

**Texas Imported Fire Ant Research and Management Project
Progress Report August 2006**

Title of project:

“The Interaction of Broadcast Baits and Native Ants on the Control and Re-invasion of Fire Ants”

Principal investigators:

Marvin Harris, Professor-Entomology (TAMU)
Alejandro Calixto, Extension Associate-Entomology, Fire Ants (TCE)
Charles Barr, Extension Program Specialist- Entomology, Fire Ants (TCE)

Project participants:

Aldo Gardea, Graduate Research Student (TAMU)
Camilo Garzon, Research Assistant (TAES)
Johnny Johnson, Extension Demonstration Technician (TCE)
Michael Morrison, Professor-Wildlife and Fisheries (TAMU)
Bryan Hays, Extension Program Specialist- Wildlife and Fisheries (Leon River Restoration Program) (TCE)

Summary of work done: The project focuses on studying the interactions of native ant species before, during and after poison baits/granules have been applied for the control of the red imported fire ant, and to investigate whether these species are affected by the treatment, and whether they affect the reinvasion of fire ants by increasing interspecific competition.

Major accomplishments to date (September 1, 2005 – August 31, 2006).

1- Large-plot experiments (Re-invasion of *S. invicta* on large bait-treated plots that also contain native ants)

September- December 2005

- Preliminary sampling was conducted to determine natural densities of *Solenopsis invicta* and native ants in different sites in Central Texas using lures (hot dogs) and pitfall traps

January – March 2006

- Selection of research sites (three in total) based on preliminary data collected with lures and traps during Fall 2005 and early spring 2006
- One site located in Snook, Burleson Co.

- Two other sites located in Gatesville, Coryell Co.
- The two sites in Gatesville are part of a large state project -Leon River Restoration Project (LRRP) – that aims to restore the habitat for several endangered species such as the Golden-cheeked Warbler and the Black-capped Vireo; both species are known to be severely affected by fire ants and our two projects agreed to mutually cooperate in assisting other students and providing input on sustainable fire ant management for this region commensurate with our combined objectives.
- Preliminary sampling was conducted to determine the natural densities of *Solenopsis invicta* and native ants in the spring in selected sites to determine and establish the location of experimental plots
- Establishment of twelve experimental plots (1 acre each) on the three selected sites

March 2006-August 2006

- Pre-treatment data collected weekly (March 2006- May 2006) using lures (hot dogs), pitfall traps and quadrat sampling
- Experimental plots treated in mid-May 2006
- Weekly monitoring of experimental plots through August 2006 using lures (hot dogs), pitfall traps and quadrat sampling following treatment (post-treatment data)
- Post processing of samples collected on pitfall traps (3600+) is still ongoing and expected to be completed before spring 2007

2- Small-plot experiments (Effect of insecticide baits/granules on native ants)

March 2006-August 2006

- Selection of sites (two in total) based on preliminary data collected with lures and traps during winter/spring of 2005-06
- Sites are located in Gatesville and also are part of the LRRP
- Preliminary sampling was conducted to determine the natural densities of *Solenopsis invicta* and native ants in the spring in selected sites to determine and establish the location of small experimental plots
- Establishment of twenty small experimental plots (1/8 acre) on the two selected sites
- Experimental plots were sampled for ants early in May 2006 with lures (hot dogs) and pitfall traps
- Treatments using different insecticide baits/granules (four products; 1) Hydramethylnon, 2) Indoxacarb, 3) Fipronil, 4) Bifenthrin) were applied in May 2006
- Post-treatment data were collected for four consecutive weeks following original treatment dates, and a fifth sample was collected in mid-August 2006
- Post processing of samples collected by pitfall traps (1000+) is still ongoing and expected to be completed before winter 2006
- Experiment will be repeated on a third site during Fall 2006

3- Estimation of *S. invicta* densities based on recruitment response time to lures

May 2006-August 2006

- Additional experiments were done in a site in Caldwell, Burleson Co., between May-August 2006 to investigate the efficiency of food lures (hot dogs) for estimating fire ant densities based on recruitment response time and hits per sampling unit
- Colonies were mapped on a 20 acre area using submeter accuracy GPS and colonies were rated from 1-5 according to colony size and reproductive condition in May 2006
- Twenty plots were established based on fire ant density (low= 1-5; medium= 5-15; high= 16-25), colony size (1-5) and reproductive stage (brood/no brood), larger colonies (4-5 on rating scale with brood) were left intact, others were removed with contact insecticide (individual mound treatment), buffer areas were treated with contact insecticides in June 2006
- Experimental plots were monitored using hot dog lures deployed using a grid design on each experimental plot and inspected every 10 minutes for an hour, colony counts were repeated in August 2006
- Experiments will continue to investigate recruitment throughout the day, and using other sampling techniques to allow greater calibration of this sampling technique

Goals achieved:

