

New records of the myxomycetes from Mona Island, Puerto Rico^{1,2}

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ABSTRACT

Seven species of myxomycetes are reported as new records for the Mona Island Commonwealth Reserve, Puerto Rico. They are *Ceratiomyxa fruticulosa*, *Cribaria intricata*, *Dictydium cancellatum*, *Fullgo septica*, *Lycogala* sp., *Stemonitis axifera* and *Tubifera ferruginosa*.

Key words: Slime molds, myxomycetes, mycobiota, protozoa, Mona Island, Puerto Rico

RESUMEN

Nuevos registros de los mixomicetos de Isla de Mona, Puerto Rico

Siete especies de mixomicetos son informados como nuevos registros para la Reserva Estatal Isla de Mona, Puerto Rico. Estos son *Ceratiomyxa fruticulosa*, *Cribaria intricata*, *Dictydium cancellatum*, *Fullgo septica*, *Lycogala* sp., *Stemonitis axifera* y *Tubifera ferruginosa*.

INTRODUCTION

Previous work on the myxomycetes of the island of Puerto Rico began with Hagelstein (1927), who catalogued 23 species. Five years later, he added about 37 species from Puerto Rico and the Virgin Islands (Hagel-

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stein, 1932). New records of this group of organisms were made by Alexopoulos (1970), Stevenson (1975), Lodge (1996) and Stephenson (1996). These records were based on collections by Alexopoulos, Lodge, and Stephenson at El Verde in the Luquillo Mountains. A total of 70 species of myxomycetes have been reported for the island of Puerto Rico. Mycological surveys of Mona Island carried out by Britton (1915), Seaver and Chardón (1926) and Stevenson (1975) did not record the presence of any myxomycetes. It is our intention to update the list of myxomycetes recorded from Puerto Rico, in particular the mycobiota of Mona Island.

MATERIALS AND METHODS

Study area

Mona Island Commonwealth Reserve (18°3-8'N and 67°51-57'W) is a 55-km² carbonate platform in the middle of the Mona Passage, 68 km west of Punta Higüero, Puerto Rico, and 60 km east of Punta Espada, Dominican Republic. According to Ewel and Whitmore (1973), Mona Island is catalogued as a subtropical dry forest life zone. Mean annual precipitation ranges from 600 to 1,200 mm and the mean annual temperature is 24 to 28°C (Calvesbert, 1973; Wiewandt, 1977).

Mona Island's climate has been described as subtropical dry or that of a typical offshore Puerto Rican island, with scanty rain and marine conditions (Ewel and Whitmore, 1973; Wiewandt, 1977). In general, there are two distinct rainy seasons on Mona Island, one May to June; the other, August to November. Summer and autumn months tend to be more or less rainy, whereas the winter and spring months are usually drier (Nieves-Rivera, 1996).

Transportation to the island was coordinated with the Puerto Rico Department of Natural and Environmental Resources. Specimens were collected at random along the trails of the Island. Microscopic observations were made using material mounted on slides in 3% KOH or lactophenol. Drawings were made at 40 ×, 60 × and 100 × with the aid of a drawing tube (Nikon, Inc.). Identifications were based on Martin and Alexopoulos (1969) and Farr (1976). Nomenclature for vascular plants was based on Woodbury et al. (1977). Color names are given according to Kornerup and Wanscher (1978). Collections were deposited in the Cryptogamic Herbarium, The New York Botanical Garden, New York (NY), the Tropical Mycology Collection of the Department of Biology, Mayagüez (MAPR) or temporarily curated at the Center for Forest Mycology Research, Luquillo, PR (CFMR), before being deposited at the Herbarium of the Department of Biology, University of Puerto Rico, Río Piedras (UPRRP).

