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## NEW FUNGI FROM *DASYLIRION* (AGAVACEAE)

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### ABSTRACT

Dead leaves of *Dasyllirion* were collected in Texas in Guadalupe Mountains National Park and Big Bend National Park, and in the Valley of Fires, New Mexico. The fungi present were identified and grown in culture to identify teleomorph-anamorph connections. Four new ascomycete species are described—*Graphyllum dasyllirionis*, *Splanchnonema dasyllirionis*, *Chaetoplea dasyllirionis*, and *Chaetoplea sotolifoliorum*. In addition, a new genus, *Parahendersonia*, is described to accommodate the coelomycete anamorph of *Chaetoplea dasyllirionis*.

Key words: Agavaceae, ascomycete, *Chaetoplea*, coelomycete, *Dasyllirion*, *Graphyllum*, *Parahendersonia*, *Splanchnonema*, systematics.

### INTRODUCTION

Spectacular flowering specimens of *Yucca* L. or *Agave* L. are almost symbolic of the vegetation of arid regions of the southwest. Nevertheless, in recent years little work has been done on the saprobic foliar fungi of the Agavaceae, the family to which *Yucca*, *Agave*, and their lesser-known relatives, *Nolina* Michx. and *Dasyllirion* Zucc. belong. Within the boundaries of the United States, approximately 80 fungal species have been described from *Yucca*, which is widespread. Many fewer species have been described from *Agave*, which is widely cultivated but more limited than *Yucca* in natural distribution. Only two species of ascomycetes and three species of coelomycetes have been described from *Dasyllirion* (Farr et al. 1989). New genera as well as new species of existing genera have been found on some members of the Agavaceae in a continuing study of foliar fungi of that flowering plant family. One new genus and four new species of existing genera, all from *Dasyllirion*, are described below.

### MATERIALS AND METHODS

Measurements are from living materials. Cultures from anamorphs were made by suspending conidia in a drop of sterile tap water on the surface of commercial potato dextrose agar (PDA) in a petri dish and spreading the drop with a glass rod. After 24 hr, single-germinated conidia were placed on PDA. Cultures from teleomorphs were prepared by washing asci three times in sterile tap water and transferring individual asci to PDA in a petri dish. Cultures were maintained at room temperature on a table top.

### RESULTS AND DISCUSSION

***Graphyllum dasyllirionis*** A. W. Ramaley, sp. nov.

Fig. 1A–D

Ascomata immersa, subepidermalia, globosa, turbinata, vel oblonga, transectiones mediae circulares vel turbinatae, usque ad ca. 570

µm longa, 440 µm lata et 480 µm alta papilla inclusa; papilla brevis (ca. 60 µm), lata (ca. 90 µm diam), dilute colorata, epidermis hospitis non superans, ostiolum circulare, centrale, hyphis repletum, peridium molle et tenue, ex 3–5 stratis cellularum parvarum atriparietiarum, 8–16 µm crassum, et interius 1 vel 2 stratis cellularum hyalinarum compressarum constans; hyphae ex peridio in substratum. Clypeus latus, tenuis, ex cellulis parvis atriparietis constans, 1–aliquot ascomata tegens. Asci 148–210 × 16–20.8 µm, bitunicati, numerosi, cylindracci, 2–8-spori, ascosporeae uniseriatae imbricatae. Pseudoparaphyses anguste cellulosae, 1.5–3.2 µm latae, septis tenuibus 20–35 µm separatis, numerosae. Ascosporeae (23.2–)27.2–42.4 × 8.8–12.8(–14.4) × 8–9.6 µm, leves, aureobrunneae, late fusoidae, extrema obtuse rotundata vel apiculata, equilaterales vel subcurvatae, symmetricae vel hemispora supera leviter latior quam hemispora infera, applanatae, in aqua tunica lata, hyalina circumcinctae, transverse 5–7(–9)-septatae, A2 septum prope A1 septum, longitudinaliter aseptatae a latere visae, longitudinaliter septatae a fronte visae, septum unum longitudinale cellulis omnibus vel cellulae terminales vel cellulae duae terminales septo carentes.

Ex foliis emortuis *Dasyllirii leiophylli* Engelm., "U.S.A. TEXAS: Brewster Co., Big Bend National Park, across road from Lost Mine Trailhead, 200 ft above game trail down to road from point of ridge, 9 May 1994, Annette Ramaley 9406A," holotypus BPI 802797; "3.75 mi from U.S. Hwy. 385 on road to The Basin, ca. 500 ft beyond stone-sided bridge and down slope, 9 May 1994, Annette Ramaley 9408A," paratypus UC 1475186.

*Ascomata* (Fig. 1B) immersed, subepidermal, globose, turbinate, or oblong, circular or turbinate in median cross section, up to ca. 570 µm long, 440 µm broad and 480 µm tall including the papilla; papilla short (ca. 60 µm), broad (ca. 90 µm in diam), light colored, not raised above the host epidermis, ostiole circular, central, stuffed with hyphae; peridium soft, thin, consisting of 3–5 layers of small, dark-walled cells, 8–16 µm thick, and 1 or 2 layers of hyaline compressed cells at the interior; hyphae from the peridium into the substrate. Clypeus broad, thin, composed of small, dark-walled cells, covering 1–several ascomata. *Asci* (Fig. 1A) 148–210 × 16–20.8 µm, bitunicate, numerous, cylindrical, 2–8-spored, ascospores overlapping uniseriate. Pseudoparaphyses narrowly cellular, 1.5–3.2 µm wide with thin septa 20–35 µm

