

## CHAPTER 32

*Couchia* W. W. Martin  
Mycologia 73:1143. 1981

Parasitic in eggs and egg masses of Chironomidae; penetration of egg mass matrix by a slender hypha, proliferating to form a eucarpic, coenocytic mycelium. Hyphae producing appressorial complexes at contact with egg surface. Sporangia terminal, inflated or elongate in part; each with a distinguishable exit papilla; renewal, when effected, occurring internally or in a basipetalous or sympodial manner. Spores dimorphic; primary ones anteriorly biflagellate, encysting in a loose cluster at or near the exit orifice at discharge; secondary spores laterally biflagellate, reniform. Oogonia smooth-walled, generally globose, subglobose, or spherical. Oospores eccentric, single or multiple. Antheridial branches declinuous. (Adapted from W. W. Martin, *loc. cit.*) Type species: *Couchia circumplexa* W. W. Martin, Mycologia 73:1144, figs. 1-30. 1981.

The species making up the genus *Couchia* are a remarkable group of individuals that parasitize eggs of species of Chironomidae (midges). Morphologically, the representatives are most readily recognized by the production of appressorial complexes, specialized structural systems that aid in fungal penetration into individual midge eggs.

Sporangia of species of *Couchia* are easily recognized as being saprolegniaceous, as are the sexual elements (oogonia and antheridia). The branched, digitate, apically swollen appressorial system, however, is unique, and is unknown in other representatives of the family.

Species of *Couchia* have dimorphic spores. The primary planonts exit the sporangia, swim in a slow, erratic pattern for a short time, and then encyst in a loose association at or near the exit pore. Thus the species have a primary spore discharge pattern which suggests, but is not entirely like the rapidly moving planonts leaving the vicinity of the exit orifice as is characteristic of members of *Saprolegnia*. The loose, unpatterned accumulation of encysted, discharged primary spores of *Couchia* species also suggest an achlyoid mode of spore release. However, the quiescent spores do not form the globose, compact, persisting cluster immediately outside the exit pore as in species of *Achlya*.

A secondary planont encysting on the periphery of an egg mass produces a slender penetration tube which grows into the egg matrix. An infection peg from an appressorial cell initiates entry of the fungus through the egg chorion; an elongate haustorium then develops in the infected chironomid egg. Subsequently, the hypha bearing the appressorial cell branches repeatedly to form a complex of digitate members, and from which hyphae producing new appressoria spread the invasion among neighboring eggs in the matrix-imbedded cluster.

Methods for the collection of invaded hosts, and culture of *Couchia* species have been published (W. W. Martin, 1987). Vegetative mycelium of representatives can be isolated and cultured on Emerson's YpSs agar.

Key to the species of *Couchia*

1. Sporangia broadly or narrowly-ellipsoid, obovate, ovate, pyriform, obpyriform, clavate, or globose . . . . . 2
1. Sporangia long flask-shaped or "tenpin"-shaped; characteristically with an ellipsoid or globose base and a single, long, cylindrical, distal extension functioning as an exit tube . . . . . *C. amphora* ( p. 462)
  2. Sporangia renewed by internal proliferation . . . . . *C. circumplexa* (p. 463)
  2. Sporangia solitary; not renewed, or if so only rarely by sympodial, or basipetalous branching . . . . . *C. limnophila* (p. 463)

The prominent characteristic of *Couchia* species, the appressorial cluster, might be expected to be the primary identifying feature of individual specimens. Characteristically, *C. amphora* produces appressorial complexes that are small clusters of several appressoria originating from a hyphal tip. In *C. limnophila*, the appressorial complexes are either low, relatively compact clusters, or are broad, raised, loosely clustered arrangements of appressoria arising from a branched hyphal apex. The appressorial complex of *C. circumplexa* has a compact or raised growth pattern, or spreading and closely appressed elements. Other appressorial arrays represent morphological intergrades among the three species of the genus (W. W. Martin, 2000). Thus, the configuration of the appressorial apparatus has but limited application in species differentiation.

