

Brazilian Myxomycetes in the Herbarium of the National Science Museum, Tokyo

Yukinori Yamamoto¹, Hiromitsu Hagiwara² and Shin-ichi Kawakami³

¹1010–53, Ohtsu-ko, Kochi 781–5102, Japan

²Department of Botany, National Science Museum, Tsukuba 305–0005, Japan

E-mail: h-hagiwa@kahaku.go.jp

³Institute of Biological Sciences, University of Tsukuba, Tsukuba 305–8572, Japan

Abstract Twenty-six taxa of myxomycetes are reported from the states of São Paulo and Paraná, Brazil, on a basis of the specimens preserved in the herbarium of the National Science Museum, Tokyo (TNS). Five taxa of them, *Arcyria minuta*, *Dicetydiaethalium plumbeum* var. *entoxanthum*, *Physarum* cf. *oblatum*, *P. viride* f. *aurantium* and *Stemonitopsis typhina* var. *similis*, are new to both the states.

Key words: Brazil, myxomycetes, Paraná, São Paulo, taxonomy

A collection of 62 Brazilian myxomycete specimens is preserved in the herbarium of the National Science Museum, Tokyo (TNS). This collection, which was made by Goro Hashimoto, Shinichi Kamiya, Fumihide Okubo, Kiju Sakai and Naomi Sannomiya in the states of São Paulo and Paraná from 1938 to 1941, was presented by Goro Hashimoto to the Showa Emperor. Later on, all the specimens were identified by Shiro Koaze. But any report on the collection has not been made yet.

Brazilian myxomycetes have been comprehensively listed by Farr (1976) in her monographic study of Neotropical myxomycetes. However, there is no report on the myxomycetes collected in the states of São Paulo and Paraná as far as we know except for two papers, namely, Hashimoto (1953) and Hochgesand and Gottsberger (1996). In the present paper, we enumerate 26 taxa on a basis of the present collection. Among them, 5 taxa are newly recorded in both the states.

List of species

Forty-two specimens of the present collection are classified into 26 taxa. In the following list, these taxa are arranged alphabetically by scientific names in each order. An asterisk (*) indicates a taxon reported from both the states of São Paulo and Paraná for the first time. Some taxa are illustrated.

Ceratiomyxales

1. *Ceratiomyxa fruticulosa* (Muell.) T. Macbr., N. A. Slime-Moulds, 18, 1899.

TNS-M-R: 417 (Figueira, Guararapes, São Paulo, on dead wood. Coll. N. Sannomiya, 3 V 1939).

2. *Ceratiomyxa fruticulosa* var. *flexuosa* Lister, Mycet. ed. 2, 26, 1911. (Fig. 1)

TNS-M-R: 416 (Cantareira, Arrabalde de São Paulo, on fallen twig. Coll. G. Hashimoto, 6 XI 1938), TNS-M-R: 463 (Mogi das Cruzes, São Paulo, on dead wood. Coll. G. Hashimoto, 30 X 1938).

One of the specimens, TNS-M-R:416, has slender sporocarps than those of Lister's original description.

Liceales

3*. *Dictydiaethalium plumbeum* (Schum.) Rostaf. var. *entoxanthum* (Berk.) G. Lister, J. Linn. Soc. Bot. 46: 95, 1922. (Fig. 2)

TNS-M-R: 958 (Campos do Jordão, São Paulo, on bark of dead tree. Coll. F. Okubo, 7 VI 1940).