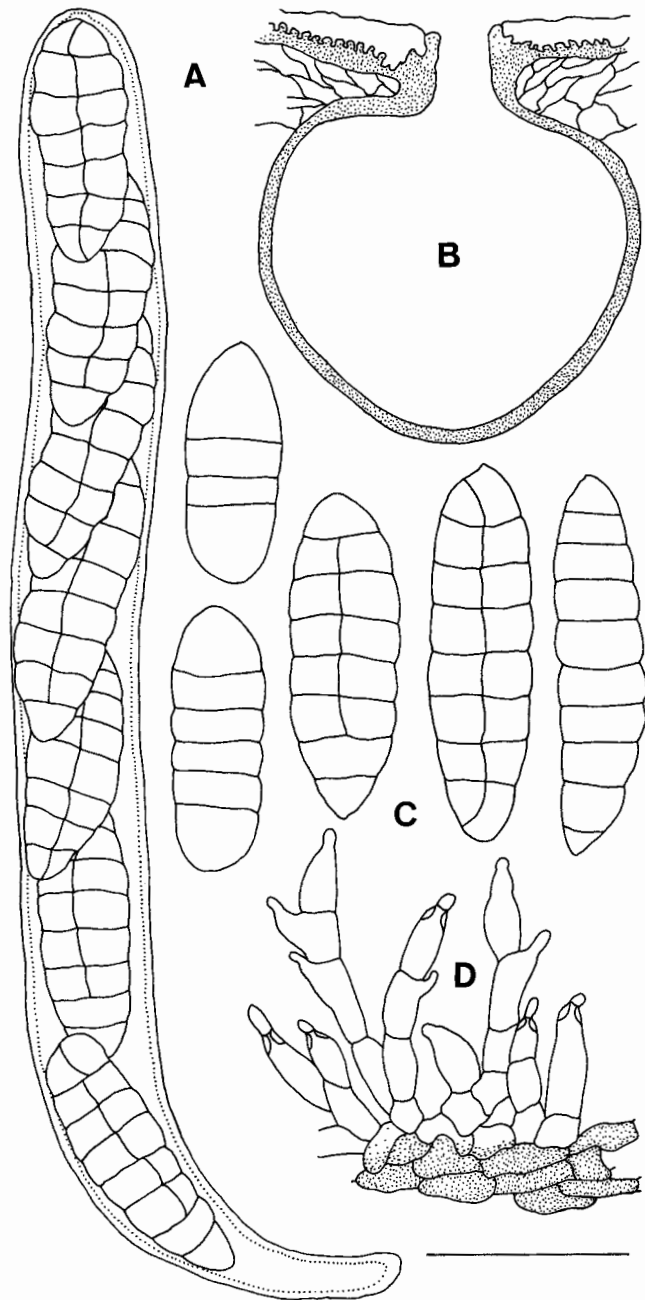


Fig. 1A–D. *Graphyllum dasytirionis*.—A. Ascus.—B. Ascoma.—C. Ascospores.—D. Conidiogenous cells and portion of wall from conidiomata formed in culture. (Standard line: A = 25  $\mu\text{m}$ ; B = 250  $\mu\text{m}$ ; C, D = 20  $\mu\text{m}$ .)

apart, numerous even at maturity. *Ascospores* (Fig. 1C) (23.2–)27.2–42.4  $\times$  8.8–12.8(–14.4)  $\times$  8–9.6  $\mu\text{m}$ , smooth, golden brown, broadly fusoid, both ends bluntly rounded or a small apiculus at one or both ends, equilateral to slightly curved, symmetric or the top hemispore slightly broader than the bottom hemispore, applanate, surrounded by a broad hyaline sheath in water, transversely 5–7(–9)-septate, septation macrocephalic, the A2 septum very close to the A1 septum, no longitudinal septa in side view, longitudinally

septate in face view only, the single longitudinal septum in all cells, or the end cells or two end cells may lack a septum.

Cultures with little aerial mycelium, light brown around the inoculum, the rest white to tan, then darkening with age from the inoculum outward, producing small, dark, irregularly shaped multilocular pycnidial conidiomata with several small nonpapillate ostioles, 50–250  $\mu\text{m}$  in diam, in groups up to 500  $\mu\text{m}$  in diam. Locules with a few layers of unevenly brown-pigmented wall cells. Conidiogenous cells phialidic, channel minute, periclinal walls thickened, discrete or integrated on short, 1–2 celled, sometimes branched, conidiophores (Fig. 1D). Conidia mostly 4.8–6.4  $\times$  1.6–2.0  $\mu\text{m}$ , hyaline, smooth, mono- or biguttulate, bacillar, allantoid or sigmoid, released in hyaline to pinkish droplets. Conidia spread on PDA showed no growth, therefore these conidia are likely spermatia.

