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LABOULBENIALES ON SEMIAQUATIC HEMIPTERA. II.

AUTOPHAGOMYCES, DIOICOMYCES, AND PROLIXANDROMYCES GEN. NOV.

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INTRODUCTION

In a previous contribution (Benjamin, 1967), I reviewed briefly those Laboulbeniales found on insects of the order Hemiptera and described in detail the species of Laboulbenia then known to me that parasitize semiaquatic bugs of the families Macroveliidae and Veliidae. In this paper I shall describe representatives of three other genera of Laboulbeniales that occur on species of Veliidae or Mesoveliidae.

Subsequent to publication of the above mentioned paper, I learned of two earlier studies by the French entomologist Raymond Poisson that also dealt with Laboulbeniales parasitizing semiaquatic bugs. In 1954, Prof. Poisson published a short account of his observations on a species of Laboulbenia found on Velia osborniana collected in southern Peru. He named the fungus L. titschackii but did not provide a validating Latin diagnosis. Poisson's illustrations show clearly that L. titschackii is related to other species on Veliidae, but it can not be identified with any of the species illustrated by me. In his discussions of aquatic Hemiptera published in 1957, Poisson reported a species of Autophagomyces on Microvelia pygmaea (Dufour) and Autophagomyces mesoveliae on Mesovelia furcata (Mulsant & Rey) and M. vittigera Horváth from France. He did not, however, formally describe or illustrate these fungi, and their characteristics are unknown.

In my earlier work (Benjamin, 1967), I followed the classification of insects of Brues, Melander, & Carpenter (1954). In this system, four families of primarily semiaquatic bugs, Hebridae, Hydrometridae, Mesoveliiidae, and Saldidae, are placed in the superfamily Aradoidea and the Macroveliidae in the Lygaeoidea. The late Dr. Robert L. Usinger, a leading authority on aquatic Hemiptera, informed me (personal communication) that these families all undoubtedly belong to the Gerroidea and thus are more or less related phylogenetically.

1 Please note the following errors in my previous paper (Benjamin, 1967): In all instances the epithets uhleri and usingeri should replace the orthographically incorrect uhlerii and usingerii. — On p. 118, l. 9 from bottom: leechii not lechii. — On p. 134, l. 20: drakei not drakeii. — On p. 135, l. 7 of last paragraph: Lygaeoidea not Aradoidea.

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I wish to thank Dr. I. Mackenzie Lamb, Director, Farlow Herbarium, Harvard University, for loan of the type specimen of Autophagomyces microveliae Thaxter, and Dr. David Lauck, Division of Biological Sciences, Humboldt State College, Arcata, Calif., who collected the hosts from which were taken the other fungi described in this study. I also am indebted to Dr. Jean Balazuc, Eaubonne, France, for calling my attention to the two publications by Poisson noted above.

DESCRIPTIONS

Autophagomyces Thaxter.


When Thaxter established Autophagomyces in 1912 he described two species, A. platensis, the type, and A. nigripes, both found on Tomoderus forticornis Pic of the Anthicidae (Coleoptera). In 1931 he added four more species that also parasitize Tomoderus. With some reservation, Thaxter first decided that Autophagomyces species were dioecious, the male parasitizing the female near its base, and he so characterized the genus. However, by 1931 he had learned that they are, instead, hermaphroditic. The generic type and its related species on Tomoderus is a simple one, the mature receptacle consisting of three cells: a very small basal cell (I) that forms the foot and usually becomes darkly pigmented so that its relationship to the other two cells is partly obscured; a subbasal cell (II) that bears the stalked perithecium; and an upper cell (III) that subtends the antheridial appendage or appendages. The latter cell, in the forms known on Anthicidae, usually is relatively small and positioned near the base or along the lower lateral margin of the subbasal cell in close proximity to the basal cell. It was this unusual relationship of the basal and terminal cells of the receptacle to the subbasal cell that caused Thaxter to misinterpret the true relationship of the sexual structures when he originally described the genus. In the forms on Tomoderus, the antheridial appendage, of which one to several may be present, consists of 2–3 superposed cells terminated by a simple antheridium; occasionally a pair of antheridia may develop. The perithecium has a well-developed stalk-cell, clearly defined basal cells, and five tiers of wall-cells.

In his final treatment of Autophagomyces, Thaxter (1931) also added several species found on representatives of other families of insects: five on Pselaphidae (Coleoptera), of which three were new combinations of forms previously placed in other genera of Laboulbeniales; three on Phalacridae (Coleoptera); one on Orthoperidae (Coleoptera); and one on Veliidae (Hemiptera). Autophagomyces peyerimhoffii (Maire) Thaxter (=Cryptandromyces peyerimhoffii Maire, 1920), on a species of Arthrolips (Orthoperidae) from Algeria, probably is not properly classified in this genus, and the author has unpublished data showing that A. sarawakensis Thaxter, on an undetermined species of Phalacridae from Borneo, definitely does not belong in the genus. The receptacle of the species of Autophagomyces that occur on Pselaphidae and Phalacridae as well as the one on Veliidae
differs from that of species on Anthicidae in that the cell (III) subtending
the antheridial appendage is closely associated with the upper rather than
the lower end of the subbasal cell. Cell III usually is more or less united
with the base of the stalk-cell of the perithecium as shown in Fig. 1A.