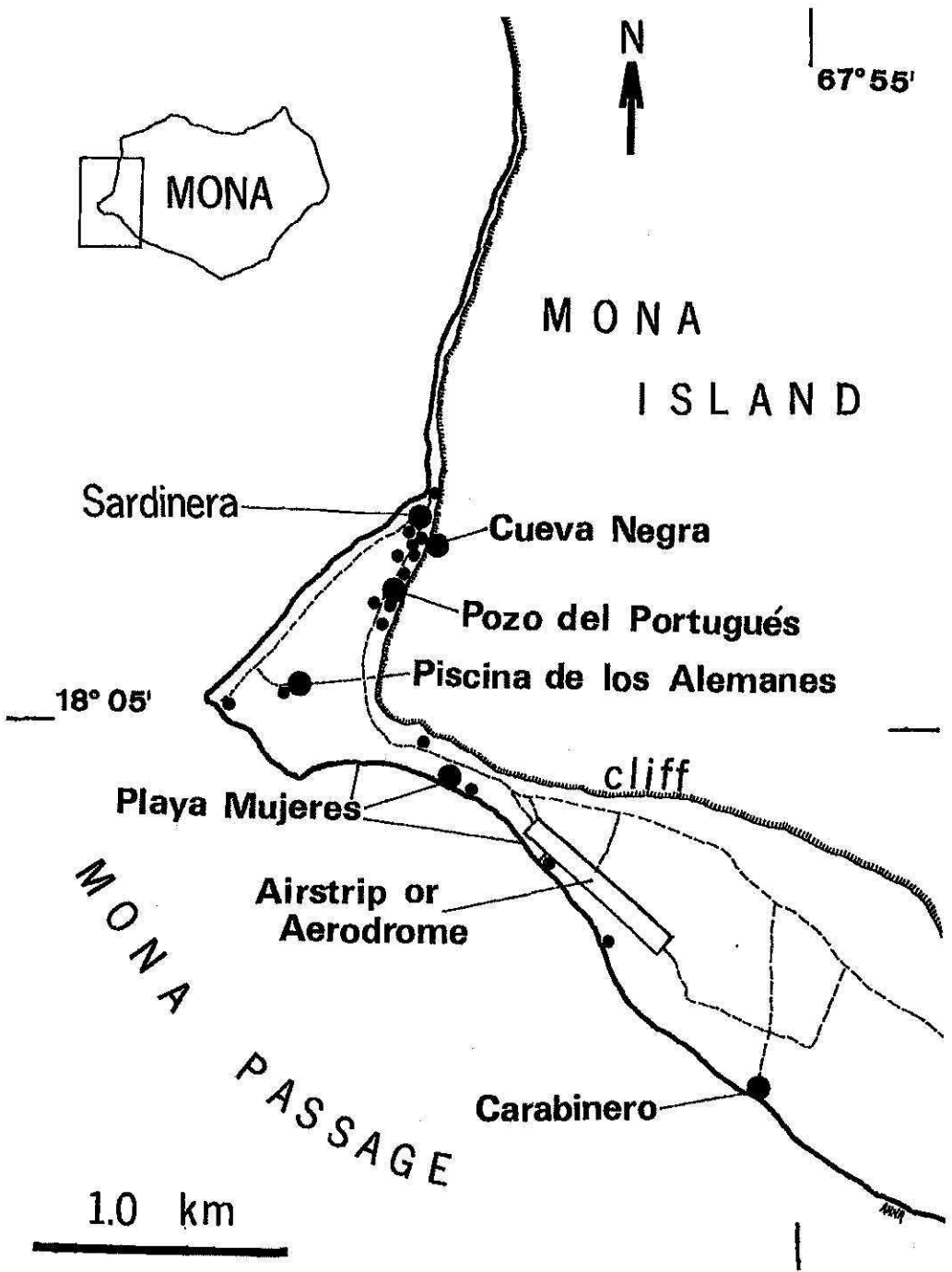


FIGURE 1. Map of collection sites at Mona Island Commonwealth Reserve, Puerto Rico (● = research natural area; • = incidental site).

RESULTS

Seven species of myxomycetes were collected by the senior author, mostly between Sardinera and Pozo del Portugués, Piscina de los Alemanes, Playa Mujeres and near the airstrip (or aerodrome) (Figure 1). Pure cultures were not attempted because of the lack of fresh plasmodia in some collections and the fast growth rate of contaminants (bacteria, molds and yeasts).

