

SEM studies of the Myxomycetes from the Peninsula of Baja California (Mexico), III. Additions

Gabriel Moreno¹, Carlos Illana¹ & Marcos Lizárraga²

¹ Dpto. Biología Vegetal (Botánica), Facultad de Ciencias, Universidad de Alcalá, 28871 Alcalá de Henares, Madrid, España

² Centro de Estudios Biológicos, Dirección General de Investigación y Posgrado, Universidad Autónoma de Ciudad Juárez, 7252 Imperial Ridge El Paso, Texas 79912, U.S.A.

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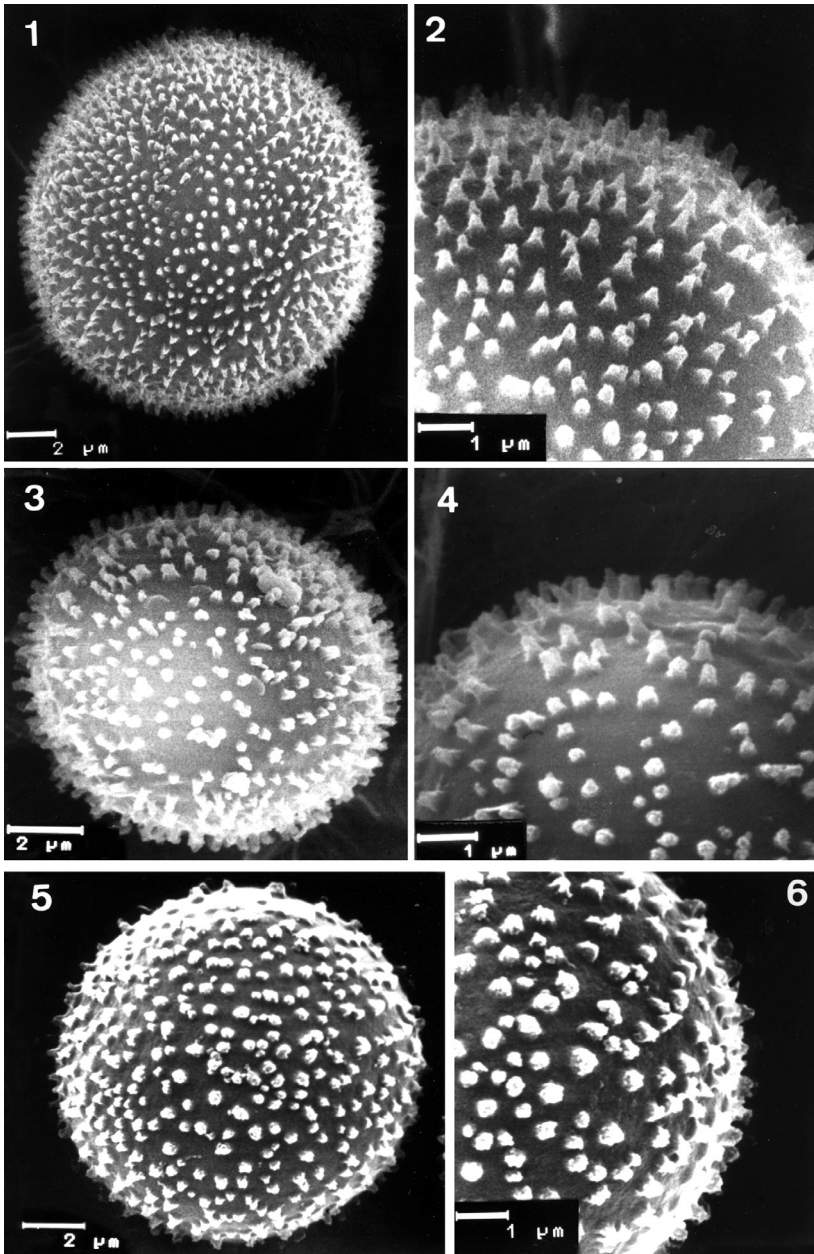
We present a list of 35 taxa collected in the Peninsula of Baja California. Fourteen of them are new records for Mexico: *Comatricha ellae*, *Craterium obovatum* var. *dictyosporum*, *Diderma subincarnatum*, *Didymium bahiense*, *D. dubium*, *D. laxifilum*, *D. sturgisii*, *D. trachysporum*, *Echinostelium colliculosum*, *Physarum auriscalpium*, *P. lateritium*, *P. lividum*, *Protophysarum phloiogenum* and *Trichia contorta*. Twenty species are new records for the peninsula of Baja California: *Badhamia affinis*, *B. macrocarpa*, *B. panicea*, *Comatricha laxa*, *C. nigra*, *Cribraria intricata*, *C. purpurea*, *C. violacea*, *Didymium megalosporum*, *D. melanospermum*, *D. minus*, *Echinostelium arboreum*, *E. minutum*, *Lamproderma scintillans*, *Licea kleistobolus*, *Lycogala epidendrum*, *L. flavofuscum*, *Physarum cinereum*, *P. leucophaeum* and *P. pusillum*. SEM micrographs of the taxa are presented.

Key words: Baja California, chorology, Mexico, Myxomycetes, scanning electron microscopy, taxonomy

Introduction

This paper is a further contribution to the systematic, ecological and chorological study of the

Myxomycetes of Baja California started by Lizárraga *et al.* (1997, 1999a, 1999b). Before our studies, just three species of Myxomycetes from the peninsula of Baja California had been re-



Figs. 1–6. — 1 and 2: *Badhamia affinis* Rostaf. (AH 15812). SEM of a spore and detail of ornamentation. — 3 and 4: *Badhamiopsis ainoae* (Yamashiro) T.E. Brooks & H.W. Keller (AH 20181). SEM of a spore and detail of ornamentation. — 5 and 6: *Badhamia macrocarpa* (Ces.) Rostaf. (AH 20172). SEM of a spore and detail of ornamentation.

ported. Completion of this study raises the number to 101 taxa (88 from the state of Baja California and 27 from the state of Baja California Sur). Other states where higher numbers of Myxomycetes are known include Veracruz (101 species), Tlaxcala (82) and Jalisco (72). The remaining states have less than 25 species each (Illana *et al.* 2000).

Material and methods

The methods were described in the first part of this series (Lizárraga *et al.* 1999a), which also contains a list and a map of the collecting localities in the two states of Baja California. The chorology of the species is based on our own data. The specimens are deposited in the Herba-

rium of the Departamento de Biología Vegetal, Universidad de Alcalá, Alcalá de Henares, Madrid, Spain (AH). Author abbreviations follow Brummnit and Powell (1992).

Listing of taxa

Badhamia affinis Rostaf. (Figs. 1 and 2)

Śluzowce Monogr.: 143. 1874

The main characteristics of *Badhamia affinis* are its subglobose sporocarps and capillitium of calcareous tubes which are narrow, white, branched, and connected to the base and peridium.

Some Y-shaped tubules are sometimes present, just as Nannenga-Bremekamp (1991) noted for this species. They are very different from those photographed by Neubert *et al.* (1995). The larger spores, (12–)14–18 µm in diameter (Figs. 1 and 2) separate this species from *Badhamiopsis ainoae* (Yamash.) T. E. Brooks & H. W. Keller (Figs. 3 and 4), a similar corticolous species that has an unbranched capillitium and the spores 9–11 µm in diameter (Keller & Brooks 1976a). The spore ornamentation of *Badhamia affinis*, as shown by SEM, is formed by baculae similar to those of *Badhamiopsis ainoae* (Figs. 1–4).

This species was previously reported from Mexico from the state of Chiapas (Emoto 1933) and Veracruz (Villarreal 1983).

LOCALITY: 27.

Badhamia macrocarpa (Ces.) Rostaf. (Figs. 5 and 6)

Śluzowce Monogr.: 143. 1874

Badhamia macrocarpa is a difficult species to interpret. We follow the concept of Nannenga-Bremekamp (1991), who noted that it can be macroscopically confused with *B. panicea* (Fr.) Rostaf., but that the latter has paler, less strongly ornamented, and usually ovate spores. The spore ornamentation is baculate.

Previously known in Mexico from the state

of Puebla (Welden & Lemke 1961) and Veracruz (López *et al.* 1981).

LOCALITY: 4.

Badhamia panicea (Fr.) Rostaf. (Figs. 7 and 8)

in Fuckel, Jahrb. Nass. Ver. Nat. 27–28: 71. 1873

This species can usually be recognized by the red base of the sporocarp, the capillitium formed by branched, calcareous tubules and subglobose or ovoid spores. The spore ornamentation is baculate. *Badhamia panicea* has also been reported in Mexico from the state of Puebla by Welden and Lemke (1961).

LOCALITY: 7.

Comatricha ellae Härk. (Figs. 9 and 10)

Karstenia 18: 23. 1978. = *Comatricha nannengae* Härk.

Sporocarps scattered or gregarious, stalked, 0.7–1.0 mm in total height, globose, 0.2–0.3 mm in diam., peridium evanescent. Stalk dark brown, fibrous. Hypothallus scanty. Columella reaching the middle of the sporocarp, branching at the apex. Capillitium consisting of dark brown threads, 1–2 µm in diam., branched and forming an incomplete surface net with few free ends. Spores 8–9 µm in diam., globose, dark brown in mass, violaceous brown with a small pale germination pore by transmitted light, warted. Spore ornamentation baculate.

