

## Some Zoosporic Fungi of New Zealand. XIII. Traustochytriaceae, Saprolegniaceae and Puthiaceae

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In two previous publications on the biflagellate zoosporic fungi, the author (1967 a, 1967 b) discussed the species of the Plasmodiophoraceae, Olpidiopsidaceae, Sirolpidiaceae and Lagenidiaceae which were identified as parasites of higher plants, fungi and algae and as saprophytes in the soils of New Zealand. The present contribution concerns some species of the Traustochytriaceae, Saprolegniaceae and Pythiaceae. So far as the author is aware there are no published records of species of the Saprolegniaceae in New Zealand, but in two forthcoming papers Mrs. Elliott is reporting the occurrence of and morphological variations exhibited by *Achlya caroliniana* Coker, *A. flagellata* Coker, *Saprolegnia terrestris* Cookson and *S. australis* sp. nov. Species of the Saprolegniaceae were found by the author to be fairly common in water and soil, and many of the baited samples yielded several species. In addition to those identified below many others developed on substrata such as house flies, bits of corn leaves and hemp seeds, but these did not develop oogonia, antheridia and oospores. Therefore, it was impossible to identify them accurately. Accordingly, only a few species are listed here, and it is quite probable that with more intensive study many more species will be found in New Zealand. Species of *Pythium*, also, are very abundant in the soils, and they developed so vigorously on the various substrata that they became a nuisance in the study of other zoosporic fungi. As in the case of the saprolegniaceous species, only a few of them could be identified in the limited time available. As noted previously by the author (1965) most of the species became heavily infected by *Rozella* parasites. Species of the Albuginaceae and Peronosporaceae, parasitic on economic crop plants and "weeds", are well known in New Zealand and need not be considered in this series of papers on the zoosporic fungi of New Zealand.

*Traustochytrium proliferum* Sparrow, 1936. Biol. Bull. 70: 259, figs. 22—28, pl. 7, fig. 2.

Saprophytic (?) on *Bryopsis plumosa* and *Cladophora* sp. at the University of Otago Marine Biology Station, Portobello, Dunedin.

This species was very abundant on the two hosts named above, and continued to multiply for 2 weeks after the hosts and sea water were brought into the laboratory. The sizes of the proliferating sporangia, rhizoids, and zoospores and the variations which they exhibited conformed fairly closely to those reported from the States and elsewhere.

*Schizochytrium aggregatum* Goldstein and Belsky, 1964.  
Amer. J. Bot. 51: 72, figs. 1—16.

Saprophytic on algal debris and pollen grains of *Phyllocladus trichomanoides* at the University of Otago Marine Biology Station, Portobello, Dunedin.

This peculiar species which proliferates sporangia by successive bipartitioning of the thallus occurred in great abundance when algal debris and sea water were brought into the laboratory and baited with pollen grains. Its occurrence in marine waters of New Zealand is of special interest because it has been reported only once previously from Connecticut and New York, U.S.A. Now that its appearance and development are known, it will probably be found to be widely distributed in marine waters. The shapes and sizes of the thalli, sporangia and zoospores, and the sequence of developmental stages in the New Zealand specimens were similar to those described by Goldstein and Belsky, and at present there seems to be no reason for regarding them as relating to a different species. Goldstein and Belsky classified this fungus as a member of the Traustochytriaceae, but the successive bipartitioning of the thallus to form sporangia is unique, so far as is known. On this basis it might better be made the type of a new family for which the name Schizochytriaceae is proposed.

*Sommersstorffia spinosa* Arnaudow, 1923. Flora 116: 109,  
5 figs.

Attached to bits of snake skin and predaceous on rotifers in soil samples AMA and AKT.

This unusual, stiff-looking fungus with tapering predaceous pegs appears to be more widely distributed than was formerly believed, and this reports of its presence in New Zealand adds another country to the growing list of localities in which it occurs. So far it has been reported in Bulgaria (Arnaudow, 1923), Massachusetts (Sparrow, 1929), New Jersey, Virginia, Louisiana and Alaska, U.S.A. (Karling, 1952), England (Prowse, 1954), and India (Karling, 1966). No oogonia and antheridia were found in the New Zealand material, but the thalli, zoospores and sporelings were similar to those described by the author (1952) for the Alaskan specimens.

*Pythiopsis cymosa* de Bary, 1888. Bot. Zeit. 46: 63, pl. 9, fig. 1.

Saprophytic in decaying vegetable debris from the Hutt River near the water wier, Wellington, Province.