Species collected

Ceratiomyxa fruticulosa (O. F. Müll.) T. Macbr., 1899

(Figures 2A-D)

Fructifications 1-2 × 1-3 mm, clavarioid, unbranched, unstalked, smooth, white and brownish red to greyish red (Figures 2A, B). **Columns (or erect columns)** 12-25 µm diam, long branched tubes with transverse folds and wrinkles, minutely spinulose, hyaline (Figure 2C). **Spores** 10-11 × 6-6.5 µm, globose, ovoid, sometimes elliptical, smooth, thin-walled, hyaline (Figure 2D). **Plasmodium** hyaline.

Habitat. Gregarious on dead petioles and fruits of *Cocos nucifera* L. (Palmeaceae) and decayed wood of *Casuarina equisetifolia* J. R. & Forst. (Casuarinaceae).

Material studied. MONA ISLAND: Sardinera, on trail to Cueva Negra, 2-m alt., 26 August 1995, Nieves-Rivera PR 9 (CFMR); Nieves-Rivera PR 10 (NY); near Pozo del Portugués, 2-m alt., 25 August 1995, Nieves-Rivera PR 15 (CFMR).

Cribaria intricata Schrad., 1797

(Figures 2E-G)

Sporangia 2-4 × 0.5-0.7 mm, stipitate, nodding or erect, globose, yellowish brown to dark brown (Figure 2E). **Calyculus** discoid to bowl-like, strongly ribbed, with dentate margin; reticulum regular, with trapezoid meshes, and consisting of prominent, dark, thick, polygonal or branching nodes, each with 5-6 connecting filaments (Figure 2F). **Stalk** 2-3 mm long, slender, tapering or not upward, curved to twisted at top, dark brown. **Dictydine granules** small, light brown to brown. **Spores** 3.5-5 µm diam, globose, with minute spines, thin or thick-walled, light brown (Figure 2G). **Plasmodium** yellowish brown or brown.

Habitat. Gregarious on decayed logs, dead twigs, leaves and fruits of *Casuarina equisetifolia*.

Material studied. MONA ISLAND: Sardinera, near house M-2, 2-m alt., 29 June 1995, Nieves-Rivera PR 5 (CFMR); near Pozo del Portugués, 2-m alt., 28 August 1995, Nieves-Rivera PR 7 (MAPR); Nieves-Rivera PR 13 (NY).