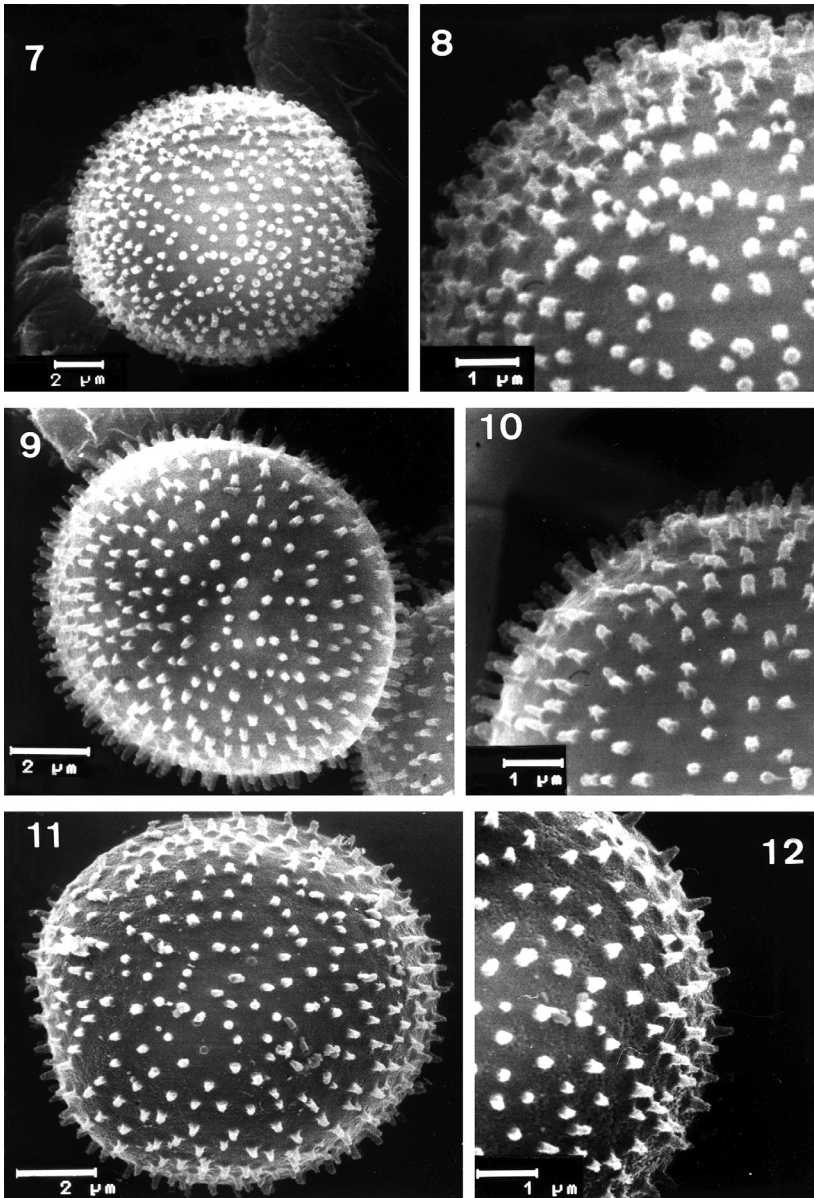
Comatricha ellae may be mistaken for small sporocarps of *C. nigra* (Pers.) Schroet. The present record is the first for Mexico.

MEXICAN SPECIMEN EXAMINED. Baja California Sur: On wood, Mexico highway 1, near Loreto, 27.I.1996 M. Lizárraga, G. Moreno & C. Illana (AH 20058).

Comatricha laxa Rostaf. (Figs. 11 and 12)

Śluzowce Monogr. 201. 1874

Comatricha laxa its characterized by a small size, cylindrical, ovate to subglobose sporo-



Figs. 7–12. — 7 and 8: *Badhamia panicea* (Fr.) Rostaf. (AH 20289). SEM of a spore and detail of ornamentation. — 9 and 10: *Comatricha ellae* Härk. (AH 20058). SEM of a spore and detail of ornamentation. — 11 and 12: *Comatricha laxa* Rostaf. (AH 16038). SEM of a spore and ornamentation.

carps, capillitium with threads forming a flexuose internal net, with free ends at the periphery, and globose spores, (9–)10–11(–13) μm in diam. The spore ornamentation is baculate. Recently, Castillo *et al.* (1997) studied the type of *Comatricha laxa*, and found that the sporal dimensions and the characteristics of the capillitium given by different authors do not agree with

those of the type material.

The collections found in the desert of Cataviña are very abundant, that confirms the findings of Blackwell and Gilbertson (1980) that *Comatricha laxa* is a common species in desert areas. It has previously been reported in Mexico from the states of Quintana Roo (Guzmán, 1983) and Tlaxcala (Rodríguez-Palma & Estrada-Torres, 1996a).

LOCALITIES: 7, 13, 26, 27, 28.

***Comatricha nigra* (Pers.) Schroet. (Figs. 13 and 14)**

Krypt.-Fl. Schles. 3(1): 118. 1885

Comatricha nigra is a common species in the peninsula of Baja California and in Mexico. The spore ornamentation is baculate.

LOCALITIES: 7, 16, 17, 20, 28.

***Craterium obovatum* Peck var. *dictyosporum* (Rostaf.) G. Moreno & Illana (Figs. 15 and 16)**

Mycotaxon 46: 414. 1993. ≡ *C. dictyosporum* (Rostaf.) Neubert, Nowotny & Baumann. ≡ *Badhamia dictyospora* Rostaf.

In the first part of our studies (Lizárraga *et al.* 1999a) we described *Craterium obovatum* var. *obovatum* as having a pilate spore ornamentation. *Craterium obovatum* var. *dictyosporum* is recognised by its spore ornamentation with large ridges that form a reticulum. The present records are the first for Mexico.

MEXICAN SPECIMENS EXAMINED. Baja California: On leaves of *Quercus agrifolia*, Rancho San Antonio, Sierra de San Pedro Mártir, 31.V.1997, M. Lizárraga & G. Ruiz (AH 22418, 22424, 22426, 22428, 22429, 22434, 22435).

***Cribraria intricata* Schrad. (Figs. 17–19)**

Nov. Gen. Pl. 7. 1797

The main characteristics of *Cribraria intricata* are the 2–4 mm high sporocarps, peridial net with thickened nodes, each with 2–4 free-ending threads, and calyculus reduced to a basal disc. In SEM the spore ornamentation has small spines united at the bases by a reticulum. *Cribraria intricata* was previously reported for Mexico from the state of Quintana Roo by Guzmán (1983).

LOCALITY: 31.

***Cribraria purpurea* Schrad. (Figs. 20 and 21)**

Nov. Gen. Pl.: 8. 1797.

Cribraria purpurea can be distinguished by its large purple sporocarps (2 mm long) and irregular peridial net. The spore ornamentation is baculate. This species has been reported for Mexico from states of Estado de México (Galindo-Flores *et al.* 1993), Jalisco (Trujillo-Flores 1988) and Tlaxcala (Rodríguez-Palma & Estrada-Torres 1996b, 1997, Rodríguez-Palma 1998).

LOCALITY: 30.

***Cribraria violacea* Rex (Figs. 22 and 23)**

Proc. Acad. Nat. Sci. Philadelphia 43: 393. 1891

Cribraria violacea is easily recognized by its grouped sporocarps, small size (0.5–1 mm tall), and bright violaceous sporophores with a deep calyculus. The spore ornamentation is baculate with small crests.

Cribraria zonatispora Lado, Mosquera & Beltrán-Tej. was described by Lado *et al.* (1999). It is similar in size and colour, but has a characteristic pale equatorial cingulum in its spore and it inhabits cladodes of *Opuntia* spp.

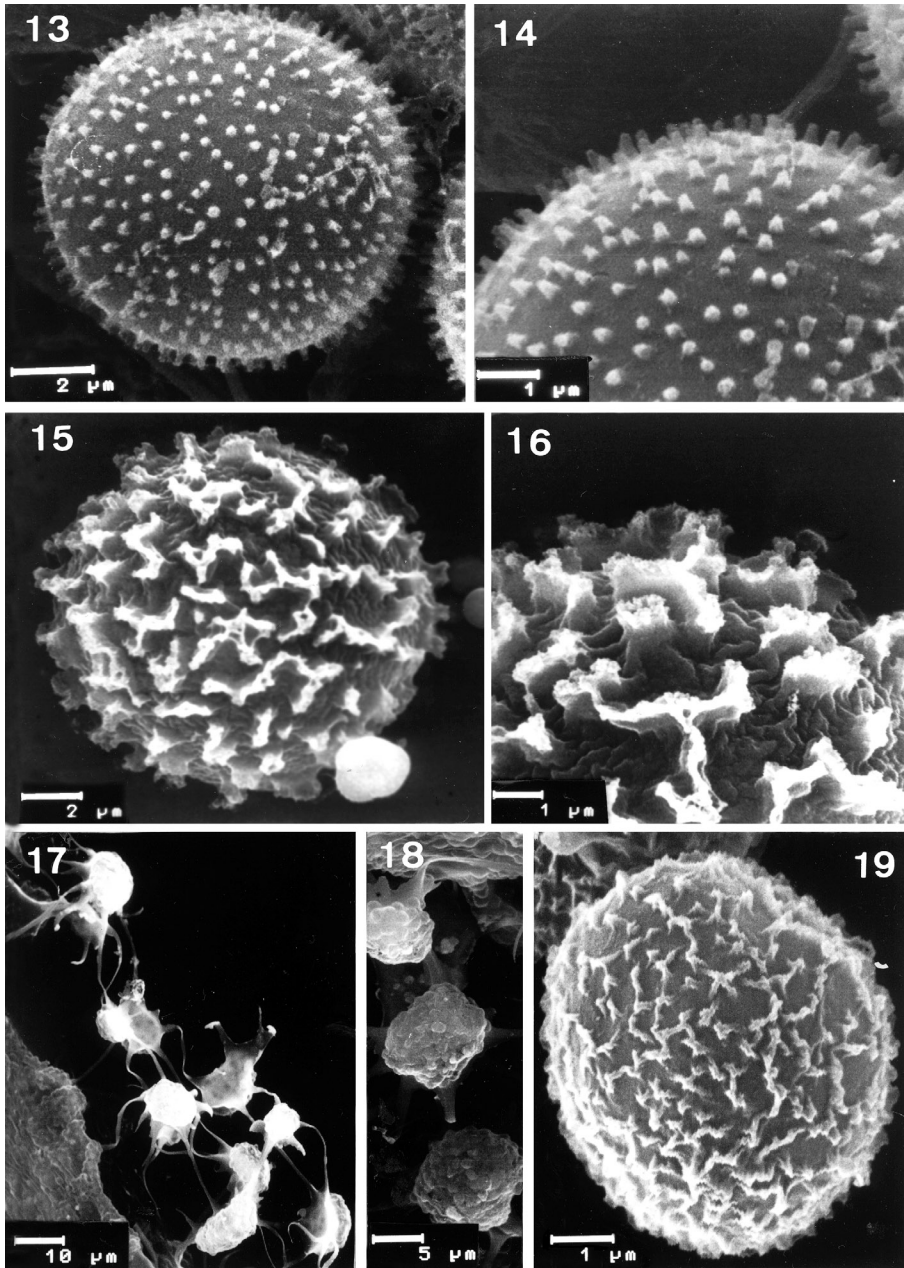
Cribraria violacea is widely distributed in Mexico, but this is the first record for Baja California.

LOCALITIES: 24, 30.

***Diderma subincarnatum* Kowalski (Figs. 24–27)**

Mycologia 59: 169. 1967.