Specimen is in good condition. Pseudoaethalium is brown to dark brown and over 10 cm long. Threads of pseudocapillitium are yellow, thick, up to $30\ \mu\text{m}$ wide near the peridial caps, and somewhat elastic. Spores are yellow in mass, pale yellow by transmitted light, distinctly spinulose, and $9.4\text{--}10.7\ \mu\text{m}$ in diam. (mean = 10.1,

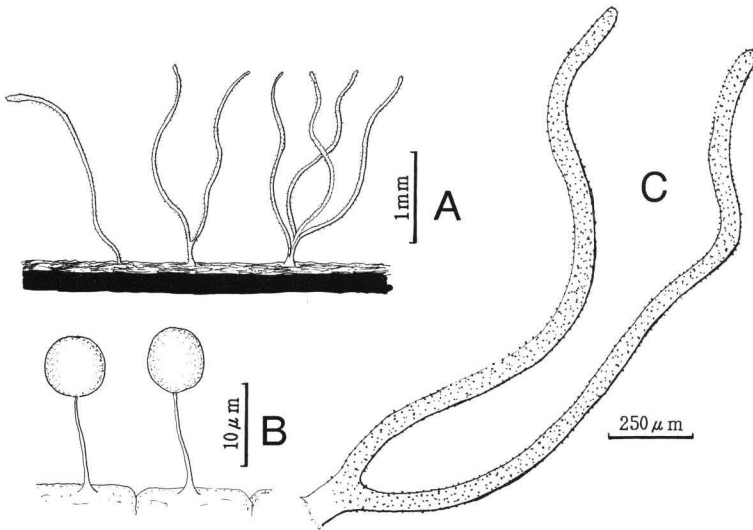


Fig. 1. *Ceratiomyxa fruticulosa* var. *flexuosa* (TNS-M-R: 416). A: Three sporophores. B: Two spores with stalks. C: Sporophore.

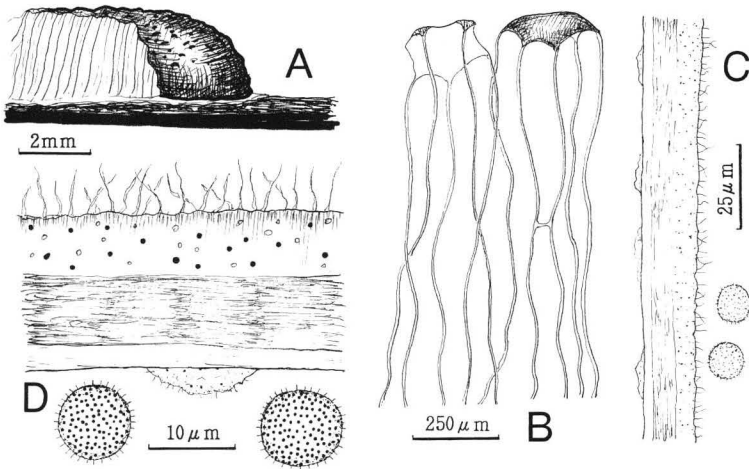


Fig. 2. *Dictydiaethalium plumbeum* var. *entoxanthum* (TNS-M-R: 958). A: Pseudoaethalium. B: Two peridial caps and pseudocapillitium. C & D: Pseudocapillitium and two spores.

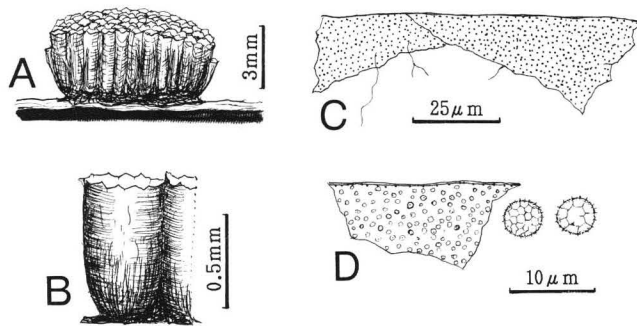


Fig. 3. *Tubifera microsperma* (TNS-M-R: 2973). A & B: Pseudoaethalium. C: Peridium and pseudocapillitium. D: Peridium and two spores.

sd=0.49, n=20) including spines which are up to $1.4 \mu\text{m}$ long.

4. *Tubifera microsperma* (Berk. & Curt.) G. W. Martin, *Mycologia*, **39**: 461, 1947. (Fig. 3)

TNS-M-R: 2973 (Cantareira, Arrabalde de São Paulo, on dead wood. Coll. G. Hashimoto, 6 XI 1938).

