

A MONOGRAPH OF THE GENUS *WYNNEA* (PEZIZALES, SARCOSCYPHACEAE)

DONALD H. PFISTER

*Farlow Reference Library and Herbarium of Cryptogamic Botany,
Harvard University, Cambridge, Massachusetts 02138*

SUMMARY

Previous studies of the genus *Wynnea* are discussed; the genus and four recognized species are described. All have suboperculate asci and produce auriculate or sparassoid apothecia on multiaxial stalks. Sclerotia are sometimes produced. The four accepted species are: *W. americana*, from eastern USA, Costa Rica, and Japan; *W. macrotis*, from Asia; *W. gigantea*, from Mexico and South America; and *W. sparassoides*, a new species, from eastern USA. Hypotheses suggesting that *Wynnea* is a primitive discomycete are advanced.

Wynnea Berk. & Curt. in Berkeley (1867) was erected to accommodate two species: *Peziza macrotis* Berk. (\equiv *Wynnea macrotis* (Berk.) Berk.) and *Wynnea gigantea* Berk. & Curt. The erection of a new genus was justified by the following comment, "The substance is so totally different from that of *Peziza*, though this curious fungus is closely allied to *Peziza leporina* and *P. onotica*, that it cannot be placed in the same genus." Saccardo (1889) treated both *W. macrotis* and *W. gigantea* in the genus *Midotis* Fr. along with several other species including *M. heteromera* Mont. Thaxter (1905) discussed the uncertainties surrounding *Midotis* and later, in a paper completed by Thaxter, Durand (1923) concluded that *M. heteromera* should be considered the type species of *Midotis*. Durand placed discomycetes with inoperculate asci in *Midotis*. Patouillard (1895) appears to be the first to have discovered that the asci of *Wynnea* are operculate. Nonetheless, Clements and Shear (1931) treated *Wynnea* as a synonym of *Midotis* and listed *Wynnea gigantea* as type of *Midotis*. Both Clements and Shear and Saccardo erred in including both operculate and inoperculate members in the genus *Midotis*. *Midotis* has been abandoned in recent literature (Korf, 1973a).

Seaver (1928) correctly recognized that species of *Wynnea* were operculate discomycetes. Later, Le Gal (1946) determined that the ascus construction of *Wynnea americana* agreed in apical configuration with those species she placed in the suboperculate series. Subsequently,

authors have regarded *Wynnea* as being related either to *Urnula* or to *Sarcoscypha* and *Phillipsia*. Rifai (1968) and Eckblad (1968) placed the genus in the Sarcoscyphaceae tribe Urnuleae because of the dark color of the mature hymenium and dark excipulum. Korf (1949), who had collected *W. americana* several times, pointed out that the hymenium is pinkish red when young and fresh. In later treatments, Korf (1970, 1972, 1973a) referred the genus to the Sarcoscyphaceae sensu Korf, that is, to the family of suboperculate discomycetes with light or bright colored hymenia.

The species of the genus are widespread. They have been collected in Asia (Berkeley, 1851; Imai, 1938; Lloyd, 1920; Patouillard, 1895; Rifai, 1968; Teng, 1934; Waraitch, 1976) and in the Americas (Berkeley, 1867; Henry, 1943; Korf, 1949; Lloyd, 1924; Overholts, 1924; Pfister and Gómez, 1978; Sumstine, 1906; Thaxter, 1905). The inadequacies of previous treatments have led to the use of the names *W. gigantea* and *W. macrotis* interchangeably for tropical members of the genus. Lloyd, moreover, recorded a specimen from Java under the name *Midotis heinricherii* Bres. *Midotis heinricherii* is here referred to the genus *Ascosparrassis* Kobayasi.

THE GENUS WYNNEA

WYNNEA Berk. & Curt. in Berk., J. Linn. Soc. Bot. 9: 424. 1867.

Apothecia large, firm to tough and somewhat coriaceous, upright, spatuliform, auriculiform to otideoid, or in sparassoid clumps. Apothecia rarely solitary, generally several apothecia arising from a single stalk or in clumps from a sclerotium. Stalk at least partially hypogean, sometimes arising from a sclerotium. Sclerotium, when known, dark, irregular to lobed, composed of a dark cortical layer and medullary layer of more or less gelatinized hyphae, chambered. Hymenium black, grayish, or brownish when dried, purplish, pinkish, dark orangish red, brownish or black when fresh. Asci suboperculate with lateral opercula, 8-spored. Ascospores ellipsoid to naviculate, symmetrical or bilaterally asymmetrical, marked with longitudinal ridges similar to those found in *Phillipsia*, sometimes apiculate. Ridges and apiculi cyanophobic and apparently of homogeneous wall material. Paraphyses stout, septate, sometimes swollen slightly at the tip, anastomosing. Excipulum composed of two distinct layers. Medullary excipulum of *textura intricata* composed of hyaline, thin-walled hyphae sometimes appearing to be embedded in a gelatinous matrix. Ectal excipulum of *textura angularis* either forming a discrete palisade layer or a hyphal layer of dark thick-walled cells. The outer layer of the ectal excipulum often giving rise

to groups of angular cells or dark, septate, hyphoid hairs. Species occurring on soil, rarely reported on wood.

Type species: *Wynnea gigantea* Berk. & Curt.