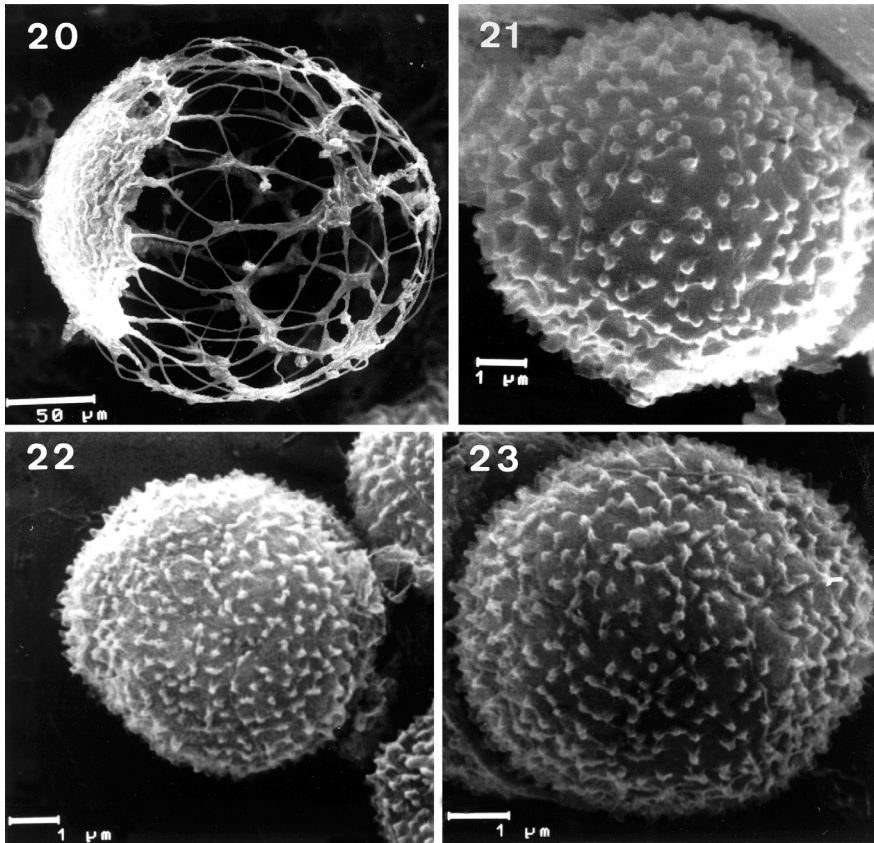
Sporocarps sessile, crowded, hemispherical to subglobose and polygonal by mutual contact, 0.4–1.5 mm in diam. and 0.3–0.8 mm high. Peridium double, outer layer calcareous, thick, fragile, pinkish to dark reddish brown, inner layer membranous, white. Dehiscence irregular. Hypothallus membranous, confluent, colourless to yellow. Columella large, subglobose to hemi-



Figs. 13–19. — 13 and 14: *Comatricha nigra* (Pers.) Schroet. (AH 24298). SEM of a spore and detail of ornamentation. — 15 and 16: *Craterium obovatum* Peck var. *dictyosporum* (Rostaf.) G. Moreno & Illana (AH 22426). SEM of a spore and detail of ornamentation. — 17–19: *Cribraria intricata* Schrad. (AH 20032). 17 and 18: Nodes of peridial net. 19: SEM of a spore ornamentation.

spherical, rugose, cream-coloured to flesh-coloured. Capillitium radiating from columella to peridium, threads hyaline, branched and anastomosing, 0.5–1.0 μm in diam., sometimes with

membranous expansions. Spores black in mass, dark brown in transmitted light, paler on one side, globose, 12–14(–15) μm in diam., spinose. Spore ornamentation baculate, apices of baculae



Figs. 20–23. — **20 and 21:** *Cribraria purpurea* Schrad. (AH 20099). SEM of a detail of sporotheca and spore ornamentation. — **22 and 23:** *Cribraria violacea* Rex (AH 22514). SEM of a spore and detail of ornamentation.

verrucose.

Diderma subincarnatum is easy to recognize by its crowded sporocarps, dark pink to reddish-brown peridium, and foliicolous habitat (leaves of *Quercus* spp.). This is the first report for Mexico and our collections probably represent the first records of this species since its original description.

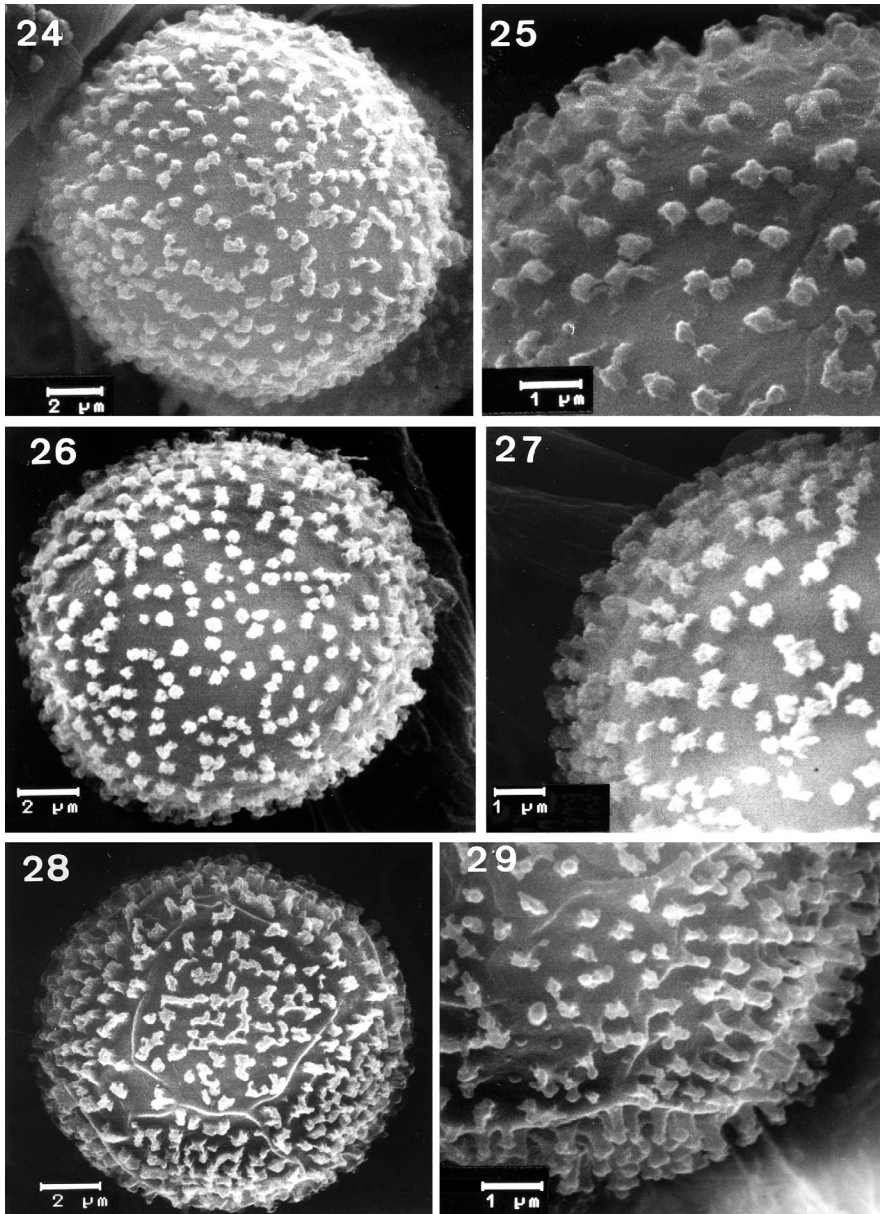
MEXICAN SPECIMENS EXAMINED. Baja California: On leaves of *Quercus agrifolia*, Tecate-Mexicali road, 31.XII.1994 *M. Lizárraga* (AH 18472); on leaves of *Quercus agrifolia*, Cañón Billy, Tecate, 24.V.1997 *M. Lizárraga & E. J. Torres* (AH 22538, 22546). — *Other specimens examined.* U.S.A. California, Moore's Ranch, 10 miles S. of Chico Butte Co., on leaves, & det. D. T. Kowalski, 19.II.65 (Myxomycetes of California n° 1134, type, University of Michigan Fungus Collection MICH n° 00004824). **Chile.** Punta Arenas, I.1906, on wood, det. C. Spegazzini (LPS n° 31371 as *Licea antarctica* Speg.).

Didymium bahiense Gottsb. (Figs. 28–29)

Nova Hedwigia 15: 365. 1968.

Sporocarps stalked, gregarious, 1.5–2.0 mm long, subglobose, umbilicate at base. Peridium single, membranous, grey, with calcareous deposits. Dehiscence irregular. Stalk long, slender, striate, pale ochraceous, dark at base, 0.8–1.3 mm in long. Hypothallus small, discoid. Columella absent, a white discoid pseudocolumella present. Capillitium abundant, threads hyaline with small swellings, 0.5–1.0 μm in diam. Spores dark brown in mass, pale purple brown in transmitted light, globose, (8–)9–12(–13) μm in diam., warty, with groups of larger warts. Spore ornamentation formed of slightly capitate baculae sometimes united at base to form small crests.

Didymium megalosporum Berk. & M.A. Cur-



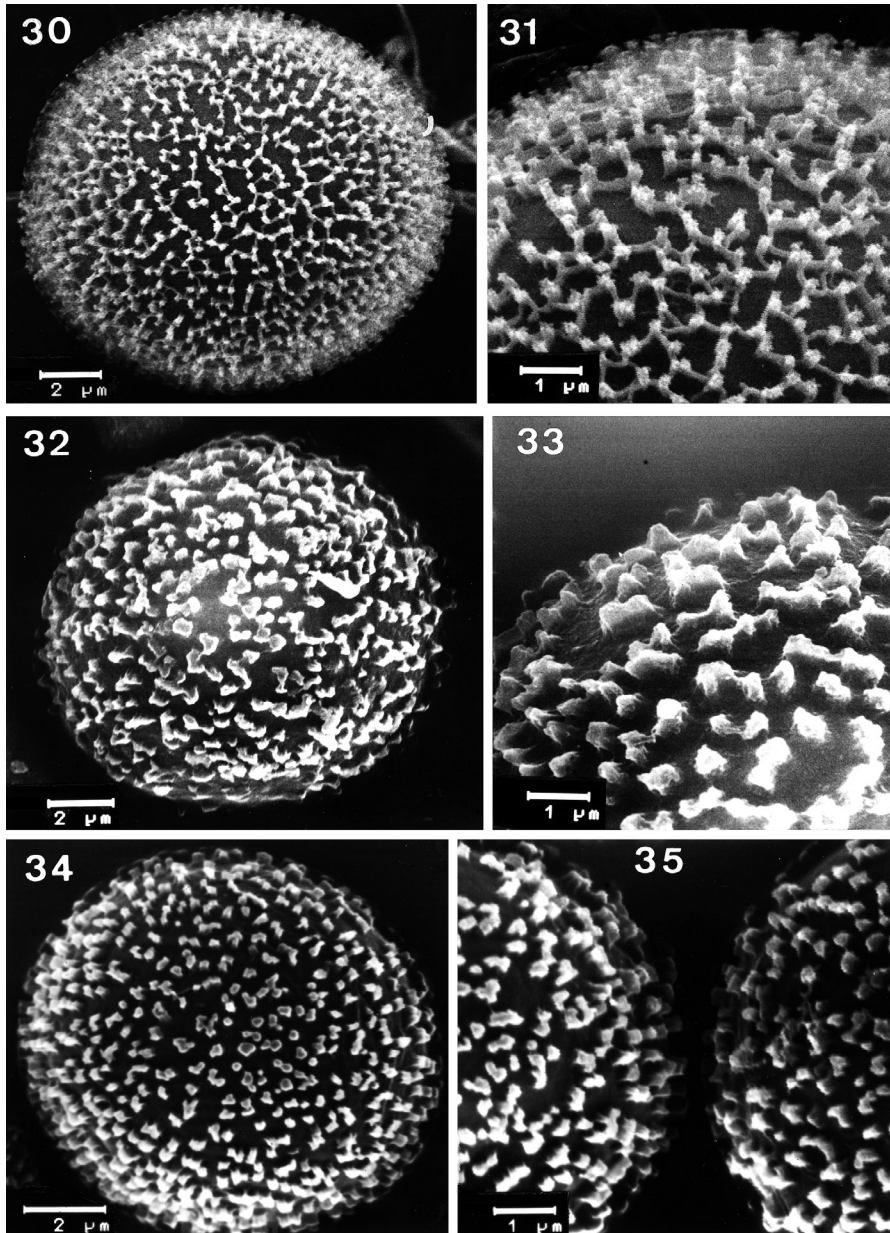
Figs. 24–29. — **24** and **25:** *Diderma subincarnatum* Kowalski (AH 18742). SEM of a spore and detail of ornamentation. — **26** and **27:** *Diderma subincarnatum* Kowalski (type MICH 000048241134). SEM of a spore and detail of ornamentation. — **28** and **29:** *Didymium bahiense* Gottsb. (AH 15817). SEM of a spore and detail of ornamentation, slightly collapsed (wrinkled).

tis is a similar species in having an ochraceous pseudocolumella but it has smaller spores.

