

SEM studies of the Myxomycetes from the Peninsula of Baja California (Mexico), II. *Hemitrichia* to *Trichia*

Marcos Lizárraga, Carlos Illana & Gabriel Moreno

Lizárraga, M., Illana, C. & Moreno, G., *Departamento de Biología Vegetal (Botánica), Universidad de Alcalá, 28871 Alcalá de Henares, Madrid, Spain*

Received 4 May 1998, accepted 14 August 1998

Lizárraga, M., Illana, C. & Moreno, G. 1999: SEM studies of the Myxomycetes from the Peninsula of Baja California (Mexico), II. *Hemitrichia* to *Trichia*. — *Ann. Bot. Fennici* 36: 187–210.

In two papers, of which this is the second, the authors present a macro- and microscopic study of 45 Myxomycetes collected on the Peninsula of Baja California, Mexico. This part treats 21 taxa, in alphabetical order, from *Hemitrichia clavata* (Pers.) Rostaf. to *Trichia varia* (J. F. Gmelin) Pers. SEM photographs of spores and capillitial threads are provided. The following taxa are new to Mexico: *Hemitrichia minor* G. Lister, *Licea biforis* Morgan, *L. variabilis* Schrad., *Physarum contextum* (Pers.) Pers., *P. viride* var. *aurantium* (Pers.) Lister and *P. viride* var. *incanum* Lister. We propose the synonymy of *Mucilago crustacea* F. H. Wigg. var. *crustacea* and *M. crustacea* var. *solida* Sturgis. We also propose the following two new combinations: *Mucilago dictyospora* (R. E. Fr.) Lizárraga, G. Moreno & Illana. *Hemitrichia serpula* (Scop.) Lister var. *parviverrucospora* Lizárraga, Illana & G. Moreno is described as new to science.

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

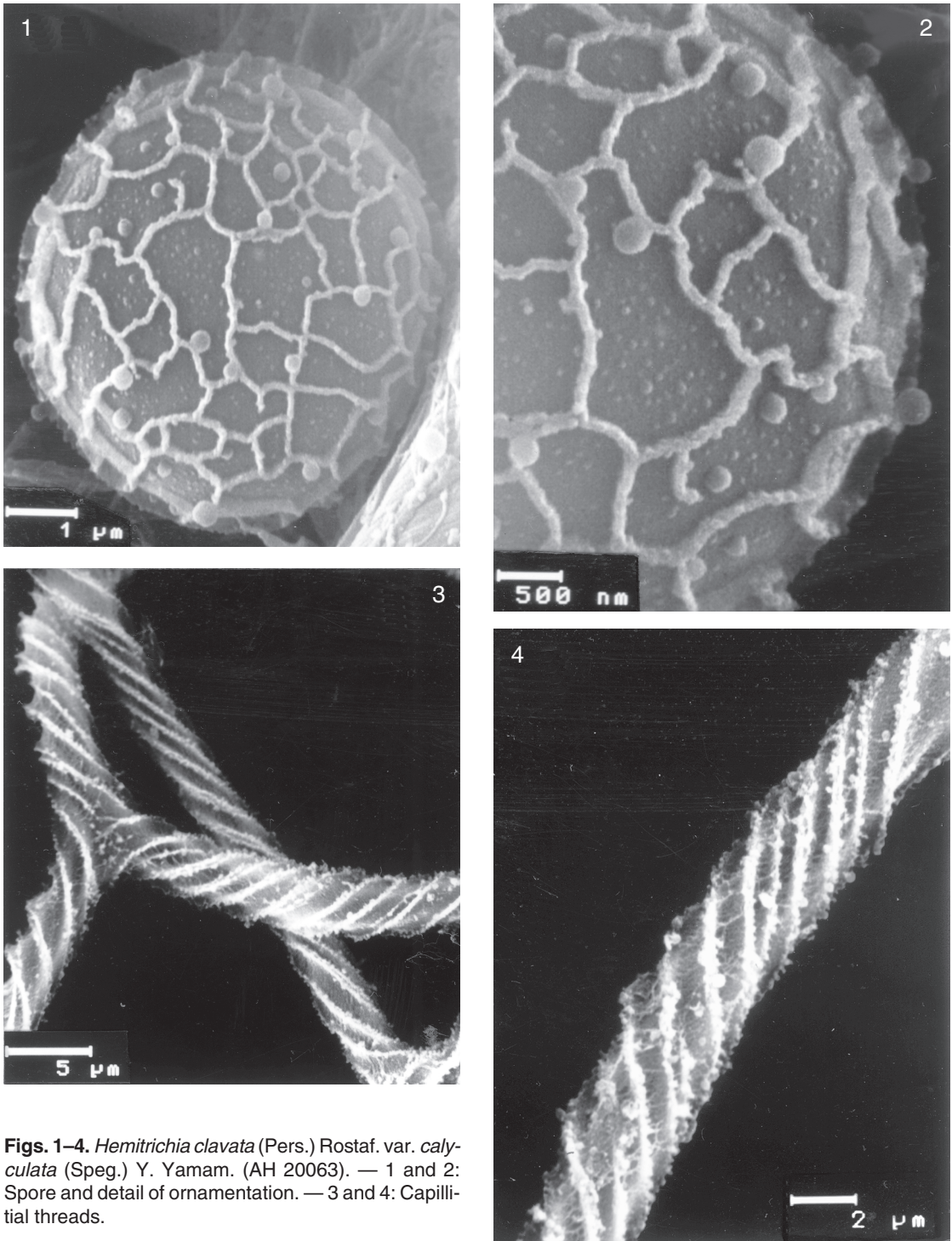
The background information and material and methods, including a list of collecting localities, were given in the first part (Lizárraga *et al.* 1999a). It treated in alphabetical order 24 species in the genera *Arcyria*, *Badhamia*, *Ceratiomyxa*, *Comatricha*, *Crateurium*, *Diachea*, *Dictydiaethalium*, *Diderma*, *Didymium*, *Enerthenema*, *Enteridium*, and *Fuligo*. This second part treats 21 species in alphabetical order in the genera *Hemitrichia*, *Licea*, *Mucilago*, *Perichaea*, *Physarum*, *Stemonitis*, and *Trichia*.

LIST OF SPECIES

Hemitrichia clavata (Pers.) Rostaf. var. *calyculata* (Speg.) Y. Yamam. (Figs. 1–4)

Cryptog. Fl. Pakistan 2: 28. 1993. — *Hemiarcyria calyculata* Speg., *Anales Soc. Ci. Argentina* 10: 152. 1880. — *Hemitrichia calyculata* (Speg.) M. L. Farr, *Mycologia* 66: 887. 1974.

This taxon is distinguished by its yellow to ochraceous pyriform sporocarps with a cylindrical



Figs. 1–4. *Hemitrichia clavata* (Pers.) Rostaf. var. *calyculata* (Speg.) Y. Yamam. (AH 20063). — 1 and 2: Spore and detail of ornamentation. — 3 and 4: Capillitial threads.

ical, erect stalk. With SEM the capillitium has spirals ornamented with small warts and the spore ornamentation presents a reticulum with irregular meshes.

Hemitrichia clavata var. *calyculata* is easy to identify by its stipitate sporocarps with a cylindrical narrow stalk. Microscopically, it is very similar to *H. clavata* var. *clavata*. These taxa have

been considered closely related by different authors (Martin & Alexopoulos 1969, Farr 1976, Flatau 1990, Nannenga-Bremekamp 1991, Lado 1997). Rammeloo (1975b) observed only minor differences in the ornamentation of the internal face of the peridium. For this reason Yamamoto *et al.* (1993) decided to treat this species as *Hemitrichia clavata* var. *calyculata* since there are no relevant differences between these two taxa. We follow this last opinion in the taxonomic treatment. *Hemitrichia clavata* var. *calyculata* is widely distributed in Mexico.

Locality (Lizárraga *et al.* 1999): 30.

Hemitrichia minor G. Lister (Figs. 5–10)

J. Bot. 49: 62. 1911.

Sporocarps scattered, sessile, subglobose, 0.3–0.6 mm diam., yellowish brown. Peridium single, thin, translucent, smooth. Hypothallus inconspicuous. Columella absent. Capillitium tubular, elastic, tubes 2–4 µm diam., branched, with few pointed free ends, ornamented with 3–4 spiral bands with spines and warts, yellowish by transmitted light. Spores 10–12 µm diam., globose, yellow in mass and by transmitted light, minutely warted. With SEM the capillitium has spirals ornamented with spines and the spore ornamentation is regularly pilate.

Although *Hemitrichia minor* is a new record for Mexico, we believe that it must be common in Mexico on succulent plants.

Mexican specimen examined. — Baja California: On stems of *Opuntia ficus indica*, Las Chichiuas, Ensenada, 1.II.1996, *M. Lizárraga* (AH 20080).

Hemitrichia serpula (Scop.) Rostaf. ex Lister var. ***parviverrucospora*** Lizárraga, Illana & G. Moreno, var. nov. (Figs. 11–17)

Hemitrichia serpula var. *parviverrucospora* *difert a typo ab forma typica verrucis minutis intrareticulatis differ.*

Holotype: Mexico. Baja California Sur, on wood, Sierra de la Laguna (28 km E of San Juan del Aserradero), *Manjarrez & N. Ayala* (BCMEX 2047 in AH 24440). — Paratype: Same locality and collectors, on Aphyllphorales (BCMEX 1332 in AH 24448).

Hemitrichia serpula var. *parviverrucospora* is

easy to recognize macroscopically by its branched to reticulate plasmodiocarps. With SEM the inner side of the peridium has veins of variable width, forming a framework with long spines. The spores have irregular meshes, and the spore surface within the meshes has low verrucae. The internal warts in the sporal ornamentation are the only differences from *Hemitrichia serpula* var. *serpula* (Figs. 18–24).

Referring to the spore ornamentation, our SEM observations agree with the photographs shown by Rammeloo (1981), from material collected in Central Africa, and thus the specimens cited by him belong to this new variety. We studied material of *Hemitrichia serpula* from various countries (Japan, New Caledonia, Spain, France, Germany, Lithuania, Guinea), but did not find var. *parviverrucospora*. The new variety remains for the moment limited to Central Africa (Burundi, Rwanda, Zaire; cf. Rammeloo 1981) and Mexico (Baja California Sur and Sinaloa; Lizárraga *et al.* 1999b).

Licea biforis Morgan (Figs. 25–27)

J. Cincinnati Soc. Nat. Hist. 15: 131. 1893.

Plasmodiocarps scattered or gregarious, sessile, elongated (occasionally branched), sinuate, 0.2–0.3 × 0.1–0.15 mm. Hypothallus inconspicuous. Peridium single, membranous, thin, yellowish brown, surface smooth with minute deposits of granular material. Dehiscence by a preformed longitudinal fissure. Columella absent. Capillitium absent. Spores 11–13 × 9–10 µm diam., globose or ovoid, yellowish-brown in mass, pale yellow by transmitted light, very minutely warted. With SEM the spores are densely covered with small warts.

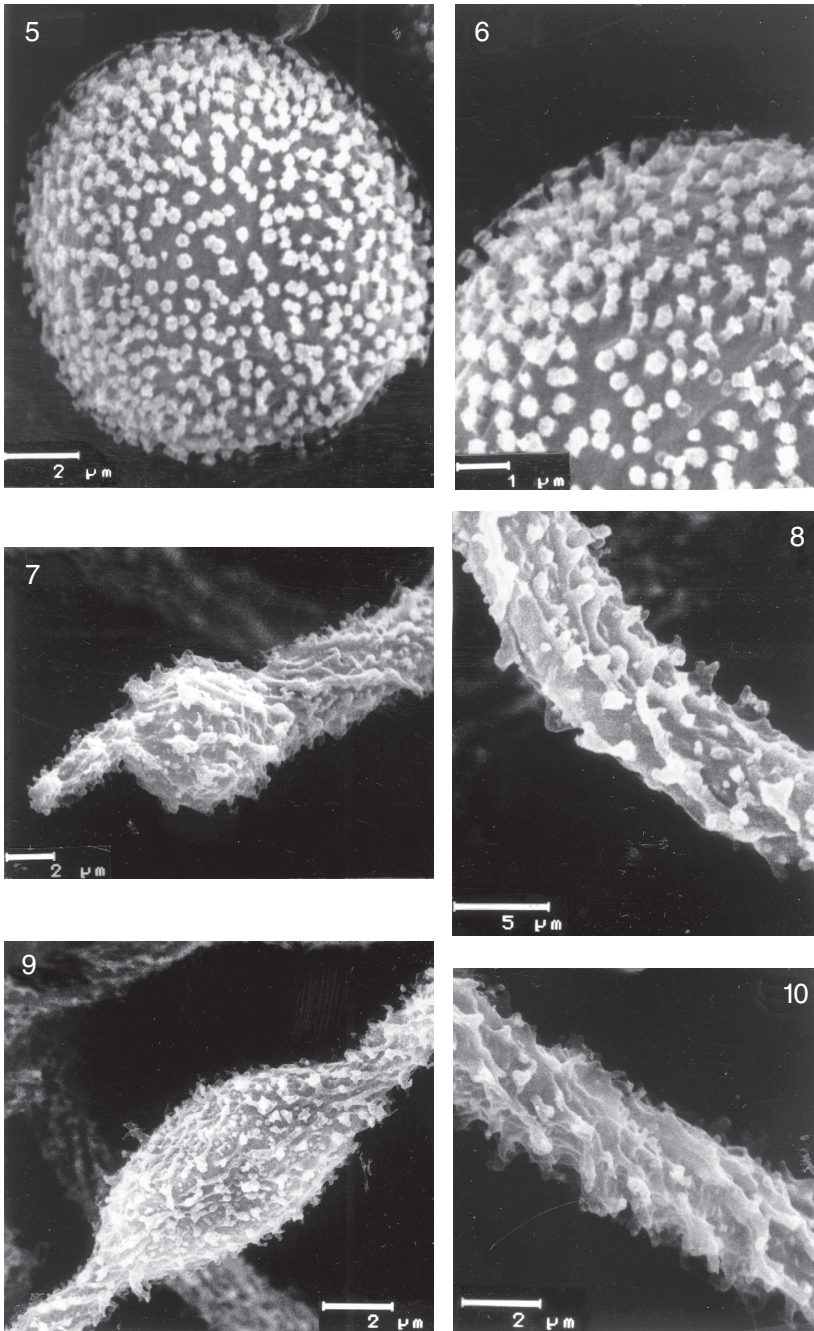
This is the first record of *Licea biforis* for Mexico.

