

CHAPTER 50

APPENDIX

MYCOPARASITES OF THE SAPROLEGNIACEAE

Only a few of the members of the Saprolegniaceae invade other organisms, there to thrive in a biotrophic or necrotrophic existence (R. Cooke, 1977). There are more numerous cases in which water molds themselves are victims of invasion. For the most part, the intruders are primitive zoosporic fungi occupying the same habitats as the water molds, but these are not the sole associates. Moreau (1946) reported that bacterial galls (hypha became swollen and branched) developed on the mycelium of *Achlya colorata*, but such an association needs further exploration and experimentation. Quite at another extreme of the spectrum of organisms associated with water molds is the curiously interesting case recorded by Beers and Sherwood (1966). They discovered a new species of *Woodruffia*, a ciliate, attached to a sporangium of *Saprolegnia ferax* and feeding on the planonts as they were released. If the ciliate remained attached to the emptied primary sporangium, the animal also fed on spores emerging from internally proliferated, secondary sporangia. The ciliate ingested spores of *S. diclina* and *S. megasperma* as well. So far as is known (Lemke and Nash, 1974) water molds are not hosts for viruses.

It is beyond the scope of this treatise to deal *in extenso* with the organisms parasitizing the water molds. The compilations by Karling (1968a) and Sparrow (1960) deal with these fungi admirably (the first substantial publication to treat the biology of parasitism of water molds is that by A. Fischer, published in 1882). In the pages to follow we list the cases of mycoparasitism of water molds either not included in the accounts by Karling and Sparrow or which were discovered since those publications were written (approximately 1966 and 1958, respectively). The parasitic representatives of the genus *Aphanomyces* are not included; these are treated in the systematic account. The names of host species cited by various investigators may have been altered by subsequent taxonomic changes; these instances are noted only the first time the species name appears in the listing.

Three papers by Held (1972, 1973, 1974) on host-parasite relations should be consulted by those interested in pursuing studies on mycoparasites of Saprolegniaceae.

CHYTRIDIALES:

Chytriomycetes willoughbyi (Willoughby) Karling

Aphanomyces sp. (*scaber?*) (Willoughby, 1971b).

Chytriomycetes sp.

Aphanomyces sp. (*scaber?*) (Willoughby, 1971b).

Dictyomorpha dioica Mullins

Achlya ambisexualis (Mullins and Barksdale, 1965); *A. americana*, (Dogma, 1975; Hidalgo-Quimio, 1965; Mullins and Barksdale, 1965; Reynolds, 1970); *A. caroliniana*, *A. conspicua* (Mullins and Barksdale, 1965); *A. flagellata* (= *debaryana*) (Mullins, 1961; Hidalgo-Quimio, 1965; Mullins and Barksdale, 1965); *A. klebsiana* (= *debaryana*) (Hidalgo-Quimio, 1965); *A. klebsiana*, *A. recurva*, *Achlya* sp., *Thraustotheca clavata* (Mullins and Barksdale, 1965); *A. megasperma*, *Achlya* sp., *T. clavata* (Hidalgo-Quimio, 1965).

Olpidium sp.

Dictyuchus monosporus (W. B. Cooke and Bartsch, 1959); *Saprolegnia ferax* (Tempère, 1904; possibly not an *Olpidium* but an *Olpidiopsis*); hyphae of a watermold (Maurizio, 1899).

Phlyctochytrium parasitans Sparrow and Dogma

Achlya caroliniana (T. W. Johnson, 1976); *A. flagellata* (Sparrow and Dogma, 1973).

Phlyctochytrium planicorne Atkinson emend Umphlett and Holland

Achlya oligacantha, *Saprolegnia ferax* (Milanez, 1967).

Phlyctochytrium zygnematis (Rosen) Schroeter

Saprolegnia sp. (T. W. Johnson, 1975).

Phlyctochytrium sp.

Achlya spiraculis (= *papillosa*) (T. W. Johnson and Howard, 1972).

Rhizophyidium aphanomycis Karling

Aphanomyces sp. (Karling, 1976).

Rhizophyidium carpophilum (Zopf) Fischer

Achlya americana (Dogma, 1975); *A. colorata*, *A. diffusa* (T. W. Johnson, 1973c, 1976); *A. flagellata* (Dogma, 1975; T. W. Johnson, 1973c; Karling, 1946; Milanez, 1966b; A. L. Rogers et al., 1970); *A. intricata* (Milanez, 1966); *A. klebsiana* (Beneke and Rogers, 1970); *A. oligacantha*, *A. recurva* (Milanez, 1966); *Achlya* sp. (Karling, 1966b; Kobayasi and Konno, 1971b; Konno, 1972); *Aphanomyces stellatus* (Karling, 1966b); *Dictyuchus monosporus* (A.