This is the first record of *Didymium bahiense* for Mexico.

MEXICAN SPECIMENS EXAMINED. Baja California: On cladodes of *Opuntia basilaris*, Ensenada-Santo Tomás,

Mexico highway 1 (Rancho las Jacarandas, Cañón de las Ánimas), 7.II.1993 *F. Bersan, G. Moreno & C. Illana* (AH 15817, 15948, 15959); on leaves of *Arundo donax*, Cantamar, Rosarito, 20.III.1997 *M. Lizárraga, G. Ruiz, J. Alanís & S. González* (AH 22457); on stems of *Helianthus annuus*, Colonia Lomas Taurinas, Tijuana, 6.II.1995 *M. Lizárraga* (AH 20234, 20255).



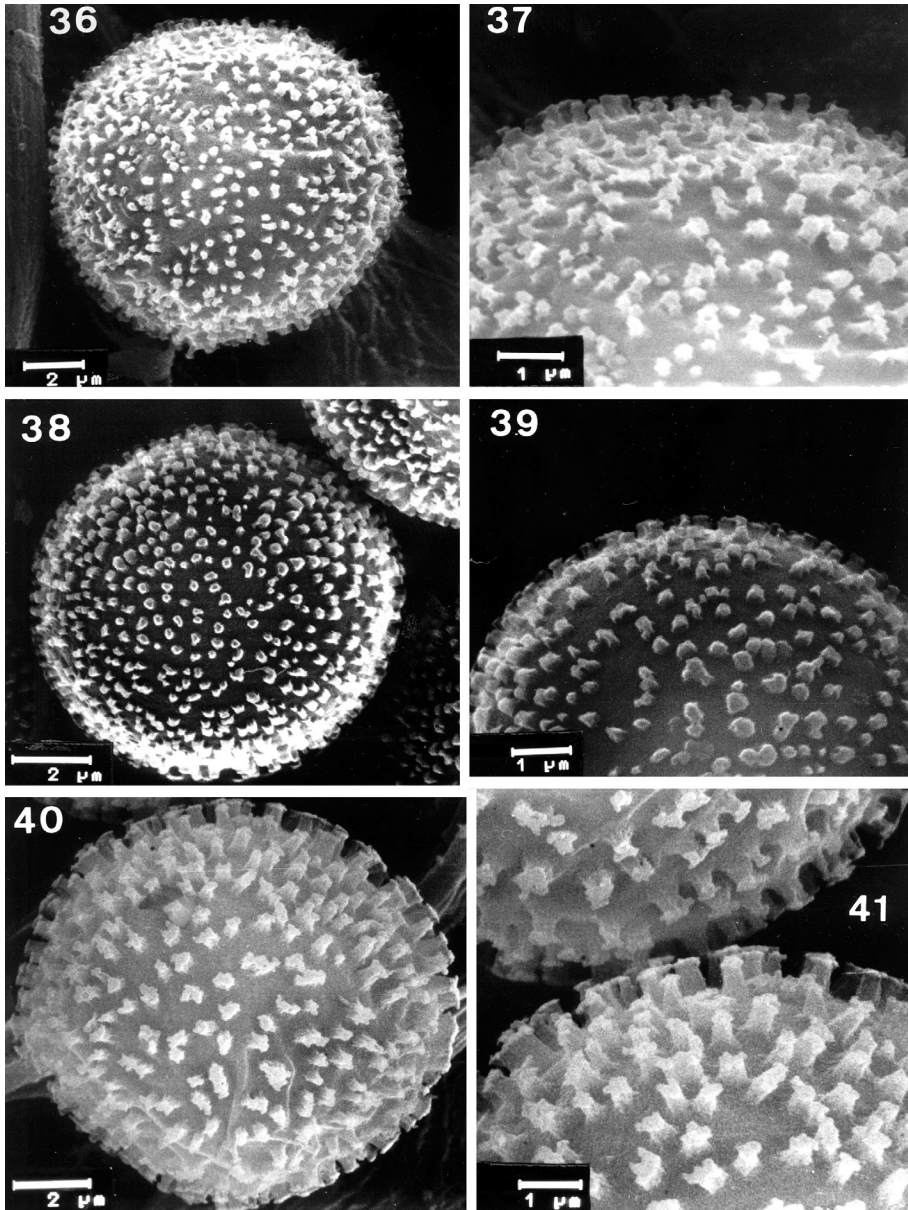
Figs. 30–35. — **30 and 31:** *Didymium dubium* Rostaf. (AH 24276). SEM of a spore and detail of ornamentation. — **32 and 33:** *Didymium laxifilum* G. Lister & J. Ross. (AH 17122). SEM of a spore and detail of ornamentation. — **34 and 35:** *Didymium megalosporum* Berk. & M. A. Curtis (AH 16014). SEM of a spore and detail of ornamentation.

Didymium dubium Rostaf. (Figs. 30 and 31)

Śluzowce Monogr.: 152. 1874

Plasmodiocarps sessile, solitary, flattened

to semiglobose, 0.6–0.8 mm in diam., 0.1–0.2 mm long. Peridium single, membranous, grey to white, covered with lime crystals. Dehiscence irregular. Hypothallus inconspicuous. Columella absent. Capillitium abundant, radiating



Figs. 36–41. — **36 and 37:** *Didymium melanospermum* (Pers.) T. Macbr. (AH 21009). SEM of a spore and detail of ornamentation. — **38 and 39:** *Didymium minus* (Lister) Morgan (AH 18489). SEM of a spore and detail of ornamentation. — **40 and 41:** *Didymium rubeopus* G. Moreno, Castillo & Illana var. *albocapillitium* (G. Moreno, Castillo & Illana) G. Moreno, Castillo, Illana & Lizárraga (AH 21006). SEM of a spore and detail of ornamentation.

from base to peridium, elastic, threads branched and anastomosed, pale violaceous, 0.5 μm in diam. Spores dark brown in mass, pale violaceous in transmitted light, globose, 12–14 μm in diam., spinose. Spore ornamentation baculate, baculae capitate at apices, united at bases

by a reticulum.

Neubert *et al.* (1995) have seen high variability in the episporal ornamentation of *Didymium dubium*, which varies from spinose to subreticulate and reticulate. This is the first record for Mexico.

MEXICAN SPECIMENS EXAMINED. Baja California: On stems of *Ephedra* sp., 50 km west of Bahía de Los Ángeles-Cataviña, 5.V.1997 M. Lizárraga & J. Alanis, moist chamber wetted 24.XI.1997 harvested 1.XII.1997 (AH 24276).

Didymium laxifilum G. Lister & J. Ross
(Figs. 32 and 33)

in G. Lister, Essex Naturalist 27: 264. 1945. = *Didymium aurantipes* T.E. Brooks & Kowalski.

Sporocarps stalked, gregarious, subglobose, umbilicate below, 0.4–0.7 mm long. Peridium single, membranous, dark and white, densely covered with lime crystals. Dehiscence irregular. Columella globose to subglobose, white. Stalk dark reddish, striate, 0.1–0.3 mm in long. Hypothallus discoid, reddish. Capillitium abundant, threads thick, branched and anastomosed, dark but hyaline in the apex, 4–6 µm in diam. Spores dark in mass, dark violaceous brown with a pale area in transmitted light, globose, (10–)12–14 µm in diam., warty. Spore ornamentation is formed of warts united to form small crests.

The main characteristics of *Didymium laxifilum* are its sporocarps with a dark reddish stalk and the capillitium of thick dark threads, which are colourless at the periphery.

The recently published *Didymium rubeopus* G. Moreno, Castillo & Illana is very close to *D. laxifilum*. The key characters of the former species are the more slender capillitium and the baculate spore ornamentation (Moreno *et al.* 1997).

This is the first record of *Didymium laxifilum* for Mexico.

MEXICAN SPECIMENS EXAMINED. Baja California: On leaves of *Quercus* sp., Cañón Billy, Tecate, 31.XII.1996 M. Lizárraga & E. J. Torres (AH 17134, 18464, 20379, 17122).

Didymium megalosporum Berk. & M.A.
Curtis (Figs. 34 and 35)

Grevillea 23: 53. 1873. = *Didymium eximium* Peck

The stalked sporocarps, the presence of a discoid pseudolumella and small ochraceous pe-

ridial crystals are reliable characters that separate this species. Spore ornamentation is baculate. *Didymium megalosporum* was reported for Mexico by Hagelstein (1944) and Martin and Alexopoulos (1969), without specifying the locality.

LOCALITIES: 1, 7, 9, 14, 15, 17, 18, 24.

Didymium melanospermum (Pers.) T.
Macbr. (Figs. 36 and 37)

N. Amer. Slime-Moulds 88. 1899

Didymium melanospermum is distinguished by its short- and dark-stalked sporocarps, a purple-brown areolate peridium and dark spores 10–14 µm in diameter. Spore ornamentation is formed of pila.

Didymium melanospermum was previously reported for Mexico from the states of Guerrero (Keller & Braun (1977) and Veracruz (López *et al.* 1981).

LOCALITIES: 4, 20, 22.

Didymium minus (Lister) Morgan (Figs.
38–39)

J. Cincinnati Soc. Nat. Hist. 16: 145. 1894

Didymium minus is distinguished from *D. melanospermum* by its smaller and paler spores and from *D. nigripes* by the short stalk. Spore ornamentation is baculate. *Didymium minus* was reported for Mexico from the state of Guerrero by Braun and Keller (1976).