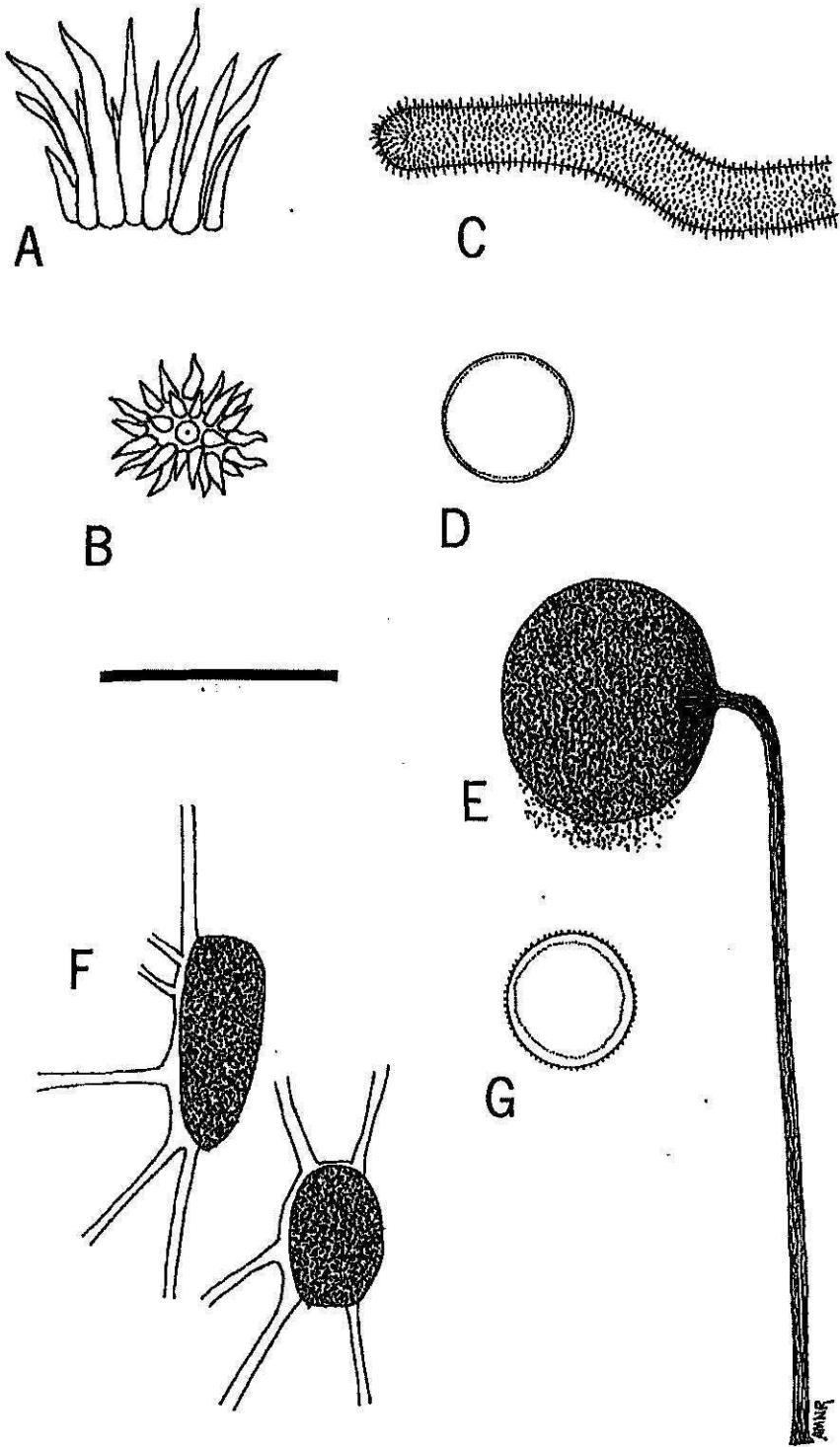


FIGURE 2. A-D *Ceratiomyxa fruticulosa*. A. Fructifications. B. Top view of fructifications. C. Column. D. Spore. E-G *Cribaria intricata*. E. Sporangium. F. Nodes (part of net). G. Spore. Scale bar = 1.5 mm for A; 1 mm for B; 15 μ m for C; 19 μ m for D; 1 mm for E; 15 μ m for F; 8 μ m for G.

Dictydium cancellatum (Batsch) T. Macbr., 1899

(Figures 3A-C)

Sporangia 2-4 × 0.5-1 mm, stipitate nodding, globose to depressed-globose, umbilicate below and sometimes above, reddish brown to

