LEMNAPHILA SCOTLANDAE (DIPTERA: EPHYDRIDAE) 
AND THREE OF ITS PARASITES DISCOVERED IN FLORIDA

GARY R. BUCKINGHAM
Agricultural Research Service, U. S. Department of Agriculture
e/o Biological Control Laboratory, P.O. Box 1269
Gainesville, Florida 32602

A small leaf-mining fly, Lemnaphila scotlandae Cresson, was discovered attacking a duckweed, Lemna valdiviana Phil., in water tanks at the Biological Control Laboratory in Gainesville in June 1986. States where this fly, perhaps the best known native fly that attacks aquatic plants, has been reported are Illinois, Michigan, New York and Ohio (Steinly et al. 1987). Merritt & Cummins (1978) reported it from the "East" (United States). Additional collections were made from March to October 1987 at 7 sites in north-central Florida: Alachua County—Calf Pond, Bivens Arm (Gainesville), Orange Lake; Hamilton County—6.4 km NW White Springs; Levy County—Manatee Springs State Park; Putnam County—Rodman Reservoir; and Sumter County—Lake Okahumpka. In November 1988 it was collected in southern Florida: Broward County—Ft. Lauderdale Research and Education Center. Additional host plants were L. gibba L. and L. minor L. Three hymenopterous parasites were also reared from puparia. They were Opis lemnaphilae Muesebeck (Braconidae), Trichopria anqustipennis Muesebeck (Diapriidae), and T. palpidis Muesebeck. All were previously reported only from New York (Krombein et al. 1979). Attempts to obtain egg parasites were unsuccessful.

A brief description of the biology of L. scotlandae was published by Scotland (1939). White to yellowish eggs were laid singly on the edges of the upper surfaces of leaves. Larvae eclosed after two days and mined within the leaves for about ten days. Amber-colored puparia were formed within mined leaves, one per leaf. Sexual maturity was attained the day after emergence. Unlike most flies, adult L. scotlandae feed on their host plant. They have strong spines on the labella with which they scrape the leaf surface. Scotland (1940) illustrated the labella and the characteristic parallel feeding scars. These scars, which look like gouges that might be made by a miniature rake, are diagnostic for the presence of this fly. Transparent leaves are good indicators of a possible fly infestation but are not diagnostic because larvae of the weevil, Tanysphyrus lemmac Fab., cause similar damage. When fly puparia are present, they can be easily seen.
*Lemnaphila scotlandiae* is the only species of the genus present in the United States. It can be separated from our other ephyrid genera using the key of Wirth et al. (1987). The genus includes three additional species, all Neotropical. They are *L. illinoana* Lizarralete de Grosso which attacks *Spirodela biperforata* W. Kock in Argentina, *L. neotropica* Lizarralete de Grosso from *Lemna minima* Philippi and *Spirodela* sp. in Argentina, Jamaica, and Panama and *L. wirthi* Lizarralete de Grosso in Ecuador and Argentina, whose host is unknown (Lizarralete de Grosso 1978). Lizarralete de Grosso (1978) also reported brief descriptions of the biology of the first two species, both of which are leaf miners.

Puparia from two sites were isolated to recover parasites. A sample from *L. minor*, Rodman Reservoir, 6 October 1987, yielded 6 flies, 5 *O. lemnaphilae*, and 7 *Trichopria* spp., and a sample from *L. valdiviana*, Lake Okahumpka, 22 October 1987, yielded 1 fly, 1 *O. lemnaphilae*, and 1 *T. paludis*. Total parasitism in both samples was 66.6% (n = 21), which compared closely with the 59% (n = 29) reported by Scotland (1939) for the same three parasite species during August in New York.