In connection with the present report, the one species of *Autophagomyces*
that has been described from semiaquatic Hemiptera (Veliidae) is
*A. microveliae* found on *Microvelia albolineata* Bueno from Fort de Kock,
Sumatra. Thaxter characterized and illustrated this species in Part V of his
monograph (Thaxter, 1931, p. 96, Pl. XVIII, Fig. 5). My own drawings
of the type specimen, kindly provided by Dr. Lamb, from the Thaxter
Collection at Harvard are shown in Fig. 1 A–B.

As noted in the introduction, Poisson (1957) reported the existence of
an "*Autophagomyces mesoveliae*" on two species of *Mesovelia* (Mesovelii-
dae) from France. Prof. Poisson did not, however, properly describe and
validate this species, and according to Jean Balazuc, M.D. (personal com-
munication), he did not preserve specimens. Dr. Balazuc has collected and
examined numerous specimens of *Mesovelia* in France but has not en-
countered the fungus. A single collection of *Mesovelia multisanti* White
from the vicinity of Georgetown, Texas, has been found parasitized by a
species of *Autophagomyces*. Whether or not this is the same species as the
one observed by Poisson in France remains to be determined.

*Autophagomyces poissonii* sp. nov.

(Fig. 1 C–D)

**Receptaculum:** Porphyreum; 50 μ × 30 μ; cellula basilaris (I) parva et
parte opaca; cellula subbasilaris (II) et cellula superna (III) subaequae
elongatae fere parallelae.

**Appendix:** Tota longitudo 85–90 μ; ex quatuor cellulis subaequis super-
positis et duobus antheridiis terminalibus simplicibus 25–30 μ × 8–10 μ
constans; antheridium extimum cellula parva subtentum.

**Perithecium:** Pallide porphyreum; stipes 50–100 μ × 25 μ; corpus uni-
formiter inflatum 110–140 μ × 50 μ; apex gradatim diminutus obtusatus
margine interiore fusca.

Totus fungus 225–290 μ longus.

**Receptacle:** Suffused with reddish-brown, darker than the yellowish to
pale reddish-brown perithecium and its stalk; basal cell (I) small, partly
obscured by the blackish suffusion of the foot; subbasal cell (II) about
two times longer than broad, subtending a single, stalked perithecium; up-
per cell (III) two times longer than broad, shorter than the subbasal cell,
bearing a single antheridial appendage distally, laterally adnate to the sub-
basal cell, extending nearly to the base of the latter. Receptacle, 50 μ ×
30 μ.

**Appendage:** Consisting of four superposed cells, the two upper cells
slightly longer than broad; the upper cell darker in color than the other
three, subtending two simple, flask-shaped antheridia; the upper antheridi-
ium itself subtended by a smallish cell that is adnate to the venter of the
lower antheridium. Total length of the appendage including the antheridia, 85-90 μ. Antheridia, 25-30 μ × 8-10 μ.

Perithecium: Stalk-cell slightly longer than broad, 30 μ × 23 μ, together with the elongate secondary stalk-cell and basal cells forming a stalk 80-100 μ × 25 μ; perithecium to base of the ascigerous region, 110-140 μ × 50 μ, more or less uniformly inflated, its outline somewhat angular at the juncture of the successive tiers of wall-cells, tapered to the bluntly rounded apex that is more darkly pigmented on the inner side.

Total length from base of foot to tip of perithecium, 225-290 μ.

Etym.—Named for Prof. Raymond Poisson, French zoologist.

Holotype.—TEXAS. Williamson County: Georgetown, 15 June, 1957, D. Lauck coll. On abdomen and legs of Mesovelia mulsanti White (Hemiptera: Mesoveliidae); RKB 2075 B, C; slides in RSA.

The material upon which this species is based is scanty and consists of but two immature and two mature individuals. Undoubtedly the collection of additional specimens may require emendation of the above description, but the illustration of the mature type (Fig. 1 C) should serve for ready identification of the fungus. The four appendages studied all bore two antheridia as shown in Fig. 1 C-D. The small cell subtending the terminal antheridium probably should be regarded as the upper cell of a 5-celled appendage. The second antheridium, adherent along one side to this small cell, appears definitely to arise from what then is the subterminal cell. Thus interpreted, the appendage is like that of the type species of Acalloomyces, A. homalotae Thaxter (1902; 1908, p. 300, Pl. XLII, Fig. 1-4). Acalloomyces, however, has a perithecium with but four tiers of wall-cells, the upper, or lip-cells, form upwardly-directed outgrowths, and there are four ascogenous cells. The perithecium of Autophagomyces, on the contrary, has a wall composed of five tiers of wall-cells, the lip-cells lack conspicuous outgrowths, and there is but one ascogenous cell. There is some variation in the number of cells composing the appendage of the various forms included in Autophagomyces by Thaxter, and in several species the appendage may be terminated by two rather than one antheridium. For the present, it seems best to classify the species found on Mesovelia mulsanti in Autophagomyces.