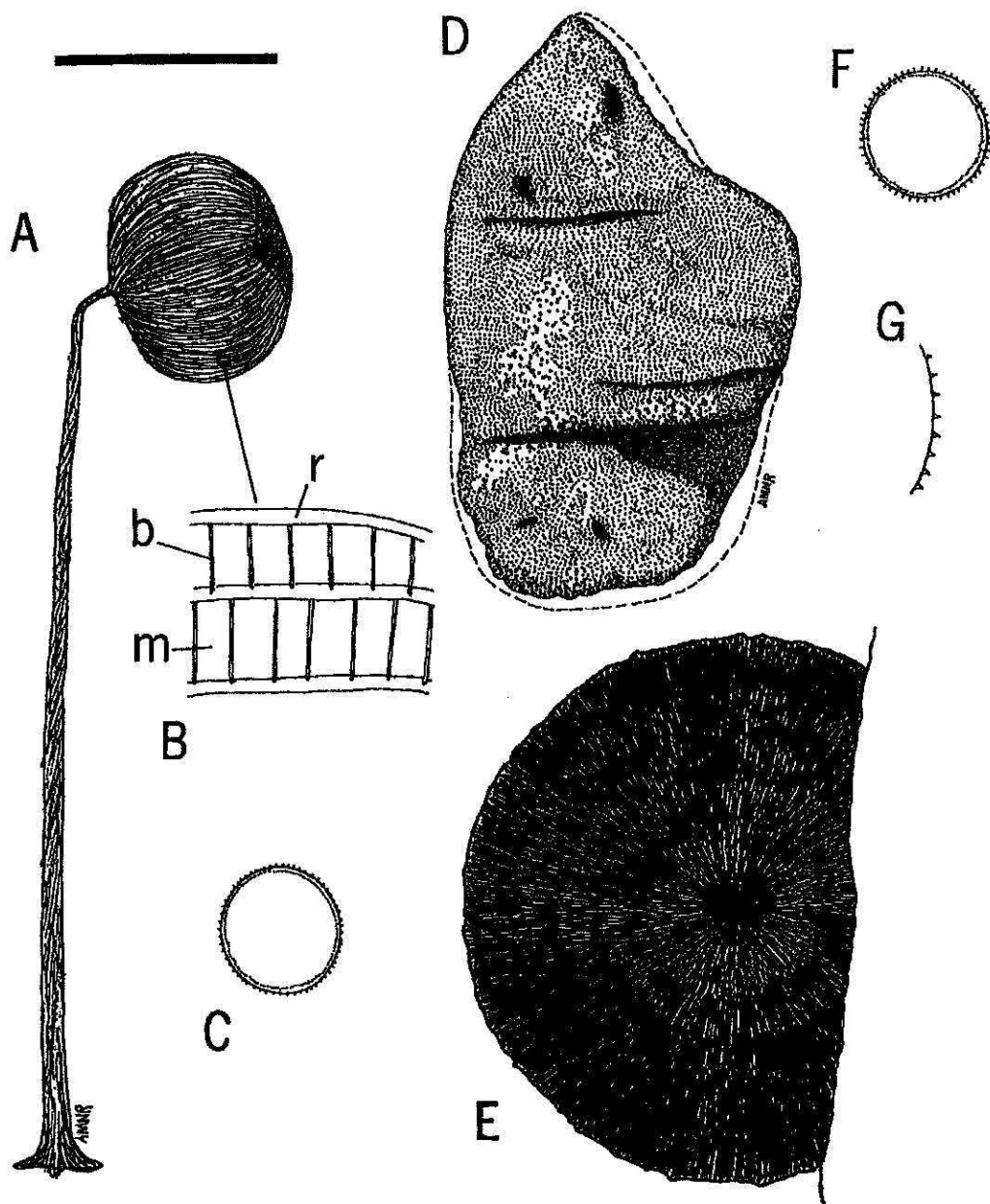


FIGURE 3. A-C *Dictydium cancellatum*. A. Sporangium. B. Detail of net (b = bands; m = mesh; r = ribs). C. Spore. D-G *Fuligo septica*. D. Aethalium. E. Cross section of aethalium. F. Spore. G. Detail of spore surface. Scale bar = 1 mm for A; 5 μ m for B; 5.8 μ m for C; 6 cm for D; 2 cm for E; 14 μ m for F; 3 μ m for G.

brown (Figure 3A). **Peridium** membranous, delicate, thickened in the form of stout longitudinal ribs (Figure 3B, r), connected by delicate transverse bands (Figure 3B, b), 0.9-1.4 μm apart, meshes (Figure 3B, m) rectangular in shape and irregular at apex and base, reddish brown to brown. **Calyculus** absent. **Stalk** 1-3 mm long, subulate, curved to twisted at top, tapering upward, brown. **Spores** 4.9-5.2 μm diam, globose, minutely verrucose or smooth, thin-walled, light brown (Figure 3C). **Plasmodium** not seen.

Habitat. Solitary or gregarious with *Cribaria intricata* on dead wood of *Casuarina equisetifolia* and on unidentified decayed wood.

Material studied. MONA ISLAND: Sardinera, on trail to Cueva Negra, 2-m alt., 28 August 1995, Nieves-Rivera PR 286 (CFMR).