L. Rogers *et al.*, 1970); *Dictyuchus* sp. (Karling, 1946); *Saprolegnia ferax* (Milanez, 1966); *S. megasperma* (Beneke and Rogers, 1970); *Saprolegnia* sp. (T. W. Johnson, 1976; Karling, 1966b; Scott, 1960b); *Thraustotheca clavata* (Karling, 1946); unidentified watermold host (Harder and Gallwitz-Uebelmesser, 1959; Howard and Johnson, 1969; Persiel *et al.*, 1966).

Rhizophydium hyperparasiticum Karling

On hyphae and oogonia of a sterile (?)phycomycete (Sparrow, 1957).

Rozella achlyae Shanor

Achlya sp. (Scott, 1960b); *Dictyuchus anomalus* (=monosporus) (T. W. Johnson, 1955b).

Rozella septigena Cornu

Achlya flagellata (T. W. Johnson, 1977a); *Achlya* sp. (Ou, 1940); *Aphanomyces* sp. (Howard and Johnson, 1969); *Dictyuchus* (=Achlya) *achlyoides*, *D. anomalus*, *D. pseudodictyon*, *Saprolegnia ferax*, *S. torulosa* (T. W. Johnson, 1977a); unidentified watermold host (Maurizio, 1899).

Rozella sp.

Achlya americana, unidentified watermold host (T. W. Johnson, 1973c); host unidentified (Reynolds, 1970).

HYPHOCHYTRIALES:

Hyphochytrium catenoides Karling

Aphanomyces euteiches (Ayers and Lumsden, 1977).

Rhizidiomyces apophysatus Zopf

Achlya americana (Dogma, 1975; Sparrow and Dogma, 1973); *A. brasiliensis* (=apiculata) (Milanez, 196b); *A. flagellata* (Dogma, 1975; Harder and Gallwitz-Uebelmesser, 1959; Hutchison, 1940; T. W. Johnson, 1956a; Karling, 1966c; Konno, 1972; Sparrow, 1965; Sparrow and Dogma, 1973); *A. klebsiana* (Karling, 1966a); *Achlya* sp. (Karling, 1966a, c; Ou, 1940); *Saprolegnia ferax* (Milanez, 1966; Milanez and Beneke, 1968).

Rhizidiomyces bivellatus Nabel

Achlya sp. (Karling, 1966c).

Rhizidiomyces japonicus (Kobayasi and Ookubo) Sparrow

(?)*Aplanes* sp. (Kobayashi and Ôkubo, 1954; Konno, 1972).

PLASMODIOPHORALES:

Octomyxa achlyae Couch, Leitner, Whiffen

Achlya glomerata (Whiffen, 1939)

Octomyxa brevillegniae Pendergrass

Brevilegnia unisperma, *Dictyuchus missouriensis* (=monosporus), *D. pseudodictyon* (W. A. Sherwood, 1966b).

Octomyxa sp.

Aphanomyces (?)*laevis* (T. W. Johnson, 1974b).

Woronina polycystis Cornu

Achlya bisexualis (A. L. Rogers *et al.*, 1970); *A. colorata*, *A. polyandra* (Toma, 1971); *A. racemosa*, *Achlya* sp., *Saprolegnia ferax* (Cejp, 1959a); *S. hypogyna* (Dudka and Logvinenko, 1968); *Saprolegnia* sp. (Karling, 1966a, d; Moesz, 1937-38; Willoughby, 1969); unidentified watermold host (Domashova, 1974b; Maurizio, 1899; Perrott, 1960).

PERONOSPORALES

Pythium oligandrum Drechsler

Aphanomyces laevis (Vesely, 1978).

LAGENIDIALES:

Lagenidium destruens Sparrow

Achlya recurva (Scott, 1960b); *Saprolegnia diclina* (A. L. Rogers *et al.*, 1970); *Saprolegnia* sp. (T. W. Johnson, 1974b).

Olpidiopsis achlyae McLarty

Achlya americana (T. W. Johnson, 1977e); *A. flagellata* (Karling, 1966a, e; A. L. Rogers *et al.*, 1970; Scott, 1960b); *Achlya* sp. (Das-Gupta and John, 1953; Dayal and Thakur Ji, 1968a; T. W. Johnson, 1977e; Karling, 1966a; Manoharachary, 1979a).