**Dioicomyces** Thaxter.


*Dioicomyces anthici*, the type, *D. onchophorus*, and *D. spiniger* were described by Thaxter in 1901 when he established this dioecious genus of Laboulbeniales. All three species were taken from specimens of *Anthicus floralis* L (Anthicidae) collected in the vicinity of Cambridge, Mass. Subsequently, 21 additional species and two varieties of *Dioicomyces* that parasitize various members of this family of Coleoptera have been described from both the new and the old world (Thaxter: 1908, 1912, 1931; Spegazzini: 1917; Maire: 1920). Although most of the described species of *Dioicomyces* have been found on anthicid beetles a few are known on
other insect groups. Two species, first named *Amorphomyces floridanus* Thaxter (1893) and *A. oblique septatus* Thaxter (1900), parasitic on species of Staphylinidae were referred to *Dioicomyces* by Thaxter in 1901.

![Fig. 1. A–D.](image)

A. *Autophagomyces microveliae* Thaxter—A. The mature type specimen (*Thaxter 3302*) showing the distinctive, slightly spiral arrangement of the vertical rows of wall-cells. ×400.—B. Appendage consisting of three superposed cells terminated by a single flask-shaped antheridium. ×895.—C–D. *Autophagomyces poissonii* Benjamin.—C. The mature type specimen. ×485.—D. Receptacle and appendage. Note the small, partly obscured basal cell (I) and the elongate subbasal cell (II) and terminal cell (III). The latter subtends the four-celled appendage that is terminated by two flask-shaped antheridia the outermost of which is subtended by a single smallish cell. In the specimen depicted here, the primary perithecium had aborted and only the base of the stalk-cell is shown. The subbasal cell (II) of the receptacle is beginning to grow upward as the first stage of development of a second perithecium. ×855.
An anomalous species, *D. endogaeus*, taken from one of the Carabidae, *Anillus coecus* Jacq., was described and illustrated by Picard in 1912.

The male individual of *Dioicomyces* species consists of four superposed cells, the upper of which is a simple antheridium. The basal cell usually constitutes nearly half the total length and represents the lower cell of the original spore; the antheridium and the two smallish cells immediately below are products of division of the upper spore segment (Fig. 2 E, G; 3 B–C). In most species on Anthicidae the discharge tube of the antheridium diverges slightly below the apex of the upper cell (Fig. 3 C). However, in several species on Asiatic hosts, such as *D. formicomi* Thaxter (1931) and *D. indentatus* Thaxter (1931) from the Philippines, the discharge tube is strictly terminal (Fig. 3 B). In several species the spore giving rise to the male is decidedly smaller than that from which the female is derived (Fig. 3 D). Spore germination often begins while the spores still are inside the perithecium, and the foot-cell of the young receptacle of both sexes often has taken on its characteristic dark color prior to spore discharge (Fig. 3 D). In *Dioicomyces*, the male typically forms a single antheridium, but if for some reason this aborts or is damaged a second antheridium develops alongside the first. It is not unusual to find males having two antheridia, only one of which is functional. Thaxter separated into separate genera a small number of species having females more or less identical in basic structure to *Dioicomyces* but with males that normally bear multiple antheridia. Whether or not any or all of these genera, *Dicrandromyces* Thaxter (1931), *Triandromyces* Thaxter (1931), and *Tetrandromyces* Thaxter (1912, 1931), should be retained as distinct from *Dioicomyces* remains to be determined from study of additional species.

The receptacle of the female individual of *Dioicomyces* is, like many other genera of Laboulbeniales, extremely simple, and when it is mature consists of but three cells: a basal cell (I) the lower part of which is partially obscured by the darkening of the foot; a usually somewhat smaller subbasal cell (II) that subtends a single, divergent, stalked perithecium;
and a small, often inconspicuous upper cell (III) that subtends a sterile appendage. The appendage typically is unicellular, somewhat flattened in several species, and pigmented or not; it represents the undeveloped upper segment of the female spore. The stalk-cell of the perithecium is well-developed and variable in length depending on the species, the basal cells are clearly defined, and the outer wall of the body proper is composed of five tiers of cells.

Among the species of *Dioicomyces* in the author's collection only one has been obtained from a host that is not a member of the Anthicidae. This exception is a very distinctive form that parasitizes *Mesovelia mulsanti* White of the Mesoveliidae. The species has been found on apparently the same host species from four different localities in the United States, Mexico, and Nicaragua.