Mexican specimens examined. — Baja California: On bark of *Populus* sp., Cañón Billy, Tecate, 5.II.1996, *M. Lizárraga & E. J. Torres* (AH 20285). On leaves of *Rhus laurina*, San Antonio de las Minas, Ensenada, 20.I.1995, *M. Lizárraga* (AH 21019).

Licea variabilis Schrad. (Figs. 28–30)

Nov. Gen. Pl. 18. 1797.

Plasmodiocarps small, scattered or gregarious,



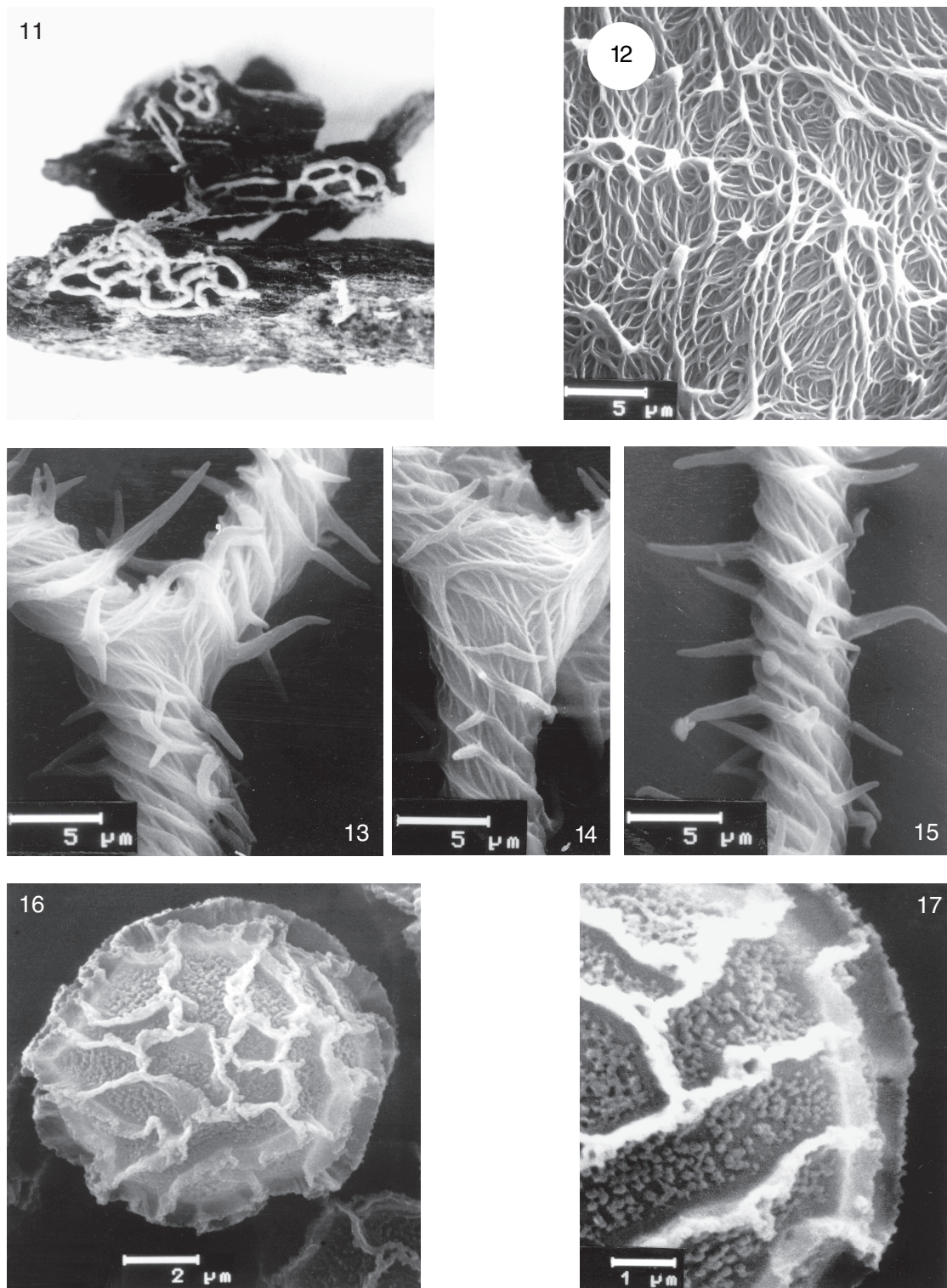
Figs. 5–10. *Hemitrichia minor* G. Lister (AH 20376). — 5 and 6: Spore and detail of ornamentation. — 7–10: Capillitial threads.

pulvinate, 0.5–2 × 0.3–0.5 mm. Hypothallus inconspicuous. Peridium single, membranous, brown, surface smooth with deposits of granular material. Dehiscence irregular. Columella absent. Capillitium absent. Spores 12–14 µm diam., globose or subglobose, pale olivaceous in mass, yellowish by transmitted light, densely spinulose,

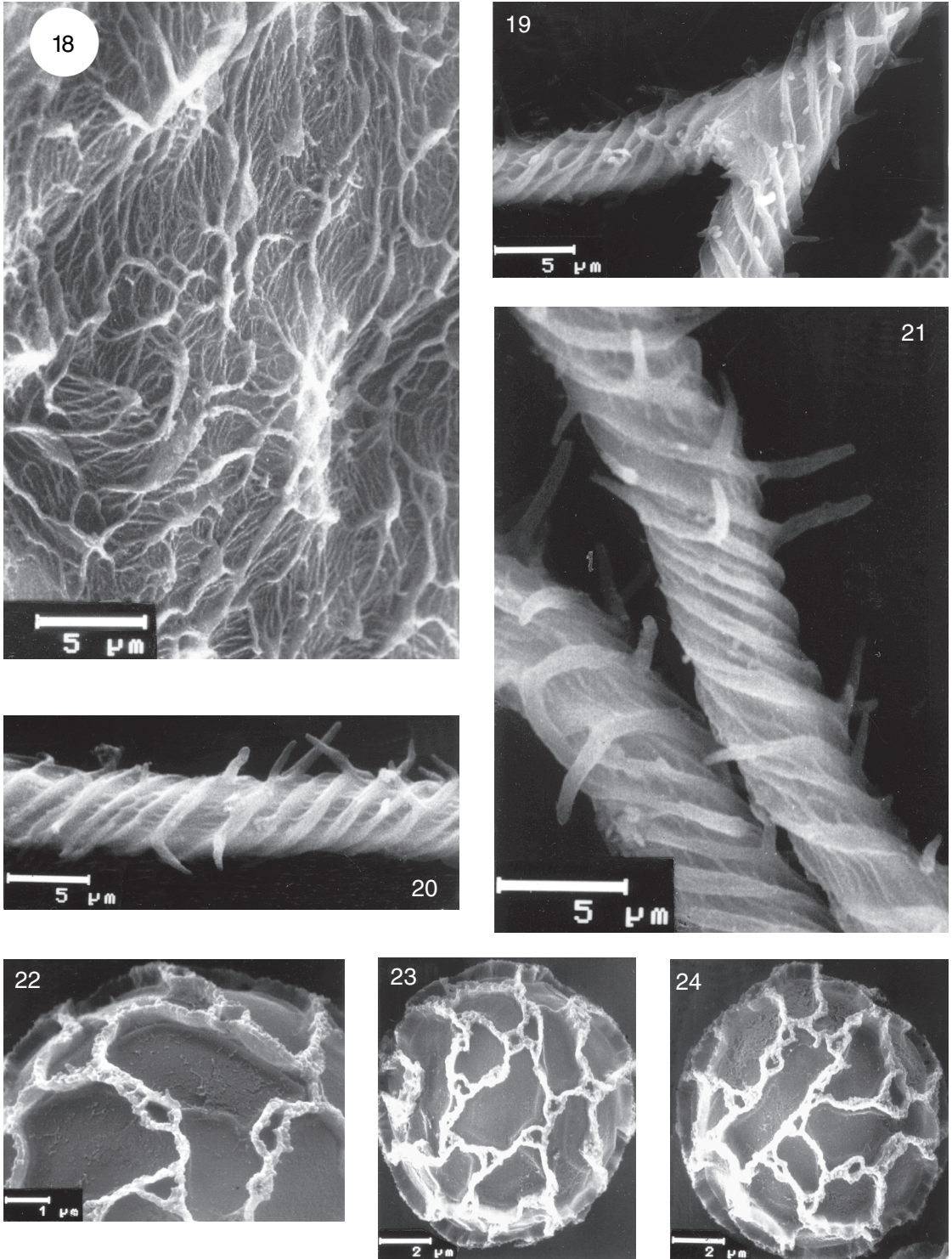
with SEM with regularly distributed long, curved spines.

This is the first record of *Licea variabilis* for Mexico.

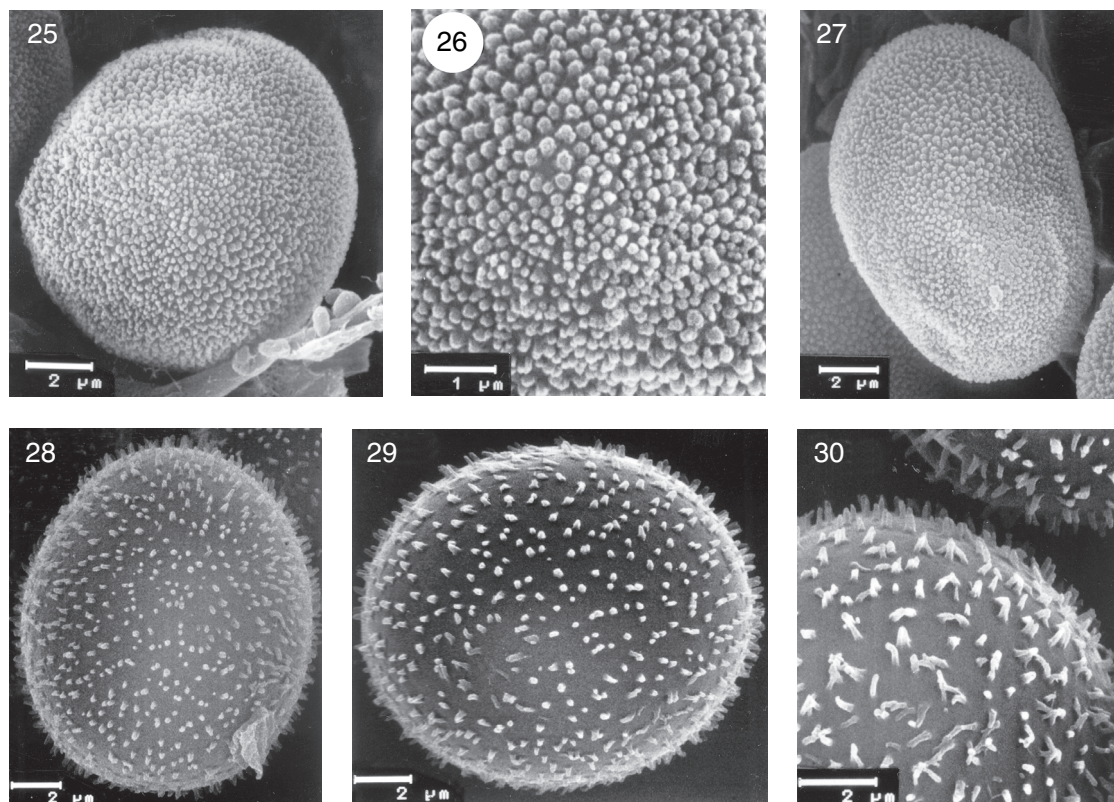
Mexican specimens examined. — Baja California: On bark of *Pinus jeffreyi*, Sierra de Juárez, Laguna de Hanson, 17.II.1993, G. Moreno, C. Illana & M. Lizárraga (AH 15814).