Notes.—Eckblad (1968) considered Seaver (1928) to have selected *Wynnea gigantea* as type species of the genus. Thaxter (1905) stated that *W. gigantea* was the type species but it is unclear whether his judgment was based on application of the American Code “first species rule” or on his interpretation of Berkeley and Curtis’s original description in which *W. gigantea* was more prominently mentioned than *W. macrotis*.

The nature of the sclerotium has been commented upon briefly by Korf (1972). He stated that in *Wynnea americana* “the so-called ‘sclerotium’ is in reality a tangled mass of rhizomorphs.” My studies do not bear out his opinion but rather conform with Thaxter’s (1905) observations and illustration. To Thaxter’s detailed comments I can add only that the dark angular cells which he mentioned as forming the outer surface of the sclerotium and which line the chambers are very similar in size and arrangement to those cells found in the ectal excipulum of the apothecium. In some collections of *Wynnea americana* I have seen rhizomorphs on the outside of the sclerotia. I could never satisfactorily resolve whether these originated from the sclerotia or were simply growing through the soil. In structure they are very unlike any part of *W. americana*. Sclerotia have been reported in *W. americana* and *W. macrotis* (sub *W. intermedia* fide Waraitch, 1976). In addition, a long subterranean structure has been described to me from *W. sparassoides*. Whether these amalgamations of fungus cells and hyphae deserve to be called *true* sclerotia is a debatable question. Thaxter believed it “to be in the nature of a sclerotium” which possibly serves the purposes of supplying moisture and nutriment. Corner (1930) hypothesized that it was a resistant structure which carried the fungus through periods of stress.

WYNNEA AMERICANA Thaxter. Bot. Gaz. (Crawfordsville) 39: 246.
1905. FIG. 1

≡ *Midotis americana* (Thaxter) Sacc. & Trav., Syll. Fung. 22:
711. 1913.

Apothecia erect, broadly auriculate to otideoid, reaching a maximum size of 130 × 60 mm, margin sometimes somewhat involute. External surface dark brown and verruculose. Hymenium pinkish

orange to dull purplish red or brown at maturity. Apothecia arising singly or in groups from a short stalk. Stalk variable in length and solid, dark outside, white within. Sclerotium tough, subgelatinous, irregularly lobed, reaching a diam of 40–60 μm , internally chambered. Ectal excipulum 125 μm thick, composed of dark angular to subglobose cells 40–70 μm in diam, the angular cells forming pyramidal warts on the outer surface. Medullary excipulum subgelatinous, of *textura intricata*, composed of hyphae 10 μm in diam. Asci 330–400 \times 16–20 μm . Ascospores 35–38(–40) \times 12–14(–18) μm , naviculate, bilaterally asymmetrical, marked with prominent longitudinal striations, more or less apiculate when mature, multiguttulate. Paraphyses septate, 8–9 μm wide, barely expanded apically. Occurring on soil in deciduous forests.

Specimens examined.—COSTA RICA: Volcán Turrialba, Nov. 5, 1977, Luis D. Gómez and R. A. Chacón, CR-58955.

JAPAN: Mt. Hiko-san, Fukuoka-Pref. Kyushu, July 10, 1938, H. Yoshii, RPK (ex Herb. Kyushu Univ. (FU) no. 0811); on the ground in woods, Nopporo Forest, Ishikari Prov., Hokkaido, September 1, 1935, RPK (ex Herb. Sanshi Imai); Morioka-Pref., Honshu, no date or collector, RPK (ex Herb. Imai, ex Herb. Morioka Koto Norin School); Sendai, September 20, 1914, A. Yasuda, BPI-Lloyd, NY.

USA: New York: Big Basin, Allegany State Park, August 16, 1935, "Gene" Rea, NY; on ground in woods, Lloyd-Cornell Preserve, Ringwood, Ithaca, September 27, 1947, R. E. Perkins and Richard P. Korf (No. 713), NY, RPK; Ringwood, near Ithaca, September 6, 1952, D. P. Rogers, NY; on ground, mixed woods, Ringwood near Ithaca, September 26, 1947, H. M. Fitzpatrick and C. T. Rogerson (no. 1724), NY; in woods, near Hume, October 7, 1968, George M. Smith, NY; on soil, 2.5 miles east of Obi, Allegheny Co., Sept. 2, 1976, George and Marion Smith, Julie Bluhm, Linda M. Kohn, and R. P. Korf (4308), CUP 55062.

North Carolina: on stump, Green Cove, Tuxedo, 1975, Harley Barnhart, FH; Cranberry, Aug. 1896, R. Thaxter, FH (sub *Syncephalis wynneae*); Cranberry July 1887, R. Thaxter, FH (sub *S. wynneae*).

Ohio: Highland Park, Wooster, September 1912, E. G. Arzberger, NY; Akron, no date, G. D. Smith, BPI-Lloyd.