Specimen was identified by Koaze as *T. ferruginosa* (Batsch) J. F. Gmel., probably because it has a sessile pseudoaethalium. But *T. microsperma* is distinguishable from *T. ferruginosa* by the peridium with dense crater-like wartlets on the inner surface and the smaller spores.

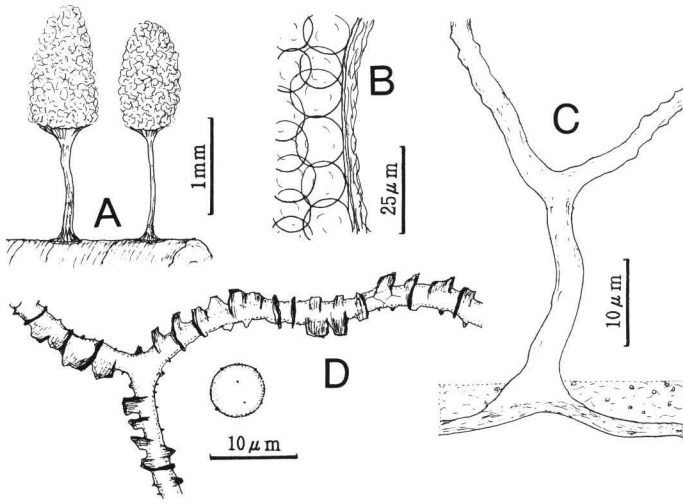


Fig. 4. *Arcyria minuta* (TNS-M-R: 22). A: Two sporocarps. B: Cysts in a stalk. C: Basal part of capillitium attached to peridium. C: Capillitium and a spore.

Trichiales

5. *Arcyria cinerea* (Bull.) Pers., Syn. Fung., 184, 1801.

TNS-M-R: 74 (Mogi das Cruzes, São Paulo, on dead wood. Coll. G. Hashimoto, 30 X 1938), TNS-M-R: 75, 77 & 78 (Cantareira, Arrabalde de São Paulo, on wood and bark of dead tree. Coll. G. Hashimoto, 6 XI 1938), TNS-M-R: 79 (Parque do Estado, São Paulo, on dead wood. Coll. G. Hashimoto, 3 XI 1938).

6. *Arcyria denudata* (L.) Wettst., Verh. Zool.-Bot. Ges. Wien, **35**: Abh. 535, 1886.

TNS-M-R: 171 (Parque do Estado, São Paulo, on fallen twig and dead wood. Coll. G. Hashimoto, 30 X 1938), TNS-M-R: 172 (Mogi das Cruzes, São Paulo, on dead wood. Coll. G. Hashimoto, 3 XI 1938), TNS-M-R: 173 (Cantareira, Arrabalde de São Paulo, on dead wood. Coll. G. Hashimoto, 6 XI 1938), TNS-M-R: 175 (Fiqueira, Guararapes, São Paulo, on bark of dead tree. Coll. G. Hashimoto, 11 IV 1939).

7. *Arcyria insignis* Kalchbr. & Cooke, in Kalchbr., Grevillea, **10**: 143, 1882.

TNS-M-R: 239 (Campos do Jordao, São Paulo, on bark of dead tree. Coll. F. Okubo, 26 IV 1939), TNS-M-R: 241 (Campos do Jordão, São Paulo, on fallen twig. Coll. K. Sakai, 17 III 1941).

8*. *Arcyria minuta* Buchet, in Pat., Mem. Acad. Malgache, **6**: 42, 1927. (Fig. 4)

TNS-M-R: 22 (Fiqueira, Guararapes, São Paulo, on fallen twig. Coll. G.

Hashimoto, 11 IV 1939).

This species is easily distinguished from its closely related species, such as *A. denudata* and *A. insignis*, by the capillitium threads with many square-ended protuberances.

9. *Arcyria obvelata* (Oeder) Onsberg, *Mycologia*, **70**: 1286, 1978.