Figs. 11–17. *Hemitrichia serpula* (Scop.) G. Lister var. *parviverrucospora* Lizárraga, Illana & G. Moreno (holotype). — 11: Plasmodiocarp. — 12: Inner side of peridium. — 13–15: Capillitial threads. — 16 and 17: Spore and detail of ornamentation.



Figs. 18–24. *Hemitrichia serpula* (Scop.) G. Lister var. *serpula* (AH 21027). — 18: Inner side of peridium. — 19–21: Capillitial threads. — 22–24: Spore and detail of ornamentation.



Figs. 25–30. — 25–27: *Licea biforis* Morgan (AH 20285). Spore and detail of ornamentation. — 28–30: *Licea variabilis* Schrad. (AH 15814). Spore and detail of ornamentation.

Mucilago crustacea F. H. Wigg. (Figs. 31–48)

Prim. Fl. Holsat. 112. 1780.

Spumaria alba (Bull.) DC. in Lam. & DC., Fl. Franç., 3 ed., 2: 261. 1805.

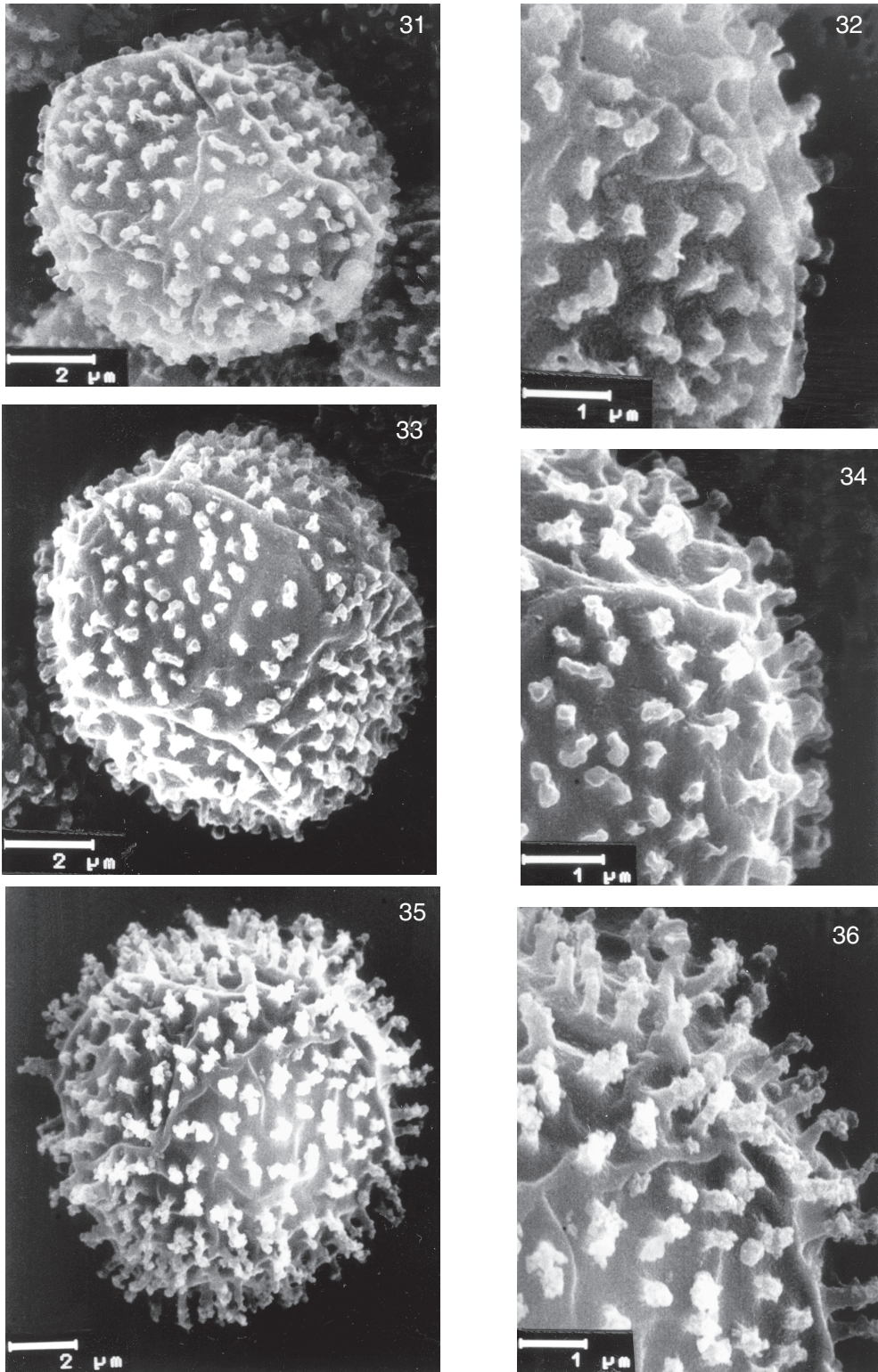
Spumaria alba var. *solida* Sturgis, Colorado Coll. Publ. Sci. 12: 29. 1907. — *Mucilago crustacea* var. *solida* (Sturgis) Lister ex Nann.-Brem., Nederl. Myxom. 390. 1974.

Aethalium sessile, solitary, pulvinate to elongate, 1–5 × 1–1.5 cm, white to pale cream. Capillitium formed by filaments of 1–2 µm in diam., dark violaceous. Spores (9–)10–11 µm diam., globose, black in mass, purple brown by transmitted light, warted.

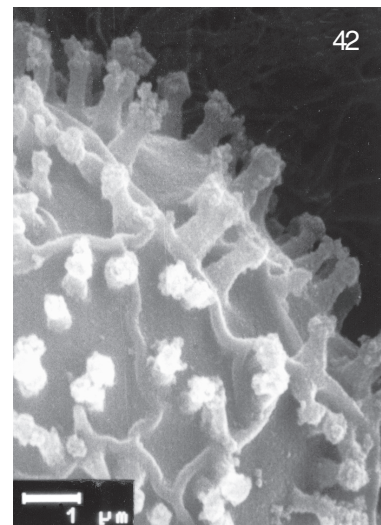
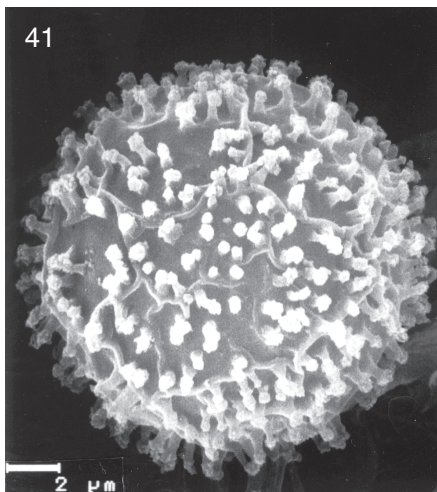
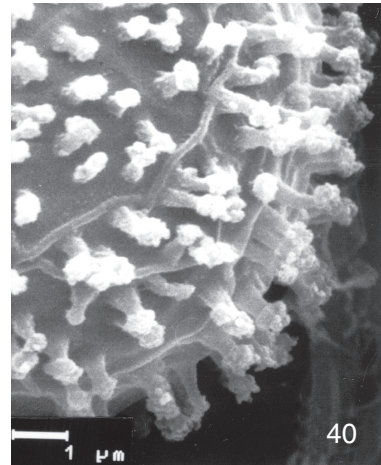
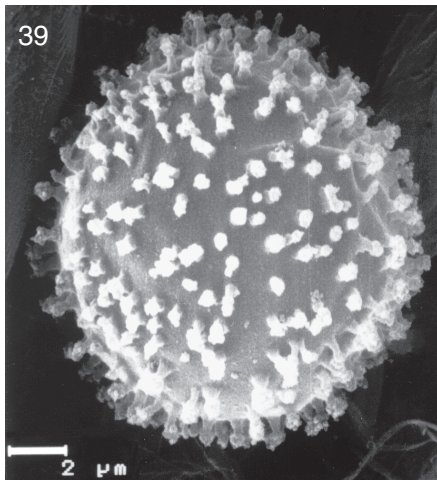
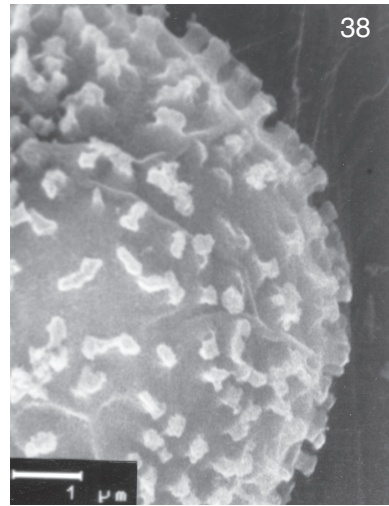
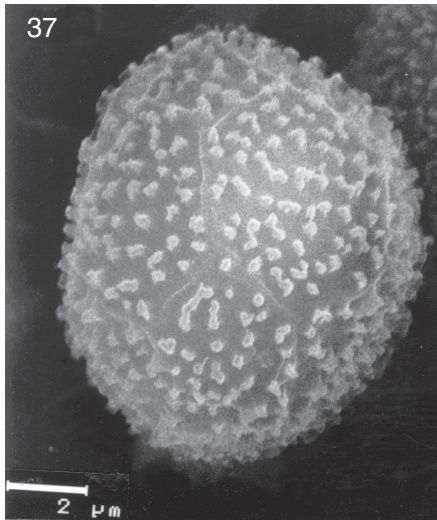
Facing the existing problems to differentiate between *Mucilago crustacea* var. *crustacea* and *Mucilago crustacea* var. *solida*, a taxon described from the USA, we studied numerous American specimens from NYBG, determined as *Mucilago spongiosa* var. *solida* or *Spumaria alba* var. *solida*.

We observed great variability in the presence and colour of the capillitium, spore size, and spore ornamentation. The variability in the sporal ornamentation is also clear with SEM, possibly due to variation in conditions at the time of maturation of the fructifications. The samples from NYBG are well matured and show spores with smooth bacula to bacula with verrucose tips.

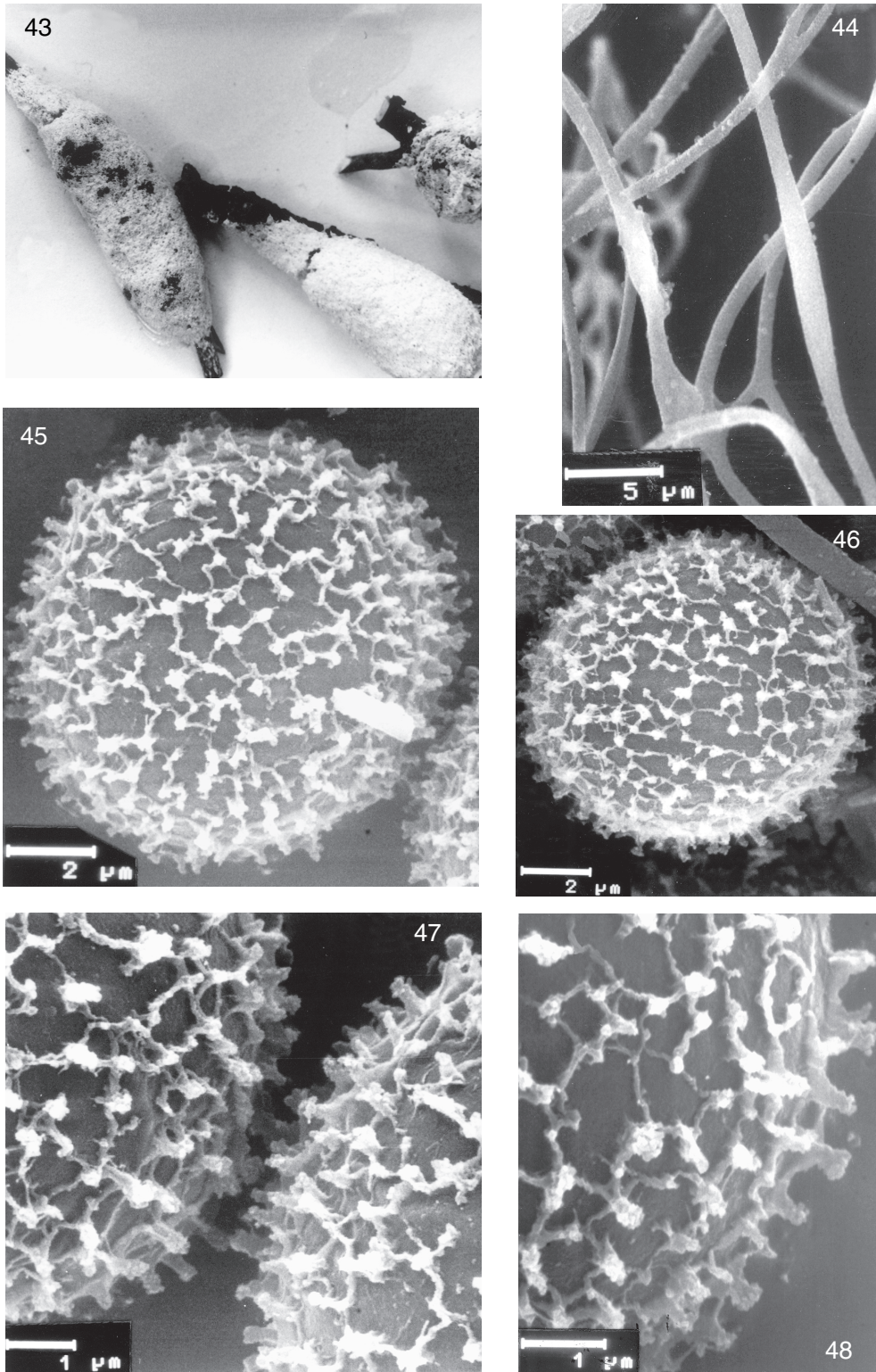
When we compared the American and the Spanish collections of *Mucilago crustacea* var. *crustacea*, we observed a similar ornamentation and morphology of the aethalium. For this reason we think that *Mucilago crustacea* var. *crustacea* and *M. crustacea* var. *solida* are synonymous taxa, as stated by Martin and Alexopoulos (1969): “the transition from the variety to the typical form is complete, so that it seems desirable to expand the definition of the species to include it”. Figs. 31–36 present the variability of sporal ornamentation of the NYBG material.