Pennsylvania: 4 mi. N.E. of Harmony, Butler County, July 6, 1937, L. K. Henry, NY; on ground, northeastern Pa., G. E. Miller farm, E. E. Honey, September 8, 1920, NY, BPI; 3 mi. N.E. of Emberton, Venaugo Co., September 26, 1942, L. K. Henry, NY; on ground in ravine, Meadville, September 18, 1922, E. C. Smith, NY (ex Herb. Overholts); Idlewild Park near Ligonier, Westmoreland Co., August 5,

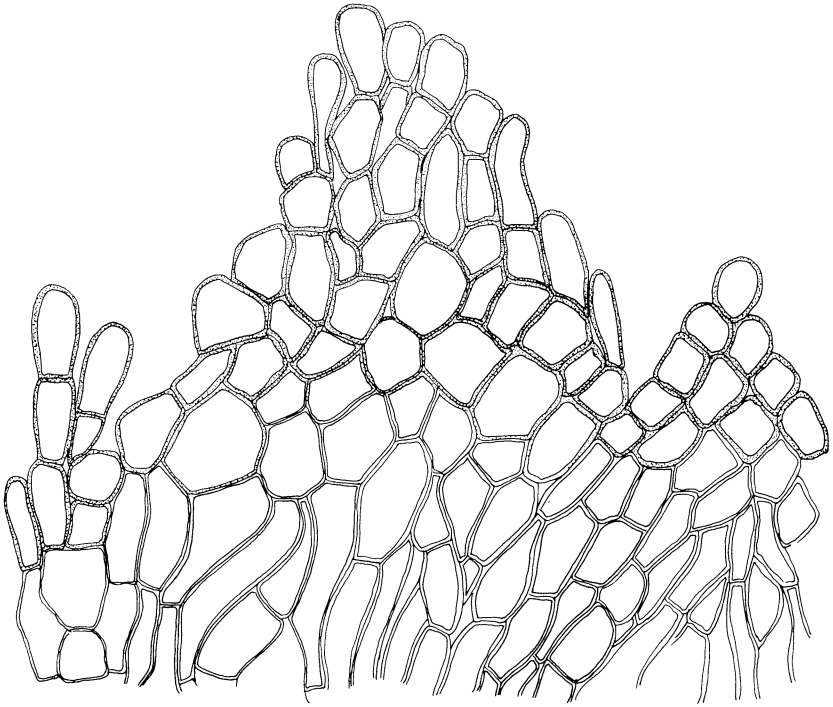


FIG. 1. Excipulum of *Wynnea americana*. Drawn from lectotype, FH, $\times 500$.

1910, D. R. Sumstine, NY; near Trent, Somerset Co., July 31, 1932, C. M. Hepner, NY; Ohio Pyle, Fayette Co., August 31–September 2, 1907, O. E. and G. K. Jennings, NY; Rachelwood, Mellon's Estate near New Florence, Westmoreland Co., September 7–10, 1907, O. E. Jennings, NY.

Tennessee: on the ground in woods, Burbank, August 20, 1896, R. Thaxter, FH, lectotype of *Wynnea americana* (issued as no. 647 in *Reliquiae Farlowianae*); Burbank, August–September, 1887, R. Thaxter, FH; on soil at edge of trail, Greenbrier turnaround, Great Smokey Mountain National Park, September 7, 1977, D. H. Pfister, FH.

West Virginia: on river trail about 200 yds. from Nature Center, in loose alluvial soil, under mixed hardwoods, Pipestem Park (near Athens), July 23, 1977, Harley Barnhart, FH.

Notes.—When describing *Wynnea americana* Thaxter (1905) listed two specimens: one from Burbank, Tennessee, the other from Cran-

berry, North Carolina. Since no holotype was designated, the Farlow Herbarium portion of Thaxter's Tennessee collection (on ground in woods, Burbank, Aug. 20, 1896) is here designated lectotype. Parts of this collection were distributed in the *Reliquiae Farlowianae* as number 647. The collection from North Carolina is parasitized by *Syncephalis wynneae* Thaxter and has been used as type material for that taxon.

Wynnea americana has been described in detail by Thaxter (1905) and Seaver (1928). Eckblad (1968) gave supplementary anatomical information.

The large asymmetrical longitudinally ribbed and apiculate ascospores of *Wynnea americana* were illustrated by Thaxter (1905). The ridges and apiculi seem to be composed of homogeneous wall material. They are cyanophobic. The spores of *W. sparassoides*, described later in this paper, are very similar but bilaterally symmetrical. The distinctly pustulate appearance of the outer surface of the apothecium distinguishes *W. americana* from the other species. Thaxter (1905) described and illustrated the sclerotium and Imai (1938) published a photograph of the sclerotium in a Japanese collection.

In both Asia and North America the fungus produces apothecia most often during the months of August and September. The single Central American collection, from Costa Rica, was made in early November.

WYNNEA GIGANTEA Berk. & Curt., J. Linn. Soc. Bot. 9: 424. 1867.

FIG. 2

≡ *Midotis gigantea* (Berk. & Curt.) Sacc., Syll. Fung. 8: 547. 1889.

