

## **Release and establishment of fire ant parasitic flies, *Pseudacteon curvatus* and *Pseudacteon tricuspis* (Diptera: Phoridae) in Denton and Red River counties in 2009**

Kimberly Schofield, Program Specialist-IPM and Lynn Golden, CEA-AGNR, Texas  
AgriLife Extension Service  
Bill and Katy Hammon, Elm Fork Master Naturalists

Releases of natural enemies combined with conventional chemical methods are being used to manage the red imported fire ant, *Solenopsis invicta* Buren (Hymenoptera: Formicidae) in the United States. There are many natural enemies of the red imported fire ant that have been identified in South America. One natural enemy is a parasitic fly in the genus *Pseudacteon* (Diptera: Phoridae) that attacks fire ants in the genus *Solenopsis*. Upon finding a foraging worker fire ant, the female fly lays her egg inside the thoracic region of the fire ant worker. After the egg hatches, the larva digests the tissues within the thoracic region of the fire ant worker and then the fly larva moves into the head. The fire ant worker's head falls off and the larva continues to feed on tissues within the head and then pupates inside the head (Knutson and Drees 1998).

Currently there are five candidate species within the genus *Pseudacteon* that attack fire ants. However, two species have been released in North Texas, *Pseudacteon tricuspis* and *Pseudacteon curvatus*. In 2009, we monitored the spread of the phorid flies in the three release sites within Denton and Red River counties.

### **Materials and Methods**

The October 2006 release site for *P. tricuspis* was below the dam of Lake Ray Roberts in Pilot Point, TX in Denton County, where a total of 2,906 flies were released onto 53 mounds. On May 21<sup>st</sup> and October 22, 2008, we used “pizza traps” at the release area to determine the expansion of the *P. tricuspis* population (Puckett, 2007). The passive “pizza traps” consist of a large petri dish containing a smaller petri dish filled with 1 tablespoon of midden (decomposing fire ants) and an upside down pizza tri-stand covered with Tanglefoot® (**Figure 1**). The phorid flies are attracted to the midden and perch onto one of the prongs of the pizza stand. We collected the traps after 24 hours and then placed each trap under a microscope so the phorid flies could be properly identified. With the help of volunteers, the traps were placed out in each of the four cardinal directions at every mile for a total of 10 miles in each direction on May 21<sup>st</sup> (**Table 1**) and at every 2 miles for a total of 20 miles in each direction on October 23<sup>rd</sup> (**Table 2**). The traps were placed out beginning at 10:00am and concluding at 1:00pm with temperatures at 75°F. The traps remained in the respective locations overnight and each one was collected on May 22<sup>nd</sup> and October 23<sup>rd</sup> from 11:00am-3:00pm with temperatures at 87°F and 72°F, respectively.

A release of *P. tricuspis* occurred in Bagwell, TX, in Red River County in 2008, where a total of 422 flies were released onto 13 mounds. On June 24, 2009, ten “pizza traps” were placed into the release area to determine the establishment of the population (**Table 3**). The traps remained in their respective locations overnight and each one was collected on June 25, 2009 from 11:00am- 1:30pm with temperatures at 90°F. On October 28, 2009, “pizza traps” were placed out in each of the four cardinal directions at every ½ mile for a total of 5 miles and the traps were collected on October 29, 2009 from 9:00am- 11:00pm with temperatures

at 70°F (**Table 4**).

The *P. curvatus* release was conducted in Madras, TX in Red River County on a 100 acre ranch beginning on October 11<sup>th</sup> and concluded on October 26, 2007. On May 28<sup>th</sup> and October 28, 2009, “pizza traps” were placed in each of the four cardinal directions at every ½ mile for a total of 5 miles and the traps were collected on May 29<sup>th</sup> and October 29, 2009 from 11:00am- 1:30pm with temperatures at 90°F and 70°F, respectively (**Table 5**).

## Results and Discussion

For the 2006 release of *P. tricuspsis* at Ray Roberts Park, we monitored the expansion of the population on May 21, 2009, for a total of 10 miles from the release site in all four cardinal directions. On May 22, 2009 (**Table 6**), one fly was recovered on traps 1 and 4 on the southbound traps, and two flies were recovered on traps 2 and 3 and one fly on trap 6 on the westbound traps. On October 22, 2009 (**Table 7**), we monitored a total of 20 miles from the original release site in all four cardinal directions. On October 23<sup>rd</sup>, we recovered one fly on trap 4 on the southbound traps, one fly was recovered on trap 7 on the northbound traps, one fly was recovered on trap 8 on the eastbound traps and one fly was recovered on the trap 6 on the westbound traps. This was the final year to monitor this release site and we were able to recover *P. tricuspsis* 16 miles from the original release site.

