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STUDIES ON THE AQUATIC CHYTRIDS OF JAPAN

II. Olpidiaceae

BY

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(With one plate)

In the preceding number of the Transactions¹, the writer published the first paper of a series which recorded ten species of aquatic chytrids belonging to the Woroninaceae. The present paper successively deals with seven species of Olpidiaceae which were found newly by the writer in our country. Up to the present time a few species of *Olpidium* parasitic on phanerogamic plants have been reported from Japan and nine aquatic species belonging to the same genus and *Sphaerita* from Manchuria. All description of these species hitherto recorded is omitted here because some of them seem to be doubtful or invalid.

The writer wishes to express his sincere thanks to Prof. Emer. K. MIYABE for his valuable suggestions and to Profs. S. ITO and Y. TOCHINAI for their kind directions. He is also indebted to Mr. M. NAGAI for his kind help in the identification of the host plants.

Olpidium SCHRÖTER

in Krypt. Fl. Schlesien, III, 1, p. 180, 1886.

Syn. *Olpidium* A. BRAUN, Sulgenus of *Chytridium*, in Abhandl. Berl. Akad. Wissensch. p. 75, 1855; *Olpidiella* LAGERHEIM, in Journ. de Bot. II, 1888; *Reessia* FISCH, Beitr. Kenntn. Chytrid. 1884.

1. *Olpidium aggregatum* DANGEARD

(Pl. V, fig. 8)

in Le Botaniste, 2 sér. VI, p. 237, pl. XVI, figs. 25-26, 1891; A. FISCHER, in RABENHORST'S Krypt. Fl. I, 4, p. 26, 1892.

Zoosporangia few to 20 or more in a host cell, long ellipsoidal to cylindrical, sometimes irregular in shape, 26.4-90 μ in length, 12-27.6 μ in width, vacuolated in younger stage, with smooth, hyaline membrane; exit-tubes single, 24-51.6 μ long; Zoospores small, long ellipsoidal, with a long cilium; resting spores unknown.

1) Vol. XIII, Pt. 1, p. 20-28, 1933.

[Trans. Sapporo Nat. Hist. Soc., Vol. XIII, Pt. 2, 1933]

Hab. In the cells of *Cladophora* sp. (marine species)

Hokkaido: Prov. Kushiro; Harutori (Aug. 23, 1931. Y. TOKUNAGA).

Distrib. Europe and Japan.

Since discovery of the species by DANGEARD in 1891, it seems not to have been reported from anywhere. In a botanical excursion at Harutori in Kushiro Province, the writer fortunately collected the fungus parasitic in the cells of *Cladophora* sp. Although cultured for some days in our laboratory, the resting spore of the fungus was not secured.

2. *Olpidium entophytum* A. BRAUN

(Pl. V, figs. 1-3)

in Monatsber. Berl. Akad. Wissensch. p. 589, 1856; A. FISCHER, in RABENHORST'S KRYPT. FL. I, 4, p. 25, 1892; v. MINDEN, in KRYPT. FL. MARK BRAND. V, p. 243, 1915.

Syn. *Olpidium endogenum* A. BRAUN, in Abhandl. Berl. Akad. Wissensch. p. 60, 1855, pro parte; *Reessia Cladophorae* FISCH, in Sitzungsber. Med. Phys. Soc. Erlangen, 1884.

Zoosporangia 1-5 in a vegetative cell, spherical or broad ellipsoidal, sometimes egg-shaped, usually 12-19.2 μ in diameter, with smooth membrane; exit-tubes single or rarely double, variable in length, never swollen in any part; zoospores globular, about 4.8 μ in diameter, with a single cilium; resting spores spherical or ellipsoidal, 12-18 μ in diameter, with smooth, thick membrane.

Hab. In the cells of *Spirogyra communis* (HASS.) KÜTZ.

Hokkaido: Prov. Ishikari; Sapporo (June 24, 1931. Y. TOKUNAGA).

In the cells of *Spirogyra* sp.

Hokkaido: Prov. Ishikari; Maruyama near Sapporo (July 4, 1932. Y. TOKUNAGA).