Fuligo septica (L.) F. H. Wigg., 1780

(Figures 3D-G)

Aethalia 13-19 \times 2-5.5 cm, pulvinate, dusty, fragile, rarely calcareous, brownish orange, reddish brown, brown, white, greyish blue, and golden yellow (Figures 3D, E). **Cortex** membranous, thick, fragile, hyaline. **Hypothallus** consisting of one or more layers, brownish orange, reddish brown. **Capillitium** composed of hyaline filaments, without nodes. **Spores** 7-9 μm diam, globose, minutely spinulose, thin-walled, brown to light brown (Figures 3F, G). **Plasmodium** yellow to golden yellow.

Habitat. Solitary or sometimes gregarious on decayed log and branches of *Casuarina equisetifolia* and also occurring on unidentified living trees.

Material studied. MONA ISLAND: Camino Sardinera, near trail to Cueva Negra, 2.5-m alt., 26 March 1995, Nieves-Rivera PR 107 (NY); near house M-2, 2-m alt., 26 March 1995, Nieves-Rivera PR 108 (MAPR); near water pump (Pozo del Portugués), 2-m alt., 26 March 1995, Nieves-Rivera PR 157 (NY); 21 April 1995, Nieves-Rivera PR 207 (CFMR); Playa Mujeres, near the beach (approx. 9 m from shoreline), 2.7-m alt., 26 March 1995, Nieves-Rivera PR 160 (MAPR); near aerodrome, 1.5-m alt., 1 June 1995, Nieves-Rivera PR 162 (CFMR); Punta Arenas, near the road to Piscina de los Alemanes, 3-m alt., 1 June 1995, Nieves-Rivera PR 161 (NY); 2-m alt., 6 April 1995, Nieves-Rivera PR 199 (CFMR).

Remarks. The senior author observed ants inhabiting aethalium of *F. septica*, collection Nieves-Rivera PR 157 (NY), on a unidentified living tree. In collections Nieves-Rivera PR 107 (MAPR), 161 (NY), 162, 199 and 207 (CFMR), aethalia developed on dead or decayed basidiocarps of *Hexagonia hydroides* (Fr.:Sw.) M. Fidalgo (Polyporaceae/