*Graphyllum dasytirionis* was placed in *Graphyllum* because it has applanate ascospores with one longiseptum in face view, and soft, thin peridia composed of small, dark cells. The generic concept presented by Shoemaker and Babcock (1991) would exclude this species with applanate ascospores from *Graphyllum*, in the Hysteriaceae, because the peridia do not open by a long slit. *Graphyllum dasytirionis* cannot be placed in the Pleosporaceae, a second family used to accommodate species with applanate ascospores, because, as delimited by Barr (1987), members of this family have relatively large-celled peridia and the known anamorphs are hyphomycetous. The third family Shoemaker and Babcock use for species with applanate ascospores is the Diademaceae. The opening mechanism characterizing peridia of this family is not found in all species of genera they include in the family, nor are all genera with species opening by a discoid lid included in the Diademaceae. Barr (1993a) therefore rejects using the opening mechanism of ascomata as the only character on which to base a family or genus. Barr's revised sense of the Diademaceae includes taxa which may open by a lid, a lysigenous pore, or a slit (1993a). She removes *Graphyllum* from the Hysteriaceae to the Diademaceae because the thick, three-layered peridium of true members of the Hysteriaceae is quite different from that of species of *Graphyllum*. *Graphyllum dasytirionis* can now be properly placed with other species of *Graphyllum* in the Diademaceae.

***Splanchnonema dasytirionis* A. W. Ramaley, sp. nov.**

Fig. 2A–D

Ascomata immersa, subepidermalia, globosa, turbinata, vel oblonga, 225–350  $\mu\text{m}$  lata, 275–450  $\mu\text{m}$  longa, 225–350  $\mu\text{m}$  alta; apex leniter depressus, rotundatus, vel brevipapillatus, papilla ex cellulis dilute coloratis composita, ca. 80–100  $\mu\text{m}$  lata et 60–80  $\mu\text{m}$  alta, canalis ostioli hyphi repletus; peridium atribrunneum, molle, ex ca.

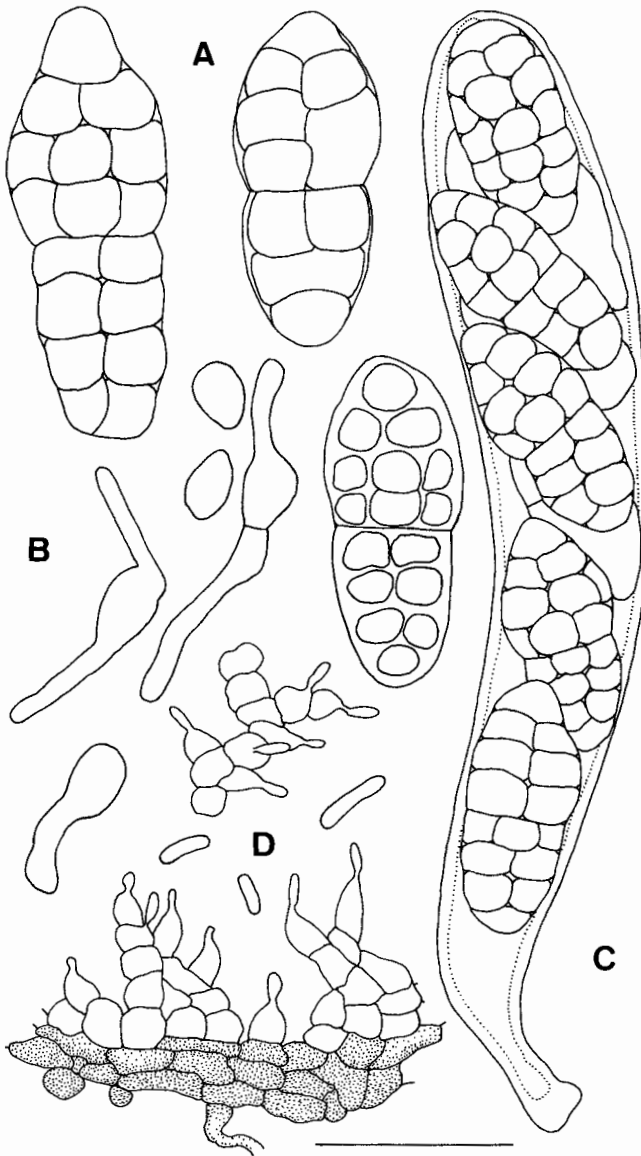


Fig. 2A–D. *Splanchnonema dasyllirionis*.—A. Ascospores.—B. Germinating conidia.—C. Ascus.—D. Conidiogenous cells and portion of wall from conidiomata formed in culture. (Standard line: A, B, D = 20  $\mu\text{m}$ ; C = 25  $\mu\text{m}$ .)

5 stratis cellularum parvarum, atriparietarum, parum compressarum, pseudoparenchymatarum compositum, imo et latis ca. 20  $\mu\text{m}$  crassum, versus apicem aliquantum crassius, hyphae brunneae ex peridio in substratum. Asci 125–160  $\times$  20–28  $\mu\text{m}$ , bitunicati, basiales et laterales, clavati, 4- vel 8-spori. Pseudoparaphyses anguste cellulosae, canalem ostioli complentes. Ascospores 28–45.6  $\times$  12.4–17.6  $\mu\text{m}$ , rufobrunneae, obovoideae, extrema obtusa, apex angustior quam basis, 5–7-septatae, unum vel duo septa longitudinalia in plurimum cellulis sed cellulae terminales frequenter aseptatae, septum primum plerumque submedium constrictum, septa alia distoseptata; paries crassus, subtiliter punctatus vel sublevis, in aqua tunica lata, hyalina circumcinctae, in asco biseriatae imbricatae.

Ex foliis emortuis *Dasyllirii leiophylli*, "U.S.A. TEXAS: Brewster Co., roadside, U.S. Hwy. 90, mi 267.8, 8 May 1994, Annette Ramaley 9414A," holotypus UC 1475187.