Apothecia up to 8 cm long, arising singly or in clumps from a stalk which generally divides several times below the soil surface. Stalk dark outside, white within, solid. Hymenium and outer surface dull rust color to dark purplish brown when dry (chocolate according to Rick's field notes). Stalk solid, whitish within. Sclerotium, if present, unknown. Ectal excipulum 80 μm thick, composed of elongate brown-walled cells up to $30 \times 50 \mu\text{m}$, arranged more or less radially to form an indistinct palisade layer; some of the outer cells elongating to form short blunt hairs which reach a diam of 6–8 μm and a length of 10 μm . Medullary excipulum subgelatinous, of textura intricata, hyphae 9–12 μm wide. Asci 300–325 \times 14–18 μm . Ascospores 30–33(–35) \times 13–16 μm , naviculate, bilaterally asymmetrical, with two or more often three guttules, marked with low longitudinal ridges, without definite apiculi. Paraphyses thin walled, below about 4–5 μm wide, above occasionally

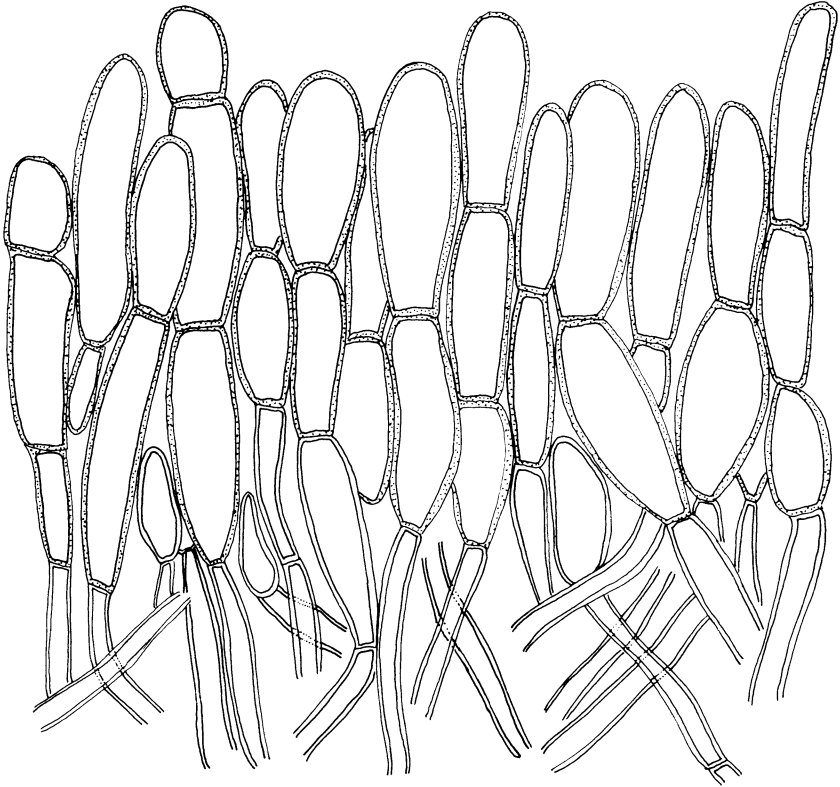


FIG. 2. Excipulum of *Wynnea gigantea*. Drawn from Rick's collection from Brazil, BPI. $\times 350$.

up to 10 μm , sometimes widening abruptly, becoming bent or malformed, or forming short bud-like branches, other times completely straight and unexpanded, anastomosing frequently, tending to branch at the base. Occurring on soil.

Specimens examined.—BRAZIL: no locality or date, J. Rick, BPI-Lloyd; no locality or date, Glaziou (20181), K; no locality or date, Sallé (178), K.

MEXICO: à terre dans les forêts du Mathaguihahuite, Cordova, Juin 1859, FH-herb. Patouillard (? part of type collection of *W. gigantea*); no locality or date, FH, (part of type collection of *W. gigantea* studied by R. Thaxter).

PERU: on soil, ca 38 km from Tingo María, on the Tingo María-

Pucallpa Rd., Dpto. Huanuco, elev. ca. 5200 ft., July 4, 1976, K. P. Dumont et al., NY (PE-812).

Notes.—Though there have been few collections of the species in the American tropics, it is likely that *Wynnea gigantea* is fairly widespread through Central and South America. So far as known the species does not exist outside of the Americas. The ascospore size and the construction of the ectal excipulum distinguish the species as presently circumscribed.

Several questions remain to be answered concerning this species. Sclerotia have never been collected in association with *W. gigantea*. But, in almost all collections examined the stalk, on which the apothecia are produced, has been broken. There is no evidence of it having arisen directly from the substrate but rather it seems to have been broken from an underground portion. Also there appear to be only Rick's fieldnotes which report the hymenial color when fresh.

WYNNEA MACROTIS (Berk.) Berk., J. Linn. Soc. Bot. **9**: 424. 1867.

FIG. 3

≡ *Pezizia macrotis* Berk., J. Bot. (Hooker) **3**: 203. 1851.

≡ *Midotis macrotis* (Berk.) Sacc., Syll. Fung. **8**: 547. 1889.

= *Midotis gigantea* (Berk. & Curt.) Sacc. var. *nana* Pat., Bull. Soc. Mycol. France **11**: 198. 1895.

= *Wynnea intermedia* Waraitch, Trans. Brit. Mycol. Soc. **67**: 536. 1976.

Apothecia up to 40 mm wide × 180 mm high, long auriculate, hymenium purple to reddish brown. Apothecia arising from a stalk. Sclerotium, fide Waraitch (1976 sub *Wynnea intermedia*), "4 × 1.8 cm, reddish brown, subgelatinous, wrinkled and hypogeous," unknown in other collections. Ectal excipulum an irregular palisade layer of brownish angular to cylindrical cells, up to 40 × 70 μm, on the outside giving rise to hyphoid hairs 4–6 μm in diam; hairs often curved or coiled, forming a superficial tomentum. Medullary excipulum of textura intricata, hyphae thin walled, 10–12 μm wide. Asci 320–360 × 15–18 μm. Ascospores bilaterally asymmetrical, subreniform, without apiculi, somewhat flattened at the ends, faintly striate, 28–31(–32) × 12–13 μm, three guttulate to multiguttulate. Paraphyses about 3–4 μm below, up to 5–6 μm at the apex. Occurring on soil, rarely reported on wood.