*Saprolegnia ferrax* (Gruith.) Thuret, 1850. Ann. Sci. Nat. Bot. ser. 3, 14: 229, pl. 22.

*Achlya prolifera* Pringsheim, 1851. Nova Acta Acad. Leop. Carol. 23: 395, pls. 64—50.

*Saprolegnia dioica* Pringsheim, 1860. Jahrb. Wiss. Bot. 2: 206, pl. 22, figs. 1—6.

*Saprolegnia dioica* var. *racemosa* de la Rue, 1869. Bull. Soc. Imp. Nat. Moscow 421: 469 (See Fischer, 1892, p. 336).

*Saprolegnia thureti* de Bary, 1881. Abhandl. Senckenb. Nat. Gesell. 12: 326, pl. 5; figs. 1—10.

*Saprolegnia bodanica* Maurizio, 1896. Jahrb. Wiss. Bot. 29: 107, pl. 2, Figs. 52—59 a.

Saprophytic on house flies in a tub of rainwater at the Botany Dept., University of Otago, Dunedin.

*Saprolegnia litoralis* Coker, 1923. Saprolegniaceae, p. 54, pls. 15, 16.

Saprophytic on insect exuviae and bits of hemp seed in water from a swampy brook on the Kaitoke Farm, Wellington Province.

*Brevilegnia longicaulis* Johnson, 1950. Mycologia 42: 244, figs. 1 a—1 q.

Saprophytic on bits of hemp seed form soil sample AW RKF.

The isolate of this fungus resembled Johnson's species from New Caledonia quite closely and it is, accordingly, identified a such.

*Aphanomyces stellatus* de Bary, 1860. Jahrb. wiss. Bot. 2: 178, pl. 19, figs. 1—13.

*Aphanomyces coniger* Petersen, 1910. Ann. Mycol. 8: 525, figs. J—L.

Saprophytic on bits of snake skin and insect exuviae in soil samples AKT, HBHW and OHT.

*Aphanomyces laevis* de Bary, 1860. Jahrb. Wiss. Bot. 2: 179, pl. 20, figs. 17, 18.

*Aphanomyces balboensis* Harvey, 1942. J. Elisha Mitchell Sci. Soc. 58: 35, pl. 8, figs. 1—7.

Saprophytic on bits of snake skin and insect exuviae in soil samples ATRC, WKI-WK 4, WT4, OD2, ODC, OKF and NTF.

*Aphanomyces phycophilus* de Bary, 1860. Jahrb. Wiss. Bot. 2: 179, pl. 20, figs. 19—24.

Parasitic in *Spirogyra* sp. in a pond at the Soil Bureau, Taita, Wellington Province.

*Leptolegnia caudata* de Bary, 1888. Bot. Zeit. 46: 609, pl. 9.

Saprophytic on insect exuviae and bits of snake skin in soil sample ATFP.

*Leptolegniella keratinophila* Huneycutt, 1952. J. Elisha Mitchell Sci. Soc. 68: 109, pl. 15.

Saprophytic in bits of snake skin in soil samples ATFP, OD4, OKF and NTF.

This species is fairly common in New Zealand and developed abundantly in bits of snake skin floated on watered soil samples.

*Leptolegniella exospora* Kane, 1966. Mycologia 58: 909, figs.

1—24.

Saprophytic in human hair from soil samples AKT, and WK3.

This recently described species occurred abundantly in the two soil samples noted above, and it appears to be widely distributed in European and African soils according to Miss Kane, who found it in Indiana, U.S.A., soil. In checking back on his notes and illustrations the author found that he had recorded but not identified it in human hair in soil samples from Tippecanoe County, Indiana, while he was studying keratinophilic chytrids in 1946 to 1948.

*Achlya prolifera* Nees, 1823. Nova Acta Acad. Leop.-Carol. 11: 514, pl. 58.

*Leptomitus prolifer* Agardh, 1824. Systema algarum. 1: 48.

*Saprolegnia prolifera* Braun, 1851. Betrachtungen über die Erscheinung der Verjüngung in der Natur, p. 268.

*Achlya aplana* Maurizio, 1894. Flora 79: 135, pls. 4, 5, figs. 28—31.

Saprophytic in bleached corn leaves, dead flies, and bits of hemp seeds in soil samples ADSIR, WT2, OD4, OKF, and water from a pond at the Soil Bureau, Taita, Wellington Province.