For *P. tricuspsis* in Bagwell, we monitored the establishment at the release site on June 24, 2009 by placing out “pizza traps” (**Table 8**). On June 25, 2009 we recovered two flies on trap 1. We then monitored the expansion of *P. tricuspsis* on October 28, 2009 for a total of 5 miles from the release site in all four cardinal directions (**Table 9**). On October 29, 2009 we found four flies on trap 3 on the northbound traps, 2 flies on trap 6 and one fly on trap 9 on the eastbound traps, and one fly on traps 1, 2, 6 and 10 and two flies on trap 9 on the westbound traps. We were able to recover *P. tricuspsis* 5 miles from the original release site.

For *P. curvatus* in Red River County, we monitored the expansion of the population by placing “pizza traps” a total of 5 miles from the release site in all four cardinal directions on May 28<sup>th</sup> (**Table 10**) and October 28, 2009 (**Table 11**). On May 29<sup>th</sup>, we recovered one fly on traps 3 and 5 and two flies on trap 7 on the northbound traps, two flies on trap 10 on the southbound traps, two flies on trap 6 on the eastbound traps and one fly on traps 5 and 9 on the westbound traps. On October 29<sup>th</sup>, we recovered four flies on trap 3, one fly on traps 4, 5 and 8 and two flies on trap 9 on the northbound traps; one fly on trap 1 and six flies on trap 4 on the southbound traps; one fly on trap 2, two flies on trap 5 and one fly on trap 9 on the eastbound traps; and one fly on trap 9 on the westbound traps. We were able to recover *P. curvatus* 4.5 miles from the original release site.

We were able to successfully release *P. tricuspsis* and *P. curvatus* in Denton and in Red River counties. We plan to monitor the two sites in Red River County in April and October 2010 for a total of 10 miles from the release site using the “pizza traps.” By introducing and establishing these two parasitic phorid flies, we are providing a stress onto the fire ant colonies. Hopefully, this will allow native ants to better compete with the fire ants in order to regain their territories. As the native ants reclaim their territories, it is hoped that the number of red imported fire ant colonies will decrease.

**Figure 1.** Passive “pizza” trap used to monitor the establishment and spread of both *P. curvatus* and *P. tricuspis* from the original release sites in Denton and Red River counties.



**Table 1.** Coordinates of each passive “pizza trap” placed every mile for 10 miles north, south, east and west of the original release site at Ray Roberts Park, Denton Co. in order to detect the spread of *P. tricuspis* used on May 21, 2009.

Trap	North	South	East	West
1	33.3587N 97.332W	33.3494N 97.0355W	33.3545N 97.039W	33.347N 97.667W
2	33.3627N 97.032W	33.3452N 97.0318W	33.3579N 97.031W	33.344N 97.0625W
3	33.3725N 97.083W	33.3313N 97.0302W	33.3611N 97.0223W	33.3466N 97.644W
4	33.3793N 97.016W	33.3189N 97.0288W	33.3494N 97.0113W	33.3466N 97.0642W
5	33.383N 97.028W	33.3119N 97.0405W	33.3485N 97.0034W	33.3466N 97.0643W
6	33.3857N 97.028W	33.3069N 97.0427W	33.3490N 96.9932W	33.346N 97.06435W
7	In the middle of lake	33.3032N 97.042W	33.3486N 96.9834W	33.346N 97.0716W
8	33.406N 97.047W	33.2914N 97.035W	33.3464N 96.9737W	33.346N 97.08121
9	33.413N 97.046W	33.2815N 97.038W	33.3463N 96.963W	33.346N 97.0834W
10	33.421N 97.051W	33.2678N 97.0483W	33.3484N 96.954W	33.346N 97.0845W

**Table 2.** Coordinates of each passive “pizza trap” placed every two miles for 20 miles north, south, east and west of the original release site at Ray Roberts Park, Denton Co. in order to detect the spread of *P. tricuspis* used on October 28, 2009.