Figs. 31–36. *Mucilago crustacea* F. H. Wigg. Spore and detail of ornamentation. (31 and 32 from NYBG 12783; 33 and 34 from NYBG 2203; 35 and 36 from NYBG 4234).



Figs. 37–42. *Mucilago crustacea* F. H. Wigg. Spore and detail of ornamentation. (37 and 38 from NYBG 12785, cotype of *Spumaria alba* (Bull.) DC. var. *solida* Sturgis; 39 and 42 from AH 14117).



Figs. 43–48. *Mucilago crustacea* F. H. Wigg. — 43: Aethalium. — 44: Capillitial threads. — 45–48: Spores and detail of ornamentation. (43 from AH 20152; 44 from AH 20291; 45–47 from AH 20112; 48 from AH 20113).

However, other authors such as Lister (1925), Nannenga-Bremekamp (1991) and Neubert *et al.* (1993) maintain *Mucilago crustacea* var. *solida*, because of the structure of the aethalium, smaller spores and paler capillitium.

The collections from the deserts of Baja California Sur may represent a "Baja Californian ecotype" of *Mucilago crustacea*, characterized by its subreticulate spores with a less conspicuous ornamentation which can be observed with an optical microscope using phase-contrast and with SEM (Figs. 43–48). Some new collections from ecologically similar areas would be needed to support the concept of the name variety of *Mucilago crustacea*.

Mucilago crustacea var. *dictyospora* has been described from Bolivia (*see next species*), and it also presents the conspicuous spore reticulation. We compared its type with the samples from Baja California that have reticulated spores. Nevertheless, we appreciate that the sporal ornamentation of the type from Bolivia is totally different from *Mucilago crustacea* s. lato, and from the samples of Baja California, and it represents a different taxon.

Locality (Lizárraga *et al.* 1999): 27.

Mucilago dictyospora (R. E. Fr.) Lizárraga, G. Moreno & Illana, *comb. & stat. nov.* (Figs. 49–54)

Spumaria alba var. *dictyospora* N. E. Fr., Ark. Bot. 1: 66. 1903. — Type: Bolivia. Tarija Sv. Chaco-Cordillera, on remains of *Opuntia* sp., 15.II.1902, R. E. Fries, S 96/103 (S).

The type material consists of three well conserved aethalia of 3.5–6.2 × 1–2.4 cm, and 0.6–0.8 cm tall. The peridium is hardly conserved, whitish in colour; abundant crystals of calcium carbonate are present. Capillitium is abundant, filaments forming an internal net of variable morphology, hyaline to light greyish with nodules. Spores 12–15 µm diam. (including the ornamentation), black in mass, dark brown in transmitted light, polyhedral to more rarely globose, reticulate and warted. With SEM the ornamentation is formed by a well formed and irregular reticulum with smaller ridges or reticulum and more or less complete in its interior.

Mucilago dictyospora differs from *Mucilago crustacea* by its spore ornamentation with SEM

(Figs. 32–49), and its habitat on *Opuntia* spp.

Mucilago crustacea var. *dictyospora* was mentioned in the works of Lister (1925), Martin and Alexopoulos (1969), Nannenga-Bremekamp (1991) and Neubert *et al.* (1995). Nevertheless, we are not aware of any recent detailed study of the type material of Fries (1903), so the material of the above mentioned authors should be reviewed.

Perichaena chryosperma (Curr.) Lister (Figs. 55–59)

Monogr. Mycetozoa 196. 1894.

The main characteristics of *Perichaena chryosperma* are its pulvinate sporocarps or reniform or ring-shaped plasmodiocarps, and capillitium with long spines. With SEM the capillitium is ornamented with long spines and alveoli covering the entire surface. The spore ornamentation is pilate. Our observations with SEM coincide with those of Rammeloo (1984), except that his SEM studies show the sporal ornamentation to be denser and have pila which are wider.

Perichaena chryosperma is a common species in Mexico.

Localities (Lizárraga *et al.* 1999): 18, 19, 30.

Perichaena depressa Lib. (Figs. 60–63)

Pl. Crypt. Arduenna 4: 378. 1837.

With SEM the capillitium has an ornamentation with irregular reticulum; the spore ornamentation is regularly pilate.

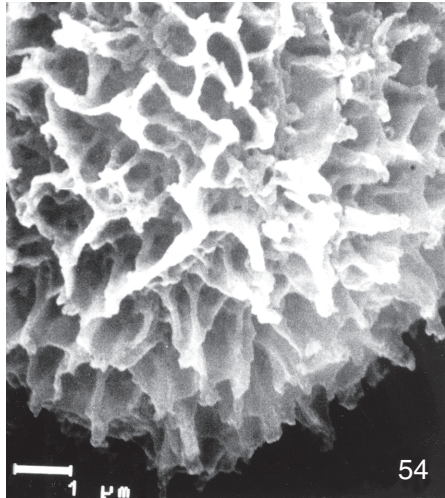
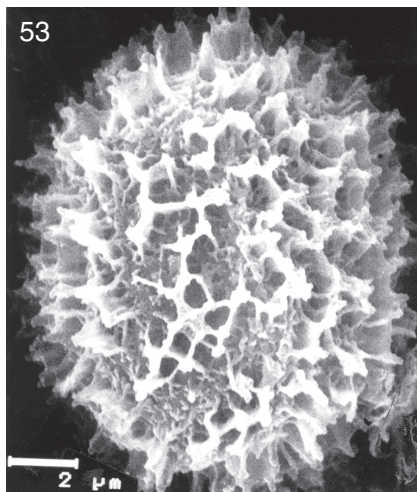
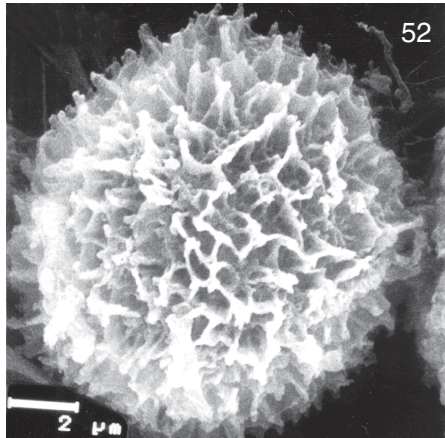
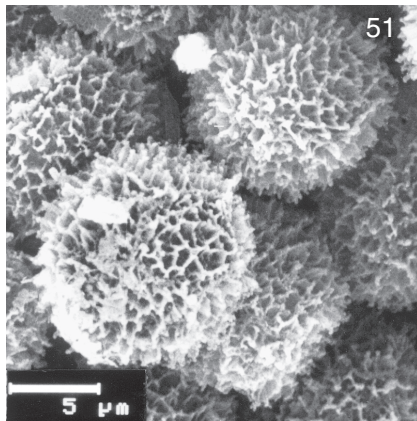
Perichaena depressa is common in Mexico. It is characterized by its sessile, depressed and flattened sporocarps.

Locality (Lizárraga *et al.* 1999): 2.

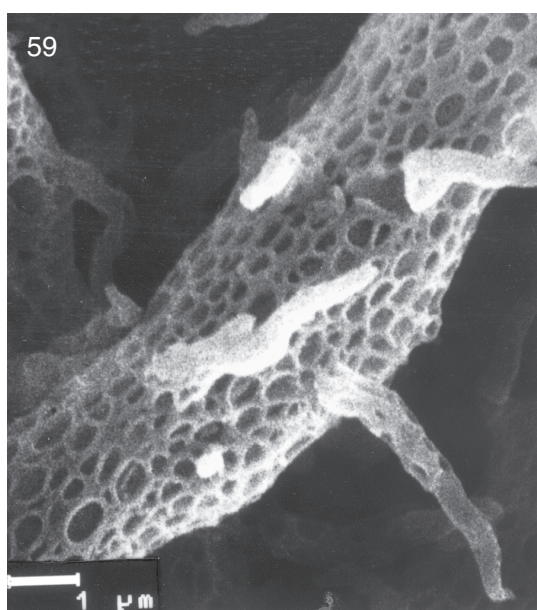
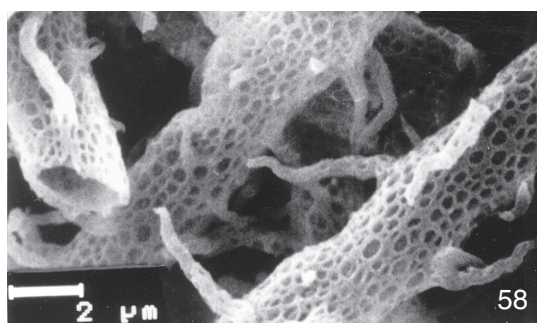
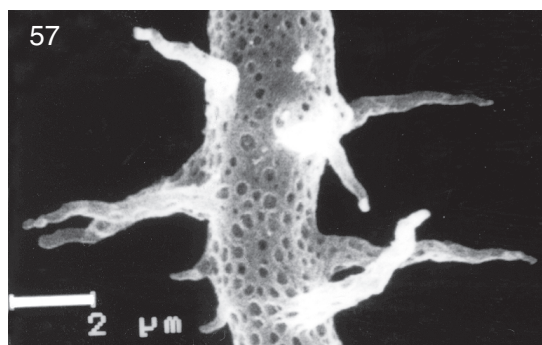
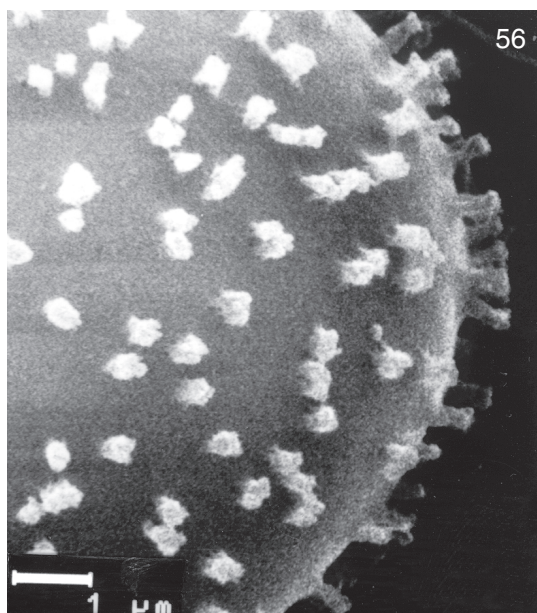
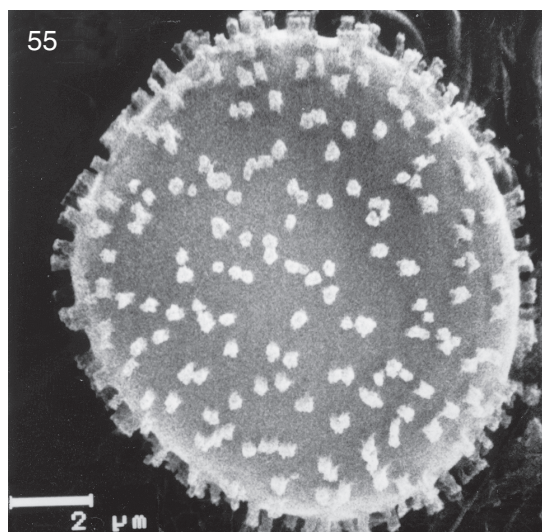
Perichaena vermicularis (Schwein.) Rostaf. (Figs. 64–67)

Eluzowce Monogr. Suppl. 34. 1876.