*Dioicomyces mesoveliae* sp. nov.

(Fig. 2 A-I)

**Fungus masculus.**—Longitudo tota 60-80 μ; cellula basilaris paene hyalina, 30–40 μ × 7–9 μ; pes atroporphyreus; cellulae 2–3 pallide porphyreae isodiametricae 6–10 μ × 7–10 μ; antheridium leviter curvatum 15–30 μ × 8–10 μ collo terminali.

**Fungus feminus.**—Receptaculum: Porphyreum; cellula basilaris (I) parva inconspicua fere opaca; cellula subbasilaris (II) elongata 25–30 μ × 10–12 μ perithecium singulum gerens; cellula superna (III) elongata 30–35 μ × 12–15 μ appendicem simplicem sterilem gerens; cellulis II et III prope parallelae.

**Appendix:** Ex duobus cellulis constans; apex obtuse rotundatus; 28–35 μ × 11–13 μ.

**Perithecium:** Pallidum testaceum rectum aliquantum sigmoideum; stipes elongata 125–185 μ × 20–25 μ; corpus elongatum inflatum 120–190 μ × 40–55 μ margine interiore fortiter convexo; apex perithecii attenuatus obtuse rotundatus margine externa atroporphyrea; ascosporae hyalinae 45–55 μ × 6–8 μ.

Totus fungus (235–)330–395 μ longus.

**Male individual.**—Basal cell, 30–40 μ × 7–9 μ, about half the total length of 60–80 μ, nearly hyaline except for the dark reddish-brown foot; the middle two cells small, nearly isodiametric, 6–10 μ × 7–10 μ, pale reddish-brown; antheridium 15–30 μ × 8–10 μ, more rounded on one side, the neck terminal, slightly curved.

**Female individual.**—Receptacle: Reddish-brown; basal cell (I) small, nearly obscured by the opaque surface of the foot; subbasal cell (II) about two times longer than broad, 25–30 μ × 10–12 μ, bearing a single, stalked perithecium; cell III elongate, 30–35 μ × 12–15 μ, vertically adnate to the subbasal cell, in contact with the basal cell below, bearing the sterile appendage above.

**Appendage:** Two-celled, 28–35 μ × 11–13 μ, apex bluntly rounded; the upper cell about two times longer than the lower cell.
**Peritheciun:** Pale yellowish-brown; more or less erect and slightly sigmoid; the stalk elongate, 125–185 μ × 20–25 μ, consisting of the relatively short stalk-cell and the greatly elongate secondary stalk-cell that is united throughout its length with one elongate basal cell; the other two basal cells shorter, about twice as long as wide; outer surface of the stalk immediately above the stalk-cell more darkly tinged with reddish-brown. Body of the perithecium elongate, inflated gradually above the basal-cell region, the outer margin much less strongly convex than the paler inner margin, taper-

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Fig. 3. A–D.—A. Dioicomycyes spiniger Thaxter. Mature female individual showing the small, 3-celled receptacle bearing, on the upper right the small unicellular appendage and, on the upper left, the large, stalked perithecium. In this species the outer upper wall of the perithecial body bears a long, curved, unicellular process. ×350.—B. Dioicomycyes sp. Male individual of an undetermined species from the Philippine Islands in which the discharge tube of the antheridium is terminal. ×700.—C. Dioicomycyes sp. Male individual of an undetermined species from California showing the subterminal origin of the antheridial discharge tube that is characteristic of most species of the genus occurring in the Western Hemisphere. ×700.—D. Dioicomycyes anthici Thaxter. Upper end of the perithecium showing ascospores that have attained a late stage of germination prior to discharge. The blackened foot has begun to differentiate. The extreme dimorphism of the spores of this species is readily seen in the pair of spores — the female on the left, the male on the right — that are not yet completely free of the ostiole. ×500.
ing gradually to the slightly out-turned apex that is deeply suffused with reddish-brown along the outer margin; total length to base of ascigerous cavity, 120–190 μ × 40–55 μ; ascospores 45–55 μ × 6–8 μ, not showing marked size differences according to sex.

Total length from base of foot to tip of perithecium, (235–)330–385 μ (mean, 378 μ; based on 15 mature individuals).

Etym.—Named for the host genus, *Mesovelia*.

*Holotype.*—MEXICO. Oaxaca: 28 June, 1957, D. Lauck coll. On the femur of the right middle leg of *Mesovelia mulsanti* White (Hemiptera: Mesoveliidae, RKB 2080; slides in RSA.