*Achlya treleaseana* (Humphrey) Kauffman, 1906. Ann. Rept. Mich. Acad. Sci., Arts and Letters 8: 26.

*Saprolegnia treleaseana* Humphrey, 1893. Trans. Amer. Phil. Soc. (n. s.) 17, 111, pl. 17, figs. 56—59.

Saprophytic on bits of hemp seed in water from a small brook at Cornwallis Wharf, Auckland Province.

*Achlya hypogyna* Coker and Pemberton, 1908. Bot. Gaz. 45: 194, figs. 1—6.

Saprophytic on bits of hemp seed in a pond in the Eglington Valley, Otago Province.

*Achlya flagellata* Coker, 1923. Saprolegniaceae p. 116, pl. 37.

Saprophytic on dead flies and bits of hemp seed in water from the Hutt River near Taita, Wellington Province.

*Achly a klebsiana* Pieters, 1915. Bot. Gaz. 60: 486, pl. 21, figs. 1—4.

*Achly a oryzae* Ito and Nagai, 1931, in Nagai J. Fac. Agric. Hokkaido Imp. Univ. 32: 17, pl. 4, figs. 3—11.

*Achly a klebsiana* var. *indica* Chaudhuri and Lotus, 1936. Proc. Indian Acad. Sci., Sect. B, 3: 328, pl. 2.

*Achly a michiganensis* Johnson, 1950. Mycologia 42: 393, fig. 2.

Saprophytic on bits of hemp seed in soil sample OD4.

*Isoachly a unispora* Coker and Couch, 1923. Saprolegniaceae, p. 85, pls. 22, 23.

Saprophytic on house fly in a pond at the Soil Bureau, Taita, Wellington Province.

*Dictyuchus monosporous* Leitgeb, 1869. Jahrb. Wiss. Bot. 7: 357, pl. 22, figs. 1—12, pl. 23, figs. 1—8.

Saprophytic on house flies from soil sample HBTF.

*Thraustotheca clavata* (de Bary) Humphrey 1893. Trans. Amer. Phil. Soc. 17: 131.

*Dictyuchus clavatus* de Bary, 1888. Bot. Zeit. 46: 649, pl. 9, fig. 3.

Saprophytic on bits of hemp seed in a cold pool, Gibb's Bache, Belmont, Wellington.

*Zoopagulus insidians* Sommerstorff, 1911. Österr. Bot. Zeitschr. 61: 372, pls. 5, 6.

Growing among algae in ponds at the Soil Bureau, Taita, Wellington Province; Eglinton Valley, and swampy soil sample HBJF2, Otago Province, and predaceous on rotifers.

*Pythium monospermum* Pringsheim, 1858. Jahrb. Wiss. Bot. 1: 284—306.

*Pythium gracile* de Bary, 1860. Jahrb. Wiss. Bot. 2: 169—192.

*Pythium reptans* de Bary, l. c., p. 169.

*Pythium fecundum* Wahrlich, 1887. Ber. deut. Bot. Gesell. 5: 246, pl. 10.

*Pythium complens* Fischer, 1892. Rabenhorst Kryptogamen-Fl. 1, (4): 398, fig. 64 a—b.

Saprophytic in bleached corn leaves in soil sample AKT.

*Pythium gracile* Schenk, 1859. Verhandl. Phys. Med. Gesell. Würzburg 9: 12, pl. 1, figs. 1—6.

Parasitic in *Spirogyra* sp. and *Vaucheria* sp. in a pond at the Soil Bureau, Taita, Wellington Province.

*Pythium tenuue* Gobi, 1899—1900. Scrip. Bot. Hort. Imp. Petropol. 15: 211, pls. 415.

Parasitic in *Vaucheria sessilis* in a small stream at the Soil Bureau, Taita, Wellington Province.

*Pythium torulosum* Coker and Patterson, 1927. J. Elisha Mitchell Sci. Soc. 42: 247—250, pl. 46.

In decaying *Marchantia* thalli in a swampy area at the Soil Bureau, Taita, Wellington Province.

*Pythium graminicolum* Subramaniam, 1928. Bull. Agric. Res. Inst. Pusa 177: 1—7, fig. 1.

Parasitic (?) in decaying roots of rye grass in soil sample HBT.

*Pythium inflatum* Matthews, 1931. Studies on the genus *Pythium*, p. 45, pl. 9.

Saprophytic in bleached corn leaves from soil sample WK3.

*Pythium proliferum* de Bary, 1860. Jahrb. Wiss. Bot. 2: 169, pl. 21.