*Couchia amphora* W. W. Martin  
Mycologia 92:1149, figs. 1-14. 2000  
(Figure 118 I-L)

Parasitic in eggs of *Polypedilum simulans*. Appressorial complex characteristically a raised, compact cluster of ovate or pyriform appressoria arising as unbranched or short-branched extensions from a swollen hyphal tip. Sporangia characteristically flask-shaped, extending distally in a single, long, cylindrical portion arising from the enlarged base, or "tenpin"-shaped, obpyriform, ellipsoid, or clavate; cylindrical portion often inflated immediately basal to the exit pore; single, terminal, or occasionally renewed in a basipetalous mariner; 125-707 (-1204)  $\mu\text{m}$  long x 17-12-11  $\mu\text{m}$  in diameter basally. Spores dimorphic; primary spore cysts 12-15  $\mu\text{m}$  in diameter. Oogonia globose, broadly clavate, or obovate; basal neck usually present; smooth-walled, but with a

raised, receptive papilla at site of antheridial cell contact; 68-126 x 61-105  $\mu\text{m}$ . Oospores eccentric; spherical to broadly ellipsoid; 2-9, and generally filling the oogonial cavity; 30-41 (-50) x 22-37  $\mu\text{m}$ . Antheridial branches declinous. Antheridial cells pyriform, ovate, or, clavate; attached apically to the oogonial wall; fertilization tubes present. (Adapted from W. W. Martin, *loc. cit.*).

*Couchia amphora* is identifiable by the predominating sporangial shape: long-necked, flask-shaped cells (Fig. 118 I, J). Among the three species in the genus, *C. amphora* has the smallest primary spore cysts. In addition, *C. amphora* produces larger oogonia that contain larger and more numerous oospores than are produced by *C. circumplexa*, but which approach the number in *C. limnophila*.

*Couchia circumplexa* W. W. Martin  
Mycologia 73:1144, figs. 1-30. 1981.  
(Figure 118 A-C)

Parasitic in eggs of *Chironomus attenuatus*, *Tendipes decorus*, and *Pentaneura carnea*. Appressorial complex consisting of rounded appressoria on branching hyphae which encircle the egg, or made up of raised clusters of such elements. Sporangia broadly or narrowly ellipsoid, obovate, pyriform, clavate, or ovate, rarely obpyriform or flask-shaped, intercalary ones dolioform; single, terminal; apical papilla prominent; renewed by internal proliferation; 53-166 (-344) x 32-95  $\mu\text{m}$ . Spores dimorphic; primary spore cysts 14-22  $\mu\text{m}$  in diameter. Oogonia spherical or, pyriform (? obpyriform), rarely apiculate; smooth-walled, but with raised papillae at sites of antheridial cell contact; 38-63 (-71) x 30-51  $\mu\text{m}$ ; spherical ones 30-84  $\mu\text{m}$  in diameter. Oospores eccentric; spherical to broadly ellipsoid, 1-5, and if more than one, filling the oogonial cavity; 23-47  $\mu\text{m}$  in diameter. Antheridial branches declinous. Antheridial cells pyriform or clavate; broadly attached apically; fertilization tubes present. (Adapted from W. W. Martin, *loc. cit.*)

Sporangial renewal is accomplished by internal proliferation (Fig. 118 C), a feature not found in the other species in the genus. In their general configuration the predominating appressorial complexes produced by *Couchia circumplexa* are compact, thus most nearly resembling those of *C. amphora*.

*Couchia limnophila* W. W. Martin  
Mycologia 92:1151, figs. 15-20. 2000  
(Figure 118 D-H)

Parasitic in eggs of *Glyptotendipe lobiferus*. Appressorial complex consisting of pyriform or ovate appressoria in relatively low, compact clusters arising laterally from major hyphal branches, or broad, raised, loosely clustered hyphal elements with appressoria arising from apices of once- or twice branched hyphae. Sporangia globose,

broadly or narrowly ellipsoid, ovate or obovate, but rarely clavate, pyriform, obpyriform, or flask-shaped; generally broadly ellipsoid; apical exit papillae usually short-cylindric; renewal system lacking, or rarely occurring by sympodial branching; 58-191 (-221) × 34-104 μm. Spores dimorphic; primary spore cysts 16-19 μm in diameter. Oogonia nearly spherical to subglobose; smooth-walled, but with swollen, barely raised papillae at sites of antheridial cell contact; 81-129 × 73-118 μm. Oospores eccentric; spherical; 2-11, and characteristically not filling the oogonial cavity; 28-41 μm in diameter. Antheridial branches declinous. Antheridial cells pyriform, ovate, or clavate; usually attached apically to oogonial wall; fertilization tubes present. (Adapted from W. W. Martin, *loc. cit.*)

The broadly ellipsoid sporangia (Fig. 118 D, E) of *Couchia limnophila* are not far removed from the general configuration of sporangia produced by *C. circumplexa*. Unlike the sporangia of the latter, however, those of the former do not proliferate internally. The appressorial complex in *C. limnophila* is generally larger and more open and branched than in either of the other species in the genus. In common with *C. amphora*, the predominating oospore number in *C. limnophila* is all but identical; 2-9 in *C. amphora*, 2-11 in *C. limnophila*. Oospore number in these two species, however, is noticeably larger, than in the type species of the genus (1-5).