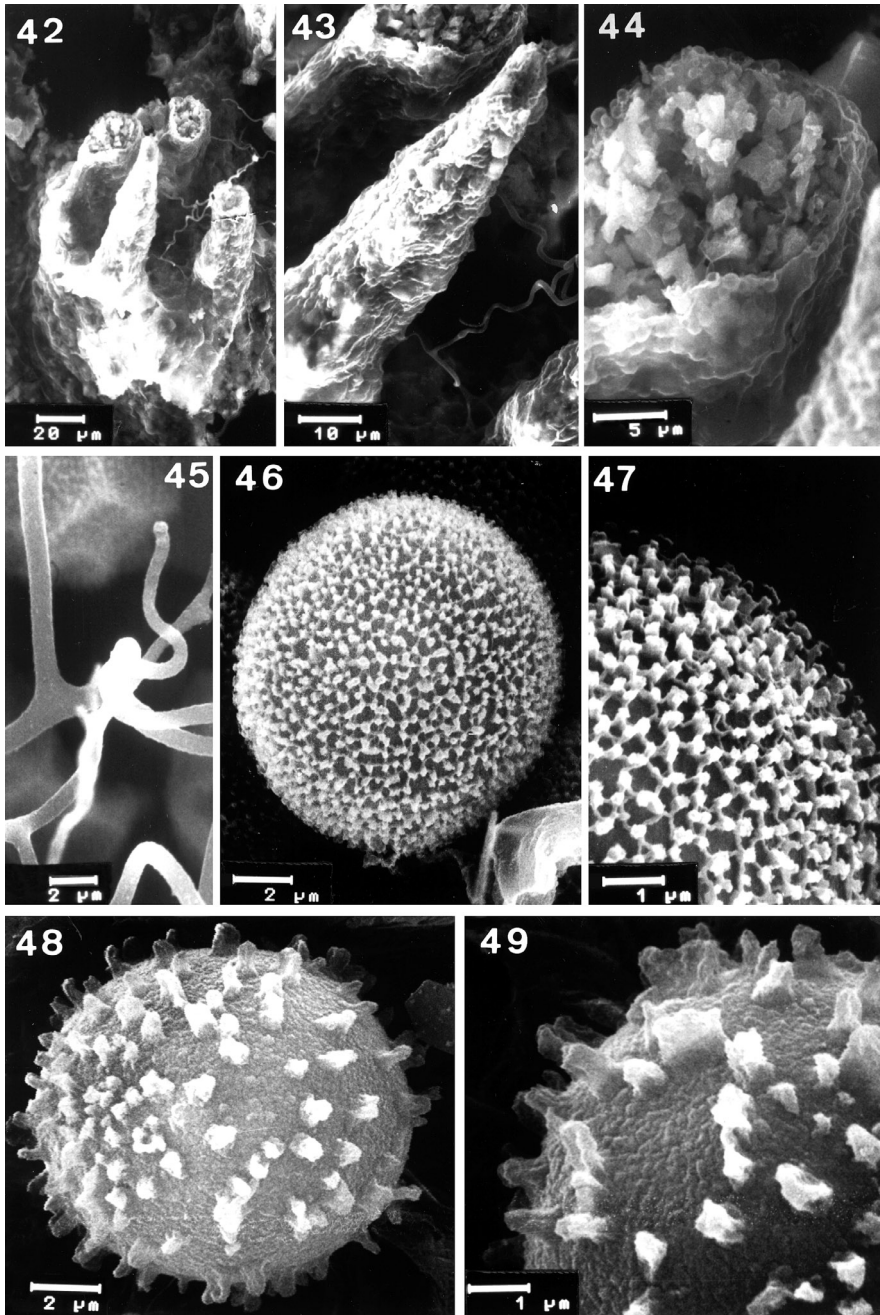
LOCALITIES: 13, 20.

Didymium rubeopus G. Moreno, Castillo
& Illana var. ***albocapillitium*** (G. Moreno,
Castillo & Illana) G. Moreno, Castillo, Illana
& Lizárraga (Figs. 40 and 41)

Cryptog. Mycol. 18: 318. 1997

This differs from *Didymium rubeopus* var. *rubeopus* by the dark rather than hyaline capillitium (Moreno *et al.* 1997). Spores are ornamented with pila, which are sometimes united.

LOCALITIES: 15, 20.



Figs. 42–49. — 42–47: *Didymium sturgisii* Hagelst. 42–44: SEM of calcareous pillars (AH 20148). 45: SEM of capillitium (AH 24273). 46–47: SEM of a spore and detail of ornamentation (AH 24273). — 48–49: *Didymium trachysporum* G. Lister (AH 24251). SEM of a spore and detail of ornamentation.

Didymium sturgisii Hagelst. (Figs. 42–47)

Mycologia 29: 397. 1937

Plasmodiocarps sessile, scattered to gregarious, flattened, 0.3–2 mm in diam. Peridium membranous, covered with white lime crystals. Dehiscence irregular. Columella absent, but calcareous erect pillars present. Hypothallus inconspicuous. Capillitium formed of dark threads, branching and anastomosing, dark violet-brown, 1 µm in diam. Spores dark in mass, pale violaceous brown in transmitted light, globose, 12–13 µm in diam., warted. Spore ornamentation is formed by baculae united at the base to form a reticulum.

This species is easy to recognize by its sessile plasmodiocarps and calcareous pillars. This is the first record for Mexico.

MEXICAN SPECIMENS EXAMINED. Baja California: On cladodes of *Opuntia cholla*, Vizcaíno-Bahía Tortugas road, 26.I.1996 M. Lizárraga, G. Moreno & C. Illana (AH 20104, 20148). On stems of *Pachycereus* sp., 53 km Cataviña-Bahía de los Ángeles road, 5.V.1997 M. Lizárraga & J. Alanis, moist chamber wetted 24.XI.1997 harvested 8.XII.1997 (AH 24314). On stems of *Pachycereus* sp., 53 km Cataviña-Bahía de los Ángeles road, 5.V.1997 M. Lizárraga & J. Alanis, moist chamber wetted 24.XI.1997 harvested 19.XII.1997 (AH 24226). On stems of *Pachycereus* sp., 53 km Cataviña-Bahía de los Ángeles, 5.V.1997 M. Lizárraga & J. Alanis, moist chamber wetted 24.XI.1997 harvested 20.XII.1997 (AH 24273). On stems of *Idria columnaris*, 53 km Cataviña-Bahía de los Ángeles road, 5.V.1997 M. Lizárraga & J. Alanis, moist chamber wetted 24.XI.1997 harvested 1.XII.1997 (AH 24315).

Didymium trachysporum G. Lister (Figs. 48 and 49)

Essex Naturalist 20: 113. 1923

Sporocarps sessile, gregarious, hemispherical to pulvinate, 0.2–0.6 mm in diam. Peridium double, the outer layer white, forming an egg-

shell-like crust of calcareous crystals, the inner layer membranous, thin, iridescent. Dehiscence irregular. Columella absent. Hypothallus inconspicuous. Capillitium scanty, threads hyaline, 1 µm in diam., forming a net. Spores black in mass, dark purple brown in transmitted light, globose, 8–10 µm in diam., with long warts. Spore ornamentation is baculate.

Didymium trachysporum is close to *D. difforme* (Pers.) S. F. Gray but the latter has dark spores with a pale area and the ornamentation is more delicate.

Didymium trachysporum is a new record for Mexico.

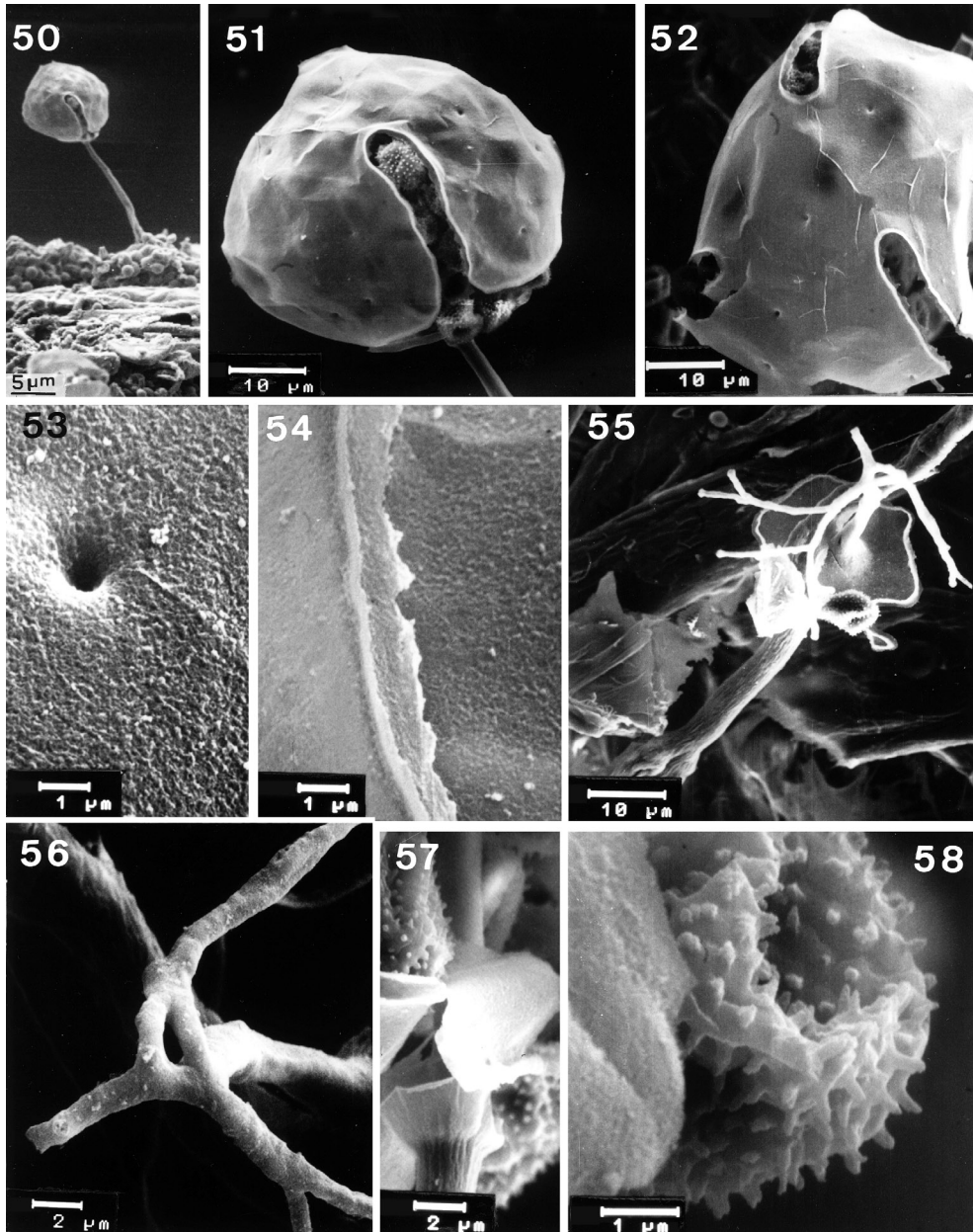
MEXICAN SPECIMENS EXAMINED. Baja California: On stems of *Pachycereus* sp., 53 km Cataviña-Bahía de los Ángeles road, 5.V.1997 M. Lizárraga & J. Alanis, moist chamber wetted 24.XI.1997 harvested 4.XII.1997 (AH 24311). On stems of *Pachycereus* sp., 53 km Cataviña-Bahía de los Ángeles road, 5.V.1997 M. Lizárraga & J. Alanis, moist chamber wetted 24.XI.1997 harvested 16.XII.1997 (AH 24238). On stems of *Pachycereus* sp., 53 km Cataviña-Bahía de los Ángeles road, 5.V.1997 M. Lizárraga & J. Alanis, moist chamber wetted 24.XI.1997 harvested 17.XII.1997 (AH 24251).

