

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

Three biological control agents imported against pest (*Scapteriscus*) mole crickets agents have been established in parts of Florida since at least the early 1990s. All were imported from South America with the idea that they should provide area-wide permanent control of the pests. They are the beneficial nematode *Steinernema scapterisci*, the wasp *Larra bicolor*, and the fly *Ormia depleta*.

Biological control by these three agents is not yet fully implemented in any part of Florida. The best case is in the vicinity of Gainesville, where two of them, the wasp and nematode, are widespread and have together achieved a reduction of mole cricket numbers by >95% (based on a 23-year nightly record of mole crickets collected in sound-traps). However, even in Gainesville, the wasp population is not being managed for best effect, the fly contributes little or no mortality (its population is farther south), and a fourth biocontrol agent (a beetle) has not yet been released.

The objectives of the current project were to try to establish the same three organisms in Georgia. Through small-scale releases by Dr. Will Hudson (University of Georgia), the nematode already had been established in a few pastures near Tifton,

Georgia. Evidently it can survive winters in southern Georgia.

Any large-scale attempt to distribute it farther would have to await its renewed commercial production as a biopesticide. Fortunately, it is again being produced as a biopesticide (called Nematac-S by Becker-Underwood) that can be purchased by golf course managers. However, it is not merely a biopesticide. Experimental applications on two Gainesville, Florida golf courses in the late 1980s resulted in populations that so far have persisted 12 years.

The nematodes were found at the time of sampling in 2001 to be infecting 16.7% and 20.4% respectively of trapped mole crickets on two courses. Because of the short life cycle of the nematode and the single annual generation of mole crickets, it is evident that they must kill a large percentage of mole crickets each year.

Releases of the wasp, collected from Gainesville, Florida in September, 2000, have been successful. Wasps were detected in 2002 at all three of the Georgia sites where they were released, no matter that numbers released were only 30 at one site, 60 at a second, and 90 at a third. Each site was no closer than 10 miles to any of the others, which argues that establishment at each site was independent. Along with that observation go observations of feeding by adult wasps at nectar several wildflowers species. It is time to consider distribution of the wasp to other southern states.

Current research on the wasp covers: (a) a comparative study of some alternative nectar sources for adult wasps, (b) an analysis of the food ingested by adult wasps-sugars composition, and (c) whether pollen is indigested and digested.

There is yet no evidence that releases of any strain of *Ormia depleta* in



The adult fly *Ormia depleta*.

Georgia have yet been successful. Flies of the "old" (Piracicaba, more tropical) and "new" (Osório, more temperate) strain have been released in the Tifton vicinity. Future research should be aimed at evaluation of the effect of the fly on populations of mole crickets at places in Florida where the fly is well-established.

Summary Points

- As few as 30 *Larra bicolor* wasps succeeded in establishing a local population when released at a distant site in Georgia.
- None of the initial Gainesville, Florida nor Tifton, Georgia releases of the wasp were on a golf course. Instead, they were released in places with high numbers of mole crickets. The point is to establish populations throughout counties, which will provide area-wide control of pest mole crickets. This will reduce numbers of these pests flying in to golf courses.
- Eventually the wasps (or flies or nematodes) will turn up on golf courses where, we can hope, that action of the first two can be enhanced by provision of nectar sources. Many superintendents think that unless research is performed on a golf course, it should not be funded: they do not yet understand the concept of area-wide biocontrol.



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