Specimens examined.—INDIA, West Bengal: no locality or date, FH, (part of holotype of *W. macrotis* studied by R. Thaxter); in humus,

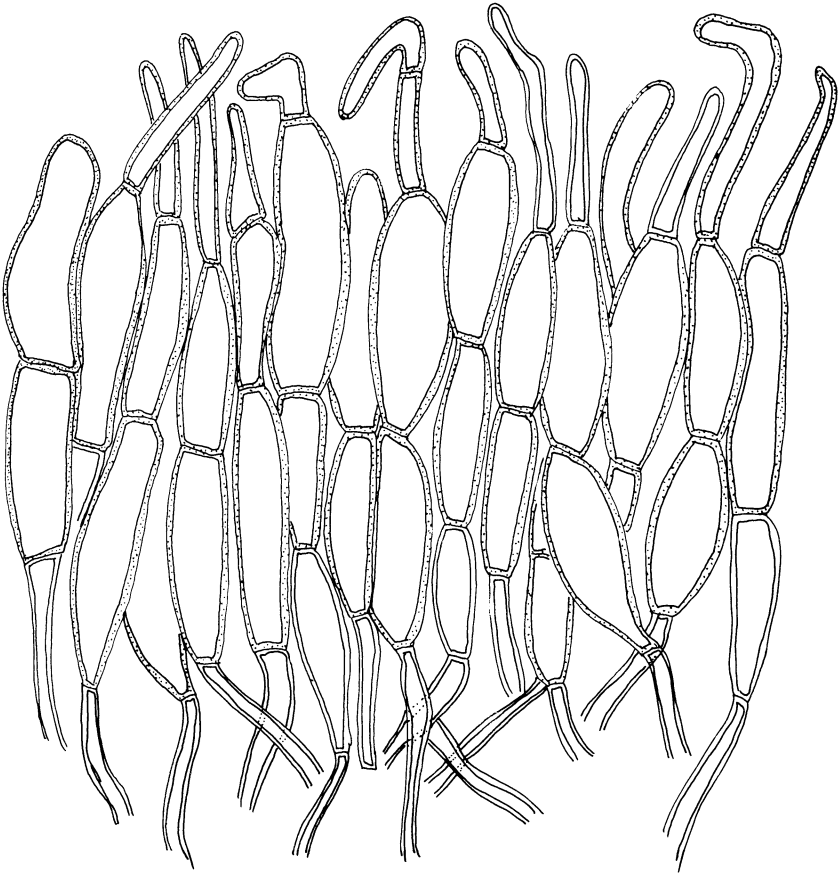


FIG. 3. Excipulum of *Wynnea macrotis*. Drawn from isotype of *W. intermedia*, K, $\times 350$.

mixed forest, Swel, Darjeeling, August 6, 1964, K. S. Thind (354), K (isotype of *Wynnea intermedia* Waraitch); on soil in oak forest, Lal Tibba Mussoorie, Sept. 18, 1952, K. S. Thind, BPI.

TIBET: Su-tchuen oriental district de Tchen-Kéon-Tin, 1894, Abbé Farges, FH-herb. Patouillard, sheet 4995; as above, FH-herb. Patouillard, sheet 4995 (holotype of *Midotis gigantea* var. *nana* Pat.).

Notes.—*Wynnea macrotis* remains an enigmatic species. Most of the collections are poorly preserved resulting in difficulties in discerning apothecial features.

The ascospores of *Wynnea macrotis* are smaller than any other

species in the genus and the ectal excipulum differs from others. The relatively faint ascospore markings seem to be diagnostic.

Rifai (1968) dubiously referred a collection from the Solomon Islands (on ground, 1885, Dr. Guppy, K) to *Wynnea macrotis*. It does not agree completely with my concept of *W. macrotis*. It might represent an undescribed species. The material is so scanty that a complete description cannot be drawn from it. The unique feature of this collection is the presence of relatively long, dark, septate, hyphoid hairs on the outside of the apothecia. These become interwoven and give the apothecium a distinctly woolly appearance. In addition, the hairs also sometimes become fasciculate.

Wynnea sparassoides Pfister, sp. nov.

FIGS. 4-6

Apothecia sparassoidea in stipitibus haud ramosis. Partes fertiles \pm globulosae, 6-8 cm diam, hinnuleae. Stipites cartilaginei 2 cm diam, 10 cm longi, parte exteriore brunnea, parte interior alba, solidi. Sclerotia ignota. Cortex, 80-100 μ m, e cellulis globulosis et hyphis fuscis compositus. Medulla e textura intricata composita. Asci 350-375 \times 16-20 μ m. Ascosporae (32-)33-36 \times 12-15 μ m, ellipsoidae, triguttulatae, cum cristis longitudinalibus. Paraphyses septatae, 4-5 μ m diam, apice 9-10 μ m diam. Habitat a terram.