<b>Trap</b>	<b>North</b>	<b>South</b>	<b>East</b>	<b>West</b>
<b>1</b>	33.3757N 97.0112W	33.3498N 97.0349W	33.3494N 97.0095W	33.3464N 97.0841W
<b>2</b>	33.9994N 97.0604W	33.3278N 97.0294W	33.3464N 96.9718W	33.3575N 97.1229W
<b>3</b>	33.4237N 97.0719W	33.3042N 97.0286W	33.3481N 96.9343W	33.3588N 97.1604W
<b>4</b>	33.4477N 97.0457W	33.2819N 97.0077W	33.3468N 96.8964W	33.3674N 97.1951W
<b>5</b>	33.4716N 97.0419W	33.5696N 97.0068W	33.3708N 96.8581W	33.3932N 97.2349W
<b>6</b>	33.4954N 97.0442W	33.2798N 97.0013W	33.3638N 96.8211W	33.3574N 97.2744W
<b>7</b>	33.5193N 97.0435W	33.2096N 96.9749W	33.3239N 96.7837W	33.3578N 97.3182W
<b>8</b>	33.5432N 97.0333W	33.1857N 96.9769W	33.3301N 96.7472W	33.3569N 97.3464W
<b>9</b>	33.5672N 97.0364W	33.1584N 96.9771W	33.3447N 96.7081W	33.3553N 97.3878W
<b>10</b>	33.5911N 97.0358W	33.1314N 96.9867W	33.3489N 96.6705W	33.3602N 97.4231W

**Table 3.** Coordinates of each passive “pizza trap” placed at the original release site of *P. tricuspis* in Red River June 24, 2009.

<b>Mound Number</b>	<b>Number of <i>P. tricuspis</i> Released</b>	<b>LATITUDE</b>	<b>LONGITUDE</b>
1	30	15SO300611	UTM3725978
2	30	15SO300603	UTM3725976
3	30	15SO300578	UTM3726055
4	30	15SO300638	UTM3725795
5	30	15SO300597	UTM3725772
6	40	15SO300575	UTM3725759
7	30	15SO300647	UTM3725841
8	25	15SO300643	UTM3725860
9	30	15SO300638	UTM3725878
10	30	15SO300628	UTM3725908

**Table 4.** Coordinates of each passive “pizza trap” placed every half mile for 5 miles north, south, east and west of the original release site at Red River County in order to detect the spread of *P. tricuspis* on October 29, 2009.

<b>Trap</b>	<b>North</b>	<b>South</b>	<b>East</b>	<b>West</b>
<b>1</b>	33.3995N 95.0978W	33.3942N 95.0969W	33.3988N 95.0868W	33.3972N 95.0966W
<b>2</b>	33.4051N 95.0994W	33.3904N 95.0946W	33.3994N 95.0803W	33.3983N 95.1034W
<b>3</b>	33.4120N 95.0981W	33.3962N 95.0916W	33.3995N 95.0760W	33.3981N 95.1096W
<b>4</b>	33.4166N 95.0967W	33.3822N 95.0886W	33.3991N 95.0700W	33.3981N 95.1118W
<b>5</b>	33.4209N 95.0964W	33.3772N 95.0850W	33.3990N 95.0645W	33.3979N 95.1180W
<b>6</b>	33.4226N 95.0963W	33.3725N 95.0815W	33.3987N 95.0592W	33.3976N 95.1228W
<b>7</b>	33.4272N 95.0960W	33.3667N 95.0824W	33.3960N 95.0558W	33.3975N 95.1281W
<b>8</b>	33.4305N 95.0970W	33.36330N 95.0846W	33.3964N 95.0515W	33.3975N 95.1334W
<b>9</b>	33.4358N 95.0983W	33.3610N 95.0894W	33.3966N 95.0454W	33.3978N 95.1398W
<b>10</b>	33.4413N 95.0983W	33.3564N 95.0894W	33.3984N 95.0381W	33.3979N 95.1441W

**Table 5.** Coordinates of each passive “pizza trap” placed every half mile for 5 miles north, south, east and west of the original release site in Red River County in order to detect the spread of *P. curvatus* used on May 29<sup>th</sup> and October 29, 2009.

Trap	North	South	East	West
<b>1</b>	33.3974N 94.5903W	33.3893N 94.5890W	33.3952N 94.5772W	32.3930N 94.5889W
<b>2</b>	33.4024N 94.5904W	33.3864N 94.5890W	33.3966N 94.5730W	33.3909N 95.5929W
<b>3</b>	33.4059N 94.5882W	33.3815N 94.5871W	33.3958N 94.5665W	33.3912N 95.0064W
<b>4</b>	33.4068N 95.0345W	33.3777N 94.5869W	33.3897N 94.5622W	33.3941N 95.0519W
<b>5</b>	33.4153N 94.5933W	33.3723N 94.5869W	33.3924N 94.5558W	33.3949N 95.1080W
<b>6</b>	33.4206N 94.5892W	33.3701N 94.5854W	33.3905N 94.5527W	33.4018N 95.1573W
<b>7</b>	33.4242N 94.5840W	33.3673N 94.5858W	33.4003N 94.5471W	33.4000N 95.2038W
<b>8</b>	33.4278N 94.5801W	33.3641N 94.5822W	33.3989N 94.5411W	33.3999N 95.2411W
<b>9</b>	33.4327N 94.5802W	33.3579N 94.5789W	33.4001N 94.5366W	33.3978N 95.3028W
<b>10</b>	33.4367N 94.5816W	33.3559N 94.5778W	33.4025N 94.5290W	33.3987N 95.3592W