*Ascomata* immersed, subepidermal, globose, turbi-

nate, or oblong, 225–350  $\mu\text{m}$  wide, 275–450  $\mu\text{m}$  long, 225–350  $\mu\text{m}$  high; apex somewhat flattened, rounded, or short papillate, the papilla of light-colored cells, ca. 80–100  $\mu\text{m}$  broad and 60–80  $\mu\text{m}$  high, ostiolar channel stuffed with hyphae; peridium dark brown, soft, composed of about 5 layers of small, dark-walled, slightly compressed, pseudoparenchymatous cells, ca. 20  $\mu\text{m}$  thick at the bottom and sides, somewhat thicker toward the top, brown hyphae from the peridium into the substrate. Asci (Fig. 2C) 125–160  $\times$  20–28  $\mu\text{m}$ , bitunicate, basal and lateral, clavate, 4- or 8-spored. Pseudoparaphyses narrowly cellular, filling the ostiolar channel. Ascospores (Fig. 2A) 28–45.6  $\times$  12.4–17.6  $\mu\text{m}$ , reddish brown, obovoid, ends obtuse, the apex narrower than the base; 5–7-septate, one or two longitudinal septa through most cells but the end cells often aseptate, the first-formed, usually submedian eu-septum constricted, the other septa distoseptate; wall thick, finely punctate to nearly smooth, surrounded by a broad hyaline sheath in water, overlapping biseriate in the ascus.

In culture, mycelium white, becoming light orange centripetally, darkening at the agar surface in older parts of the colony, producing dark, thin-walled, ostiolate, nonpapillate conidiomata singly, or a few grouped together at the agar surface, 200–500  $\mu\text{m}$  in diam. The wall composed of 1–4 layers of brown-walled cells and a variable number of layers of hyaline cells internally. Conidiophores lining the entire conidiomatal cavity, multicellular, branched at the base and above. Conidiogenous cells (Fig. 2D) determinate, phialidic, channel minute, periclinal walls thickened, discrete or integrated, hyaline, smooth, used up in conidium formation, conidiogenesis centrifugal. Conidia released in white to pink droplets, bacillar, hyaline, aseptate, smooth, biguttulate, ca. 4–8  $\times$  1.6  $\mu\text{m}$ . Development of the bacillar *Splanchnonema* conidia resembles microconidium/spermatium formation in some species of *Asteromella*, the spermatial synanamorph for many species of *Mycosphaerella* (Higgins 1929; Ramaley 1991). When spread on PDA, a high percentage of these conidia increased in size and formed ovate or ellipsoid cells, germinated (Fig. 2B), and developed into normal-appearing colonies. Thus, although their size, shape, and formation suggests that their role is as spermatia they may also serve as asexual reproductive structures.

Ascospore dimensions of *Splanchnonema dasyllirionis* are similar to those of three other species with clavate asci and biseriate ascospores, *S. carpinii* (Fuckel) M. E. Barr, *S. holochistum* (Berk. & Broome) M. E. Barr, and *S. vaccinii* M. E. Barr (Barr 1993c). Reddish brown, transversely 5–7-septate ascospores distinguish *S. dasyllirionis* from *S. vaccinii* which has bright yellow brown, 7–9-septate ascospores (Barr 1993b).

Ascomata of *S. holochistum* are much larger than those of *S. dasytirionis*, 500–900 vs. 225–450  $\mu\text{m}$ . In addition, the peridium of *S. dasytirionis* is uniformly narrow at the bottom and sides and slightly thickened at the top whereas the peridium of *S. holochistum* is wide at the sides and narrowed toward both base and apex (Barr 1990). In contrast to the narrow peridium of *S. dasytirionis* ascomata, ca. 20  $\mu\text{m}$ , the peridium of *S. carpini* ascomata is 50–70  $\mu\text{m}$  wide and up to 100  $\mu\text{m}$  wide at the base (Barr 1982). *Splanchnonema carpini* also has brown ascospores which are regularly transversely 5–9-septate (Barr 1982) while the reddish brown ascospores of *S. dasytirionis* are transversely 5–7-septate.

***Chaetoplea sotoliflorum* A. W. Ramaley, sp. nov.**

Fig. 3A–D

Ascomata immersa, subepidermalia, oblonga, 250–350  $\mu\text{m}$  longa, 225–275  $\mu\text{m}$  lata, et 200–275  $\mu\text{m}$  alta, papilla parva epidermidem hospitis penetrans. Ostiolum periphysibus. Peridium 12–28  $\mu\text{m}$  crassum, ex 4–7 stratis cellularum parvarum, brunnearum compositum, hyphae copiosae, brunneae ex peridio in substratum. Asci 112–160  $\times$  10.4–14.4  $\mu\text{m}$ , bitunicati, cylindranei, 8-spori. Pseudoparaphyses cellulosa, ca. 3  $\mu\text{m}$  latae. Ascospores 16–21.6  $\times$  7.2–10.4  $\mu\text{m}$ , in asco uniseriatae imbricatae, fulvae, symmetricae vel hemispora supra leviter latior quam hemispora infra, equilaterales, extrema obtuse rotundata, paries crassus, crasse punctatus vel sublevis, 3(–5)-septatae, A1 septum constrictum, septa alia minor constricta, plerumque modo cellulae mediae longitudinaliter 1-septatae sed interdum etiam cellulae terminales longitudinaliter septatae.

Ex foliis emortuis *Dasytirii leiophylli*, "U.S.A. TEXAS: Brewster Co., Big Bend National Park, across road from Lost Mine Trailhead, ca. 200 ft above game trail down to road from point of ridge, 9 May 1994, Annette Ramaley 9406B," holotypus BPI 802794.