All parasites exited dorsally in the anterior portions of the puparia by cutting roughly circular holes. The diameters of the exit holes were generally larger than 0.30 mm for *O. lemnaphilae* and less than 0.30 mm for *Trichopria* spp. The exit hole of *Trichopria* spp. was usually confined to the head and thorax of the puparium, whereas that of *O. lemnaphilae* was slightly more posterior and extended into the second or third abdominal segments. Dissection of the empty puparium allowed easy determination of which parasite had exited. The transparent pupal or prepupal fly integument was present when *Trichopria* spp. had exited, but not when *O. lemnaphilae* had exited. The meconia also varied. Those of *Trichopria* spp. were amorphous, light brown masses lying in the posterior ends of the pupal integuments while that of *O. lemnaphilae* was a dark brown rod, 0.22 mm long, lying in a light colored substance attached to the puparial wall posteriorly. The meconia was absent in one puparium attacked by *O. lemnaphilae*.

The discovery of *L. scotlandiae* in Florida has greatly extended the reported range of this species. Initially I believed this might represent a recent range extension, but the presence of the three parasites suggests that the fly is either native to Florida or has been here for a considerable period. It is surprising that this species has been overlooked until now, but this highlights the paucity of information available about insect herbivores on aquatic plants. Increased collecting and biological studies are long overdue in this field.

Fly and parasite specimens have been deposited in the United States National Museum of Natural History, Washington, D.C., and in the Florida State Collection of Arthropods, Gainesville. Additional specimens of *Trichopria* have been deposited in the Canadian National Collection, Ottawa. I thank Brother Jim Edmiston, Padua Franciscan Friary, Parma, Ohio, and Wayne Mathis, Smithsonian Institution, for confirming the fly identification, Paul Marsh, USDA/ARS, SEL for identification of *Opius*, and Lubomir Masner, Agriculture Canada, for identification of *Trichopria*. I also thank the many individuals who collected plant samples for me. Initial drafts of the paper were reviewed by Kim Haag and Paul Boldt.

**References Cited**


MACROPTEROUS ADULTS OF ALLIGATORWEED THRIPS, AMYNOTHRIPS ANDERSONI, FOUND IN FLORIDA

G. R. BUCKINGHAM

c/o Biological Control Laboratory
Agricultural Research Service, U.S. Department of Agriculture
P.O. Box 1269, Gainesville, Florida 32602

The alligatorweed thrips, Amynothrips andersoni O'Neill, from Argentina, was released in Florida in 1967 to control alligatorweed, Alternanthera philoxeroides (Mart.) Griseb., a floating weed native to South America (Coulson 1977). Although a macropterous, or long-winged, form was described in the original description of this species (O'Neill 1968), only short-winged individuals were observed in the United States laboratory colonies that supplied material for release and in the field populations established in Florida, Georgia, and South Carolina (Coulson 1977). Coulson (1977) suggested that a study might be made of the macropterous form and its dispersal in South America relative to the desirability of importing that form into the United States to increase the dispersal capabilities of this species. There were no indications that the forms differed in feeding behavior or in damage potential. Maddox and Mayfield (1979) reported that fully macropterous adults were present during spring near Castilar, Argentina, where the U.S. population originated. O'Neill (1968) indicated that specimens from the Amazon Basin were invariably macropterous as were specimens from another host, A. hasleriana Chad., collected in Paraguay. The spectacular success of the introduced alligatorweed flea beetle, Agasicles hygrophila Selman and Vogt, in controlling A. philoxeroides in Florida and along the Gulf Coast (Coulson 1977), led to a shift in research effort, shortly after release of the thrips, from control of alligatorweed to control of waterhyacinth, Eichhornia crassipes (Mart.) Solms. No intensive evaluation studies have been reported on the thrips in the U.S., although it has been considered by aquatic weed scientists as uncommon and of limited distribution. The possibility of introducing the macropterous form was discussed at various times by researchers but no action was taken.

On 16 March 1983, long-winged adults were discovered in a laboratory colony of the alligatorweed flea beetle at Gainesville, Florida. The wings of these adults were as long as their abdomens; however, the wings of specimens placed in alcohol appeared to be relatively shorter because the abdomens were greatly distended. These adults had one of the characters that O'Neill (1968) used to define the fully macropterous form but not all of the characters. The ocelli were almost twice as wide as the eye facets or wider,