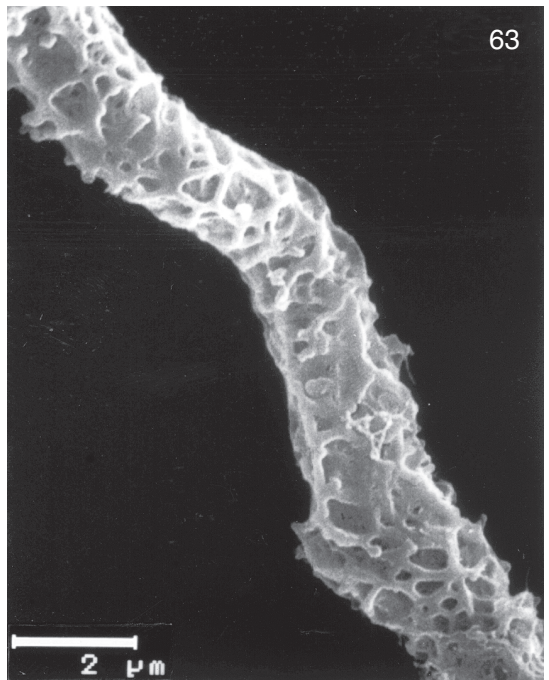
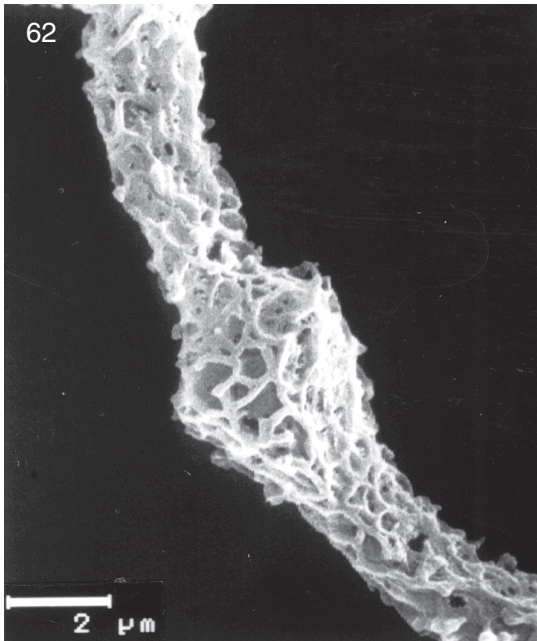
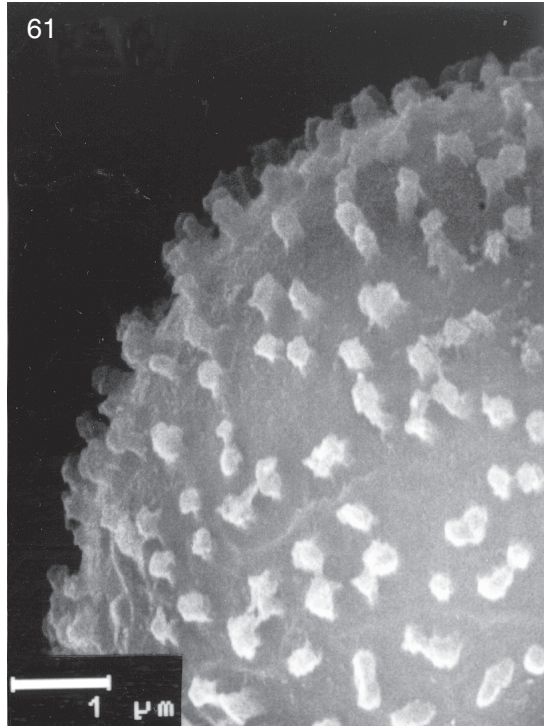
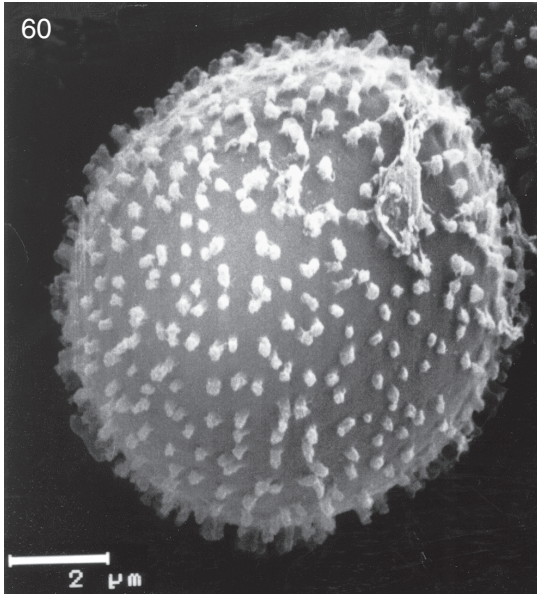
Perichaena vermicularis is macroscopically characterized by its sessile, vermiform to ring-shaped plasmodiocarps. With SEM the capillitial surface is perforated and warted. The spore or-



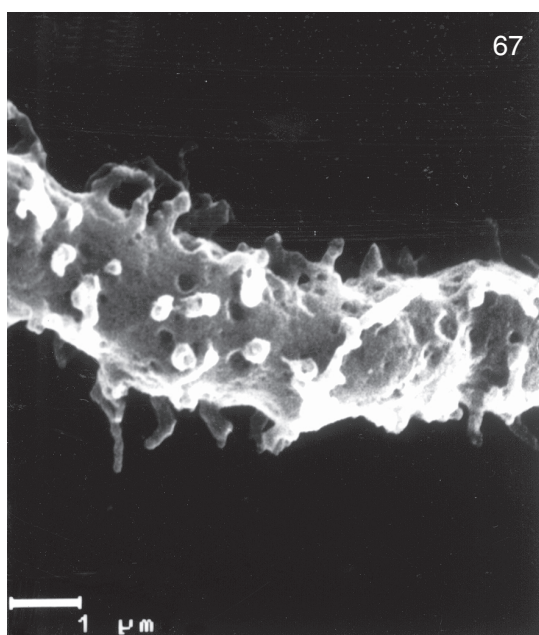
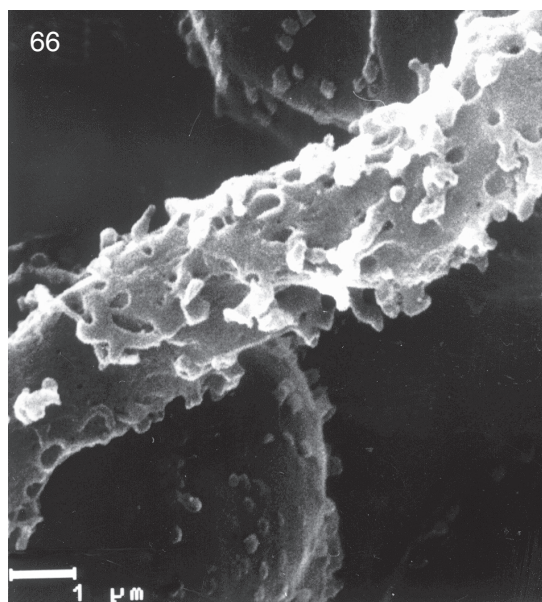
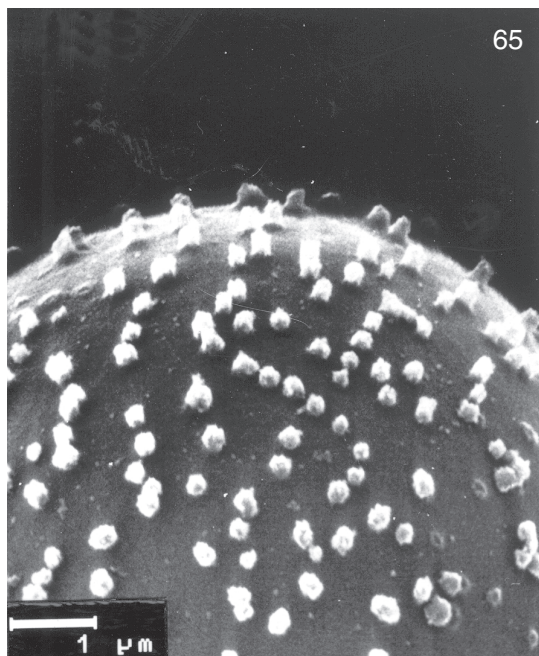
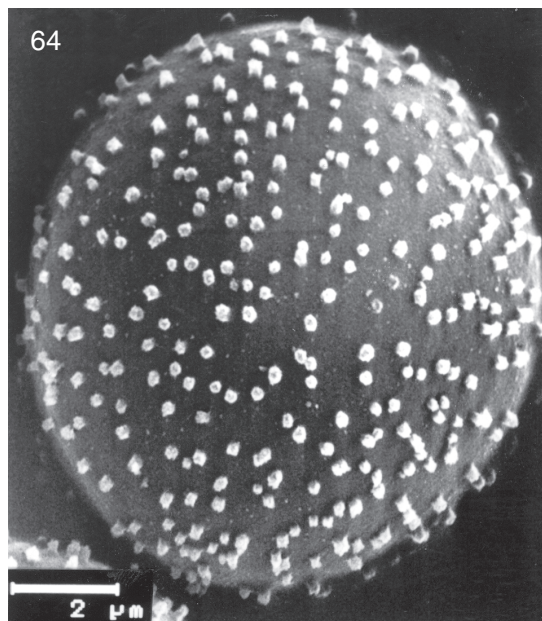
Figs. 49–54. *Mucilago dictyospora* (R. E. Fr.) Lizárraga, G. Moreno & Illana (S 96/103, S). — 49: Aethalia. — 50: Capillitial threads. — 51–54: Spores and detail of ornamentation.



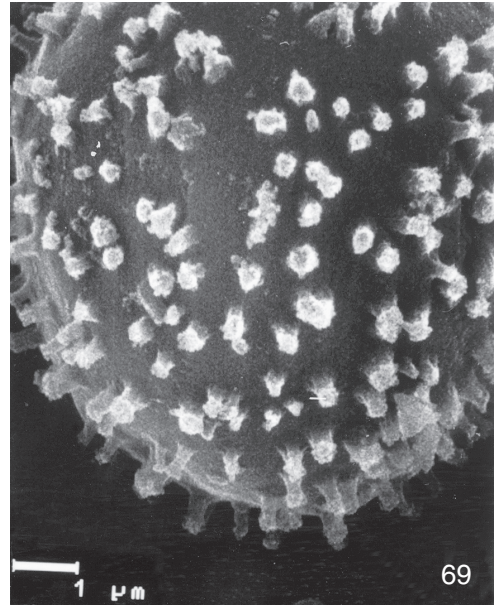
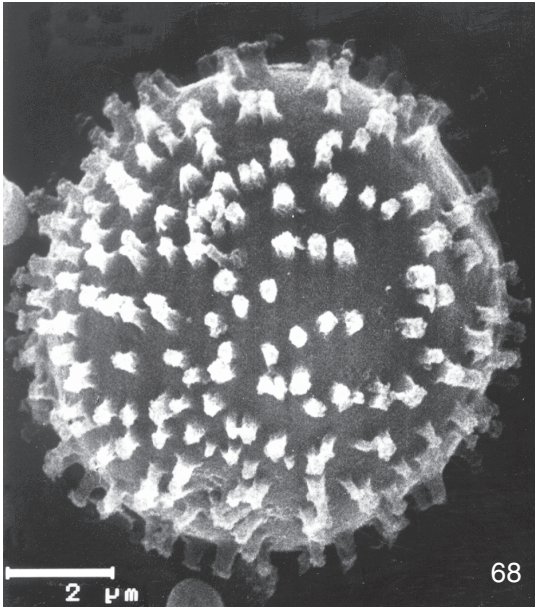
Figs. 55–59. *Perichaena chrysosperma* (Curr.) G. Lister (AH 16046). — 55 and 56: Spore and detail of ornamentation. — 57–59: Capillitial threads.



Figs. 60–63. *Perichaena depressa* Lib. (AH 20163). — 60 and 61: Spore and detail of ornamentation. — 62 and 63: Capillitial threads.



Figs. 64–67. *Perichaena vermicularis* (Schwein.) Rostaf. (AH 16010). — 64 and 65: Spore and detail of ornamentation. — 66 and 67: Capillitial threads.



Figs. 68 and 69. *Physarum bitectum* G. Lister. Spore and detail of ornamentation (AH 18467).

ornamentation is regularly baculate.

Perichaena vermicularis has been reported from the states of Baja California (Villarreal 1990) and Veracruz (López *et al.* 1981).

Locality (Lizárraga *et al.* 1999): 11.

***Physarum bitectum* G. Lister (Figs. 68 and 69)**

in Lister, Monogr. Mycetozoa, ed. 2: 78. 1911.