**Ascomata** (Fig. 3A) immersed, subepidermal, oblong, 250–350  $\mu\text{m}$  long, 225–275  $\mu\text{m}$  wide, and 200–275  $\mu\text{m}$  tall, a small papilla penetrating the host epidermis. Ostiole with periphyses. Peridium 12–28  $\mu\text{m}$  thick, composed of 4–7 layers of small, brown cells, abundant brown hyphae from the peridium into the substrate. Asci (Fig. 3C) 112–160  $\times$  10.4–14.4  $\mu\text{m}$ , bitunicate, cylindrical, 8-spored. Pseudoparaphyses cellular, ca. 3  $\mu\text{m}$  wide. Ascospores (Fig. 3D) 16–21.6  $\times$  7.2–10.4  $\mu\text{m}$ , overlapping uniseriate in the ascus, yellow-brown, symmetric or the upper hemispore slightly broader than the lower hemispore, equilateral, both ends bluntly rounded, thick walled, coarsely punctate to nearly smooth, 3(–5)-septate, the A1 septum constricted, the other septa less constricted, usually only the middle cells longitudinally 1-septate but sometimes the end cells also longitudinally 1-septate.

**Anamorph:** Coelomycetous. Conidia from cultures (Fig. 3B) light brown, smooth or longitudinally striate, 1(–3)-septate, mostly 8–12  $\times$  3.2–4.8  $\mu\text{m}$ , formed within pycnidial conidiomata. Cultures with a bright red reverse near the center, darkening toward the edges, mycelium dark green near the agar surface and be-

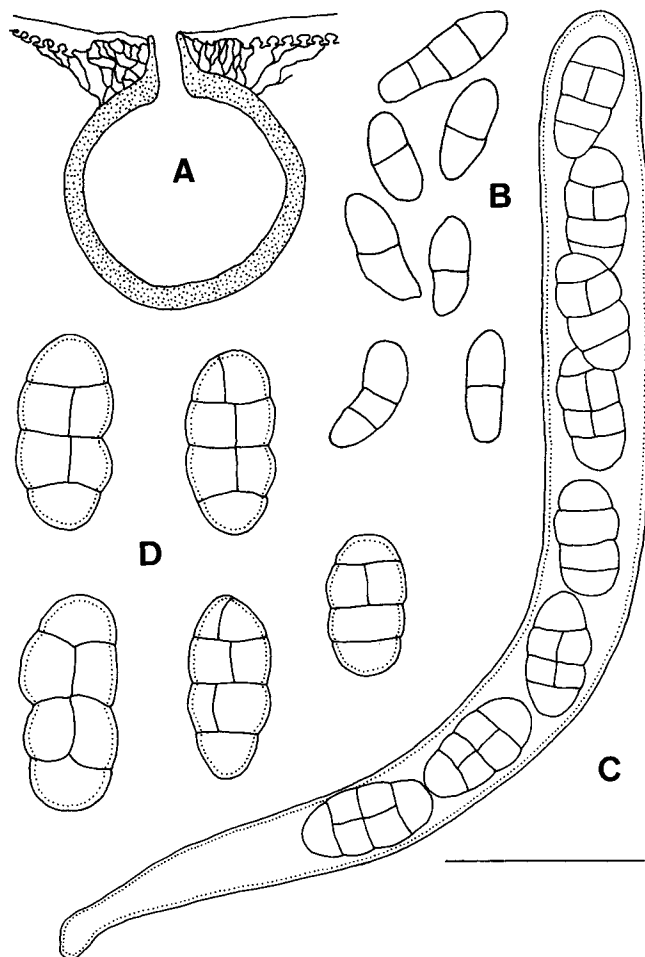


Fig. 3A–D. *Chaetoplea sotoliflorum*.—A. Ascoma.—B. Conidia formed in culture.—C. Ascus.—D. Ascospores. (Standard line: A = 250  $\mu\text{m}$ ; B, D = 20  $\mu\text{m}$ ; C = 25  $\mu\text{m}$ .)

low, white to lighter green above, agar colorless to light green in old cultures.

Five of the eight *Chaetoplea* species with 3(–5)-septate ascospores (Barr 1990; Ramaley and Barr 1995) are found on hosts not closely related to *Dasytirion*. *Chaetoplea nubilosa* (Ellis & Everh.) M. E. Barr and *C. aspera* (Ellis & Everh.) M. E. Barr are superficial on their substrates. The immersed ascomata of *C. pusilla* (Karsten & Malbranche) M. E. Barr are minutely papillate and have a dark, expanded, compact clypeus in close association with the substrate. *Chaetoplea sotoliflorum* has immersed ascomata associated with the overlying substrate by loosely woven hyphae from the upper wall to the host epidermis. These characters set it apart from *C. nubilosa*, *C. aspera*, and *C. pusilla*. *Chaetoplea carpincola* (Ellis & Everh.) M. E. Barr, immersed in woody substrates, has cylindrical asci with reddish brown, smooth, uniseriate ascospores that are 15–18  $\times$  7–7.5  $\mu\text{m}$ . *Chaetoplea sotoliflorum* also has cylindrical asci, but the uniseriate ascospores, measuring 16–21.6  $\times$  7.2–10.4  $\mu\text{m}$ , are

broader than those of *C. carpinicola*, yellowish brown, and often coarsely punctate. *Chaetoplea calvescens* (Fr. ex Desm.) Clements, immersed or erumpent in herbaceous stems, has yellowish brown to pale brown, smooth ascospores that are  $(13-15-23 \times (5-6-8(-9) \mu\text{m})$ . The asci from American collections are clavate and the spores usually biseriata (Barr 1990), whereas those in European collections (Webster and Lucas 1959) are usually cylindric and the ascospores generally uniseriate. *Chaetoplea calvescens* and *C. sotolifoliorum* are similar, but longitudinal septa appear tardily or not at all in the ascospores of *C. calvescens*, which are smooth and more tapered toward the apex and base than ascospores of *C. sotolifoliorum*.