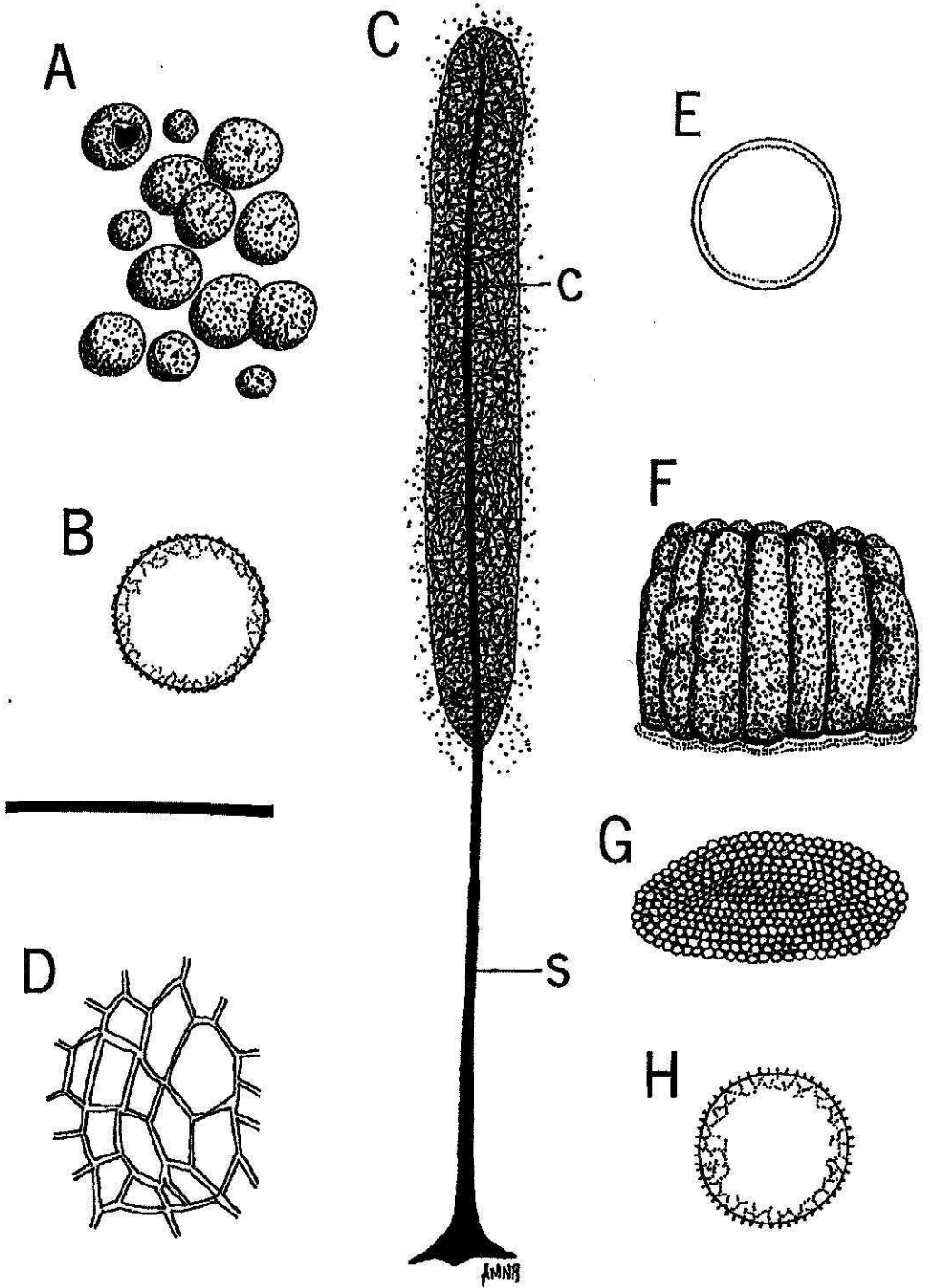


FIGURE 4. A-B *Lycogala* sp. A. Cluster of aethalia, one dehiscent. B. Spore. C-E *Stemonitis axifera*. C. Sporangium (c = columella; s = stalk). D. Detail of net. E. Spore. F-H *Tubifera ferruginosa*. F. Sporangia. G. Top view of sporangia. H. Spore. Scale bar = 3.5 mm for A; 10 μ m for B; 2.5 mm for C; 60 μ m for D; 12 μ m for E; 6 mm for F; 15 mm for G; 13 μ m for H.

Coriolaceae), *Phellinus dependens* (Murrill) Imaz., and *Phylloporia chrysitata* (Berk.) Ryvarden (Hymenochaetaceae) (Nieves-Rivera, 1996).

Lycogala sp.

(Figures 4A-B)

Aethalia 0.5-3 mm diam, scattered to crowded, sessile, spherical or subglobose, depressed when ruptured, white to buff when fresh, then brown or dark brown (Figure 4A). **Hypothallus** membranous, hyaline to light brown. **Pseudocapillitium** consisting of tubules, these folded or wrinkled, originated from cortex. **Cortex** thin, rough or smooth, dehiscence at apex, brown to dark brown. **Spores** 5.5-7 μm diam, globose, reticulated over most of the surface, thin-walled, hyaline (Figure 4B). **Plasmodium** not seen.

Habitat. Gregarious on decayed petioles of *Cocos nucifera* and on a decayed log of *Casuarina equisetifolia*.

Material studied. MONA ISLAND: Sardinera, on trail to Cueva Negra, 2-m alt., 26 August 1995, Nieves-Rivera PR 11 (CFMR); Nieves-Rivera PR 12 (MAPR).

Remarks. *Aethalia* smaller than *L. epidendrum* (= 3-15 mm diam), and without the purplish brown or black scales mentioned by Farr (1976). Mona Island specimens are similar to *L. exiguum* Morgan.