Physarum bitectum is difficult to separate from *P. bivalve* Pers., and they could simply be two varieties of the same taxon. In this work we ascribe to *P. bitectum* the samples with the following characteristics: subglobose to regularly elongated sporocarps (1–10 × 0.4–1 mm); double peridium, whitish calcareous exoperidium, and greyish, membranous endoperidium; irregular dehiscence, different from the longitudinal dehiscence along the apex as in *Physarum bivalve* (although some sporocarps in the same fructification are intermediate and similar to those of *P. bivalve*); capillitium of hyaline threads with white, triangular to rhomboid nodules; spores (8–)9–10(–12) μm diam., dark in mass, violaceous by transmitted light with a clearer zone, warted. With SEM the

spores have pila with a wide base and irregular apex.

Physarum bitectum was previously reported from Mexico from the state of Jalisco by Keller and Braun (1977).

Localities (Lizárraga *et al.* 1999): 1, 2, 8, 10, 12, 13, 18, 20.

***Physarum compressum* Alb. & Schwein. (Figs. 70 and 71)**

Consp. Fung. Lusat. 97. 1805.

Physarum compressum can be recognized by its stipitate white, laterally flattened sporocarps (sometimes plasmodiocarpous), and capillitium with small lime nodes. With SEM the spore ornamentation is spiny.

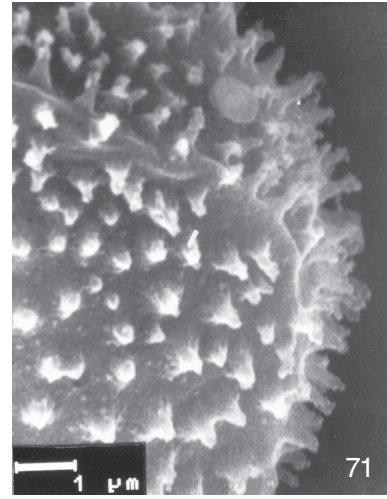
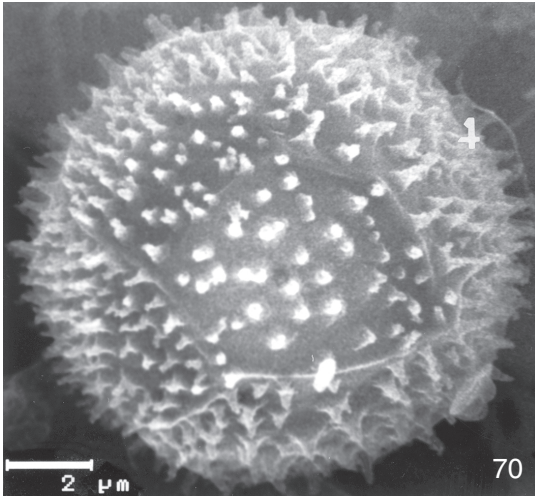
Physarum compressum is widely distributed in Mexico.

Localities (Lizárraga *et al.* 1999): 29, 30.

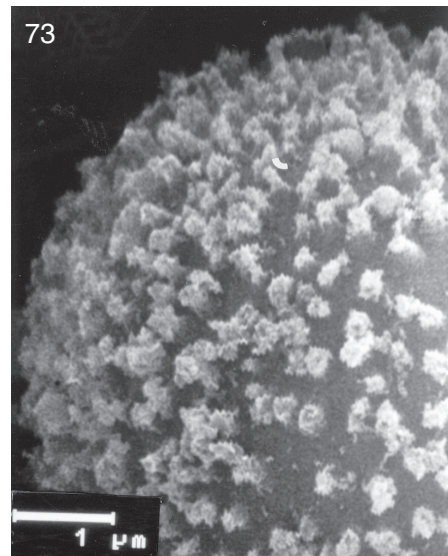
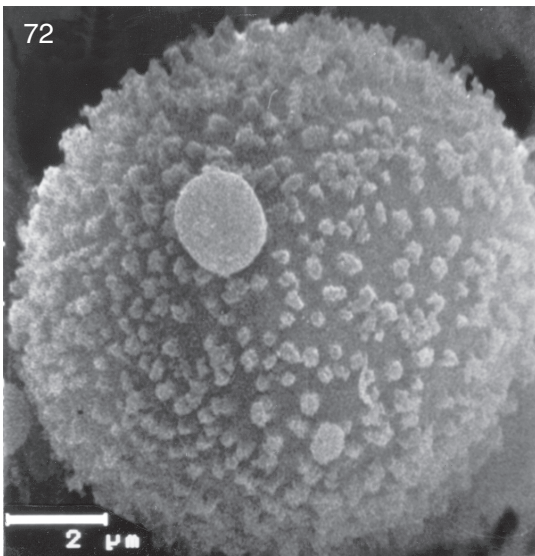
***Physarum contextum* (Pers.) Pers. (Figs. 72 and 73)**

Syn. Meth. Fung. 168. 1801.

Sporocarps subglobose to reniform or small



Figs. 70 and 71. *Physarum compressum* Alb. & Schwein. Spore and detail of ornamentation (AH 20076).

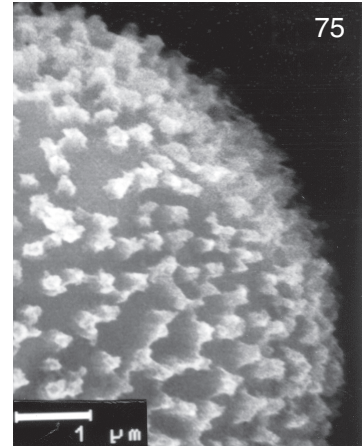
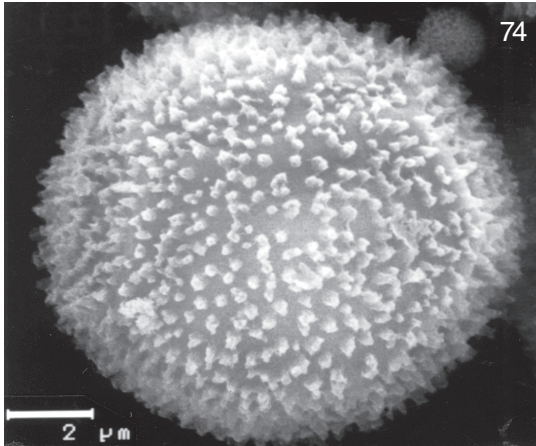


Figs. 72 and 73. *Physarum contextum* (Pers.) Pers. Spore and detail of ornamentation (AH 15989).

crowded plasmodiocarps, sessile, 0.2–1 mm diam. Hypothallus inconspicuous. Peridium double, the outer layer thick, calcareous, yellow or pale ochraceous, the inner layer membranous, whitish. Dehiscence irregular. Columella absent. Capillitium with white irregular lime nodes connected by hyaline threads. Spores (10–)11–12(–13) μm diam., globose, black in mass, dark purple-brown in transmitted light, paler on one side, warted. With SEM the spores have dense irregular warts.

Physarum contextum is a new record for Mexico.

Mexican specimens examined. — Baja California: On leaves of *Quercus agrifolia*, San Antonio de las Minas, Ensenada, 14.III.1990, G. Moreno, N. Ayala & C. Ochoa (AH 12636). On leaves of *Quercus agrifolia*, San José de la Zorra, Valle de Guadalupe, Ensenada, 16.III.1990, G. Moreno, N. Ayala & C. Ochoa (AH 12639, 20374). On leaves of *Quercus agrifolia*, Las Chichiuas, Ensenada, 10.II.1993, G. Moreno & C. Illana (AH 15989, 18633, 20368).



Figs. 74 and 75. *Physarum didermoides* (Pers.) Rostaf. Spore and detail of ornamentation (AH 20010).

Physarum didermoides (Pers.) Rostaf. (Figs. 74 and 75)

Eluzowce Monogr. 97. 1874.

Macroscopically, *Physarum didermoides* can be recognised by its large fruitings of crowded sporocarps, double peridium, the outer layer being smooth and encrusted with white lime, a membranous stalk and black spore-mass. With SEM the spore ornamentation has dense bacula, united at their bases.

Authors such as Martin and Alexopoulos (1969), Farr (1976), Nannenga-Bremekamp (1991) and Neubert *et al.* (1995) give spore measurements of about 12–15 μm , larger than those found by us. Our measurements of 10–12 μm , however, coincide with those of Lister (1925) and Emoto (1977). In some material from the state of Veracruz, Villarreal (1983) measured spores of 9–15.5 μm diam.

Physarum didermoides was first recorded from Mexico in the states of Nuevo León (Gómez-Sánchez & Castillo 1981) and Veracruz (Villarreal 1983, Ogata *et al.* 1996).

Locality (Lizárraga *et al.* 1999): 29.

Physarum leucopus Link (Figs. 76 and 77)

Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 3: 27. 1809.

Physarum leucopus is easily recognized by the habit of its sporocarps, closely resembling those of *Didymium squamulosum* (Alb. & Schwein.) Fr. because of the white calcareous stalks. *Physarum leucopus*, however, has a physaroid capillitium and the peridial lime is not crystalline. With SEM the spore ornamentation has scattered baculae with irregular apices.

Physarum leucopus was first recorded from Mexico in the State of Veracruz by Villarreal (1985).

Locality (Lizárraga *et al.* 1999): 29.

Physarum nutans Pers. (Figs. 78 and 79)

Ann. Bot. (Usteri) 15: 6. 1795.

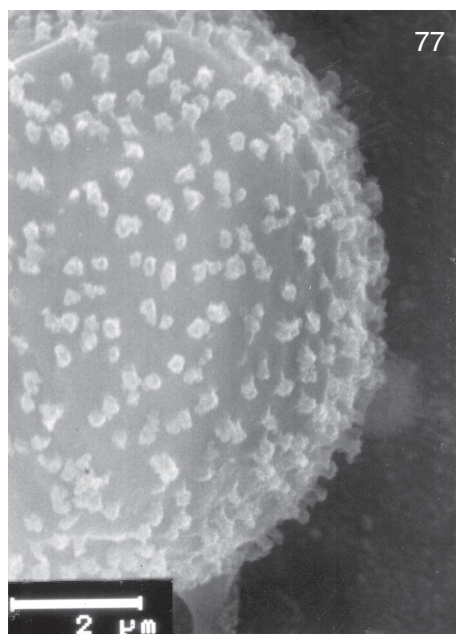
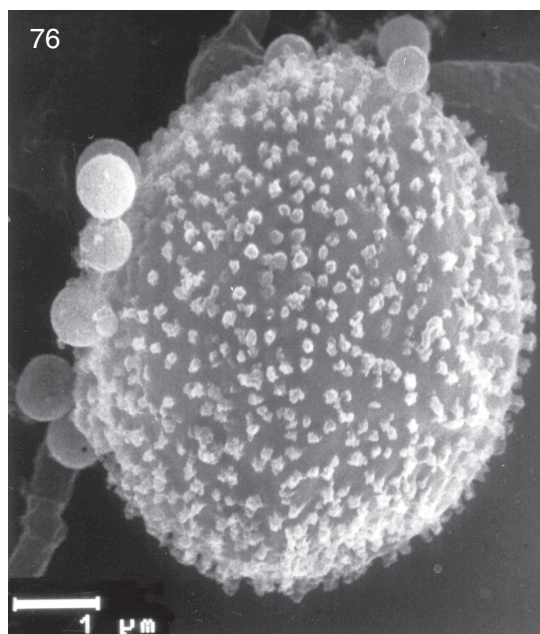
Physarum nutans is a common species easy to recognize and widely distributed in Mexico. With SEM the spore ornamentation has pila sometimes united to form small crests.

Localities (Lizárraga *et al.* 1999): 9, 13.

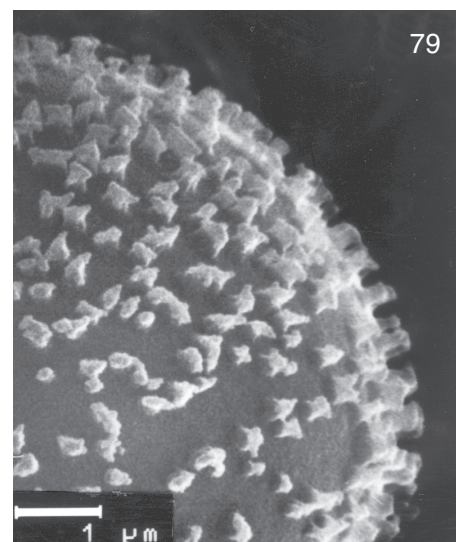
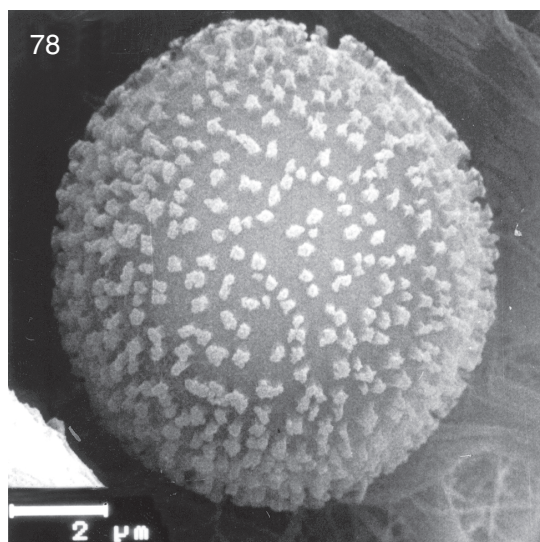
Physarum viride (Bull.) Pers. var. *aurantium* (Pers.) G. Lister (Figs. 80 and 81)

Monogr. Mycetozoa 47. 1894.