TNS-M-R: 272 (Campos do Jordão, São Paulo, on dead wood. Coll. S. Kamiya, 18 III 1941); TNS-M-R: 304 (Urai, Paraná, on dead wood. Coll. S. Kamiya, 15 V 1939).

One of the specimens, TNS-M-R: 304, was identified by Koaze as *A. virescens* G. Lister, probably because it has long stalks and narrow calyculi. However, *A. obvelata* is different from *A. virescens* in having evenly distributed ornamentation of capillitium threads.

10. *Hemitrichia clavata* (Pers.) Rostaf. var. ***calyculata*** (Speg.) Y. Yamam., in Nakaïke & Malik, *Crypt. Fl. Pakist.* **2**: 28, 1993.

TNS-M-R: 1514 & 1515 (Parque do Estado, São Paulo, on bark of dead tree. Coll. G. Hashimoto, 3 XI 1938), TNS-M-R: 1516 (Figueira, Guararapes, São Paulo, on dead wood. Coll. N. Sannomiya, 3 V 1939).

11. *Hemitrichia serpula* (Scopoli) Rostaf., in Lister, *Mycet.*, 179, 1894.

TNS-M-R: 1571 (Figueira, Guararapes, São Paulo, on dead wood. Coll. G. Hashimoto, 5 V 1939).

12. *Metatrichia floriformis* (Schw.) Nann.-Bremek., *Proc. K. Ned. Akad. Wet. C.* **88**: 127, 1985.

TNS-M-R: 2881 (Parque do Estado, São Paulo, on bark of dead tree. Coll. G. Hashimoto, 3 XI 1938).

13. *Metatrichia vesparium* (Batsch) Nann.-Bremek., *Proc. K. Ned. Akad. Wet. C.* **69**: 348, 1966. (Fig. 5)

TNS-M-R: 1599 (Figueira, Guararapes, São Paulo, on bark of dead tree. Coll. N. Sannomiya, 28 IV 1939), TNS-M-R: 1600 (Figueira, Guararapes, São Paulo, on bark of dead tree. Coll. N. Sannomiya, 3 V 1939).

Recently Moreno, Lizarraga and Illana (1997) discussed the differences between *M. vesparium* and *M. horrida* Ing. According to them, the spines on elaters measure only 1–2 μm long in the former, and 3–5 μm long in the latter, respectively. Spines of the specimens examined measure up to 5 μm long, but other characters fit *M. vesparium*.

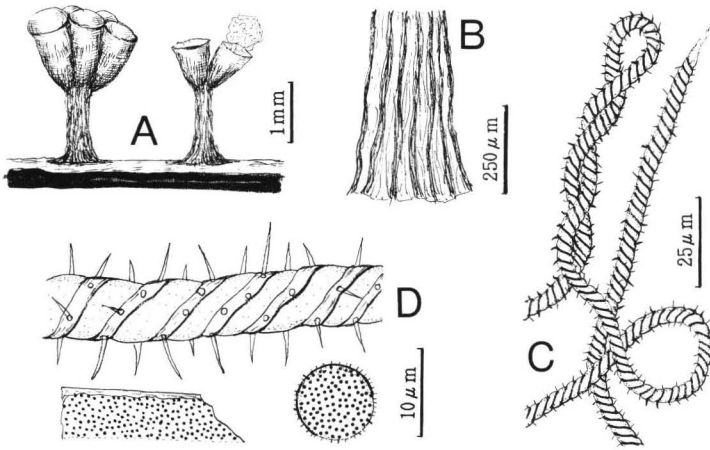


Fig. 5. *Metatrachia vesparium* (TNS-M-R: 1599). A: Two clusters of digitate sporocarps. B: Stalk. C: Capillitium. D: Capillitium, peridium and a spore.