1- Large plots experiments

- Fire ants were successfully reduced using slow and fast acting insecticide baits (methoprene and indoxacarb respectively) following the same trends previously observed for these two products
- Native ants were not severely affected by bait application (methoprene and indoxacarb) on the three sites studied based on preliminary results
- Intensive observations on the three sites using “quadrants” indicated that bait broadcast in the morning in areas with high, medium and low densities of fire ants was rapidly foraged upon by fire ants; just a few individuals of *Forelius sp.*, *Dorymyrmex sp.* and *Monomorium minimum* were observed collecting these grits on plots where fire ants were removed. This suggests that bait use in fire ant infested areas selectively affects fire ants.
- Native ant density was observed to increase following fire ant reduction; however, it is too early to determine whether native ants are slowing fire ant re-invasion
- Effects of fire ant reduction and the use of bait insecticides on arthropod communities (based on pitfall traps) is still under investigation

2- Small plots experiments

- Of the four products used in these experiments, Fipronil and Bifenthrin appear to have significantly and negatively impacted native ants; Hydramethylnon and Indoxacarb did not show significant negative impacts on native ant species

3- Estimation of *S. invicta* densities based on recruitment response time to lures

- Preliminary results indicated that hot dogs are a good estimator of fire ant densities based on the recruitment response time and saturation of the lure
- If lures are saturated at or less than 20 minutes, this indicates the site is high in fire ants, if lures are saturated in 21-59 minutes, the site is intermediate and saturation in 60+ minutes indicates the site is low in fire ants
- The optimum time during the day for deploying these lures is in the morning (7-10 hr) and late in the afternoon/evening (18-21 hr) or when soil temperature remains under 90°F.

Readings taken at other times during the day or at higher soil temperatures could cause serious misinterpretations of the “real” fire ant densities

Relevance to the Texas Imported Fire Ant Research and Management Project:

1- Large plots experiments

These experiments once again demonstrate that, if used as suggested on product labels, broadcast baits at a rate of 1.5 lb per acre in highly infested areas do not have a significant negative effect on native ant species. In our observations, fire ants, before (and even after) the treatment are collecting most of the granules broadcast on the ground. We did not observe native ants foraging on initial insecticide bait treatments. Subsequent bait only treatments presented mixed results still heavily skewed to fire ant foraging. Even highly effective treatments routinely miss a few colonies/ha and results indicate the remaining fire ants are subsequently able to recruit sufficient numbers of foragers to collect these grits. However, we observed in a few cases, following fire ant reduction and in sites that were re-treated, some native ant species foraging on these grits (i.e. *Forelius*, *Dorymyrmex*); this may have seriously harmed a few native ant colonies and will be investigated further.

Understanding these effects is critical to the success of fire ant control. Without native ants to compete with fire ants, the net effect of biological control agents already introduced or present (i.e., Phorids and *Thelohania*) and in process (Phorids) for release (USDA-APHIS) will be diminished. The current experimental design has been effectively implemented and native ants are rebounding in density; we expect to observe their effects on fire ant re-invasion during the Fall 2006 and beyond. Previous work in our lab shows effects can be observed as long as 3 yrs after the last bait treatment in a small field study and this expanded investigation is on track to further test these results.

2- Small plot experiments

These experiments demonstrate that granular baits containing Hydramethylnon and Indoxacarb (non- contact insecticides) did not have a significant impact on native ants when fire ant density is high, and we expect other baits to perform similarly. It is important, for conservation and restoration purposes, to estimate fire ant density first before applying any treatment. We are also trying to develop a simple, fast method to detect fire ant densities that would contraindicate treating minimally infested fire ant areas that also harbor native ant species.

Products containing Fipronil and Bifenthrin (contact granular insecticides) did have a significant impact on both fire ants and native ants, and their mode of action is quite different from granular baits. Any ant contacting these granules is expected to die after translocating the active compound into the colony. These materials are contraindicated for use in environmentally sensitive areas or in areas with high densities of native ants.

3- Estimation of *S. invicta* densities based on recruitment response time to lures

A fast, accurate estimate of fire ant density is needed to justify treatment/re-treatments in areas of low, medium and high densities of fire ants and in areas where native ants are intended to be restored by using a “surgical” removal of fire ants with broadcast

baits. With the data collected and taking in account some assumptions (i.e. size of colony, reproductive stage, density estimates), we intend to develop a model that predicts fire ant density (colonies) per area using lures (hot dogs) based on speed of saturation and percentage of hits per sampling area.

Publications submitted/published; presentations/posters presented at national technical meetings/conferences:

Presentations (Manuscripts, etc., in preparation are available on request):

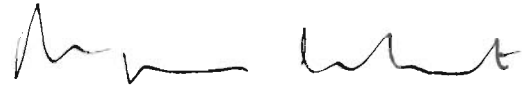
Calixto, A., M. K. Harris, C. L. Barr, A. Knutson and B. Ree. 2006. "Influence of fire ants and their control on native ant diversity". Southwestern Branch ESA Meeting, Austin, TX.

Calixto, A., M. K. Harris, C. L. Barr, A. Knutson and K. Winemiller. 2005. "Species turnover in local ant assemblages following fire ant reduction in Mumford, TX." Annual Meeting Entomological Society of America, Ft. Lauderdale, FL.

Jointly prepared by:



Marvin K. Harris
Professor
Department of Entomology
Texas A&M University
College Station, TX 77845-2475
Phone: 979-845-9757
Email: m-harris@tamu.edu



Alejandro Calixto
Extension Associate-Fire ants
Department of Entomology
Texas Cooperative Extension
Texas A&M University System
Bryan, TX 77806-2150
Phone: 979-845-6800
Email: acalixto@tamu.edu

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