*Dioicomyces mesoveliae* differs in several respects from all known species of the genus occurring on anthicid beetles. The side-by-side relationship of cells II and III is unique for the genus, and the nearly parallel arrangement of these cells apparently is the result of a longitudinal division of the mother cell rather than a transverse division followed by cellular displacement in the maturing individual (Fig. 2 B). During relatively early stages of development (Fig. 2 C–D) the lower part of the lumen of cell III becomes nearly void of cytoplasm which is concentrated in the upper part of the cell. Because of this, cell III in the mature individual has the appearance of being composed of two superposed cells (Fig. 2 H). Another feature not found in other species is the bicellular appendage of *D. mesoveliae*. The upper spore segment of the female individual divides early in development, but just when this division takes place — sometime between the very early stages shown in Fig. 2 A and Fig. 2 B — was not observed. Finally, in other species of *Dioicomyces* the perithelial stalk consists almost entirely of the more or less elongate true stalk-cell (Fig. 3 A), but in *D. mesoveliae* the stalk is composed of the relatively short true stalk-cell and the greatly elongate secondary stalk-cell combined with one elongate basal cell (Fig. 2 D,F,H). The male of *D. mesoveliae* (Fig. 2 E,G) is similar in all respects to the male of several species of *Dioicomyces* found on Anthicidae (Fig. 3 B).

*Prolixandromyces* gen. nov.

Receptaculum ex cellulis tribus superpositis constans appendicem liberam et perithecium stipitatum utrinsecus gerens; cellulae basilaris et subbasilaris receptaculi fortiter oblique superpositae; apex cellulae basilaris receptaculi cellula stipiti perithecii basi plus minusve contingens; cellula superna receptaculi appendicem gerens. Appendix ex cellulis tribus superpositis constans ad apicem antheridia duos simplicia collis magnopere elongatis gerens. Perithecium cum cellulis parietis in quatuor ordinibus
longitudinalibus unusquisque quattuor cellularum; cellula stipiti et cellulae basilares persistentes; cellula ascogena unica; ascosporae 1-septatae.

Receptacle consisting of three superposed cells bearing on one side a free appendage and on the other side a stalked perithecium. The basal and subbasal cells of the receptacle very strongly obliquely superposed; the distal end of the former approaching or contacting the base of the perithecial stalk-cell; the upper cell of the receptacle subtending the appendage. The appendage consisting of three superposed cells, the upper bearing two simple antheridia each having a greatly elongate neck. Perithecium with well-developed and persistent stalk- and basal-cells and four rows of wall-cells of four cells each; ascogenous cell single. Ascospores 1-septate.

Etym.—Prolixus, stretched far out + andro-, man + myces, fungus.
Type species.—Prolixandromyces veliae Benjamin.

Prolixandromyces veliae sp. nov.
(Fig. 4 A–E)

Receptaculum: Atrobrunneoaurantiacum elongatum 60–70 μ × 15–20 μ prope basin plus minusve curvatum; cellula basilaris (I) et cellula subbasilaris (II) oblique superpositae; cellula basilaris 50–55 μ × 10–15 μ ad apicem basi stipitis perithecii paene contingens; cellula III parva 17–22 μ × 12–14 μ ex parte cellula II et ex parte basi stipitis perithecii conjuncta.

Appendix: Atrobrunneoaurantiaca tota longitudo 120–130 μ; corpus 40–55 μ × 15–20 μ ex tribus cellulis superpositis constans; septum basilare constrictum opacum; cellula basilaris 15–20 μ × 12–16 μ; cellula subbasilaris subaequa; cellula suprema a latere visa triangularis 15–20 μ alta × basi 14–19 μ diam.; corpora antheridiorum ad apicem conjuncta; tubi liberi elongati; tubus internus 65–75 μ × 2–3 μ tubus externus 50–60 μ × 2–3 μ.

Perithecium: Brunneoaurantiacum; cellula stipitis elongata 75–120 μ × 20–28 μ basi fortiter et abrupte constricta; cellula stipitis secundaria parva a latere visa plus minusve triangularis; cellulae basilares elongatae; corpus perithecii elongatum 215–275 μ × 60–70 μ fere symmetricum marginis uniformiter convexae; apex graditim decrescens; cellula parietina externa supra appendicem leviter sigmoideam recurvatam acuminatam 22–28 μ × 7–9 μ gerens. Ascospores hyalinae 40 μ × 5–6 μ.

Totus fungus 300–440 μ longus.

Ochraceous-orange; the body of the appendage and the receptacle slightly darker than the perithecium.

Receptacle: Elongate, 60–70 μ × 15–22 μ; more or less strongly curved in the basal one-third or one-fourth; basal cell (I) 50–55 μ × 10–15 μ, about two times longer than the subbasal cell (II), the two cells obliquely superposed; the distal end of the basal cell extending nearly to the base of the perithecial stalk-cell; cell III small, 17–22 μ × 12–14 μ, tapered below, the oblique inner face united in part with cell II and in part with the extreme lower, inner surface of the perithecial stalk-cell.
Appendage: Separated from cell III of the receptacle by a constricted, externally blackened cross-wall; composed of three superposed cells, the basal cell 15-20 µ × 12-16 µ, slightly longer than the nearly isodiametric median cell; the upper cell triangular in cross-section, 15-20 µ high × 14-19 µ at the base, subtending two antheridia the venters of which are united above; antheridial discharge tubes free, elongate, the inner 65-75 µ × 2-3 µ, the outer 50-60 µ × 2-3 µ. Body of the appendage to tip of upper cell 40-55 µ × 15-20 µ; total length to tip of longest antheridium 120-130 µ.