Echinostelium arboreum H.W. Keller & T.E. Brooks (Figs. 50–58)

Mycologia 68: 1207. 1977

This species is characterized by its small sporocarps, a bright yellow colour, a persistent peridium leaving a small collar, a cylindrical columella 2/3 the total height and a well developed, dichotomously branched capillitium. The peridium consists of two layers and is perforate, the surface ornamentation of the capillitium is smooth and the spore ornamentation is warted.

Echinostelium minutum de Bary is easily separated from *E. arboreum* by its white to pale pink sporocarps, a conical columella which is never cylindrical, and a fugacious peridium.



Figs. 50–58. *Echinostelium arboreum* H. W. Keller & T. E. Brooks (AH 24316). — **50–52:** SEM of a sporocarp and detail of peridium. — **53:** SEM of a detail of peridial pore. — **54:** SEM of the two layers of peridium. — **55:** SEM of the, columella and capillitium. — **56:** SEM of a detail of capillitium. — **57:** SEM of a detail of collar. — **58:** SEM of a detail of spore ornamentation.

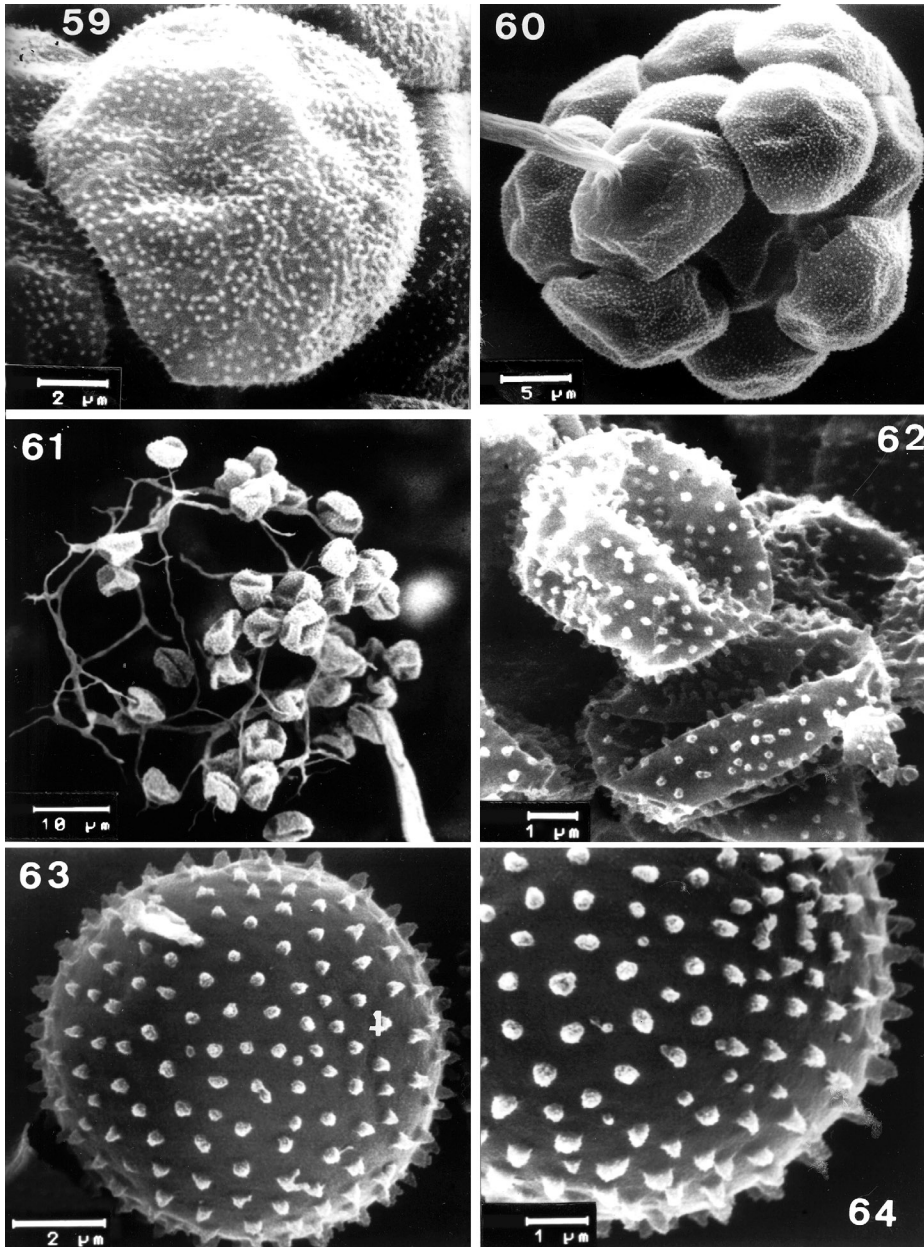
Echinostelium arboreum was previously reported from Mexico from the state of Yucatán (Keller & Brooks 1976b, Keller & Braun 1977, Braun & Keller 1986).

LOCALITIES: 6, 24, 28.

Echinostelium colliculosum K.D. Whitney & H.W. Keller (Figs. 59–60)

Mycologia 72: 641. 1980

Sporocarps scattered, stalked, globose, (60–)75–

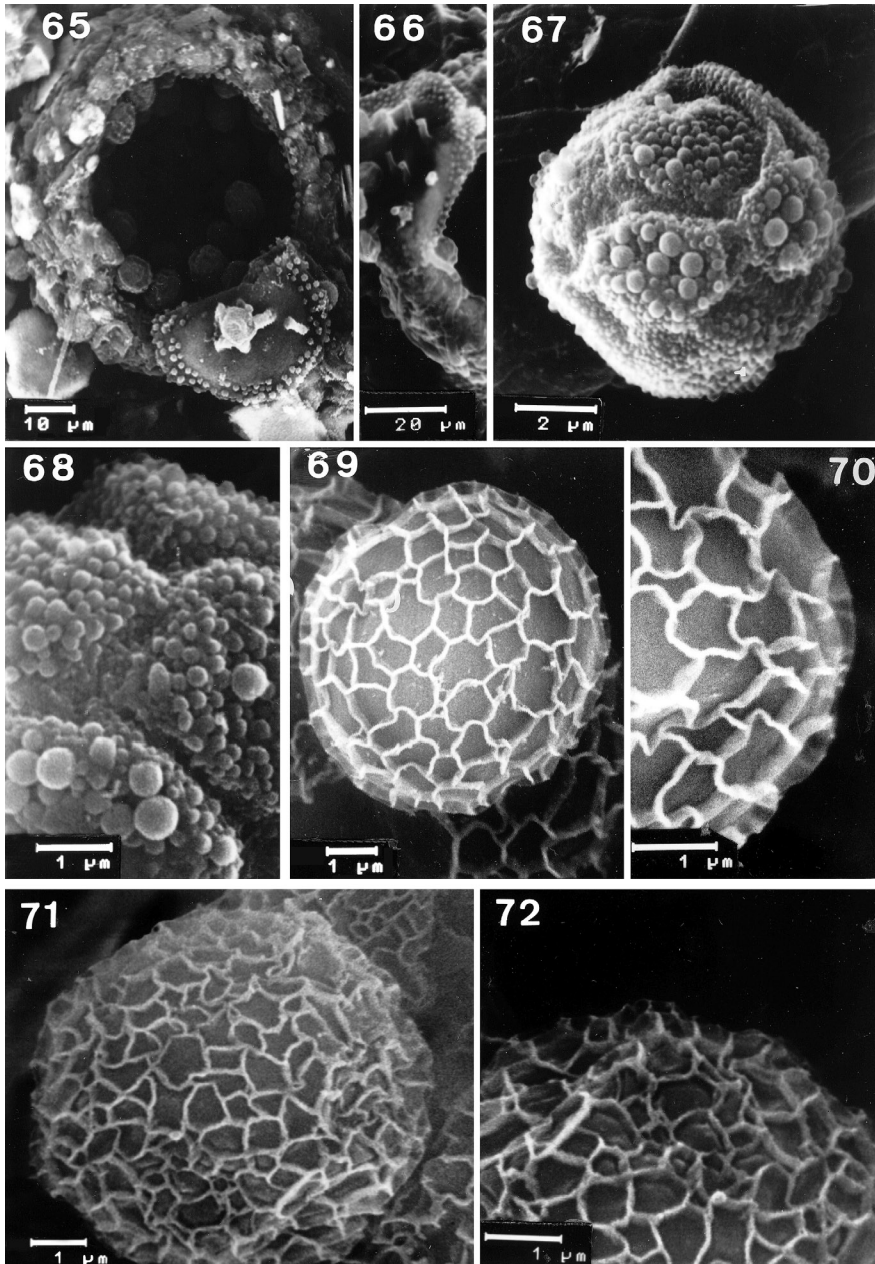


Figs. 59–64. — **59 and 60:** *Echinostelium colliculosum* K. D. Whitney & H. W. Keller (AH 20145). **59:** SEM of a spore ornamentation. **60:** SEM of sporocarp and spores. — **61 and 62:** *Echinostelium minutum* de Bary (AH 21010). SEM of sporocarp and spores. — **63 and 64:** *Lamproderma scintillans* (Berk. & Broome) Morgan (AH 17127): SEM of a spore and detail of ornamentation.

90 µm in height and 30–50 µm in diam. Peridium persisting as a collar. Columella absent but a globose spore-like body is present, (10–)12–13(–15) µm diam., warted. Capillitium absent. Spores white in mass, colourless in transmitted

light, globose, 9–13 µm in diam., warted and with thin articulations over the surface. Spore ornamentation is baculate.