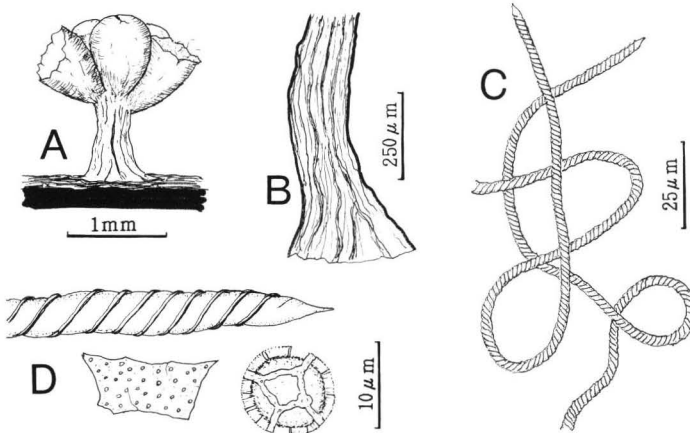


Fig. 6. *Trichia verrucosa* (TNS-M-R:2928). A: Cluster of digitate sporocarps. B: Stalk. C: Capillitium threads (elaters). D: Tip of an elater, peridium and a spore.

14. *Trichia verrucosa* Berk., in Hook. f., Fl. Tasm., 2: 269, 1859. (Fig. 6)

TNS-M-R: 2928 (Parque do Estado, São Paulo, on dead wood. Coll. G. Hashimoto, 3 XI 1938).

Specimen is very interesting for us in that its elaters have no spines on their spirals, because Japanese specimens always bear a few scattered spines on elaters (Yamamoto, 1998).

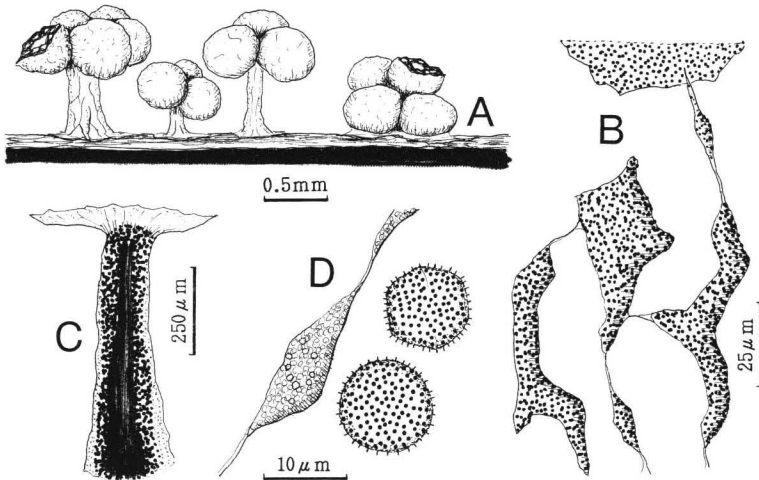


Fig. 7. *Physarum* cf. *notabile* (TNS-M-R: 334). A: Four clusters of sporocarps. B: Peridium and capillitium. C: Stalk. D: Lime node and two spores.

Physarales

15. *Didymium squamulosum* (Alb. & Schw.) Fr., *Symb. Gast.*, 19, 1818.

TNS-M-R: 1327 & 1328 (Cantareira, Arrabalde de São Paulo, on fallen leaves, Coll. G. Hashimoto, 6 XI 1938); TNS-M-R: 1329 (Boa Sorte, Lins, São Paulo, on fallen leaves, Coll. G. Hashimoto, 5 III 1941).

16. *Physarum cinereum* (Batsch) Pers., *Neues Mag. Bot.*, 1: 89, 1794.

TNS-M-R: 1980 (Campos do Jordão, São Paulo, on plant litter. Coll. G. Hashimoto, 18 III 1941).

17. *Physarum compressum* Alb. & Schw., *Consp. Fung.*, 97, 1805.

TNS-M-R: 2025 (Cantareira, Arrabalde de São Paulo, on fallen leaves and bark of dead tree. Coll. G. Hashimoto, 6 XI 1938).

18. *Physarum* cf. *notabile* T. Macbr., *N. Am. Slime-Moulds*, ed. 2, 80, 1922.

(Fig. 7)

TNS-M-R: 334 (Campos do Jordão, São Paulo, on bark of dead tree. Coll. S. Kamiya, 26 IV 1939).