Saprophytic on insect exuviae in a pond at the Soil Bureau, Taita, Wellington Province.

*Pythium debaryanum* Hesse, 1874. Inaugr. Dissert. Halle.

*Pythium equiseti* Sadebeck, 1874. Verhandl. Bot. Ver. Prov. Brandenburg, 16: 116—124.

*Lucidium pythiodes* Lhode, 1874. Tagebl. Versamm. Deut. Naturf. Aerzte, Breslau 47: 203.

*Pythium autumnale* Sadebeck, 1876. Tagebl. Versamm. Deut. Naturf. Aerzte, Breslau 49: 100.

*Artotrogus debaryanus* Atkinson, 1895. Cornell Agric. Exp. Sta. Bull. 94: 233—275, figs. 1—9.

*Pythium haplomitrii* Lilienfeld, 1911. Bull. Intern. Acad. Sci. Cracoviae 1911: 336.

*Pythium debaryanum* var. *pelargonii* Braun, 1925. J. Agric. Res. 30: 1060, pl. 7.

*Pythium marchantiae* Nicholas, 1926. Compt. Rend. Acad. Sci. Cracoviae 1911: 336.

*Pythium fabae* Cheney, 1932. Austral. J. Exp. Biol. Med. Sci. 10: 143—155.

*Pythium ariosporon* Sideris, 1932. Mycologia 24: 14—61, figs. 1 a, 8 c—d.

*Pythium cactacearum* Preti, 1936, Rev. Path. Veg. 26: 331—353.

Parasitic on seedling roots of *Brassica oleracea* var. *capitata*, Lincoln, Canterbury Province.

*Pythium spinosum* Sawada, 1926. Jour. Nat. Hist. Soc. Formosa 16: 199.

Parasitic (?) on seedling roots *Lactura sativa*, Soil Bureau, Taita, Wellington Province.

*Pythium irregularare* Buisman, 1927. Med. Phytopath. 11: 1,  
figs. 9—11.  
Saprophytic on bleached corn leaves in soil sample AKT.

#### Summary

Thirty-two species of the Traustochytriaceae, Saprolegniaceae and Pythiaceae are identified as saprophytes and parasites in the soil and algae in New Zealand. Among these is the unusual species, *Schizochytrium aggregatum*, which develops sporangia by successive bipartitioning of the thallus. This type of development is unique for the zoosporic fungi, so far as is known, and for this reason a new family, Schizochytriaceae, is proposed to include it and other similar species which may be found in the future.

#### Bibliography

- A g a r d h, C. A. 1824. Systema algarum vol. 1, Lund.
- A r n a u d o w, N. 1923a. Untersuchungen über *Sommerstorfia spinosa*, nov. gen., nov. spec. Jahrb. Univ. Sophia, 19: 161—196, 4 figs.
- 1923b. Ein neuer Rädertiere (*Rotaria*)-fanger Pilz. (*Sommerstorfia spinosa*), nov. gen., nov. spec., Flora 116: 109—113, 5 figs.
- A t k i n s o n, G. F. 1895. Damping-off. Cornell Exp. St. Bull. 94: 233—272.
- B r a u n, A. 1851. Betrachtungen über die Erscheinung der Verjüngung in der Natur, insbesondere in der Lebens- und Bildungsgeschichte der Pflanze. 363 pp., pls. 1—3. Leipzig.
- B r a u n, H. 1925. Comparative studies of *Pythium de Baryanum* and two related species from *Geranium*. J. Agric. Res. 30: 1043—1062, pls. 1—8.
- B u i s m a n, C. J. 1927a. Mededeelingen van het Phytopathologisch Laboratorium "Willie Commelin Scholten" 11: 1—11, fig. 9—11.
- 1927b. Root rots caused by Phycomycetes, 58 pp., Utrecht.
- C h a u d h u r i, H. and S. S. L o t u s, 1936. Indian water moulds. II. Proc. Indian Acad. Sci. Sect. B, 2: 137—154, pls. 5—12.
- C h e n e y, G. M. 1932. *Pythium* root rot of broad beans in Victoria. Austr. J. Exp. Biol. Med. Sci. 10: 143—155.
- C o k e r, W. C. 1923. The Saprolegniaceae. 201 pp., 63 pls. Univ. North Carolina press, Chapel Hill.
- and J. N. C o u c h, 1923. A new species of *Traustotheca*. J. Elisha Mitchell Sci. Soc. 37: 112—115, pl. 8.
- and P. M. P a t t e r s o n, 1927. A new species of *Pythium*. J. Elisha Mitchell Sci. Soc. 42: 247—250, pl. 46.
- and J. D. P e m b e r t o n, 1908. A new species of *Achlya*. Bot. Gaz. 45: 194—196, figs. 1—6.
- d e B a r y, A. 1860. Einige neue Saprolegnieen. Jahrb. Wiss. Bot. 2: 169—192, pls. 19—21.
- 1881. Untersuchungen über die Peronosporen und Saprolegien ... Abhandl. Senck. Naturf. Gesell. 12: 225—369, pls. 1—6.
- 1888. Species der Saprolegnieen. Bot. Zeit. 46: 597—610, 613—621, 629—636, 645—653, pls. 9, 10.