Echinostelium coelocephalum T.E. Brooks & H.W. Keller resembles *E. colliculosum* but



Figs. 65–72. — **65–68:** *Licea kleistobolus* G. W. Martin (AH 20263). **65:** SEM of a sporocarp with operculum. **66:** SEM of a detail of the internal peridium. **67** and **68:** SEM of a spore and detail of ornamentation. — **69** and **70:** *Lycogala epidendrum* (L.) Fr. (AH 20089). SEM of a spore and detail of ornamentation. — **71** and **72:** *Lycogala flavofuscum* (Ehrenb.) Rostaf. (AH 18789). SEM of a spore and detail of ornamentation.

can be readily separated by its thick articular surfaces of spores. *Echinostelium ladoi* Pando also resembles *E. collicosum*, but it has crescent-shaped articular spore surfaces (Pando 1997).

This is the first record for Mexico.

MEXICAN SPECIMEN EXAMINED. Baja California Sur: On remains of *Pachycereus* sp., Sierra de la Laguna, San Felipe, 29.I.1996 M. Lizárraga, G. Moreno & C. Illana,

moist chamber wetted 10.VI.1998 harvested 11.VI.1998 (AH 17062).

Echinostelium minutum de Bary (Figs. 61 and 62)

in Rostaf., Śluzowce Monogr.: 215. 1874

Echinostelium minutum is a species visible to the naked eye, due to its relatively large size. The capillitium does not form a net which, together with the conical or cylindrical columella make this species fairly distinctive. Spore ornamentation is baculate and capillitium is smooth. This species is widely distributed in Mexico.

LOCALITIES: 24, 25.

Lamproderma scintillans (Berk. & Broome) Morgan (Figs. 63 and 64)

J. Cincinnati Soc. Nat. Hist. 16: 131. 1894

Lamproderma scintillans is a common species and widely distributed in Mexico. It is easily recognized by its sporocarps with a slender stalk, iridescent peridium, rigid capillitium with proximally pale branches arising mainly from the tip of the columella, and warted spores. Spore ornamentation is baculate.

LOCALITIES: 19, 20.

Licea kleistobolus G.W. Martin (Figs. 65–68)

Mycologia 34: 702. 1942

The most characteristic feature of this species is the presence of protuberances inside the operculum of the sporocarp. Spore ornamentation is formed of warts and scattered groups of more prominent warts, and the inner side of peridium is smooth with some perforations.

There is only one previous record of *Licea kleistobolus* from Mexico, from the state of Distrito Federal (Braun & Keller 1986).

LOCALITIES: 5, 15.

Lycogala epidendrum (L.) Fr. (Figs. 69 and 70)

Syst. Mycol. 3: 80. 1829

Lycogala epidendrum is a common species in Mexico and recognized by the pulvinate aethalium, as well as the finely reticulate spores grey in mass. Spore ornamentation is reticulate.

Recently Ing (1999) has re-described a group of *Lycogala* spp. characterized by clusters of cortical scales (*L. exiguum* Morgan) or forming a reticulate pattern (*L. confusum* Nann.-Bremek. ex Ing). *Lycogala terrestre* Fr. is close to *L. epidendrum*, but is distinguished by the spores pink in mass. The former taxon was recognized by Yamamoto (1998) as *L. epidendrum* var. *terrestre* (Fr.) Y. Yamam. The Mexican samples are referable to *L. epidendrum* var. *epidendrum*.

Flatau and Schirmer (1994) described *Lycogala epidendrum* var. *cristatum* Flatau & Schirmer, distinguished by the smooth pseudocapillitium and small differences in the spore ornamentation.

LOCALITIES: 24, 30.

Lycogala flavofuscum (Ehrenb.) Rostaf. (Figs. 71 and 72)

in Fuckel, Jahrb. Nass. Ver. Nat. 27–28: 68. 1873

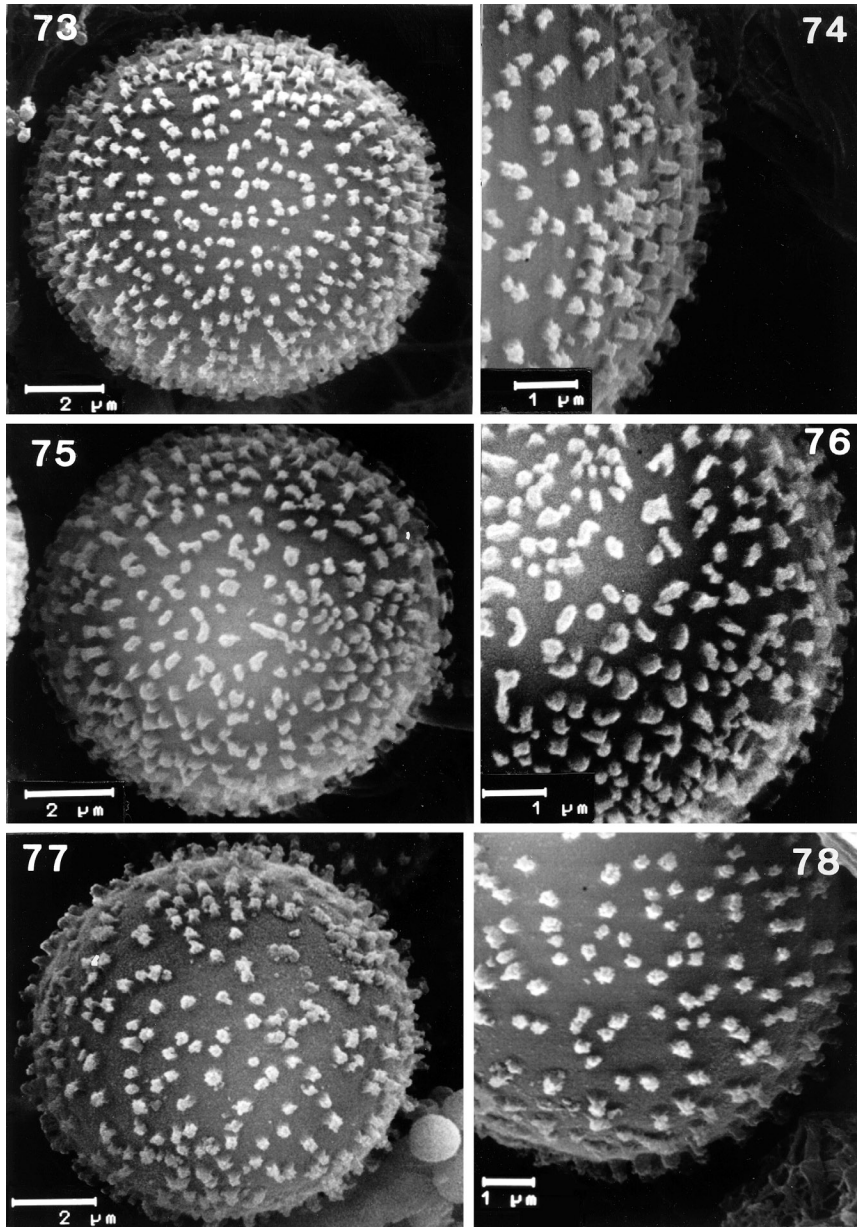
Lycogala flavofuscum has subglobose or hemispherical aethalia 2–5 cm in diam. Spore ornamentation is reticulate. The species is widely distributed in Mexico.

LOCALITY: 23.

Physarum auriscalpium Cooke (Figs. 73–74)

Ann. Lyceum Nat. Hist. New York 11: 384. 1877

Sporocarps short-stalked or sessile, gregarious, globose to subglobose, yellowish grey, 0.6–1.2 × 0.5–0.9 mm. Peridium smooth, membranous, covered with small calcareous scales. Columella absent. Hypothallus inconspicuous. Stalk dark reddish, striate. Capillitium abundant, tu-



Figs. 73–78. — **73 and 74:** *Physarum auriscalpium* Cooke (AH 15991). SEM of a spore and detail of ornamentation. — **75 and 76:** *Physarum cinereum* (Batsch) Pers. (AH 15893). SEM of a spore and detail of ornamentation. — **77 and 78:** *Physarum lateritium* (Berk. & Ravenel) Morgan (AH 17136). SEM of a spore and detail of ornamentation.

bules hyaline, connecting yellow calcareous nodes. Spores black in mass, violaceous brown in transmitted light, globose, 11–12 μm in diam., warted. Spore ornamentation is baculate.

This is the first record for Mexico.

MEXICAN SPECIMEN EXAMINED. Baja California: On wood of *Quercus agrifolia*, Las Chichiuas, Ensenada, 10.II.1993 G. Moreno, C. Illana, R. Galán, M. Lizárraga

& M. N. Blanco (AH 15991).

Physarum cinereum (Batsch) Pers. (Figs. 75 and 76)

Neues Mag. Bot. 1: 89. 1794

Physarum cinereum is cosmopolitan and a common species in Mexico. Spore ornamentation is baculate, the baculae being sometimes united.

LOCALITIES: 7, 20.

Physarum lateritium (Berk. & Ravenel) Morgan (Figs. 77 and 78)

J. Cincinnati Soc. Nat. Hist. 19: 23. 1896

Sporocarps sessile, scattered or gregarious, globose or subglobose, 0.5–0.7 in diam., rarely forming 2 mm long plasmodiocarps. Peridium membranous, grey to reddish, calcareous. Dehiscence irregular. Hypothallus membranous. Columella absent. Capillitium delicate, consisting of hyaline tubes and angular calcareous white to pale orange nodes. Spores dark in mass, pale violaceous in transmitted light, globose, 9–10 µm in diam., warty. Spore ornamentation is baculate.

This is the first report from Mexico.

MEXICAN SPECIMEN EXAMINED. Baja California: On leaves of *Malosma laurina*, near Facultad de Ciencias, Universidad Autónoma de Baja California, Ensenada, 21.I.1995 M. Lizárraga (AH 17138).

Physarum leucophaeum Fr. (Figs. 79–80)

Symb. Gasteromyc. 3: 24. 1818

This common species is recognized by its globose to subglobose sporocarps with thick dark stalks. Spore ornamentation is baculate.

Physarum leucophaeum has previously been reported in Mexico from the states of Chiapas (Emoto 1933) and Nuevo León (Gómez-Sánchez & Castillo 1981).

LOCALITIES: 2, 8, 13, 14.

Physarum lividum Rostaf. (Figs. 81–82)

Śluzowce Monograph. 95. 1874

Sporocarps sessile to short plasmodiocarps, gregarious, globose to subglobose, 0.2–0.4 mm in diam. Peridium single, membranous, grey, calcareous and white. Dehiscence irregular. Columella absent. Capillitium formed by a net of hyaline tubes connecting calcareous nodes. Spores dark in mass, dark purple-brown with a pale area in transmitted light, globose, 11–13 µm in diam., warty. Spore ornamentation is baculate.

Weathered specimens of *Physarum stramineipes* Lister can be confused with the sporocarps of *P. lividum*, but the spores of the former are polyhedral with pale bands.

This is the first record for Mexico.