**Table 6.** Number of *P. tricuspis* and *P. curvatus* found on each passive “pizza trap” at each coordinate point from the original site at Ray Roberts Park in Denton County, set out on May 21, 2009.

Trap Number	North	South	East	West
<b>1</b>	0	1	0	0
<b>2</b>	0	0	2- <i>P. curvatus</i>	2
<b>3</b>	0	3- <i>P. curvatus</i>	0	2
<b>4</b>	0	1, 1- <i>P. curvatus</i>	0	0
<b>5</b>	0	0	0	0
<b>6</b>	2- <i>P. curvatus</i>	1	0	1
<b>7</b>	0	0	0	0
<b>8</b>	0	1- <i>P. curvatus</i>	0	0
<b>9</b>	0	1- <i>P. curvatus</i>	1- <i>P. curvatus</i>	0
<b>10</b>	0	2- <i>P. curvatus</i>	0	0

**Table 7.** Number of *P. tricuspis* and *P. curvatus* found on each passive “pizza trap” at each coordinate point from the original site at Ray Roberts Park in Denton County, set out on October 22, 2009.

Trap Number	North	South	East	West
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	1	0	0
5	0	0	0	0
6	0	0	0	1
7	1	0	0	0
8	0	0	1	0
9	0	0	0	2- <i>P. curvatus</i>
10	0	0	0	0

**Table 8.** Number of *P. tricuspis* found on each of the 10 passive “pizza traps” in Red River County set out on June 24, 2009 and retrieved June 25, 2009.

Trap Number	Number of Flies Recovered
1	2
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0

**Table 9.** Number of *P. tricuspis* found on each passive “pizza trap” at each coordinate point from the original site in Red River County, in each of the four cardinal directions on October 29, 2009.

Trap Number	North	South	East	West
1	0	1	0	1
2	0	0	0	1
3	4	0	0	0
4	0	1	0	0
5	0	0	0	0
6	0	0	2	1
7	0	0	0	0
8	0	0	0	0
9	0	0	1	2
10	0	0	0	1

**Table 10.** Number of *P. curvatus* found on each passive “pizza trap” at each coordinate point from the original site Red River County, in each of the four cardinal directions on May 29, 2009.

Trap Number	North	South	East	West
1	0	1	0	0
2	0	0	0	0
3	1	0	0	0
4	0	1	0	0
5	1	0	0	1
6	0	0	2	0
7	2	0	0	0
8	0	0	0	0
9	0	0	0	1
10	0	2	0	0

**Table 11.** Number of *P. curvatus* found on each passive “pizza trap” at each coordinate point from the original site Red River County, in each of the four cardinal directions on October 29, 2009.

Trap Number	North	South	East	West
1	0	1	0	0
2	0	0	1	0
3	4	0	0	0
4	1	6	0	0
5	1	0	2	0
6	0	0	0	0
7	0	0	0	0
8	1	0	0	0
9	2	0	1	1
10	0	0	0	0

### Acknowledgements

The authors would like to thank Texas Master Naturalists: Georgette Guernsey, Barbara Cramer, Mike Kmak, Judy Guthrie, Theresa Page, Douglas Chadwick, Susan Kilpatrick, Socie Lemke, Don Chambers, Lynne List and Marilyn Turnage; Texas Parks and Wildlife Department, Sonny Solis. In addition, USDA APHIS PPQ CPHST, in Gainesville, FL for providing phorid flies and technical support for all of the releases.

### Literature cited

Knutson, A. E. And B. M. Drees. 1998. Potential biological control agents for the red imported fire ant. Fire Ant Plan Fact Sheet FAPFS009. Texas Imported Fire Ant Research & Management Project, Texas A&M University System, College Station, Texas. 4 pp.



Puckett, Robert. 2007. Passive traps for monitoring *Pseudacteon* parasitoids of *Solenopsis* fire ants. J. Econ. Entomol.