Olpidiopsis aphanomycis Cornu

Aphanomyces laevis (Holland, 1958; Howard and Johnson, 1969; T. W. Johnson, 1977e; Karling, 1966a, e, 1969, 1977; C. E. Miller, 1965; Scott, 1960b; Scott *et al.*, 1963; Staniak, 1971; Sydow *et al.*, 1907*). *Aphanomyces* sp. (Cejp, 1959a; T. W. Johnson, 1977e; Sparrow, 1957). *-as *Pseudolpidium*.

Olpidiopsis fusiformis Cornu

Achlya (?)*apiculata* (Cejp, 1934*); *A. americana* (W. B. Cooke and Bartsch, 1960; T. W. Johnson, 1974b, 1977e); *A. flagellata*, (T. W. Johnson, 1956a, 1977e; Konno, 1972; Khulbe, 1977; 1980b; Khulbe and Bhargava, 1981; V. D. Matthews, 1927*; A. L. Rogers *et al.*, 1970; G. C. Srivastava, 1966); *A. klebsiana* (Karling, 1966a; G. C. Srivastava, 1966; G. C. Srivastava and Bhargava, 1963; Khulbe and Bhargava, 1981); *A. (?)polyandra* de Bary (= *debaryana*) (Sydow *et al.*, 1907*); *A. polyandra* Hildebrand (Karling, 1966a); *A. prolifera* (Milanez, 1966; Milanez and Beneke, 1968; G. C. Srivastava, 1966); *A. racemosa* (Cejp, 1934*, 1959a; Konno, 1972); *Achlya* sp. (Cejp, 1959a; Chiou *et al.*, 1975; Karling, 1966a; Ou, 1940*); (?)*Dictyuchus* sp. (Cejp, 1959a); unidentified watermold host (W. B. Cooke and Bartsch, 1959; Hunter, 1975; Khulbe, 1980a; Khulbe and Bhargava, 1977; G. C. Srivastava, 1967b). *-as a species of *Pseudolpidium*, or the synonymous taxon, *Olpidiopsis minor*.

Olpidiopsis incrassata Cornu

Achlya klebsiana, *A. racemosa* (Cejp, 1959a); *Isoachlya* (= *Saprolegnia*) *anisospora*, *I. monilifera* (= *S. torulosa*), *I. unispora* (= *S. unispora*), *S. declina*, *S. kauffmaniana* (excluded name), *S. mixta* (Slifkin, 1961, 1964); *S. delica* (= *declina*) (Slifkin, 1961, 1964, 1968); *S. ferax* (Bretsnyder, 1943; Cejp, 1959a; Slifkin, 1961, 1964); *Saprolegnia* sp. (Cejp, 1959a; Slifkin, 1961, 1964; Toma, 1971).

Olpidiopsis luxurians Barrett

Aphanomyces helicoides (= *laevis*) (G. C. Srivastava, 1966); *A. laevis* (Karling, 1966a; Khulbe, 1977, 1980b; Khulbe and Bhargava, 1981; G. C. Srivastava, 1966; G. C. Srivastava and Bhargava, 1963); *A. laevis* forma *keratinophilus* (= *keratinophilus*) (Konno, 1972); *Aphanomyces* sp. (C. E. Miller, 1961, 1965); unidentified watermold host (G. C. Srivastava, 1967b).

Olpidiopsis saprolegniae var. *indica* Dayal and Thakur Ji

Saprolegnia sp. (Dayal and Thakur Ji, 1968a; Thakur Ji, 1967).

Olpidiopsis saprolegniae var. *levis* Coker

Isoachlya anisospora var. *indica* (= *Saprolegnia diclina*), *I. toruloides* (= *S. torulosa*), *S. crustosa* var III (= *diclina*), *S. diclina* (Khulbe, 1977, Khulbe and Bhargava, 1981); *S. (?) delicata* (T. W. Johnson, 1956a); *S. ferax* (W. B. Cooke and Bartsch, 1960; T. W. Johnson, 1977e; Khulbe, 1977, 1980b; Moreau and Moreau, 1948); *S. (?) ferax* (T. W. Johnson, 1956a); *S. mixta* var. *asplundii* (= *ferax*) (Khulbe, 1977); *S. terrestris* (T. W. Johnson, 1972); *Saprolegnia* sp. (T. W. Johnson, 1976, 1977e); unidentified watermold host (W. B. Cooke and Bartsch, 1959; Hunter, 1975; Khulbe, 1980a; Khulbe and Bhargava, 1977).