Sporocarps gregarious, stalked, lenticular or subglobose, 1–2 \times 0.3–0.5 mm. Stalk 0.6–1.2 mm



Figs. 76 and 77. *Physarum leucopus* Link. Spore and detail of ornamentation (AH 20035).

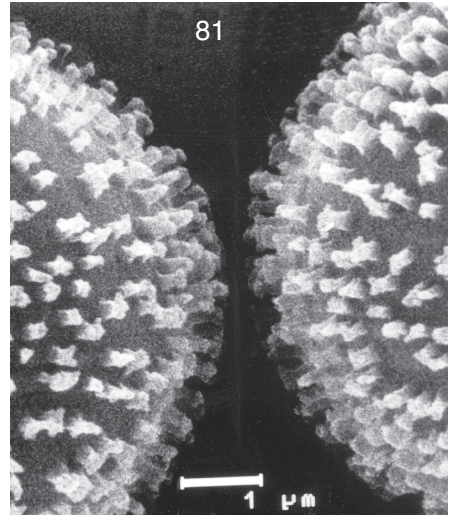
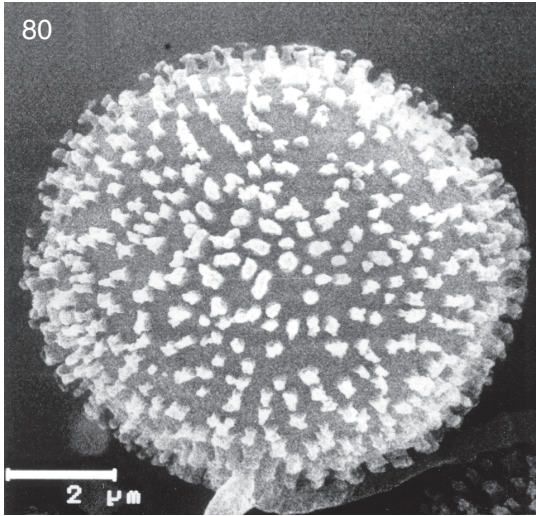


Figs. 78 and 79. *Physarum nutans* Pers. Spore and detail of ornamentation (AH 17125).

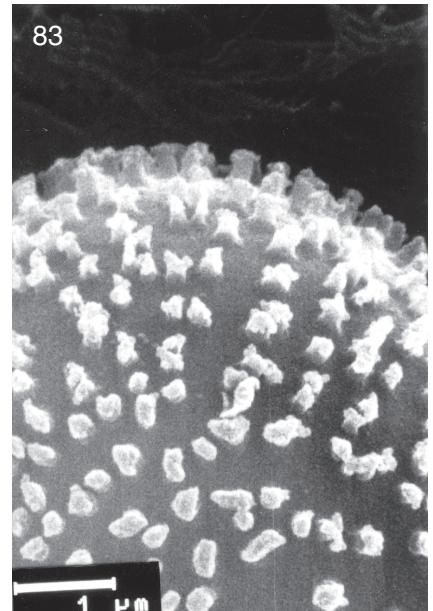
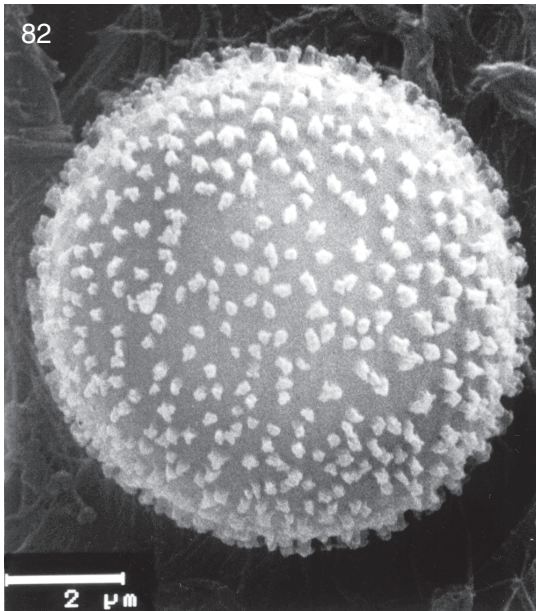
long, tapering upwards, longitudinally striate, dark. Peridium single, delicate, encrusted with orange lime scales. Dehiscence irregular, petaloid. Columella absent. Capillitium dense, the lime nodes orange, fusiform, connected by hyaline

threads. Spores 9–10 μm diam., globose, dark brown in mass, pale violaceous-brown in transmitted light, warted. With SEM the spore ornamentation is densely pilate.

This record is the first for Mexico.



Figs. 80 and 81. *Physarum viride* (Bull.) Pers. var. *aurantium* (Pers.) G. Lister. Spore and detail of ornamentation (AH 15987).



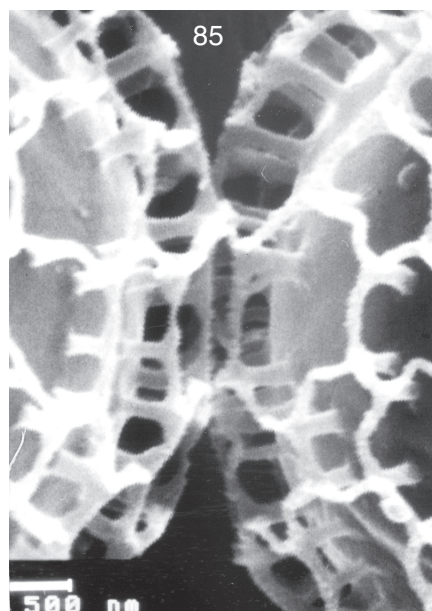
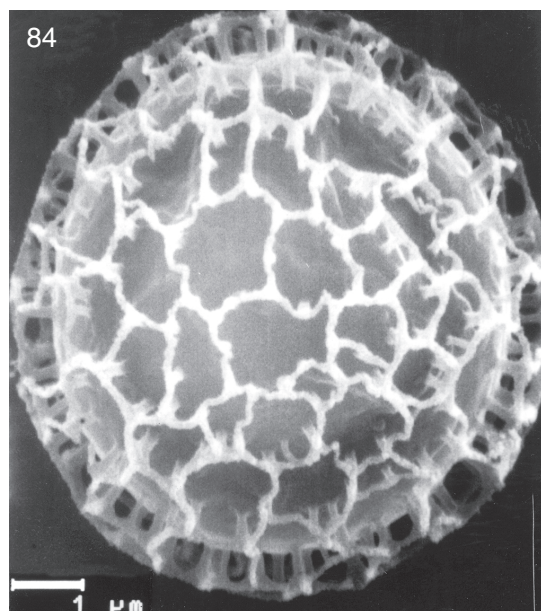
Figs. 82 and 83. *Physarum viride* var. *incanum* G. Lister. Spore and detail of ornamentation (AH 20340).

Mexican specimen examined. — Baja California: On wood of *Rhus laurina*, Las Chichiuas, Ensenada, 10.II.1993, C. Illana (AH 15987).

Physarum viride (Bull.) Pers. var. *incanum* G. Lister (Figs. 82 and 83)

Monogr. Mycetozoa: 47. 1894.

Sporocarps gregarious, stalked, subglobose to lenticular, whitish grey, 1–1.5 × 0.4–0.6 mm. Stalk 0.6–0.9 mm long, longitudinally striate, yellowish. Hypothallus hyaline, common to some sporocarps. Peridium single, dehiscence irregular, petaloid. Columella absent. Capillitium formed of pale yellow lime nodes, connected by hyaline threads. Spores 8–9 μm diam., globose, dark brown in



Figs. 84 and 85. *Stemonitis fusca* Roth. Spore and detail of ornamentation (AH 20288).

mass, pale violaceous-brown in transmitted light, darker on one side, warted. With SEM the spore ornamentation is densely pilate.

By SEM the spore ornamentation of *Physarum viride* var. *aurantium* and *P. viride* var. *incanum* are similar. Recently, some photographs of these taxa were provided by Neubert *et al.* (1995).

This is the first record for Mexico.

Mexican specimens examined. — Baja California: On wood of *Rhus laurina* and *R. integrifolia*, 14 km of the Tijuana beach-Rosarito toll highway, Tijuana, 18.II.1996, *M. Lizárraga* (AH 20339, 20340).

Stemonitis fusca Roth (Figs. 84 and 85)

Bot. Mag. (Römer & Usteri) 1(2): 26. 1788.

Stemonitis nigrescens Rex, Proc. Acad. Nat. Sci., Philadelphia: 43: 392 1891. — *S. fusca* var. *nigrescens* (Rex) Torrend, Brotéria, Sér. Bot. 7: 8 1908.

We follow the species concept of Castillo *et al.* (1997). With SEM the spore ornamentation presents a reticulum formed by perforated walls (perforated muri, Rammeloo 1975a), a few pillars supporting the perforated muri slightly exceeding the surface of the wall.

Stemonitis fusca is common in Mexico. Recently it was reported from the States of Tlaxcala

(Rodríguez-Palma & Estrada-Torres 1996) and Hidalgo (Ogata *et al.* 1996).

Locality (Lizárraga *et al.* 1999): 30.

Stemonitis splendens Rostaf. (Figs. 86 and 87)

Œluzowce Monogr. 195. 1874.

Stemonitis splendens is distinguished by its dark purplish brown, gregarious sporocarps, and a capillitial net with few main branches. With SEM the spore ornamentation is baculate.

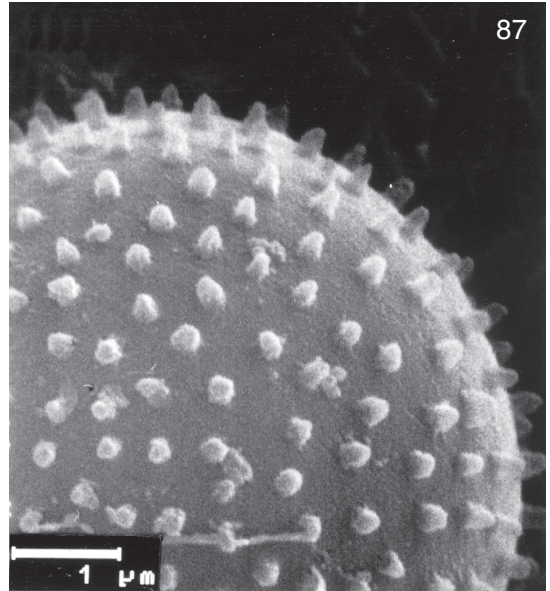
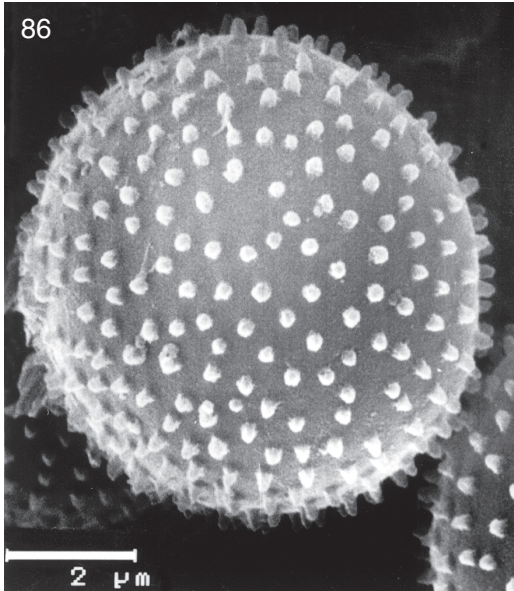
This species is widely distributed in Mexico. Recently reported from the states of Tlaxcala (Rodríguez-Palma & Estrada-Torres 1996) and Veracruz (Ogata *et al.* 1996).

Localities (Lizárraga *et al.* 1999): 2, 9, 13, 24, 25, 27, 29.

