

A Parasitic Fly that Kills Mole Crickets: Its Use in States North of Florida

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Objectives:

1. To explore farther south in South America (colder climates) to obtain stocks of the fly *Ormia depleta*, a natural enemy of the mole cricket.
2. To culture the captured South American flies in our laboratory and supply them to collaborators in other states for release.

Start Date: 1998

Project Duration: 3 years

Total Funding: \$26,680

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. One of these agents is the parasitic fly *Ormia depleta*.

Ormia depleta is a parasitoid fly whose adults are free-living and whose larvae develop in and kill mole crickets. A tropical stock of *Ormia depleta* from Brazil was brought to Florida in 1987. Rearing methods were developed at the University of Florida.

About 10,000 of laboratory-reared progeny of this stock were released in 1988-1992, funded by the Florida Turfgrass Association, in all regions of Florida. By the end of 1994, a population of this fly was found by surveys to have colonized 38 counties of peninsular Florida. Small starter stocks of the fly later supplied to collaborators in Alabama, Georgia, and North Carolina apparently failed to establish populations in those states.

In an extensive survey in most peninsular Florida counties in 1992, trap records showed that numbers of adult flies varied enormously from place to place. The numbers of flies must depend in part on number of mole crickets present in a local area, because mole crickets are the only hosts used by the fly larvae.

In 1999, funded by the USGA, a stock of the flies (Osorio stock) was brought from nearly 30°S, near the town of Osorio in the Brazilian state of Rio Grande de Sul,

to Florida. This was the farthest south that *Ormia depleta* was detected in southern Brazil in a survey in November-December, 1998.

Over eight generations of flies were reared in the laboratory until the percentage becoming gravid had risen from 1.3% to about 10%. By the fall of 1999, the improved ability to rear the Osorio stock allowed shipment of token numbers of adult flies to collaborators in Louisiana and Georgia.

Subsequently, in early summer 2000, shipments of adult flies (gravid females) were made to collaborators in North Carolina and Texas, and to Georgia and Louisiana again. A week or so following each shipment of adult flies, approximately 200 fly puparia were shipped to each of these collaborators. Adults were released on the evening of receipt.

If the Osorio stock of *Ormia depleta* is avoiding the effects of colder winters, one method it might have would be to spend the winter months underground in diapause (hibernation) in the pupal stage. The stimulus for induction of diapause varies among insect species.

Declining daylight hours in the fall induces diapause, while increasing daylight hours in spring bring the insects out of diapause. A 7-week experiment was designed to test this possibility. In mid-summer in northern Florida there are approximately 14 hours of daylight (10 of darkness) and in mid-winter the reverse of this. Therefore, beginning in July 2000, cages of newly emerged adult flies were exposed in a window (at room temperature) to normal day length. A control set was exposed to 10-hours of day length, by covering cages for 4 hours (until 10:30 am, based upon time of local sunset and



Red-eyed flies from Argentina have been evaluated as a potential biological control of Southern mole crickets in Florida.

sunrise) in the early morning with double, large, black, plastic bags.

When female flies in the cages became gravid, their larvae were extracted "by Caesarian section" and "inoculated" onto mole crickets. The "inoculated" mole crickets were immediately exposed to the same light regimes, as were the fly pupae that were produced. The duration in days of each fly pupa was recorded.

The test was of whether the fly pupae exposed to 10-hour day length would spend substantially more time in the pupal stage than those exposed to 14-hour day length. The answer was negative. Therefore, it seems that if diapause occurs in these fly pupae, it is not initiated or terminated by day length alone.

Summary Points

- Collected, reared and released cold-tolerant *Ormia depleta* fly that kills mole crickets.
- Physiological and behavioral information on this natural biological control is being discovered
- Need to understand factors influencing diapause in pupae.