MEXICAN SPECIMENS EXAMINED. Baja California: On stems of *Pluchea sericea*, Punta Banda, Ensenada, 12.II.1993 M. Lizárraga, C. Illana & G. Moreno (AH 18613). On leaves of *Quercus agrifolia*, Ensenada-Santo Tomás Mexico highway 1 (Rancho las Jacarandas, Cañón de las Ánimas), 7.II.1993 G. Moreno, C. Illana & F. Bersan (AH 21016).

Physarum pusillum (Berk. & M.A. Curtis) G. Lister (Figs. 83 and 84)

in Lister, Monogr. Mycetozoa, ed. 2: 64. 1911

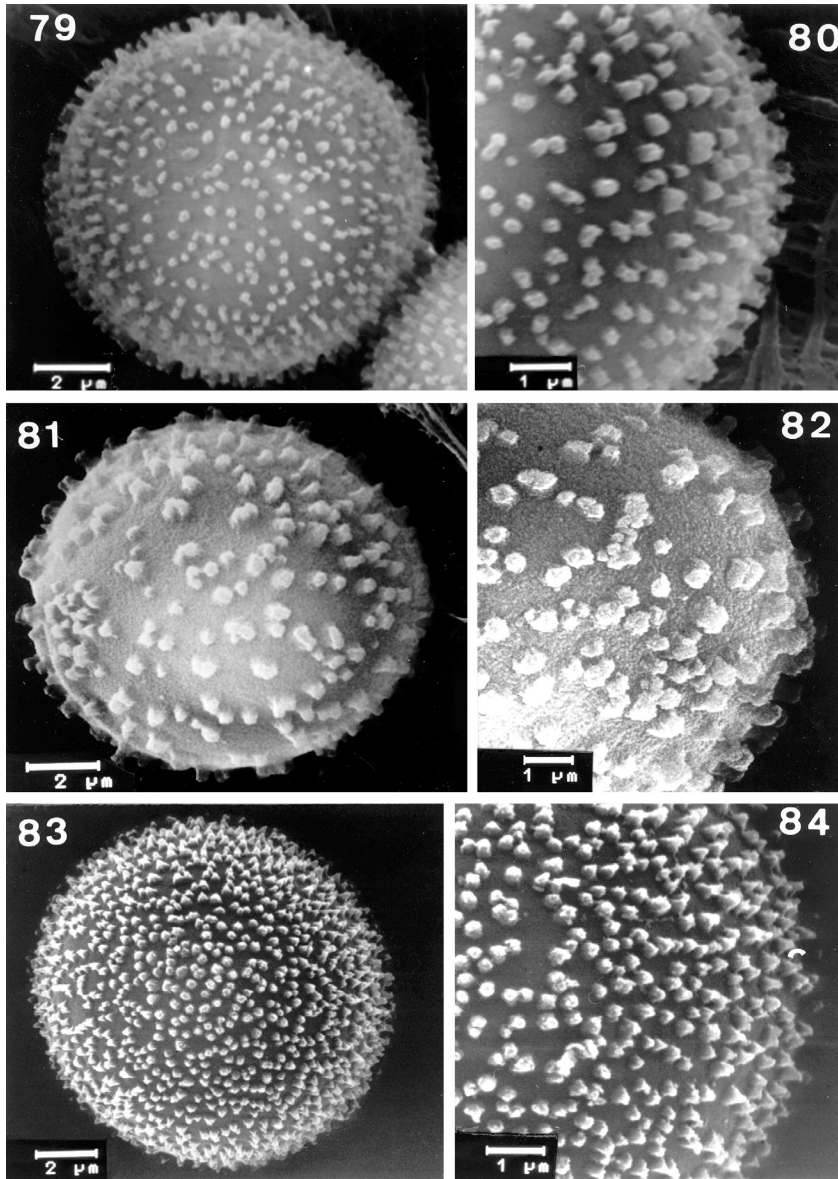
This taxon is distinguished by its sporocarps with a peridium thinly covered with lime except for a dark basal disc, a dark reddish stalk, and a somewhat badhamioid capillitium. Spore ornamentation is warty. *Physarum pusillum* is a common species in Mexico.

LOCALITIES: 3, 4, 5, 7, 10, 11, 12, 13, 15.

Protophysarum phloiogenum M. Blackw. & Alexop. (Figs. 85 and 86)

Mycologia 67: 33-34. 1975

Sporocarps scattered, stipitate, globose, 0.07–0.1 mm in diam., 0.3–0.5 mm tall. Hypothallus yellowish. Stalk yellowish brown, 0.16–0.20 mm long. Peridium delicate, iridescent, persistent in the lower part as a collar. Columella absent. Capillitium scanty, without lime, tubules

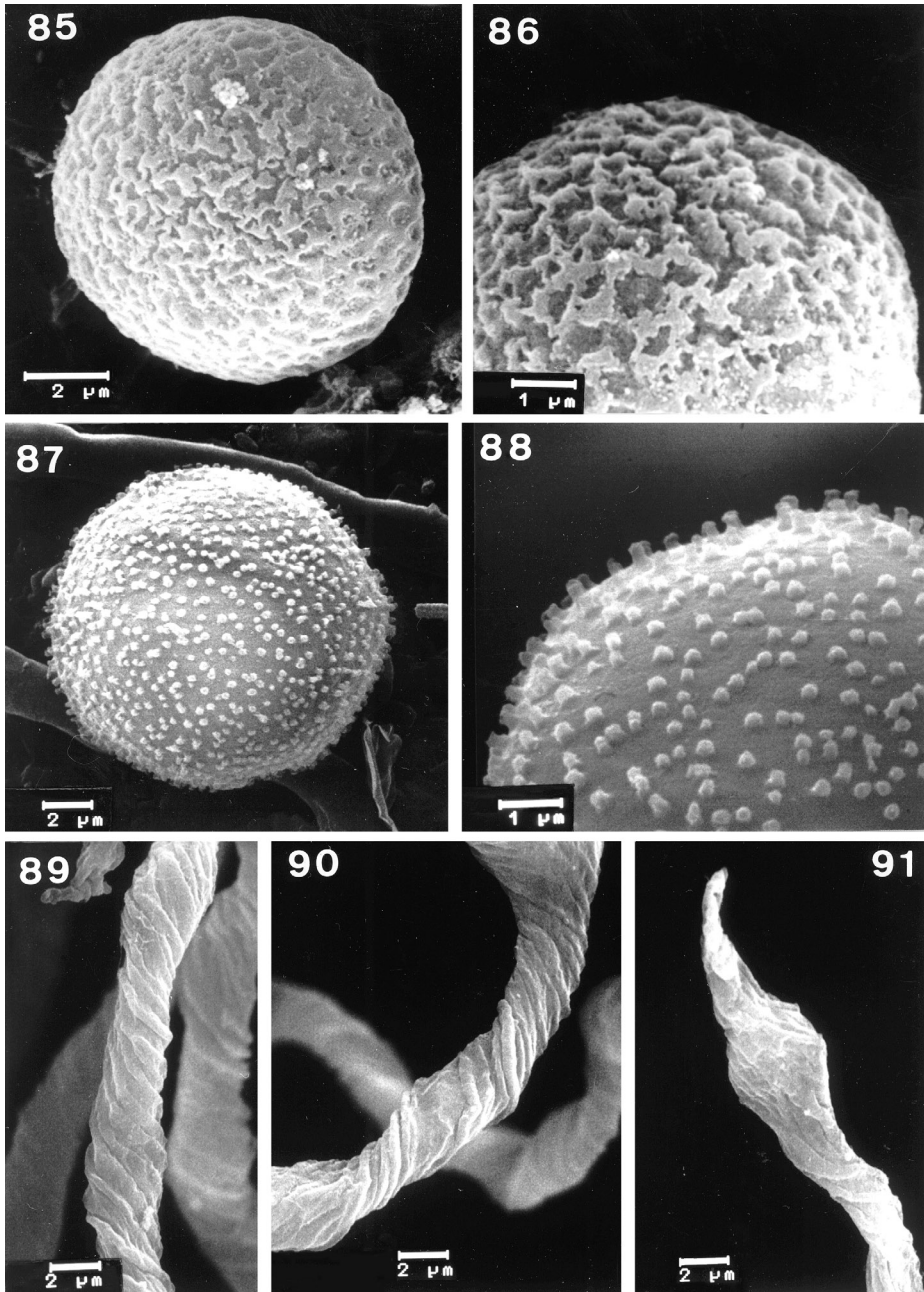


Figs. 79–84. — **79 and 80:** *Physarum leucophaeum* Fr. (AH 15934). SEM of a spore and detail of ornamentation. — **81 and 82:** *Physarum lividum* Rostaf. (AH 21016). SEM of a spore and detail of ornamentation. — **83 and 84:** *Physarum pusillum* (Berk. & M. A. Curtis) G. Lister (AH 17077). SEM of a spore and detail of ornamentation.

1 μm in diam., arising from the tip of the stalk. Spores dark in mass, violaceous brown in transmitted light, globose to ovoid, 10–11 μm in

diam., reticulate. Spore ornamentation is reticulate with prominent walls.

This is the first record for Mexico. *Proto-*



Figs. 85–91. — 85 and 86: *Protophysarum phloiogenum* M. Blackw. & Alexop. (AH 24239). SEM of a spore and detail of ornamentation. — 87–91: *Trichia contorta* (Ditmar) Rostaf. (AH 20344). 87 and 88: SEM of a spore and detail of ornamentation. 89 and 90: SEM of capillitium. 91: SEM of a detail of tip of an elater (capillitium).

physarum phloiogenum has been recorded from few localities in the world (Castillo *et al.* 1998).

MEXICAN SPECIMEN EXAMINED. Baja California: On remains of *Pachycereus* sp., 53 km west Bahía de Los Ángeles-Cataviña, 5.V.1997 M. Lizárraga, J. Alanís & R. Martínez, moist chamber wetted 24.XI.1997 harvested 4.XII.1998 (AH 24239).

***Trichia contorta* (Ditmar) Rostaf. (Figs. 87–91)**

Śluzowce Monogr.: 259. 1875

Sporocarps to plasmodiocarps, sessile, gregarious, globose to subglobose, brown yellowish, 0.3–1 mm in diam. and 0.2–0.8 mm long. Peridium double, fragile. Dehiscence irregular. Columella absent. Hypothallus membranous, hyaline, confluent. Capillitium yellow in mass, more pale in transmitted light, elaters free and sometimes branched, 3–4 µm in diam., ornamented with 4–5 spiral bands, the tips pointed. Spores yellow in mass, pale yellow in transmitted light, globose, 12–14 µm in diam., warty. Spore ornamentation is pilate and the surface of the capillitium is ornamented with 4–5 spiral bands.

Although *Trichia contorta* is a cosmopolitan species this is the first record for Mexico.

MEXICAN SPECIMEN EXAMINED. Baja California: On remains of *Agave schawii*, Cerro Solo, way Erendira-San Vicente, Ensenada, 15.II.1996 M. Lizárraga & E. Barreto (AH 20344).

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