



# Texas Imported Fire Ant Research and Management Project

*Final Progress Report - October 2001*

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## **Evaluating Biological Control of Fire Ants Using Phorid Flies: Effects on Competitive Interactions**

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### **Relevance/Implication of Project:**

Since its spread into Texas in the 1950s, the red imported fire ant *Solenopsis invicta* Buren has become a serious pest in both urban and rural environments throughout the eastern two thirds of Texas. Most insecticides used against the imported fire ant affect native species as well. Excessive use of most registered insecticides have contributed to the spread of *S. invicta* due to the toxicity of these insecticides to competing native ant species and the rapid re-invasion of *S. invicta* into areas that have been treated previously. Consequently, increasing attention is being placed on sustainable control of *S. invicta* that includes biological control. Phorid flies in the genus *Pseudacteon* show great promise as biological control agents of *S. invicta*. Phorid control of fire ant colonies is presumed to occur by shifting the competitive balance between *S. invicta* and native ant colonies in favor of native ants. This mechanism of control presumes that the presence of phorids results in a drop in the foraging rate and hence the reproductive output of *S. invicta*.

### **Summary of Work to be Done:**

We will directly test the role of natural enemy mediated competition using *P. tricuspis*, a currently available phorid approved for release. Specifically, we are examining the ability of *P. tricuspis* to affect the competitive outcome between *S. invicta* and the native hybrid fire ant, *S. geminata xyloni*. The experiment will be run under conditions of high and low food availability. Small colonies of *S. invicta* and *S. geminata xyloni* will be allowed to compete

with each other via common foraging chambers. Phorids, and protein in the form of fresh-frozen crickets, will be introduced into these foraging chambers. The ability of phorids to shift the competitive balance will be determined by measuring the fitness of all ant colonies and comparing the results to phorid-free controls. We predict that in the presence of *P. tricuspis*, the competitive balance will be shifted in favor of *S. geminata xyloni*. Furthermore, we predict that phorid effects will be strongest when food availability is low (when time spent foraging will have the greatest impact on ant reproduction and survival). Our findings will provide valuable information regarding the nature of the red imported fire ants' interactions with other ants and the potential roll played by natural enemies in mediating competition; both of which will aid in our control of this pest.

### **Major accomplishments to date (June 30, 2001 through October 30, 2001)**

Host specificity testing of *Pseudacteon tricuspis* under choice and no-choice conditions with *Forelius pruinosus* has been completed. As expected, the flies attacked *S. invicta* in both the choice and no-choice tests. However, the flies never attacked *F. pruinosus*, regardless of test type. Furthermore, *F. pruinosus* did not visibly react to the presence of the flies, indicating that *P. tricuspis* is suitably host-specific for use in competition experiments with *S. invicta* and *F. pruinosus*.

The competition experiments were carried out during the period of July 23 through August 19. Daily photographs of all brood chambers were used to quantify the growth of the brood piles over the course of the experiment. Also, data on ant foraging were collected. The experiment examined two factors affecting colony brood-pile growth and ant foraging. First, the effect of phorids was examined using arenas where zero, one, or five female phorids were added to the central foraging chamber each day. Second, the experiment was replicated under conditions of high and low food availability. All possible combinations of phorid levels and food levels resulted in six experimental treatments, each replicated six times.

Results on ant foraging were consistent with previous studies showing that fire ants significantly reduce their foraging in the presence of phorid flies. However, we were unable to detect an effect of phorids on ant brood-pile growth.