Holotypus: under leaf litter, Woodland Park, Darien, Connecticut, September 15, 1974, Mrs. Plant, CUP.

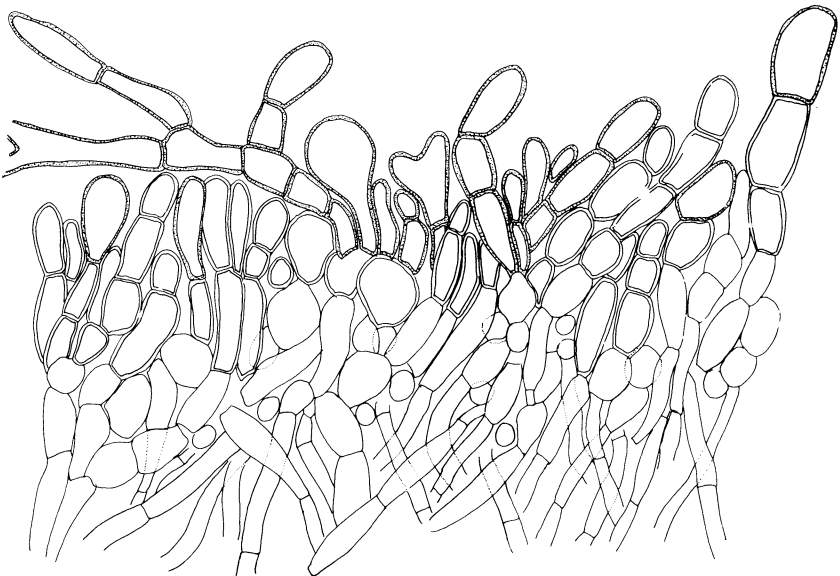


FIG. 4. Excipulum of *Wynnea sparassoides*. Drawn from holotype, CUP. \times 500.

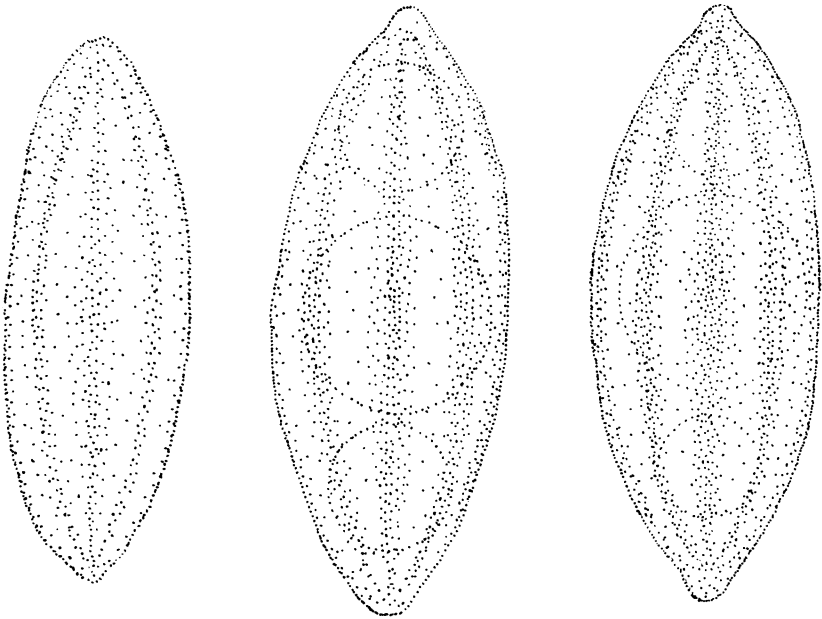


FIG. 5. Ascospores of *Wynnea sparassoides*. Drawn from holotype, CUP, $\times 2,000$.

Apothecia united into a compound sparassoid mass atop a single unbranched stalk. Fertile portion more or less globose, 6–8 cm in diam, beige. Stalk cartilaginous, up to 2 cm in diam and longer than 30 cm, dark brown outside, beige to whitish within, solid. Sclerotium, if present, unknown. Ectal excipulum 80–100 μm thick, of brownish globose cells intermixed with hyphae; globose cells reaching a diam of 20 μm ; hyphae about 10 μm in diam; elements of the ectal excipulum giving rise, on the outside, to brown-walled, hyphoid hairs 150–200 μm long. Medullary excipulum of *textura intricata*, the hyphae of which are 10–15 μm in diam, subgelatinous. Asci 350–375 \times 16–20 μm . Ascospores (32–)33–36 \times 12–15 μm , bilaterally symmetrical, marked with prominent longitudinal ridges, three guttulate. Paraphyses septate, apically expanded to 9–10 μm , below 4–5 μm in diam but with intercalary swellings of 10–12 μm . Occurring on soil.

Specimens examined.—USA: Connecticut: under leaf litter, Woodland Park, Darien, September 15, 1974, Mrs. Plant, CUP, holotype; as above, September 2, 1974, NY.

New Jersey: Stephens State Park, north of Hackettstown, Warren Co., July 17, 1977, Robert H. Peabody, NY.