The size, shape, and septation of conidia from *C. sotolifoliorum* cultures are much like those from *C. calvescens* cultures and on the host (Webster and Lucas 1959). However, mature conidia from *C. sotolifoliorum* cultures are light brown and most often longitudinally striate, whereas conidia from the anamorph of *C. calvescens*, *Microdiplodia henningsii* Staritz = *Chaetodiplodia caudina* Karst. (Sutton 1980), are pale yellow and wall sculpturing is not mentioned (Webster and Lucas 1959).

#### *Chaetoplea dasyilirionis* A. W. Ramaley, sp. nov.

Fig. 4A–C

Ascomata immersa, subepidermalia, sphaeroidea, oblonga, vel subglobosa, 250–500  $\mu\text{m}$  longa, 150–350  $\mu\text{m}$  lata, et 175–325  $\mu\text{m}$  alta, apex contra epidermidem hospitis depressus et ad epidermidem adhaerens, pars adhaerens nigra et orbiculata vel, saepius, lenticularis a vertice visa, axis longior parallelus ad longitudinem folii, saepe inter conidiomata anamorphosi mixta, clypeus angustus trans marginem apicis adhaerentis saepe extensus, papilla parva epidermidem penetrans. Ostiolum periphysibus et pseudoparaphysibus repletum. Peridium 20–40  $\mu\text{m}$  crassum, latera et basis ex 4–6 stratis cellularum parvarum atriparietarum compositum, hyphae brunneae ex peridio in substratum. Asci 96–136  $\times$  14.4–17.6(–21.6)  $\mu\text{m}$ , bitunicati, numerosi, clavati vel subcylindracei, 8-spori. Pseudoparaphyses cellulosa, ca. 3  $\mu\text{m}$  latae. Ascospores 19.2–28  $\times$  8.8–12  $\mu\text{m}$ , aureae aureobrunnescentes, typice asymmetricae, hemispora supra leviter latior quam hemispora infera, equilaterales, extrema obtuse rotundata vel apex apiculatus, paries crassus, subtiliter punctatus, A1 septum subconstrictum, septa alia minus constricta, 3(–5)-septatae, plerumque modo cellulae mediae longitudinaliter 1-septatae sed interdum etiam cellulae terminales longitudinaliter septatae, in aqua tunica lata circumcinctae.

Ex foliis emortuis *Dasyilirii leiophylli*, "U.S.A. TEXAS: Brewster Co., Big Bend National Park, 3.75 mi from U. S. Hwy. 385 on road to The Basin, ca. 500 ft beyond stone-sided bridge and down slope, 9 May 1994, Annette Ramaley 9408D," holotypus BPI 802793.

*Ascomata* (Fig. 4A) immersed, subepidermal, sphaeroid, oblong, or nearly globose, 250–500  $\mu\text{m}$  long, 150–350  $\mu\text{m}$  wide, and 175–325  $\mu\text{m}$  tall, the apex flattened against, and adhering to, the host epidermis, the adherent portion black and circular or, more often, lenticular from above, the long axis parallel to the length of the leaf, often mixed among conidiomata of the ana-

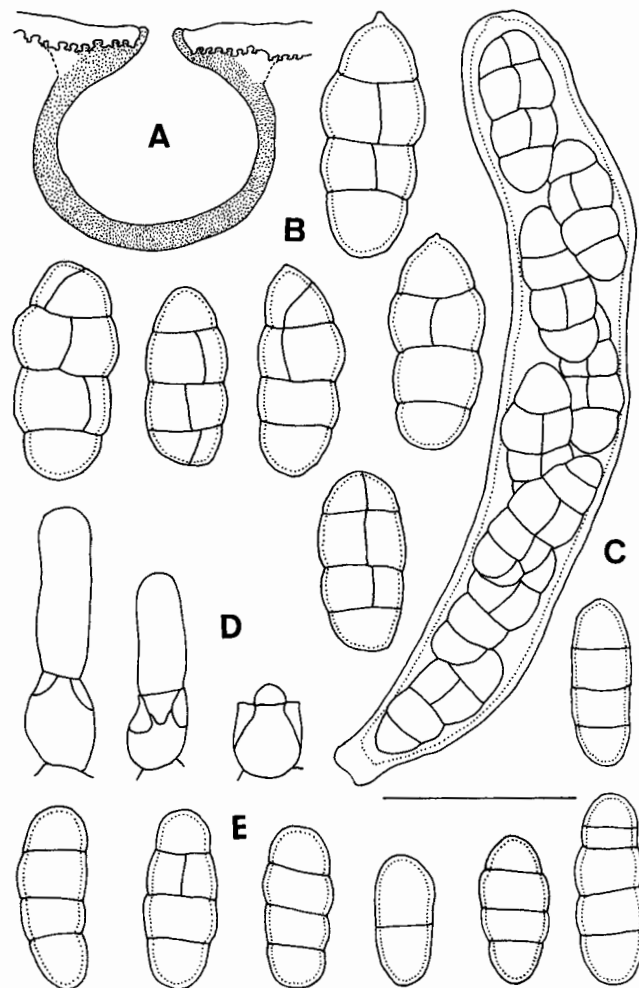


Fig. 4A–C. *Chaetoplea dasyilirionis*.—A. Ascoma.—B. Ascospores.—C. Ascus.—D, E. *Parahendersonia dasyilirionis*.—D. Conidiogenous cells.—E. Conidia. (Standard line: A = 250  $\mu\text{m}$ ; B, D, E = 20  $\mu\text{m}$ ; C = 25  $\mu\text{m}$ .)

