Aphanomyces phycophilus De Bary.

Paul Weatherwax.

While some experiments were being made with algæ about the first of March, 1913, it was noticed that some Spirogyra that had been kept for ten days in distilled water had been attacked by a fungus. Attention was at once given to this parasite, which was rapidly destroying the alga. In about a week it was producing oospores, thus making possible its identification as *Aphanomyces phycophilus* De Bary.

This fungus, which is one of the few parasitic forms of the Saprolegniaceæ, was first described by De Bary in 1860, and as late as 1892 Humphrey * noted that it had not yet been reported from America. Since then, as far as we have been able to learn, no one has mentioned finding it in this country. **

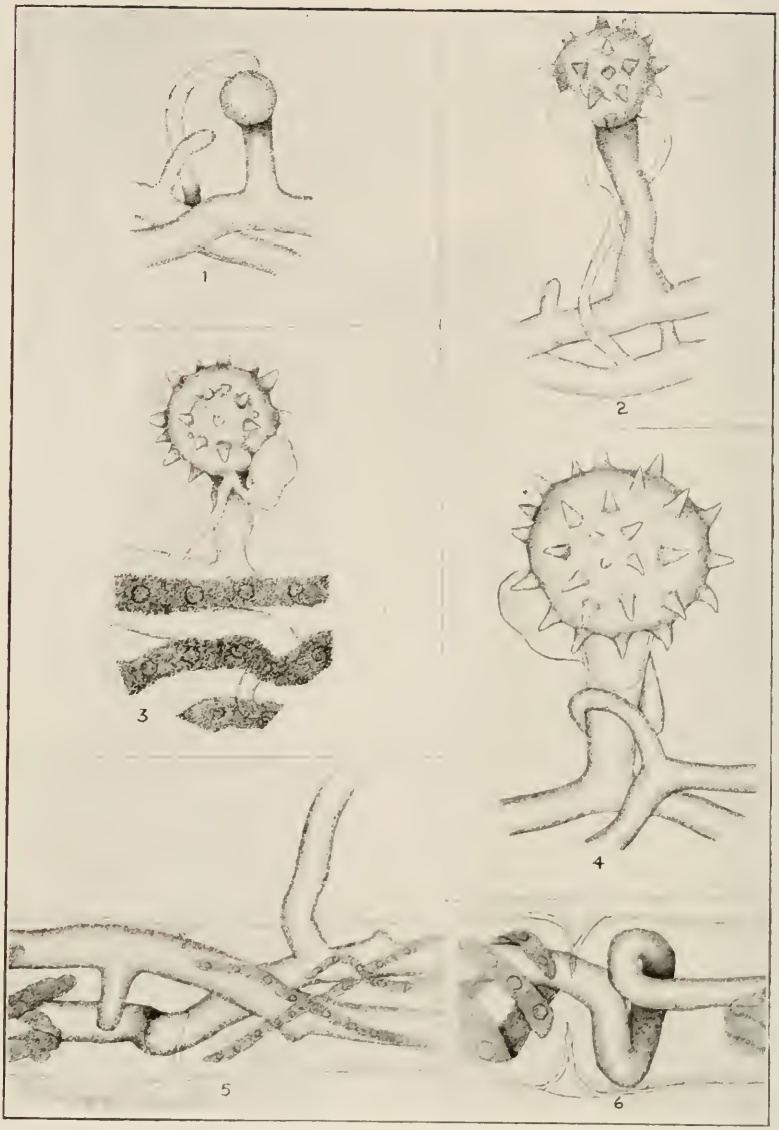
It is clear that the plant is a parasite, and, in this instance, it seemed confined to the one species of host. As well as could be determined from the sterile filaments the host was *Spirogyra dubia* Kg. Scattered filaments of other species of Spirogyra in the same vessel were not attacked, and all attempts to inoculate other species failed.

The mycelium traverses the algal filament lengthwise, sometimes as a single thread, but more often as two, side by side. (Fig. 5.) Branches may grow for some distance inside the filament of the alga, or they may at once grow through the cell wall of the host and extend for some distance into the water. Decomposition of the alga begins soon after the fungus attacks it; the chloroplasts draw together into a mass and begin to decay, and the cell walls break down.

The mycelium is regular in size and shape, sparingly branched and nonseptate except where reproducing. The diameter of the filaments is from 9 to 16 microns; the branches are usually as large as the main filaments.

* James Ellis Humphrey, The Saprolegniaceæ of the United States.

** Since writing this article attention has been called to a set of unpublished drawings made by Prof. D. M. Mottier, of an unidentified fungus that he found in 1893. These drawings and the location in which the fungus was found indicate very clearly that it was the same species as the one herein described.



Aphanomyces phycophilus.

The protoplasm in all parts of the plant is gray, and of a coarse, granular nature.

The mycelium evidently meets with some resistance in passing from cell to cell of the host, for at these places it is often more or less knotted or bent, always on the same side of the cell wall with reference to the direction of growth in the filament, as if it had not been able to penetrate the cross wall immediately. (Fig. 6.) These penetrations of the cross wall are seldom through the center, but usually far to one side of the filament.

The plant is described as producing zoospores in long slender sporangia, but, in this case, no asexual spores of any kind were observed. Oospores, however, were produced in abundance by the union of gametes which, in no case, were found to arise from the same filament.

The sex organs arise as the enlarged ends of short lateral branches of the mycelium and usually apply themselves to each other very early. (Fig. 1.) The oogonium immediately develops rather large, conical projections all over its surface. (Fig. 2.) The antheridium remains small, club-shaped, and nearly transparent even to maturity.

The conjugating tube is formed when the oogonium is still young and before all its oily content has been organized into the egg. (Fig. 3.) At about this time the oogonium is cut off by a cross wall, but, to all appearances, the antheridium remains continuous with the rest of the mycelium.

The mature oospore is about 36 microns in diameter; the spines are from 5 to 8 microns in length. (Fig 4.) The heavy wall of the spore, 3 to 4 microns in thickness, is a very serviceable adaptation for enabling the plant to live through conditions unfavorable for its growth.

The writer is indebted to Professors Mottier and Van Hook for assistance in indentifying this fungus and for valuable suggestions as to methods of studying it.

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