Notes.—Aside from the sparassoid form of growth there are several features which are unique to *Wynnea sparassoides*. The construction of the ectal excipulum and the bilaterally symmetrical ascospores are the most striking of the features. These features in particular distinguish it from *W. americana*. It should be pointed out as well that from collections of *W. sparassoides* known to date, it and *W. americana* occur in somewhat different geographical localities. *Wynnea sparassoides* is found along the coast and *W. americana* is found in the Appalachian area and its periphery.

Kodachromes of the type collection taken by Mrs. Mary Plant have been deposited at CUP and FH as well as in the personal collection of Dr. Samuel Ristich. Dr. Ristich has provided the information of the length of the stalk in Mrs. Plant's collection.

EXCLUDED SPECIES

WYNNEA ATROFUSCA (Beck) Heim, Bull. Soc. Mycol. France 41 : 442. 1925.



FIG. 6. Fruitbody of holotype of *Wynnea sparassoides*.
Photographed by Mary Plant, $\times 1$.

≡ *Wynnella silvicola* (Beck in Sacc.) Nannf., Ann. Bot. Fenn. 3: 309. 1966.

This is a member of the Helvellaceae according to Eckblad (1968) whose proposed synonymy is followed above.

MIDOTIS HEINRICHERII Bres., Ann. Mycol. 5: 242. 1907.

Lloyd (1920) used this name for a *Wynnea* collected in Java. Lloyd's specimen (BPI) is indeed a *Wynnea* but is unfortunately immature. Bresadola's specimen (S), however, is neither a *Wynnea* nor a *Midotis* but is a collection of *Ascosparassis shimizuensis* Kobayasi. The genus *Ascosparassis* was proposed by Kobayasi (1960), reviewed by Korf (1963), and synonymized with *Otidea* by Korf (1973b). The small asci and ascospores and peculiar growth habit seem to me to justify the maintenance of a distinct genus. Since Bresadola's is the older name a new combination in *Ascosparassis* is necessary.

***Ascosparassis heinricherii* (Bres.) Pfister, comb. nov.**

Basionym: *Midotis heinricherii* Bres., Ann. Mycol. 5: 242. 1907.

A previously unrecognized part of the type collection of *Ascosparassis heinricherii* is in the Patouillard Herbarium (FH) under an herbarium name which refers to its sparassoid nature.

DISCUSSION

Wynnea is properly treated as a member of the Sarcoscyphaceae as delimited by Korf (1970). Korf recognized two families within the Sarcoscyphineae: the Sarcoscyphaceae for those with bright or light colored fruit bodies and the Sarcosomataceae for those with dark fruit bodies. Samuelson's (1975) studies of the ascus construction of *Wynnea americana* also suggest that it is most similar to *Cookeina tricholoma* and *Phillipsia domingensis* which are placed in the Sarcoscyphaceae. Moreover, apothecia of *Wynnea* species seem to develop through a paragymnohymenial sequence as was suggested by Pfister (1978) to be characteristic of the Sarcoscyphaceae.

In one of his papers on the evolution of the ascocarp, Corner (1930) makes several suppositions concerning the evolutionary history of *Wynnea*. In his section on *Wynnea* he begins, "If the stipitate apothecium is the starting-point of a series of juvenile forms of monaxial ascocarp, may it not itself be a juvenile form of a more elaborate structure?"

He then hypothesizes that *Wynnea* with its multiaxial configuration supplies evidence of such a more elaborate primitive discomycete. His suppositions are based on Saccardo's interpretations of *Wynnea*, that is as *Midotis*, and therefore include unrelated operculate and inoperculate discomycetes. Whether *Wynnea* is the most archaic of living discomycetes as Corner concludes, or not, cannot be settled at this time. Pfister and Gómez (1978) present some distributional evidence which might indicate that *Wynnea* is at least of mid-tertiary origin. Interestingly, the only member of the Pezizales reported and accepted in the fossil record is from the Miocene (Tiffney and Barghoorn, 1974). This and the distributional evidence might suggest that *Wynnea* and perhaps the Pezizales in general arose and diversified during the same general period as the Angiosperms.

Knowledge of the life history of *Wynnea* species is almost completely lacking. To my knowledge ascospores have never been observed to germinate in laboratory culture. Corner (1930) suggested that the sclerotium, present in some of the species, was a resistant structure which allowed the fungus to survive harsh periods during seasonal fluctuations. Sclerotia have been reported only in *W. americana* and *W. macrotis*.

Unlike almost all of the other Sarcoscyphineae, species of *Wynnea* have not been found to be associated with woody plant parts or leaves. The single report of *Wynnea* on wood is in Berkeley's original description of *W. macrotis*. The relatively large spores of *Wynnea*, like those of the other members of the Sarcoscyphineae, seem to be adapted to deposition by impaction and it would be expected that the fungus would be most likely found on recently fallen plant parts.

Future field studies should attempt to determine whether species of *Wynnea* are associated with buried wood or roots and to resolve whether there are specific tree or forest types associated with the species of *Wynnea*.

ACKNOWLEDGMENTS

Dr. Elizabeth Shaw, of the Gray Herbarium, kindly corrected the Latin description. The curators and directors of the following herbaria have been helpful in supplying specimens for study: Royal Botanic Gardens, Kew; Cornell University Plant Pathology Herbarium, Ithaca; New York Botanical Garden, Bronx; National Fungus Collection, Beltsville; Museo Nacional, San José, Costa Rica; and Botany Section, Swedish Museum of Natural History, Stockholm. In addition, Prof. Richard P. Korf, Cornell University, allowed me to study specimens

deposited in his personal herbarium and has discussed several points. I wish to thank Mrs. Mary Plant and Dr. Samuel Ristich who have added valuable information.