Specimen was labeled by Koaze "*Badhamia conglomerata* Koaze" (*nom. herbar.*). However, it is probable that the sporocarps are aborted, because their spores are highly irregular in size and shape.

Specimen has digitate sporocarps as *P. notabile*, but their stalks and capitulum bases are calcareous and white.

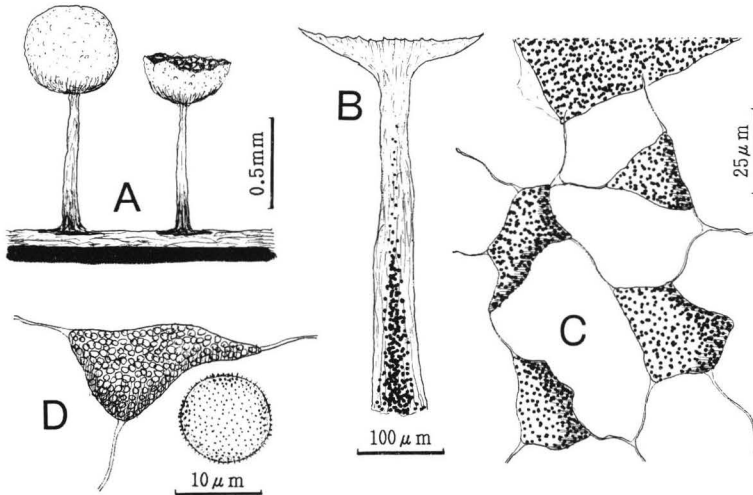


Fig. 8. *Physarum* cf. *oblatum* (TNS-M-R: 1962). A: Two stalked sporocarps. B: Stalk. C: Peridium and capillitium. D: Lime node and a spore.

19*. *Physarum* cf. *oblatum* T. Macbr., Bull. Nat. Hist. Univ. Iowa, **2**: 384, 1893.

(Fig. 8)

TNS-M-R: 1962 (Urai, Paraná, on bark of dead tree. Coll. S. Kamiya, 15 V 1939).

Specimen was identified by Koaze as *P. carneum* G. Lister & Sturgis. But the present taxon is different from *P. carneum* in having longer white limy stalks including refuse matter and larger and more delicately verruculose spores.

20. *Physarum polycephalum* Schw., Schr. Natur. Ges. Leipzig, **1**: 63, 1822. (Fig. 9)

TNS-M-R: 2230 (Campos do Jordão, São Paulo, on fallen twig. Coll. G. Hashimoto, 18 III 1941).

21*. *Physarum viride* (Bull.) Pers. f. *aurantium* (Bull.) Y. Yamam., Myxom. Biota Jpn., 495, 1998.

TNS-M-R: 2479 (Campos do Jordão, São Paulo, on bark of dead tree. Coll. G. Hashimoto, 18 III 1941).

Stemonitales

22. *Lamproderma scintillans* (Berk. & Br.) Morgan, J. Cinc. Soc. Nat. Hist., **16**: 131, 1894. (Fig. 10)

TNS-M-R: 1655 (Campos do Jordão, São Paulo, on fallen leaves. Coll. G. Hashimoto, 22 X 1938).