Olpidiopsis saprolegniae var. *saprolegniae** (Braun) Cornu

Isoachlya anisospora (Cejp, 1959a); *I. anisospora* var. *indica* (G. C. Srivastava, 1966); *Saprolegnia diclina* (T. W. Johnson, 1977e; Karling, 1966a; G. C. Srivastava and Bhargava, 1963; G. C. Srivastava, 1966); *S. ferax* (Cejp, 1959a; Chiou *et al.*, 1975; W. B. Cooke and Bartsch, 1960; T. W. Johnson, 1972, 1974b, 1977e; G. C. Srivastava, 1966; Stpiczyńska-Tober, 1965; Toma, 1971; Żebrowska, 1976b); *S. litoralis* (A. Lund, 1934); *S. mixta* (Diehl, 1935); *S. monoica* (= *ferax*) (Szwaneke, 1938; Zaborowska, 1965; Żebrowska, 1976b); *S. parasitica* (Beneke and Rogers, 1962; A. L. Rogers *et al.*, 1970); *S. torulosa* (T. W. Johnson, 1977e); *Saprolegnia* sp. (Cejp, 1959a; Clinton, 1893; Fox and Wolf, 1977a; J. V. Harvey, 1942; T. W. Johnson, 1968, 1977e; Karling, 1966a, e; Konno, 1972; Moesz, 1937-38 (as *Pseudolpidium*); Żebrowska, 1976a); unidentified watermold host (Apinis, 1964; Beneke and Schmitt, 1961; Domashova, 1974b; Harder and Gallwitz-Uebelmesser, 1959; Hunter, 1975; T. W. Johnson, 1956a; Mer *et al.*, 1980; Perrott, 1960; Sawada, 1912; Schmitt and Beneke, 1962; G. C. Srivastava, 1967b; Szwaneke, 1938). *If author(s) reporting this species did not identify it by the varietal name, it is assumed that the specimens were of the variety *saprolegniae*, not *levis* or *indica*.

Olpidiopsis spinosa Tokunaga

Achlya flagellata (Konno, 1972).

Olpidiopsis varians Shanor

Achlya flagellata (T. W. Johnson, 1977e; A. L. Rogers *et al.*, 1970; G. C. Srivastava, 1966); *A. orion* (G. C. Srivastava, 1966); *A. proliferoides* (G. C. Srivastava, 1964, 1966); *Achlya* sp. (T. W. Johnson, 1977e); *Isoachlya anisospora* var. *indica* (G. C. Srivastava, 1964, 1966); unidentified watermold host (Beneke and Schmitt, 1961; T. W. Johnson, 1972; G. C. Srivastava, 1967b).

Olpidiopsis vexans Barrett

Saprolegnia ferax, *S. turfosa* (T. W. Johnson, 1977e); *Saprolegnia* sp. (Crane and Vermillion, 1966; Konno, 1972; Perrott, 1959); unidentified watermold host (Crane and Vermillion, 1966; Perrott, 1960).

Olpidiopsis sp.

Achlya glomerata (T. W. Johnson, 1956a; identified as *O. verrucosa*, but merged with *O. vexans* by T. W. Johnson, 1977e); *A. klebsiana* (Nesom, 1969); *Achlya* sp. (J. V. Harvey, 1925b, 1927b, 1930; T. W. Johnson, 1972; Rose, 1932); *Aphanomyces* sp. (J. V. Harvey, 1925b, 1930; Howard and Johnson, 1969); *Dictyuchus monosporus* (W. B. Cooke and Bartsch, 1960); *Saprolegnia ferax* (J. V. Harvey, 1927b; T. W. Johnson, 1972; Milanez, 1966); *S. mixta* (Holland, 1958); *S. torulosa* (T. W. Johnson, 1972); *S. turfosa* (T. W. Johnson, 1972, 1974b); *Saprolegnia* sp. (Holland, 1968; Rose, 1932; Suzuki, 1960f); unidentified watermold host [Harder, 1948; Hutchison, 1940; Maurizio, 1899 (as *Pseudolpidium*)].

Petersenia irregulare (Constantineanu) Sparrow

Achlya treleaseana (= *androgyna*) (T. W. Johnson, 1977b); *Aphanomyces* sp. (Karling, 1966a); *Saprolegnia diclina* (Milanez and do Val, 1969); unidentified watermold host (Harder and Gallwitz-Uebelmesser, 1959; Höhnk, 1960).

Petersenia sp.

Unidentified watermold host (T. W. Johnson, 1968).

Rozellopsis fischerei Cejp

Saprolegnia ferax (Cejp, 1959a).

Rozellopsis septigena Karling

Saprolegnia sp. (Marcus and Willoughby, 1978).

Rozellopsis simulans (Fischer) Karling

Achlya flagellata (Konno, 1972); *A. racemosa* (Cejp, 1959a).

Rozellopsis sp.

Saprolegnia Type I (= *diclina*) (Willoughby, 1969).

HYPHOMYCETES:

Dactylella spermatophaga Drechsler

Aphanomyces euteiches (Drechsler, 1938).