In the cells of *Aegagropila Sauteri* (NEES) KÜTZ.

Hokkaido: Prov. Kushiro; Lake Akan (Aug. 20, 1931. Y. TOKUNAGA).

Distrib. Europe, Manchuria and Japan.

The descriptions as above have been given of the fungus parasitic on *Spirogyra*. The fungus on *Aegagropila Sauteri* somewhat differs from the above description. Its sporangia are larger and widely variable in size, 19.2-62.4 μ in diameter. The exit-tubes are single and very thick, sometimes 9.6 μ in width. The zoospores are short elliptical, having a long cilium and a small globule. Pending the discovery of its resting spores, we would like to classify it under the present name.

3. *Olpidium gregarium* (NOWAK.) SCHRÖTER

(Pl. V, figs. 4-7)

in KRYPT. FL. SCHLESSEN, III, 1, p. 182, 1886; BUTLER, in Mem. Dept. Agr. India, I, 5, p. 136, pl. VIII, figs. 13-18, 1907.

Syn. *Chytridium gregarium* NOWAK., in COHN's Beitr. Biol. Pfl. II, p. 77, pl. IV, fig. 2, 1876.

Zoosporangia solitary or gregarious, up to 15 in a rotifer, spherical or ellipsoidal, 19.2-52.8 μ in diameter, with a single, short, blunt exit-tube; zoospores formed in a spherical mucilaginous bladder at the mouth of exit-tube, then swim away by the dilution of mucus, globose in shape, containing a refractive body, with a long cilium; resting spores produced either in company with zoosporangia or independently, spherical, 20.4-48 μ in diameter, brownish, containing an eccentric reserve globule measuring 6-13 μ in diameter, with thick wall which consists of thin exospore and thick endospore and is about 6 μ thick, germination not observed.

Hab. In eggs of *Brachionus* sp.

Hokkaido: Prov. Ishikari; Bannosawa near Sapporo (June 21, 1931. Y. TOKUNAGA).

In *Euchlanis* sp.

Hokkaido: Prov. Ishikari; Takinosawa near Jozankei (July 12, 1931. Y. TOKUNAGA).

Distrib. Europe and Japan.

This fungus was noticed at first in eggs of *Brachionus* sp. collected with green algae in a ditch along rice-fields. One to seven zoosporangia or resting spores were observed per egg and the zoosporangia were 19.2 to 48 μ in diameter. In the next collection, the adult of *Euchlanis* sp. which were attacked by this fungus was obtained. In this case, the internal organs of the affected rotifers were severely destroyed and the zoosporangia and resting spores were enclosed in an ellipsoidal compartment. The measurement of the zoosporangia was somewhat larger than those found in eggs of *Brachionus* sp. This species has been known as a parasite of the eggs of certain rotifers up to the present. Hence it is very interesting to note here that this fungus infests not only the eggs of a rotifer but also the adult bodies.

4. *Olpidium rostriferum* TOKUNAGA, sp. nov.

(Pl. V, fig. 11)

Zoosporangiis in zygospora matricis solitariis vel 2-5 aggregatis, sphaericis vel ovoideis, 14.4-25.2 μ diam., membrana levi; tubulis exitus singulis, usque ad 70 μ longis, 3-4.2 μ interdum 6 μ crassis, in parte membranam matricis perforantibus constrictis; zoosporis globosis, ca. 3.6 μ diam., antice uno cilio praeditis; sporis perdurantibus sphaericis, interdum ellipsoideis, 16.8-24 μ diam., in medio globulum olei continentibus, membrana levi, flava, 1.6 μ crassa tectis, germinatione nondum observata.

Hab. In zygosporis of *Spirogyra Jürgensii* KÜTZ.

Hokkaido: Prov. Ishikari; Bannosawa near Sapporo (June 21, 1931. Y. TOKUNAGA).

Distrib. Japan.