- d e l a R u e, E. 1874. Sur un cas de germination des spores des Saprolégnées. Bull. Soc. Imp. Nat. Moscou 46: 80—84, figs. 1—9.
- E l l i o t, Ruth F., 1967a. Morphological variation in New Zealand Saprolegniaceae. I. *Achlya caroliana* Coker and *A. flagellata* Coker. N. Z. J. of Bot. 5 (In press).
- 1967b. Morphological variation in New Zealand Saprolegniaceae. II. *Saprolegnia terrestris* Cookson and *Saprolegnia australis* sp. nov. N. Z. J. of Bot. 5 (In press).
- F i s c h e r, A. 1892. Die Pilze Deutschlands, Österreichs und der Schweiz. Rabenhorst Kryptogamen-Fl. 1 (4): 1—105, figs. 1—74.
- G o b i, C. 1899—1900. Entwicklungsgeschichte des *Pythium tenue* n. sp. Scrip. Bot. Hort. Imp. Petropol. 15: 211—226, pls. 4, 5.
- G o l d s t e i n, S., and M. B e l s k y, 1964. Axenic culture studies on a new marine Phycomycete possessing an unusual type of asexual reproduction. Amer. J. Bot. 51: 72—78, figs. 1—16.
- H a r v e y, J. V. 1942. A study of western watermolds. J. Elisha Mitchell Sci. Soc. 58: 16—42, pls. 1—8.
- H e s s e, R., 1874. *Pythium de Baryanum* ein endophytischer Schmarotzer. Inaugr. Dissert., Göttingen, pp. 1—76.
- H u m p h r e y, J. E. 1893. The Saprolegniaceae of the United States, with notes on other species. Trans. Amer. Phil. Soc., n. s., 17: 63—148, pls. 14—20.
- H u n e y c u t t, M. B. 1952. A new water mold on keratinized materials. J. Elisha Mitchell Sci. Soc. 68: 109—112, figs.
- I t o, S., and M. N a g a i, 1931. On the rot-disease of the seeds and seedlings of riceplant caused by some aquatic fungi. J. Fac. agric. Hokkaido Imp. Univ. Sapporo 32: 45—69, pls. 8—11.
- J o h n s o n, T. W., Jr. 1950a. A study of an isolate of *Brevilegnia* from New Caledonia. Mycologia 42: 242—252, 1 fig.
- 1950b. A new *Achlya* from Mackinac Island, Michigan with notes on other species. Mycologia 42: 391—402, figs. 1, 2.
- K a n e, W. D. 1966. A new species of *Leptolegniella*. Mycologia 58: 905—911, figs. 1—29.
- K a r l i n g, J. S. 1952. *Sommerstorffia spinosa* Arnaudow. Mycologia 44: 387—412, figs. 1—76.
- 1966. The chytrids of India with a supplement of other zoosporic fungi. Beihefte z. Sydowia VI: 1—125.
- 1965. Some zoosporic fungi of New Zealand. I. Sydowia 19: 213—226, pl. XLVI.
- 1967a. Some zoosporic fungi of New Zealand. XI. Plasmodiophorales. Sydowia 20: 151—156.
- 1967b. Some zoosporic fungi of New Zealand. XII. Olpidiopsidaceae, Siroplidiaceae and Lagenidiaceae. Sydowia 20 (In press).
- K a u f m a n, C. H. 1906. Unreported Michigan fungi form Petoskey, Detroit and Ann Arbor for 1905. Ann. Rept. Mich. Acad. Sci. Arts and Letters 8: 26—37.
- L h o d e, G., 1874. Über einige neue parasitische Pilze. Tagebl. deut. Naturf. Ärzte, Breslau 47: 203.
- L i l i e n f e l d, F. A. 1911. Beiträge zur Kenntnis der Art *Haplometrium Hookeri* Nees. Bull. Intern. Acad. Sci. Cracovie, B, 1911: 336.
- M a t t h e w s, V. D. 1931. Studies on the genus *Pythium*. 136 pp. 29 pls. Univ. North Carolina press. Chapel Hill.