Stemonitis axifera (Bull.) T. Macbr., 1889

(Figures 4C-E)

Sporangia 7-8 (-9) mm long, cylindrical, stipitate, slender, acuminate, rounded at apex, brown or black (Figure 4C). **Columella** cylindrical, black (Figure 4C, c). **Stalk** 3-5 mm long, cylindrical, wider at base, black (Figure 4C, s). **Capillitium** branched free or even; reticulum smooth, uniform, and small polygonal meshes (Figure 4D). **Spores** 6-7 (-7.1) μm diam, globose, smooth or minutely equinulated, thin-walled, light brown (Figure 4E). **Plasmodium** white.

Habitat. Gregarious on a decayed wood *Casuarina equisetifolia*.

Material studied. MONA ISLAND: Sardinera, Pozo del Portugués, 2-m alt., 23 August 1995, Nieves-Rivera PR 3 (CFMR); Nieves-Rivera PR 6 (NY).

Tubifera ferruginosa (Batsch) J. F. Gmel., 1791

(Figures 4F-H)

Sporangia 3-5 \times 0.3-0.4 mm, cylindrical to elliptical, waxy, crowded, dehiscence apical, reddish brown (Figures 4F-G). **Hypothal-**

lus broadly effused, spongy, not stipitate, hyaline. *Pseudoaethalium* as fragmented plates, 4-20 mm across, reddish brown to black when dried. *Peridium* thin, membranous, spongy, iridescent, hyaline. *Spores* 6.8-8 μm diam, globose, more or less reticulate, thin-walled, light brown to brown (Figure 4H). *Plasmodium* hyaline.

Habitat. Gregarious on dead wood of *Terminalia catappa* L. (Combretaceae).

Material studied. MONA ISLAND: Camino Sardinera, close to dock (camp site), 2-m alt., 23 August 1995, Nieves-Rivera PR 8 (CFMR).

DISCUSSION

From the standpoint of collecting myxomycetes in regions with a dry climate, the level of moisture is the usual limiting factor rather than temperature. The myxomycetes from Mona Island were collected during March, June and August 1995. This year was unusual because of the even distribution of rainfall, modifying the usual pattern of wet and dry seasons. The distribution of myxomycetes on Mona Island was restricted to the coastal plain forest, close to Sardinera (Figure 1). The considerable high relative humidity (60-80%) of this forest is due to the density of vegetation, oceanic influence (particularly climatic conditions, e.g., winds from the north) and natural brackish wells; it is considered a disturbed area, where vegetational changes have occurred.

According to Wadsworth (1977), Woodbury et al. (1977) and Ortiz (C. M. Ortiz, Quinto Centenario 856, El Maní, Mayagüez, PR, personal communication), in 1937 the Civilian Conservation Corps (CCC) planted some 264,000 trees [mostly *Swietenia mahagoni* Jacq. (Meliaceae), *Casuarina equisetifolia*, and other cultivated plants] on the coastal plains of Sardinera, Carabinero, Uvero and on the plateau in Camino del Infierno and Los Caobos. Aerodrome (airstrip) construction and subsequent abandonment, as well as housing construction and periodic accidental fires have modified the native vegetation (Cintrón and Rogers, 1991). Myxomycetes collected on Mona Island occurred on dead and decayed plant material, especially on *C. equisetifolia*, *Cocos nucifera* and *Terminalia catappa*. All of these are plants introduced to the island.

As previously indicated, mycological surveys of Mona Island neglected myxomycetes in their records. Mycologists who visited Mona Island were interested in the collection of other groups of fungi [e.g., pyrenomycetes (Ascomycota)] because of their phytopathological importance. On the other hand, previous mycological expeditions visited Mona in February and March (during the dry season), when the possibilities of recovering myxomycetes were considerably low.

In conclusion, the species of myxomycetes found on Mona Island were cosmopolitan, grew on exotic vegetation, and were restricted to a humid zone. They were saprobes on dead and decayed material from introduced plants. The possibilities of myxomycetes in Mona Island are by no means exhausted, and future collections may produce some new records.

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