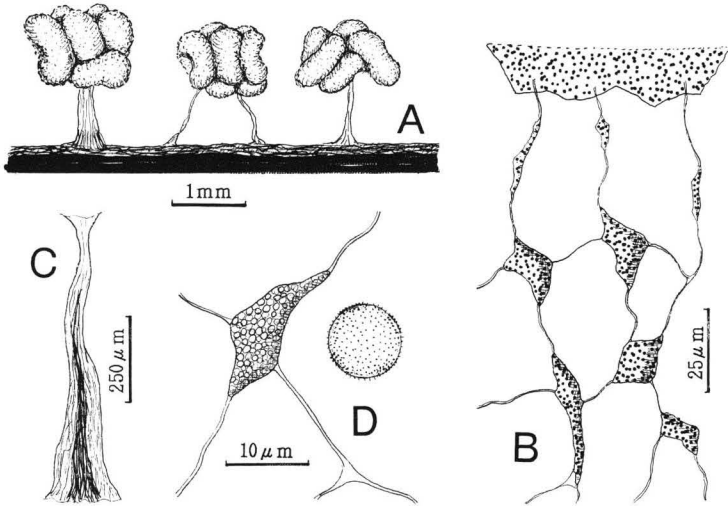


Fig. 9. *Physarum polycephalum* (TNS-M-R: 2230). A: Three clusters of sporocarps. B: Peridium and capillitium. C: Stalk. D: Lime node and a spore.

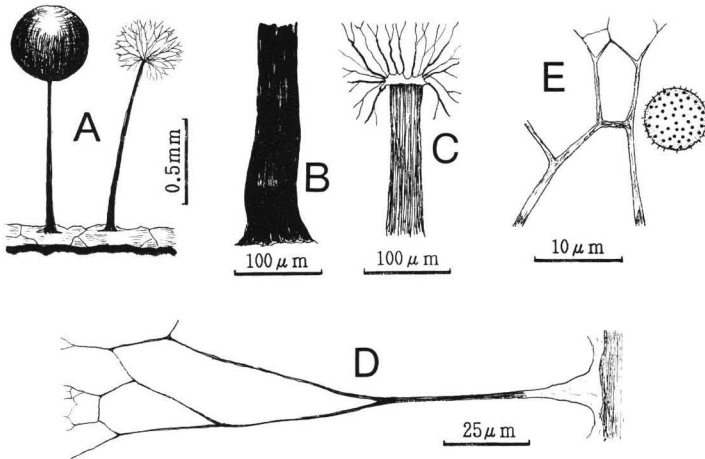


Fig. 10. *Lamproderma scintillans* (TNS-M-R: 1655). A: Two stalked sporocarps. B: Stalk. C: Tip of columella with capillitium. D: Capillitium. E: Tip of capillitium and a spore.

Specimen has truncate columella with pale membranous crest-like crown at their tips, though the present species usually forms dark clavate ones. But other characters fit *L. scintillans*.

23. *Stemonitis axifera* (Bull.) T. Macbr., N. Am. Slime-Moulds, 120, 1889.

TNS-M-R: 2553 (Campos do Jordão, São Paulo, on bark of dead tree. Coll. G. Hashimoto, 18 III 1941).

24. *Stemonitis fusca* Roth, Mag. Bot. Roemer & Usteri, 1 (2): 26, 1787.

TNS-M-R: 2618 (Cantareira, Arrabalde de São Paulo, on bark of dead tree. Coll. G. Hashimoto, 6 XI 1938).

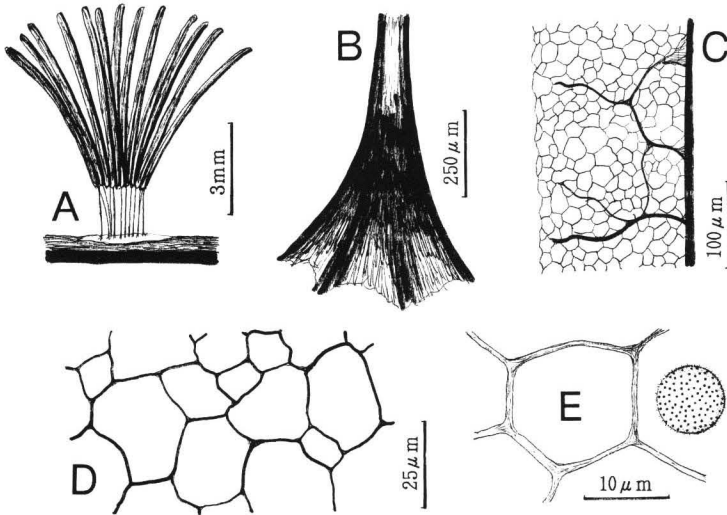


Fig. 11. *Stemonitis splendens* (TNS-M-R: 2723). A: Cluster of sporocarps. B: Stalk. C: Columella, capillitium and surface net. D: Surface net. E: Surface net and a spore.