Perithecium: Stalk-cell elongate, 75-120 µ × 20-28 µ, strongly and abruptly constricted at the base; the secondary stalk-cell small, more or less triangular in lateral view; basal cells elongate, forming the lower portion of the body of the perithecium; the latter elongate, 215-275 µ × 60-70 µ including the basal cells, nearly symmetrical, broadest near the middle, the wall-cells individually slightly convex, tapered gradually to the bluntly-rounded apex; the outer, upper wall-cell giving rise to a very slightly sigmoid, recurved, pointed appendage 22-28 µ × 7-9 µ. Ascospores hyaline, 40 µ × 5-6 µ.

Total length from base of foot to tip of perithecial appendage, 300-440 µ (mean, 400 µ; based on 19 mature individuals).

Etym.—Named for the host genus, Velia.

Holotype.—MEXICO. Michoacan: Jacona, 11 Aug., 1957, D. Lauck coll. On the femur of the right rear leg of Velia sp. (Hemiptera: Veliidae); RKB 2073A; slides in RSA.

Prolixandromyces corniculatus sp. nov.

(Fig. 4 F-J)

Receptaculum: Fuscum ochraceoaurantiacum; cellula III extrinsecus fuscioris e rubro; relative parvum fortiter curvatum 35-40 µ × 13-17 µ; cellula basilaris (I) et cellula subbasilaris (II) oblique superpositae; cellula

Fig. 4. A-J.—A-E. Prolixandromyces veliae Benjamin.—A. The mature type. X300.—B. Detail of the receptacle showing the oblique relationship of the basal cell (I) and subbasal cell (II). Note remnant of haustorium (h) that was withdrawn from the host integument when the fungus was detached for mounting. The constricted base of the perithecial stalk-cell is at the upper left; the base of the appendage separated by a blackened septum from the upper cell (III) of the receptacle is at the upper right. X660.—C. Detail of perithecial apex showing the terminal appendage projecting upward and to the left behind the two lateral lip-cells. The blackened remnant of the base of the trichogyne (tr) is seen at the upper end of the inner lip-cell. X895.—D. Detail of appendage showing relationship of the two terminal antheridia and their extremely long discharge tubes. X660.—E. Ascospore. X1080.—F-J. Prolixandromyces corniculatus Benjamin.—F. The mature type. X300.—G. Detail of perithecial apex showing horn-like terminal projection of outer lip-cell. The apex of the inner lip-cell curves inward sharply between the lateral lip-cells and contacts the base of the outer appendage. Note remnant of the trichogyne (tr) attached to the upper end of the inner lip-cell. X895.—H. Detail of receptacle. The laterally superposed basal (I) and subbasal (II) cells are in contact with the base of the perithecial stalk-cell at the upper right. Note constriction of base of stalk-cell. X660.—I. Detail of appendage showing relationship of the three sterile cells composing the body and the two terminal antheridia bearing elongate discharge tubes. X660.—J. Ascospore. X1080.
basilaris 25–30 μ × 8–10 μ ad apicem basi stipitis perithecii conjuncta; cellula III parva 10–15 μ × 10–12 μ ex parte cellula II et ex parte basi stipitis perithecii conjuncta.

Appendix: Fusca ochraceoaurantiaca e rubro; tota longitudo 105–125 μ; corpus 35–40 μ × 12–16 μ ex tribus cellulis superpositis constans; cellula basilaris 13–17 μ × 12–16 μ; cellula subbasilaris subaequa; cellula superna a latere visa triangularis 10–15 μ alta × basi 12–15 μ diam.; corpora antheridiorum ad apicem conjuncta; tubi liberi elongati; tubus internus 65–80 μ × 2–3 μ tubus externus 50–70 μ × 2–3 μ.

Perithecium: Ochraceoaurantiacum; cellula stipitis elongata 25–80 μ × 12–24 μ basi fortiter et abrupte constricta; cellula stipitis secundaria parva a latere visa plus minusve triangularis; cellulae basilares elongatae; corpus perithecii elongatum 210–250 μ × 45–58 μ symmetricum margines uniformiter convexae; apex graditim decrescens; cellula parietina externa superna appendicem elongatam erectam leviter curvatam acuminatam 26–30 μ longam × basi 7–10 μ diam. gerens. Ascosporae hyalinae 32–38 μ × 4–5 μ.

Tutus fungus 255–355 μ longus.

Ochraceo-orange; cell III of the receptacle and the appendage darker, tinged with red.