LITERATURE CITED

- Berkeley, M. J.** 1851. Decades of fungi. XXXVI. Sikkim-Himalayan Fungi collected by Dr. Hooker. *Hooker's J. Bot. Kew Gard. Misc.* 3: 200-206.
- 1867. On some new fungi from Mexico. *J. Linn. Soc. Bot.* 9: 423-425.
- Clements, F. E., and C. L. Shear.** 1931. *The genera of fungi.* H. W. Wilson Co., New York. 496 p.
- Corner, E. J. H.** 1930. Studies in the morphology of discomycetes. IV. The evolution of the ascocarp. *Trans. Brit. Mycol. Soc.* 15: 121-134.
- Durand, E. J.** 1923. The genera *Midotis*, *Ionomidotis* and *Cordierites*. *Proc. Amer. Acad. Arts* 59: 1-18.
- Eckblad, F.-E.** 1968. The genera of the operculate discomycetes. A reevaluation of their taxonomy, phylogeny and nomenclature. *Nytt Mag. Bot.* 15: 1-191.
- Henry, L. K.** 1943. *Wynnea americana* in western Pennsylvania. *Mycologia* 35: 131-132.
- Imai, S.** 1938. Symbolae ad floram mycologicum asiae orientalis II. *Bot. Mag. (Tokyo)* 52: 357-363.
- Kobayasi, Y.** 1960. *Ascosparrassis*, a new genus of discomycetes. *Bull. Natl. Sci. Museum* 5: 44-46.
- Korf, R. P.** 1949. *Wynnea americana*. *Mycologia* 41: 649-651.
- 1963. Discomycete flora of Asia, precursor II: A revision of the genera *Acervus* and *Ascosparrassis* and their new position in the Pezizales. *Lloydia* 26: 21-26.
- 1970. Nomenclatural notes. VII. Family and tribe names in the Sarcoscyphineae (Discomycetes) and a new taxonomic disposition of the genera. *Taxon* 19: 782-786.
- 1972. Synoptic key to the genera of the Pezizales. *Mycologia* 64: 937-994.
- 1973a. Discomycetes and Tuberales. Pp. 249-319. In: *The fungi: an advanced treatise. Vol. IVA.* Eds., G. C. Ainsworth, F. K. Sparrow, A. S. Sussman. Academic Press, New York.
- 1973b. Sparassoid ascocarps in Pezizales and Tuberales. *Rep. Tottori Mycol. Inst.* 10: 389-403.
- Le Gal, M.** 1946. Les discomycètes suboperculés. *Bull. Soc. Mycol. France* 62: 218-240.
- Lloyd, C. G.** 1920. *Midotis heinricherü* from Dr. Ch. Bernard, Java. *Mycol. Writ.* 6: 933-934.
- 1924. *Wynnea macrotis* from Rev. J. Rick, Brazil. *Mycol. Writ.* 7: 1306-1307.
- Overholts, L. O.** 1924. Mycological notes for 1921-22. *Mycologia* 16: 233-239.
- Patouillard, N. T.** 1895. Énumération des champignons récoltés par les RR. PP. Farges et Soulie, dans le Thibet oriental et le Su-tchuen. *Bull. Soc. Mycol. France* 11: 196-199.
- Pfister, D. H.** 1978. Apothecial development in *Cookeina tricholoma* with comments on some related species. *Mycologia* 70: 1253-1257.

- , and L. D. Gómez, P. 1978. On a collection of *Wynnea americana* from Costa Rica with some comments on the distribution and delimitation of *Wynnea* species in the neotropics. *Brenesia* 14/15: 395-400.
- Rifai, M. E. 1968. The Australasian Pezizales in the herbarium of the Royal Botanic Gardens, Kew. *Verh. Kon. Ned. Akad. Wetensch., Afd. Natuwrk., II* 57(3): 1-295.
- Saccardo, P. A. 1889. *Sylloge fungorum omnium hucusque cognitorum*. 8: 1-1143. Pavia.
- Samuelson, D. A. 1975. The apical apparatus of the suboperculate ascus. *Canad. J. Bot.* 53: 2660-2679.
- Seaver, F. J. 1927. A tentative scheme for the treatment of the genera of the Pezizaceae. *Mycologia* 19: 86-89.
- . 1928. *The North American Cup-Fungi (operculates)*. Published by the author, New York. 284 p.
- Sumstine, D. R. 1906. Note on *Wynnea americana*. *J. Mycol.* 12: 59.
- Teng, S. C. 1934. Notes on Discomycetes from China. *Sinensia* 5: 431-465.
- Thaxter, R. 1905. Contributions from the Cryptogamic Laboratory of Harvard University. LX. A new American species of *Wynnea*. *Bot. Gaz. (Crawfordsville)* 39: 241-247.
- Tiffney, B. H., and E. S. Barghoorn. 1974. The fossil record of the fungi. *Occas. Pap. Farlow Herb.* 7: 1-42.
- Waraitch, K. S. 1976. New species of *Aleuria* and *Wynnea* from India. *Trans. Brit. Mycol. Soc.* 67: 533-536.

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