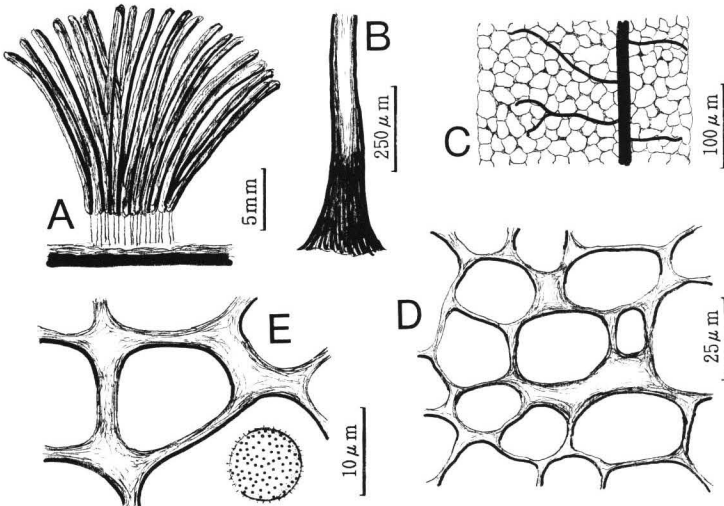


Fig. 12. *Stemonitis splendens* (TNS-M-R: 2724). A: Cluster of sporocarps. B: Stalk. C: Columella, capillitium and surface net. D: Surface net. E: Surface net and a spore.

25. *Stemonitis splendens* Rostaf., Mon., 195, 1874. (Figs. 11 & 12)

TNS-M-R: 2723 (Mogi das Cruzes, São Paulo, on dead wood. Coll. G. Hashimoto, 30 X 1938), TNS-M-R: 2724 (Urai, Paraná, on dead wood. Coll. S. Kamiya, 30 IV 1939).

One of the specimens, TNS-M-R: 2724, was identified by Koaze as *S. splendens* f. *fenestrata* Rex (*nom. illeg.*). This form is arranged in a synonymy of *S. splendens* (Yamamoto, 1998).

26*. *Stemonitopsis typhina* (Wiggers) Nann.-Bremek. var. ***similis*** (G. Lister) Nann.-Bremek. & Y. Yamam., Proc. K. Ned. Akad. Wet. C, **90**: 348, 1987.

TNS-M-R: 584 (Campos do Jordão, São Paulo, on dead wood. Coll. F. Okubo, 9 X 1940).

Specimen was identified by Koaze as *Comatricha nigra* (Pers.) Shroet. var. *aequalis* (Peck) Sturgis. The present variety is clearly distinguished from *C. nigra* var. *aequalis* by the spores with a few scattered clusters of dark warts.

Acknowledgements

We are deeply grateful to Mr. Goro Hashimoto of the Centro de Pesquisas de História Natural, São Paulo, for giving us his paper and the information on the collection sites. We also thank Dr. Hiroshi Namikawa of the National Science Museum, Tokyo, for providing us full facilities for examining the myxomycete specimens.

References

- Farr, M. L., 1976. Flora Neotropica. No. 16. Myxomycetes. 304 pp. N. Y. Bot. Garden, New York.
- Hashimoto, G., 1953. Myxomycetes da Serra do Diabo. *Revista Ceres*, **9**: 194–201.
- Hochgesand, E. and Gottsberger G., 1996. Myxomycetes from the state of São Paulo, Brazil. *Bol. Inst. Bot.*, **10**: 1–46.
- Moreno, G., Lizarraga, M. and Illana, C., 1997. *Metatrichia horrida* (Myxomycetes), an African species in the Baja California Peninsula (Mexico). *Mycotaxon*, **64**: 385–392.
- Yamamoto, Y., 1998. The Myxomycete Biota of Japan. 700 pp. Toyo Shorin Pub. Co. Ltd., Tokyo. (In Japanese)