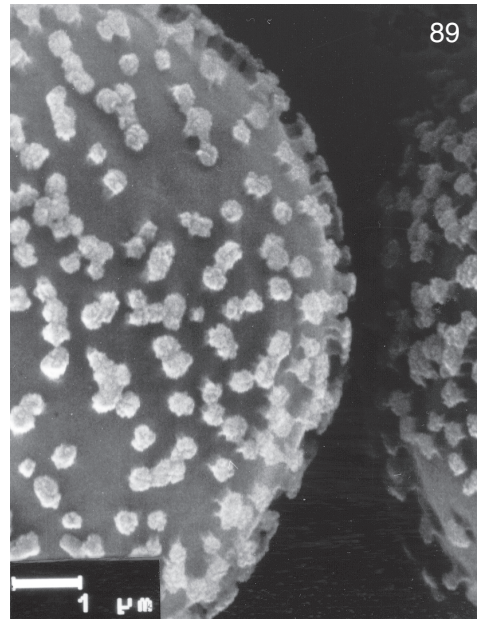
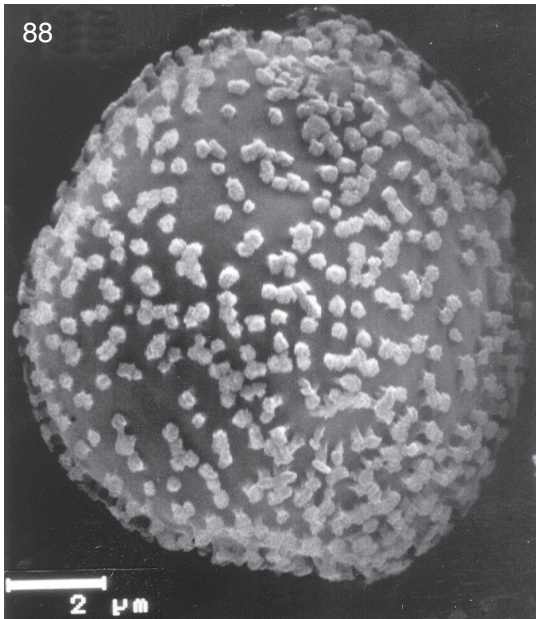
Trichia varia (J. F. Gmelin) Pers. (Figs. 88–93)

Neues Mag. Bot. 1: 90. 1794.

Trichia varia can easily be recognized macroscopically by its sessile or short stalked sporocarps. With SEM the capillitium has 1–2 spirals and pointed free ends; and the spore ornamenta-



Figs. 86 and 87. *Stemonitis splendens* Rostaf. Spore and detail of ornamentation (AH 17098).



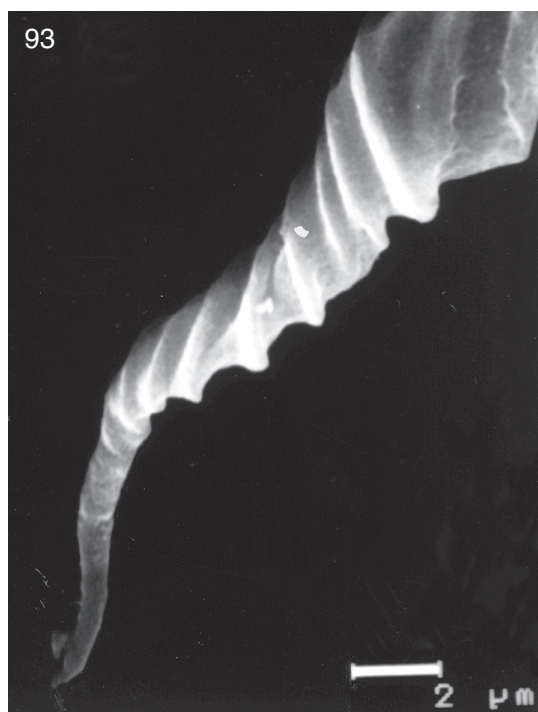
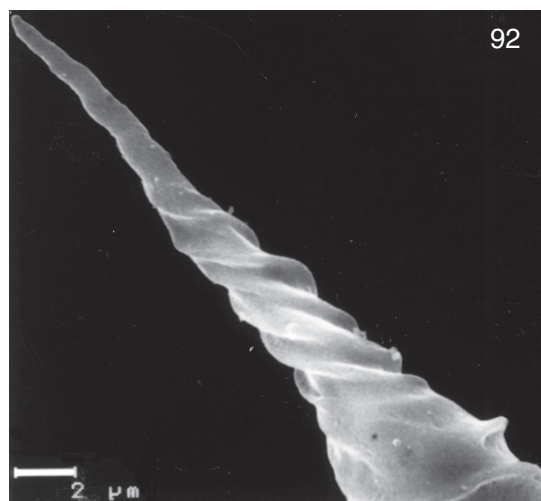
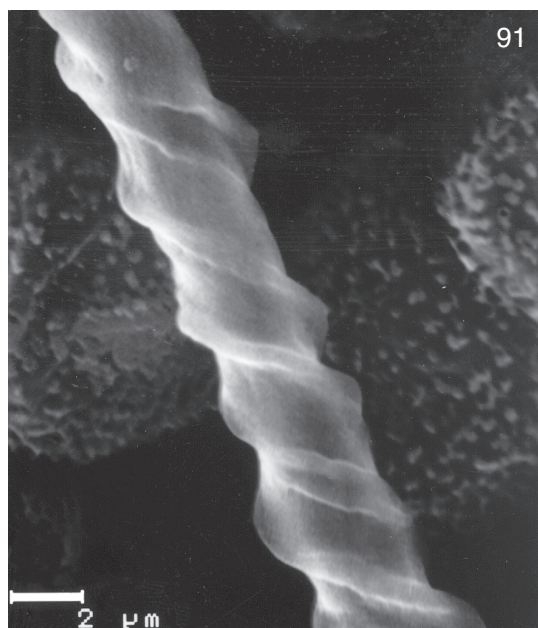
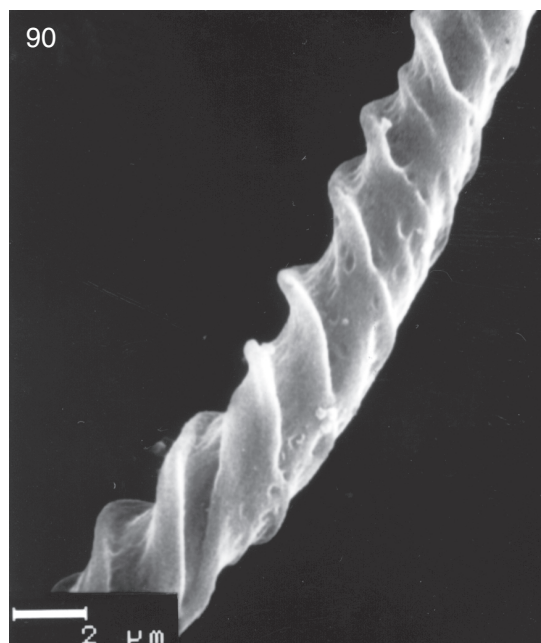
Figs. 88 and 89. *Trichia varia* (Pers. ex J. F. Gmelin) Pers. (AH 17135). Spore and detail of ornamentation.

tion has pila which are sometimes united.

This species has been reported from Mexico in the states of Veracruz (Braun & Keller 1976) and Jalisco (Trujillo *et al.* 1986).

Locality (Lizárraga *et al.* 1999): 11.

Acknowledgements: This work was made possible through the research project included in the "Programa de Cooperación con Iberoamérica, Ministerio de Educación y Ciencia, Subdirección General de Cooperación Internacional", Spain, and project DGICYT PB 95-0129. M. Lizárraga wishes to express his gratitude to the "Consejo Nacional de Ciencia y



Figs. 90–93. *Trichia varia* (Pers. ex J. F. Gmelin) Pers. (AH 17135). Capillitial threads.

Tecnología (CONACYT)" of Mexico for granting a fellowship to undertake a Ph.D. thesis on the Myxomycetes of Baja California. Also to the authorities of the "Facultad de Ciencias, Universidad de Baja California" for their continuous encouragement and support. Dr. G. Moreno and Dr. C. Illana thank the Universidad de Alcalá de Henares

for financing a brief stay at the "Universidad Autónoma de Baja California". We wish to thank J. A. Pérez and A. Priego (Servicio de Microscopía electrónica, Universidad de Alcalá) for their invaluable help with the SEM. We express our gratitude to Dr. G. Ruíz Campos and E. J. Torres for their collaboration in the collection of specimens, to the curators

of herbaria AH, MA-FUNGI, NY, NYBG, S, and Mr. D. W. Mitchell (U.K.), Mr. W. Nowotny and Mr. H. Neubert (Germany) for the loan of exsiccatae. We express our gratitude also to Mr. K. L. Braun and Mr. D. W. Mitchell for the revision of the manuscript.

REFERENCES

- Braun, K. L. & Keller, H. W. 1976: Myxomycetes of México. I. — *Mycotaxon* 3: 297–317.
- Castillo, A., Moreno, G., Illana, C. & Lago, J. 1997: A critical study of some Stemonitales (Myxomycetes). I. — *Mycol. Res.* 101: 1329–1340.
- Emoto, Y. 1977: *The Myxomycetes of Japan*. — Sangyo Tosho Publishing Co., Tokyo. 263 pp.
- Farr, M. L. 1976: Myxomycetes. — *Flora Neotropica* 16: 1–304. Cramer, New York.
- Flatau, L. 1990: Die Gattung *Hemitrichia* in Deutschland. — *Beitr. Kenntn. Pilze Mitteleuropas* 6: 57–78.
- Fries, R. E. 1903: Myxomyceten von Argentinien und Bolivia. — *Arkiv für Botanik* 1: 57–70.
- Gómez-Sánchez, A. & Castillo, J. 1981: Estudio sobre los Myxomycetes del Estado de Nuevo León. — *Bol. Soc. Mex. Mic.* 15: 199–224.
- Keller, H. W. & Braun, K. L. 1977: Myxomycetes of Mexico, II. — *Bol. Soc. Mex. Mic.* 11: 163–180.
- Lado, C. 1997: *Flora Mycologica Iberica vol. 2. Myxomycetes, I*. — Real Jardín Botánico de Madrid. 323 pp.
- Lister, G. 1925: *A monograph of the Mycetozoa*. — British Mus., London. 302 pp.
- Lizárraga, M., Illana, C. & Moreno, G. 1999a: SEM studies of the Myxomycetes from the Peninsula of Baja California (Mexico), I. *Arcyria* to *Fuligo*. — *Ann. Bot. Fennici* 35: 287–306.
- Lizárraga, M., Illana, C. & Moreno, G. 1999b: First records of Myxomycetes in the state of Sinaloa, Mexico. — *Micologia e Vegetazione Mediterranea* 13: 167–176.
- López, A., Villarreal, L. & Sosa, A. 1981: Estudios sobre los Myxomycetes del Estado de Veracruz, III. — *Bol. Soc. Mex. Mic.* 16: 77–94.
- Martin, G. W. & Alexopoulos, C. J. 1969: *The Myxomycetes*. — Univ. Iowa Press, Iowa City. 561 pp.
- Nannenga-Bremekamp, N. E. 1991: *A guide to temperate Myxomycetes*. — Biopress Ltd., Bristol. 409 pp.
- Neubert, H., Nowotny, W. & Baumann, K. 1993: *Die Myxomyceten*. Band 1. — Karlheinz Baumann Verlag, Gomeriingen. 343 pp.
- Neubert, H., Nowotny, W., Baumann, K. & Marx, H. 1995: *Die Myxomyceten*. Band 2 Physarales. — Karlheinz Baumann Verlag, Gomeriingen. 368 pp.
- Ogata, N., Rico-Gray, V. & Nestel, D. 1996: Abundance, richness and diversity of Myxomycetes in a neotropical forest ravine. — *Biotropica* 28: 627–635.
- Rammeloo, J. 1975a: Structure of the epispore in the Stemonitales (Myxomycetes) as seen with the scanning electron microscope. — *Bull. Jard. Bot. Nat. Belgique* 45: 301–306.
- Rammeloo, J. 1975b: Morphology and structure of *Hemitrichia calyculata* (Speg.) Farr and *H. clavata* (Pers.) — *Biol. Jaarb.* 43: 228–232.
- Rammeloo, J. 1981: Trichiales (Myxomycetes). — In: *Flore illustrée des champignons d'Afrique Centrale, fascicules 8–9*: 135–169. Ministère de l'Agriculture, Jardin Bot. Nat. Belgique, Meise.
- Rammeloo, J. 1984: *Icones Mycologicae 55–74*. — Jardin Bot. Nat. Belgique, Meise.
- Rodríguez-Palma, M. & Estrada-Torres, A. 1996: Some Stemonitales (Myxomycetes) from the State of Tlaxcala, Mexico. — *Mycotaxon* 60: 79–102.
- Trujillo, F., Castañeda, M. & Guzmán-Dávalos, L. 1986: Hongos del Estado de Jalisco, VI. Los Myxomycetes conocidos. — *Tiempos de Ciencia* 5: 42–50.
- Villarreal, L. 1983: Algunas especies de Myxomycetes no registradas del Estado de Veracruz. — *Bol. Soc. Mex. Micol.* 18: 153–164.
- Villarreal, L. 1985: Nuevos registros de Myxomycetes en el Estado de Veracruz. — *Rev. Mex. Micol.* 1: 363–377.
- Villarreal, L. 1990: Estudios sobre los Myxomycetes de México, I. Nuevos registros. — *Micol. Neotrop. Apl.* 3: 67–79.
- Yamamoto, Y., Hagiwara, H. & Sultana, K. 1993: Myxomycetes from Northern Pakistan II. — In: Nakaïke, T. & Malik, S. (eds.), *Cryptogamic flora of Pakistan* 2: 25–41. Nat. Sci. Mus., Tokyo.