Receptacle: Relatively small, strongly curved, 35–40 μ × 13–17 μ; basal cell (I), 25–30 μ × 8–10 μ, broader than the subbasal cell (II), the two cells approximately equal in length, obliquely superposed, the distal ends of both cells in contact with the lower end of the perithecial stalk-cell; cell III small, 10–15 μ × 10–12 μ, nearly triangular in lateral view, the outer margin darker, the oblique inner face united in part with cell II and in part with the extreme lower, inner surface of the perithecial stalk-cell.

Appendage: Separated from cell III of the receptacle by a constricted, externally blackened cross-wall; composed of three superposed cells, the basal cell 13–17 μ × 12–16 μ, slightly longer than the nearly isodiametric subbasal cell; the upper cell small, pointed above, 10–15 μ high × 12–15 μ wide at the base, subtending two antheridia; venters of antheridia united above; antheridial discharge tubes free, elongate, the inner 65–80 μ × 2–3 μ, the outer 50–70 μ × 2–3 μ. Body of the appendage to tip of upper cell 35–40 μ × 12–16 μ; total length to tip of longest antheridium 105–125 μ.

Perithecium: Stalk-cell elongate, 25–80 μ × 12–24 μ, strongly and abruptly constricted at the base; secondary stalk-cell small, triangular in lateral view; basal cells elongate, forming the lower part of the body of the perithecium, the latter elongate, 210–250 μ × 45–58 μ including the basal cells, nearly symmetrical, broadest near the middle, the wall-cells individually very slightly convex, tapering gradually to the bluntly rounded apex; the outer, upper wall-cell giving rise to an elongate, erect, slightly curved, pointed appendage 26–30 μ × 7–10 μ at the base. Ascospores hyaline, 32–38 μ × 4–5 μ.

Total length from base of foot to tip of perithecial appendage, 255–355 μ (mean, 310 μ; based on 21 mature individuals).
Etym.—corniculatus, horned.

Holotype.—MEXICO. Michoacan: Jacona, 11 Aug., 1957, D. Lauck coll. On the lower surface of the mesothorax of a male of Velia sp. (Hemiptera: Veliidae); RKB 2073B; slides in RSA.

Other specimens examined.—MEXICO. Michoacan: Jacona, 11 Aug., 1957, D. Lauck coll. On the posterior median margin of the pronotum of a female of Velia sp; RKB 2074; slide in RSA.—EL SALVADOR. La Union, 24 July, 1957, D. Lauck coll. On the right margin of the pronotum of a female of Velia sp.; RKB 2072; slide in RSA.

The relationship of Prolixandromyces clearly is with a complex of genera constituting what Thaxter (1908) termed the Stigmatomyceteae of the Laboulbeniaceae. This assemblage includes at least ten other genera: Acallomyces Thaxter (1931), Acompsomyces Thaxter (1901, 1931), Art hrorhynchus Kolenati (1857; Thaxter, 1908), Autophagomyces Thaxter (1912, 1931), Gloeandromyces Thaxter (1931), Hesperomyces Thaxter (1891, 1931), Ilyomyces Picard (1916), Stemmatomyces Thaxter (1931), Stigmatomyces Karsten (1869, Thaxter, 1891, 1908, 1931), and Synandro myces Thaxter (1912, 1931). All species belonging to these genera are characterized by a simple receptacle composed of three superposed cells: the upper cell (III) subtends an appendage; the subbasal cell (II) gives rise to a stalked perithecium; and the basal cell (I) forms the foot by which the fungus is attached to the host. The appendage bears one or more simple antheridia either terminally or laterally and lacks sterile branchlets; the apex of the spore, however, often persists in the form of a small spine attached to the host. The appendage bears one or more simple antheridia either terminally or laterally and lacks sterile branchlets; the apex of the spore, however, often persists in the form of a small spine attached to the host. The appendage bears one or more simple antheridia either terminally or laterally and lacks sterile branchlets; the apex of the spore, however, often persists in the form of a small spine attached to the host. The appendage bears one or more simple antheridia either terminally or laterally and lacks sterile branchlets; the apex of the spore, however, often persists in the form of a small spine attached to the host. 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The appendage bears one or more simple antheridia either terminally or laterally and lacks sterile branchlets; the apex of the spore, however, often persists in the form of a small spine attached to the host.
Stigmatomyces, a genus of many diverse species occurring on a variety of hosts, especially species of free-living Diptera, has an appendage consisting of a variable number — depending on the species — of superposed cells most of which bear usually one or sometimes 2–3 antheridia. The perithecium contains 2 or 4 ascogenous cells and the apex usually lacks any special modifications. The cross-wall separating the basal and subbasal cells of the receptacle typically is more or less transverse. Allied to Stigmatomyces are Arthrorhynchus and Gloeandromyces, all known species of which occur on flies parasitic on bats. Both genera may have evolved directly from Stigmatomyces-like ancestors, but they have undergone modifications that readily distinguish them generically. In Arthrorhynchus, parasitic on species of Nycteribiidae, the fertile cells of the appendage bear antheridia arranged in whorls; the perithecium contains a single ascogenous cell; and the basal cell of the receptacle penetrates the host by means of an extensive rhizoidal system. The latter feature, however, probably is not significant as a generic characteristic, for it occurs sporadically in other unrelated genera of Laboulbeniales. Gloeandromyces, found only on species of Streblidae, is very much Stigmatomyces-like in appearance and the perithecium contains 2 or 4 ascogenous cells. The antheridial appendage, however, is unique in that its cells proliferate laterally and form a small number of superposed rows of cells. Each cell of the upper row bears an antheridium; in age, the antheridia gelatinize and may disappear entirely. Some species of Gloeandromyces form a typical blackened foot of limited penetration, whereas other species develop an extensive penetrating rhizoid much like that of Arthrorhynchus species. Acallomyces and Hesperomyces also are Stigmatomyces-like in many respects, but the perithecium of all known species of these genera is distinguished by unicellular upgrowths arising from the upper wall-cells. The perithecium of Acallomyces contains four ascogenous cells, whereas that of Hesperomyces only one. The two described species of Acallomyces occur on species of Staphylinidae; six species of Hesperomyces have been described, five on species of Coccinellidae and Mycetophagidae (Coleoptera) and one on a species of Anthocoridae (Hemiptera).

