide prospective authors with two aids to publication. Both are sold at our cost, and are shipped postpaid from MYCOTAXON, LTD., P.O. Box 264, Ithaca, NY 14850 USA.

SPECIAL MANUSCRIPT PAPER is available in packages of 50 sheets, and is ruled in blue, non-photoreproducing ink for each of the two sizes of typeface called for in the instructions to authors (elite, pica). It is a convenience to typists, but certainly not an essential, since rectangles of the appropriate size can be prepared on any paper using a non-photoreproducing blue pencil. Each package of 50 sheets is sent **postpaid** for $1.75 US.

BIOPLATE is a special sheet of transfer letters for the use of authors in the preparation of plates and graphs for publication. It is manufactured for us by Prestype, and available in either black or white. Each sheet is approximately 30 x 39 cm., with a wide assortment of numbers, letters (including important Greek characters), symbols, etc. These are sent **postpaid** for $4.95 US (black will be shipped unless white is specified).