This fungus was found in the zygotes of *Spirogyra Jürgensii* collected in a ditch along rice-fields. The most part of zygotes formed in culture in a PETRI-dish were infected by the fungus. The zoosporangia are formed together with resting spores in a zygote and empty sporangia collapse from the outer pressure of growth of other sporangia or resting spores. The exit-tubes are very long and constrict at the parts where they perforate the wall of a zygote and vegetative cell. They sometimes swell at the outer part of a zygote, about $6\ \mu$ in diameter. The resting spores are formed one to three in a zygote and they are mostly spherical or sometimes become ellipsoidal owing to the lateral compression of each other. The germination of resting spores was not observed.

Olpidium entophytum A. BRAUN parasitic in the vegetative cells of *Spirogyra* and other green algae is one of the most closely related species to our fungus, but its sporangia have a short exit-tube which is not swollen and the resting spores are smaller in size.

5. *Olpidium Sphaeropleae* TOKUNAGA, sp. nov.

(Pl. V, figs. 9-10)

Zoosporangiis in oospora matricis plerumque solitariis, sphaericis, magnitudine variis, $12-24\ \mu$ diam., tubulo exitus singulo, brevi ornatis; zoosporis ellipsoideis vel ovoideis, ca. $4.8 \times 2.4\ \mu$, antice uno cilio praeditis; sporis perdurantibus in oospora matricis solitariis vel rarissime binis, sphaericis, $11.4-12.6\ \mu$ diam., membrana levi, subflava, ca. $1\ \mu$ crassa tectis, germinatione nondum observata.

Hab. In oospores of *Sphaeroplea annulina* (ROTH.) AGARDH.

Hokkaido: Prov. Ishikari; Takinosawa near Jozankei (July 12, 1931. Y. TOKUNAGA).

Distrib. Japan.

This fungus was found in the young oospores of *Sphaeroplea annulina* collected in a ditch in rice-fields. The zoosporangia mostly fill the cavity of oospore at maturity and are very irregular in size. The resting spores lie very laxly in an oospore. They are quite uniform in size, mostly $12\ \mu$ in diameter, and contain a central reserve globule surrounded by granular protoplasm in which a small hyaline spot is embedded.

Pleolpidium A. FISCHER

in RABENHORST's Krypt. Fl. I, 4, p. 43, 1892.

Syn. *Rozella* CORNU, in Ann. Sci. Nat. 5 sér. XV, p. 148, 1872, pro parte.

6. *Pleolpidium cuculus* BUTLER

(Pl. V, fig. 12)

in Mem. Dept. Agr. India, I, 5, p. 124, pl. VII, figs. 22-25, 1907.

Zoosporangia produced in large swelling of host hyphae, spherical to subspherical, usually 19.2-24 μ in diameter, with a single exit-papilla; zoospores clavate or ovoid, with a cilium in larger end; resting spores single, free in swollen hyphae of the host, spherical, 12-18 μ in diameter, light yellow, with smooth, thick membrane, germination not observed.

Hab. In hyphae of *Pythium monospermum* PRINGSHEIM.

Hokkaido: Prov. Ishikari; Maruyama near Sapporo (June 5, 1932. Y. TOKUNAGA).

Distrib. Europe and Japan.

This species was described by BUTLER as a parasite in the sporangia of *Pythium intermedium*. Our fungus was found in the hyphae of *Pythium monospermum* whose sporangia are filamentous and apparently similar to the ordinary hyphae. The affected hyphae are expanded to globular form resembling the oogonia or sporangia of the species of *Pythium* which has sporangia of spherical type. *Pleolpidium irregulare* BUTLER parasitic on *Pythium vexans* also attacks the hyphae, but its resting spores are provided with short regular spines on their wall. After careful examination of the characteristics of our fungus, it was identified with *Pleolpidium cuculus* BUTLER.

Pseudolpidiopsis v. MINDEN

in Krypt. Fl. Mark Brand. V, p. 255, 1915.

Syn. *Pleocystidium* FISCH, Beitr. Kenntn. Chytrid. p. 42, 1884; *Diplophysa* SCHRÖTER, Subgenus of *Pleocystidium*, in Krypt. Fl. Schlesien, III, 1, p. 195, 1886, pro parte; *Olpidiopsis* (CORNU) A. FISCHER, in RABENHORST's Krypt. Fl. I, 4, p. 37, 1892, pro parte.