Acompsomyces includes four species on cucujoid beetles, two on members of the family Cryptophagidae and two on Lathridiidae. The genus is readily distinguished from other Stigmatomycteae by the structure of the appendage which consists of four superposed cells the lower of which separates 2–3 antheridia, the median two cells remain sterile, and the terminal cell forms a single spinose antheridium with or without a small associated cell. The perithecium contains a single ascogenous cell. The last two genera to be considered here are Synandromyces with eight species known on members of four families of cucujiform beetles, Cucujidae, Cryptophagidae, Lathridiidae, and Nitidulidae, and Stemmatomyces with two species on beetles belonging to the Elateridae. The receptacle of members of both genera is unlike that of all other related genera in having the basal cell (I) almost completely surrounded by cells II and III which extend downward externally so that when viewed in optical section the
three cells appear to lie more or less parallel to one another. The perithecium of members of both genera contains a single ascogenous cell, and that of *Stemmatomyces* is crowned by four conspicuous upgrowths that surround the ostiole.

Although resembling *Autophagomyces* superficially, *Prolixandromyces* has been segregated generically from this and the other genera of Stigmatomyctaeae on the basis of its receptacle and especially the antheridia. The type of extreme oblique superposition of the basal and subbasal cells of the receptacle as seen in *Prolixandromyces* is found rarely in other genera of Laboulbeniales having 3-celled receptacles and can be regarded as a generic characteristic in only two of them. In both *Eucantharomyces* Thaxter (1895, 1908) and *Acrogynomyces* Thaxter (1931) the basal and subbasal cells of the receptacle are more or less parallel to one another and, as in *Prolixandromyces*, the distal end of the basal cell lies in contact with the lower surface of the perithecial stalk-cell. Neither of these genera, however, is closely related to *Prolixandromyces* or other Stigmatomyctaeae. *Eucantharomyces* has a very distinctive type of compound antheridium, and the characteristics of the *Acrogynomyces* appendage suggest a relationship of this genus with *Corethromyces* Thaxter (1892, 1931) and its allies. The receptacle of one species of *Hesperomyces*, *H. lasiochili* Thaxter (1931), is like that of *Prolixandromyces*, but species of these genera are readily separated by the characteristics of their appendages and perithecia. The greatly elongate discharge tube of the antheridium of *Prolixandromyces* species is unique and is regarded as a primary generic characteristic. Whether or not the horn-like terminal appendage and the basal constriction of the perithecial stalk-cell found in both species of *Prolixandromyces* are of generic importance must await discovery of additional species. Such features are known to occur in some, but not all, species of various other genera of Laboulbeniales.

**SUMMARY**

Five species representing three genera of Laboulbeniales parasitic on semiaquatic Hemiptera are illustrated; four of these species are described as new. The type specimen of *Autophagomyces microveliae* Thaxter is illustrated for comparison with *A. poissonii* parasitic on *Mesovelia multisanti* White (Mesoveliiidae). *Dioicomycetes mesoveliae*, also parasitic on *Mesovelia multisanti*, is contrasted with other representatives of this dioecious genus which are known only on species of Coleoptera. The new genus *Prolixandromyces* with two species, *P. veliae* and *P. corniculatus*, is described and its possible relationship with the Stigmatomyctaeae of the Laboulbeniaceae is discussed. Both species of *Prolixandromyces* were found on an undetermined species of *Velia* (Veliidae).

**LITERATURE CITED**


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