morph, a narrow clypeus often extending beyond the edge of the adherent apex, a small papilla penetrating the epidermis. Ostiole stuffed with periphyses and pseudoparaphyses. Peridium 20–40  $\mu\text{m}$  thick, the sides and bottom composed of 4–6 layers of small, dark-walled cells, brown hyphae from the peridium into the substrate. Asci (Fig. 4C) 96–136  $\times$  14.4–17.6(–21.6)  $\mu\text{m}$ , bitunicate, numerous, clavate or subcylindric, 8-spored. Pseudoparaphyses cellular, ca. 3  $\mu\text{m}$  wide. Ascospores (Fig. 4B) 19.2–28  $\times$  8.8–12  $\mu\text{m}$ , golden becoming golden brown, usually asymmetric, the upper hemispore somewhat broader than the lower hemispore, equilateral, both ends bluntly rounded or the apex with a small apiculus, thick walled, finely punctate, the A1 septum somewhat constricted, the other septa less constricted, 3(–5)-septate, usually only the middle cells longitudinally 1-septate but sometimes the end cells also longitudinalseptate, surrounded by a broad, hyaline sheath in water.

Anamorph: ***Parahendersonia dasyilirionis*** Ramaley, gen. et sp. nov. Fig. 4D, E

Conidiomata immersa, subepidermalia, sphaeroidea, oblonga, vel subglobosa, 250–500  $\mu\text{m}$  longa, 150–350  $\mu\text{m}$  lata, 175–325  $\mu\text{m}$  alta, apex contra epidermidem hospitis depressus et ad epidermidem adhaerens, pars adhaerens nigra et orbiculata vel, saepius, lenticularis a vertice visa, axis longior parallelus ad longitudinem folii, clypeus angustus ultra margo apicis adhaerentis saepe extensus, papilla parva epidermidem penetrans. Parietis 20–40  $\mu\text{m}$  crassus, ex (4–)5–7(–9) stratis cellularum brunnearum, et interdum strato cellularum hyalinum interiorum compositus, hyphae brunneae ex pariete in substratum. Cellulae macroconidiogenae ex cellulis interioribus parietis conidiomatis formatae, discretae, plerumque determinatae, leves, hyalinae vel paries maculis brunneis, ampulliformes, holoblasticae. Macroconidia 13.6–16.8  $\times$  5.6–8  $\mu\text{m}$ , brunnea, cylindracea, extrema obtuse rotundata, punctata, (1–)3-septata. Ontogenesis conidiis holoblastica constructione ad parietes apicalem; proliferatio cellularum conidiogenarum enteroblastica; conidia addita ad ca. idem punctum producentia, aliquot conidia addita ad puncta successiva altiora producentia. Microconidia ca. 5  $\mu\text{m}$  diam, ca. globosa, levia, hyalina, pariete supero conidiomatis prope ostium formata.

Ex foliis emortuis *Dasylii leiophylli*, "U.S.A. TEXAS: Brewster Co., Big Bend National Park, 3.75 mi from U. S. Hwy. 385 on road to The Basin, ca. 500 ft beyond stone-sided bridge and down slope, 9 May 1994, Annette Ramaley 9408E," holotypus BPI 802795. Ex foliis emortuis *Dasylii* sp., "TEXAS: Culberson Co., Guadalupe Mountains National Park, between the Salt Basin Trail and the eastern Park Boundary where the road and boundary run east and west, 10 May 1994, Annette Ramaley 9412A," paratypus UC 1475185. "NEW MEXICO: Lincoln Co., Valley of Fires, U. S. Hwy. 380, mi 61.3, roadside, 6 May 1994, Annette Ramaley 9416A," paratypus BPI 802796.

*Conidiomata* immersed, subepidermal, sphaeroid, oblong, or nearly globose, 250–500  $\mu\text{m}$  long, 150–350  $\mu\text{m}$  wide, 175–325  $\mu\text{m}$  tall, the top flattened against, and adhering to, the host epidermis, the adherent portion black and circular or, more often, lenticular from above, long axis parallel to the length of the leaf, a narrow clypeus often extending beyond the edge of the adherent apex, a small papilla penetrating the epidermis. Wall 20–40  $\mu\text{m}$  thick, composed of (4–)5–7(–9) layers of brown cells, sometimes with a layer of hyaline cells at the interior, brown hyphae from the wall into the substrate. *Macroconidiogenous* cells (Fig. 3D) formed from the interior of the conidiomatal wall, discrete, mostly determinate, smooth, hyaline or with brown spots on the walls, ampulliform, holoblastic. *Macroconidia* (Fig. 3E) 13.6–16.8  $\times$  5.6–8  $\mu\text{m}$ , brown, cylindrical, both ends obtusely rounded, punctate, (1–)3-septate. Conidial ontogeny holoblastic by apical wall building, conidiogenous cell proliferation enteroblastic, additional conidia produced at approximately the same level, rarely additional conidia produced at successively higher levels. *Microconidia* ca. 5  $\mu\text{m}$  in diam, approximately globose, smooth, hyaline, formed on the upper conidiomatal wall near the ostiole.