- Maurizio, A. 1894. Zur Entwicklungsgeschichte und Systematik der Saprolegnieen. Flora 79: 109—158, pls. 3—5.
- Nees von Esenbeck, C. G. 1823. Zusatz zu: Carus, C. G. 1823: Beiträge zur Geschichte der unter Wasser an verwesenden Thierkörpern sich erzeugenden Schimmel- oder Algen-Gattung. Nova Acta Acad. Leop.-Carol. 11: 507—522, pl. 58.
- Nicolas, G. 1926. Un example nouveau et certain de paratisme chez les Hépatiques (*Marchantia polymorpha* L.). Compt. Rend. Acad. Sci. 182: 82—83.  
— 1927. Sur un *Pythium* parasite du *Marchantia polymorpha* L. Bull. Soc. Mycol. France 43: 119—121.
- Petersen, H. E. 1910. An account of Danish freshwater Phycomycetes with biological and systematical remarks. Ann. Mycol. 8: 494—560, figs. 1—27.
- Pieters, A. J. 1915. The relation between vegetative vigor and reproduction in some Saprolegniaceae. Amer. J. Bot. 2: 529—576, 2 figs.
- Preti, G. 1932. Sulla presenza del *Pythium de Baryanum* Hesse nelle piante di Cereus. Riv. Pat. Veg. 22: 121—132.
- Pringsheim, N. 1851. Die Entwicklungsgeschichte der *Achlya prolifera*. Verhandl. Leop.-Carol. Acad. Naturf. 23: 395—460, pls. 46—50.  
— 1858. Beiträge zur Morphologie und Systematik der Algen. II. Die Saprolegnieen. Jahrb. Wiss. Bot. 1: 284—304, pls. 19—21.  
— 1860. Beiträge zur Morphologie und Systematik der Algen. IV. Nachträge zur Morphologie der Saprolegnieen. Jahrb. Wiss. Bot. 2: 205—236, pls. 22—25.
- Prowse, G. A. 1954. *Sommerstorffia spinosa* and *Zoopaghus insidians* predaceous on rotifers, and *Rozellopsis inflata* the endoparasite of *Zoopaghus*. Trans. Brit. mycol. Soc. 37: 134—150, 8 figs.
- Sadebeck, R. 1874. Über *Pythium equiseti*. Verhandl. Bot. Ver. Brandenburg 16: 116—124.  
— 1876. Über Infectionen welche *Pythium*-arten bei lebenden Pflanzen hervorbringen. Versamm. deutsch. Naturf. Ärzte 49: 100.
- Swada, K., and C. C. Chen, 1926. On the Putrifaction disease of *Anthirrhinum majus*. J. Nat. Hist. Soc. Formosa 16: 199—212.
- Schenk, A. 1859. Algologische Mittheilungen V. Verhandl. Phys.-Med. Gesell. Würzburg 9: 12—31, pl. 1.
- Sideris, C. P. 1932. Taxonomic study in the family Pythiaceae II. *Pythium*. Mycologia 24: 14—61, figs. 1—21.
- Sommerstorff, H. 1911. Ein Tiere fangender Pilz (*Zoopaghus insidians* nov. gen., nov. sp.). Österr. Bot. Zeitschr. 61: 361—373, pls. 5, 6.
- Sparrow, F. K., Jr. 1929. A note on the occurrence of two rotifer-capturing Phycomycetes. Mycologia 21: 90—96, 1 fig.  
— 1936. Biological observations on the marine fungi of Woods Hole waters. Biol. Bull. 70: 236—263, 35 figs., pls. 1—3.
- Subramaniam, L. S. 1928. Root rot and sclerotical diseases of wheat. Agric. Res. Inst. Pusa Bull. 177: 1—17, fig. 1.
- Thuret, G. 1850. Recherches sur les Zoospores des Algues et la Anthéridies des Cryptogames. Ann. Sci. Nat. Bot. Ser. 3, 14: 214—282, pls. 16—31.
- Wahrlich, W. 1887. *Pythium* n. sp. Ber. Deut. Bot. Gesell. 5: 242—246, pl. 10.

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