

Biological Control Agents for Mole Crickets

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Objectives:

1. To research and develop biological control agents in Florida for pest mole crickets.
2. To establish, if possible, three of these biological control agents in Georgia where they may be independently evaluated.

Start Date: 2001

Project Duration: 2 years

Total Funding: \$24,070

Scapteriscus mole crickets, all of South American origin, are the most damaging insect pests of southern turf. In the 1980s, three classical biological control agents were introduced from South America into Florida to control mole cricket pests. Evaluation of the combined effect of two of them in the Gainesville area showed that populations of mole crickets fell steadily during the 1990s as judged by catches of adults at sound traps that were operated every night of the year.

The two biological control agents established near Gainesville are a beneficial wasp (*Larra bicolor*) and a beneficial nematode (*Steinernema scapterisci*). The beneficial fly (*Ormia depleta*) has permanent populations only south of Gainesville. A beneficial beetle has not yet been released from quarantine. Laboratory cultures of mole crickets, the fly, and the beetle are maintained in Gainesville for experimental use. Ways are being developed to improve culture methods.

The beneficial nematode is now being produced on an industrial scale by MicroBio for field trials. If these go well, the nematode is likely to be marketed beginning in

spring 2002.

The wasp *Larra bicolor* can be harvested in the field from plots of a wildflower established in 1997-1998 in the Gainesville area. It is available in highest numbers in the autumn, September to November, thus without need to maintain a laboratory culture. The wildflower is *Spermacoce verticillata* (Rubiaceae), which is better adapted for growing in tropical and subtropical areas than in northern Florida. This wildflower is widespread in Florida's southernmost counties.

In July, 2000, plots of the wildflower were installed at three sites in Tift County, Georgia. In September, 2000, wasps were harvested in Gainesville, transported to Georgia, and released at the three wildflower plots. The wildflowers did not survive the Georgia winter and were replaced in May, 2001. In July, 2001, more than a dozen adult *Larra bicolor* were seen at one of the three Georgia sites -- they were foraging on flowers of pennywort, another wildflower. The wasps seen in July must have been descendants of the wasps that were released, suggesting establishment of a population in Georgia.

At the University of Florida, a new graduate student has initiated a search for additional plants (wildflowers and cultivated



Fully-grown wasp grub ready to pupate and with the remains of the mole cricket it has killed.

plants) that are useful to the wasp. Two other students have obtained data that show the percentage parasitism of pest mole crickets by *Larra bicolor* at two field sites with plots of *Spermacoce verticillata*. One of these students also has shown that the new strain of the fly *Ormia depleta* develops faster at cooler temperatures than does the old strain (the one imported from subtropical Brazil in 1988 and now widespread in central and southern Florida). A fourth student is beginning a study of the combined effect of temperature and daylength on development of the fly. A fifth student is about to publish basic studies on the behavior of the predatory beetle *Pheropsophus aequinoctialis* (the unreleased potential fourth biological control agent).

Summary Points

- Collected *Larra bicolor* wasps that parasitize mole crickets in Florida and released in Georgia. A population of this wasp now appears to be established in Tift County, Georgia.
- Determined in northern Florida that this wasp parasitizes a substantial proportion of pest mole crickets in places where it is established.
- Continued to obtain data on behavior and physiology of the fly *Ormia depleta* and beetle *Pheropsophus aequinoctialis* which are actual or potential biological control agents of mole crickets.



An adult *Larra bicolor* wasp stings a mole cricket to paralyze it temporarily while an egg is laid.