Among the *Chaetoplea* species with 3(–5)-septate ascospores (Barr 1990), only *C. pusilla* has immersed,

clypeate ascomata appearing at all similar to ascomata of *C. dasyilirionis*. However, *C. dasyilirionis* asci are much larger than those of *C. pusilla*, 96–136  $\times$  14.4–17.6(–21.6)  $\mu\text{m}$  vs. 60–90  $\times$  10–15  $\mu\text{m}$ . In addition, the ascospores of *C. dasyilirionis* are 19.2–28  $\times$  8.8–12  $\mu\text{m}$ , golden, becoming golden brown, and finely punctate, whereas ascospores of *C. pusilla* are 14–18(–20)  $\times$  6.5–8(–9)  $\mu\text{m}$ , and pale brown with smooth walls. The three *Chaetoplea* species from hosts in the Agavaceae are quite easily distinguished. The tiny papilla and expanded upper wall or clypeus flattened against the host epidermis distinguishes ascomata of *C. dasyilirionis* from those of *C. rosipapilla* A. W. Ramaley & M. E. Barr and *C. sotolifoliorum*. Ascomata of *C. rosipapilla* from *Yucca*, have a broadly papillate apex with a rosy pigment at the tip, and clavate to subcylindric asci containing golden yellow-brown to brown, finely foveolate to smooth ascospores 19.2–30.4  $\times$  8–14.4  $\mu\text{m}$  (Ramaley and Barr 1995). Ascomata of *C. sotolifoliorum* lack a rosy pigment at the tip of the papilla, the asci are mostly cylindrical, and the often coarsely punctate ascospores are smaller, 16–21.6  $\times$  7.2–10.4  $\mu\text{m}$ .

*Parahendersonia dasyilirionis* was thought to be the anamorph of *Chaetoplea dasyilirionis* because ascomata and conidiomata were found separately or intermixed on the host and were so similar in appearance that the contents could be ascertained only by opening them. Colonies in cultures from conidia and asci had the same appearance and those from both sources produced *Parahendersonia* conidia, so the connection was concluded to be correct.

In the past, *Parahendersonia dasyilirionis* would probably have been described as a species of *Hendersonia* Berk., which has been treated as the dark-spored counterpart of *Stagonospora* (Sacc.) Sacc. *Hendersonia* is now a *nomen rejiciendum* replaced by *Stagonospora* (Sutton 1977) which has priority. *Parahendersonia* cannot be placed, even provisionally, in *Stagonospora*. Successive conidia secede from conidiogenous cells at approximately the same level and the conidial walls are thick, brown, and sculptured. *Stagonospora* conidia secede at successively higher levels when more than one conidium is formed by a conidiogenous cell (Sutton 1980), and the conidia are thin walled, hyaline, and smooth. Although the genus has not been revised, former *Hendersonia* species, as well as species that would have been considered *Hendersonia* in the past, have now been placed in at least 25 different genera (Sutton 1980; Swart and Walker 1988; Sutton and Dyko 1989; Walker et al. 1992). As presently delimited, none of these genera comfortably accommodates *P. dasyilirionis*. Members of nine of these genera have hyaline conidia or are acervular. Seven more genera regularly have percurrent proliferation when more than one conidium is formed on a single

conidiogenous cell. Like *Parahendersonia*, the nine remaining genera have pycnidial conidiomata and conidial secession is at approximately the same level on the conidiogenous cells. These genera may be separated from *Parahendersonia* by a variety of characters. *Masariothea* Syd. and *Camarographium* Bub. conidia are smooth and distoseptate. Conidiomata of *Wojnowicia* Sacc. are setose and bear smooth, pale brown, several-septate conidia. *Neottiospora* Desm. conidia are hyaline to olivaceous, aseptate, and fusiform, with a gelatinous sheath everted toward the base. *Sphaerellopsis* Cooke conidia are 0–1-septate and the apex has a gelatinous cap. *Stenocarpella* Syd. conidia are smooth, pale brown, fusiform, and (0–)1(–3)-septate. *Hendersoniopsis* Höhn. conidiomata are multilocular and eustromatic. Macroconidia are pale brown, smooth, and fusiform, and microconidia are falcate. *Hendersonula* Speg. has been recently revised (Sutton and Dyko 1989), and all three accepted species are mycoparasitic, not saprobic. The single remaining genus, *Camarosporium* Schulz., is itself in need of revision. The conidia are brown, muriform, and smooth or verruculose according to species. In some species conidial secession repeatedly occurs at nearly the same level while in other species secession occurs at gradually higher levels on the conidiogenous cell (Sutton 1980; Ramaley and Barr 1995). Although some conidia of *Parahendersonia dasylirionis* have a longitudinal septum in one cell, and the variation found in *Camarosporium* might seem to encompass the other characters of *Parahendersonia*, a new genus was described because, (1) if *Camarosporium* can be revised on the basis of conidiogenesis, *Parahendersonia* would be separated from the type of *Camarosporium* in which conidial secession takes place at successively higher levels on the conidiogenous cells (Sutton 1980), and (2) the punctate conidia of *Parahendersonia* rarely have a longiseptum while the smooth conidia of the type species of *Camarosporium* characteristically have longitudinal septa.

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