7. *Pseudolpidiopsis Schenkiana* (ZOPF) v. MINDEN

(Pl. V, fig. 13)

in Krypt. Fl. Mark Brand. V, p. 257, 1915.

Syn. *Olpidiopsis Schenkiana* ZOPF, in Nova Acta Acad. Leop. XLVII, p. 168, pl. XV, figs. 1-32, 1884; BUTLER, in Mem. Dept. Agr. India, I, 5, p. 135, pl. X, figs. 11-13, 1907.

Zoosporangia solitary or gregarious in a vegetative cell of the host, ellipsoidal or elongated, sometimes spherical, variable in size, 30-81.6 μ long, 21.6-26.4 μ wide, with smooth membrane; exit-tubes single, irregular in length, rarely 60 μ long, sometimes swollen at inside of host wall; zoospores globular 4-5.4 μ in diameter, with a long cilium; resting spores formed one or two in a vegetative cell of the host, spherical or ellipsoidal, 30-42 μ in diameter, with

smooth, thick, brownish-yellow membrane and a large oil drop; companion cells single, hyaline, spherical, 16.8-21.6 μ in diameter.

Hab. In vegetative cells of *Spirogyra* sp.

Hokkaido: Prov. Ishikari; Sapporo (July 2, 1931; June 26, 1932. Y. TOKUNAGA); Bannosawa near Sapporo (June 5, 1932. Y. TOKUNAGA).

Distrib. Europe, India and Japan.

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摘 要

日本産水生壺状菌に就て

II. 油壺菌科

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前號に於て著者は日本産水生壺状菌中ボロロン菌科に屬する10種を報告せり。今回油壺菌科に屬する下記の7種を報告せんとす。

1. *Olpidium aggregatum* DANGEARD
海産 *Cladophora* sp. の細胞に寄生す。
2. *Olpidium entophytum* A. BRAUN
Spirogyra communis (HASS.) KÜTZ., *Spirogyra* sp. 及び *Aegagropila Sauteri* (NEES) KÜTZ. の細胞に寄生す。
3. *Olpidium gregarium* (NOWAK.) SCHRÖTER
Brachionus sp. の卵及び *Euchlanis* sp. の成虫に寄生す。
4. *Olpidium rostriferum* TOKUNAGA (新種)
Spirogyra Jürgensii KÜTZ. の接合胞子に寄生す。
5. *Olpidium Sphaeropleae* TOKUNAGA (新種)
Sphaeroplea annulina (ROTH.) AGARDH. の卵胞子に寄生す。
6. *Pleolpidium cuculus* BUTLER
Pythium monospermum PRINGSHEIM の菌絲に寄生す。
7. *Pseudolpidiopsis Schenkiana* (ZOPF) v. MINDEN
Spirogyra sp. の細胞に寄生す。

Explanation of Plate

The magnifications of figures are $\times 400$ in Fig. 6 and $\times 650$ in the others.

- Figs. 1-3. *Olpidium entophyllum*: 1. Zoosporangia in a cell of *Spirogyra communis*. 2. Resting spores formed in *Spirogyra communis*. 3. Zoosporangia in a cell of *Aegagropila Sauteri*.
- Figs. 4-7. *Olpidium gregarium*: 4. Zoosporangia in an egg of *Brachionus* sp. 5. Resting spore in an egg of *Brachionus* sp. 6. Zoosporangia and resting spores in an adult of *Euchlanis* sp. 7. Resting spore formed in the adult of *Euchlanis* sp.
- Fig. 8. *Olpidium aggregatum*: Zoosporangia in a host cell.
- Figs. 9 & 10. *Olpidium Sphaeropleae*: 9. Zoosporangia of fungus and healthy oospores of host. 10. Resting spores in oospores of the host.
- Fig. 11. *Olpidium rostriferum*: Zoosporangia and resting spores in zygotes of the host.
- Fig. 12. *Pleolpidium cuculus*: Zoosporangia and resting spore in the host hyphae.
- Fig. 13. *Pseudolpidiopsis Schenkiana*: Zoosporangium and resting spore in the cells of the host.

