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Source: Florida Entomologist, 89(4) : 536-538

Published By: Florida Entomological Society

URL: https://doi.org/10.1653/0015-4040(2006)89[536:REOTFA]2.0.CO;2

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RANGE EXPANSION OF THE FIRE ANT DECAPITATING FLY, *PSEUDACTEON TRICUSPIS*, EIGHT TO NINE YEARS AFTER RELEASES IN NORTH FLORIDA

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Pseudacteon tricuspis Borgmeier (Diptera: Phoridae) was the first decapitating fly species released in the United States as a biological control agent against imported *Solenopsis* fire ants. Early releases were made in and around Gainesville, FL on several occasions between Jul 1997 and Nov 1999. The flies originated from collections made in Jaguariúna, State of São Paulo, Brazil in 1996 (Porter & Alonso 1999; Porter et al. 2004). Release methods varied and flies were either introduced into the field as adult flies or as immatures in parasitized fire ant workers. By the fall of 2001, the decapitating flies had expanded 35-60 km from the release sites, and occupied approximately 8100 km^2 (Porter et al. 2004). A survey was conducted in late 2005 and early 2006 to determine the current extent of the range of *P. tricuspis* resulting from the original release in Gainesville, FL.

The distribution of decapitating flies in the field was sampled on grassy areas and fields along roads with low traffic volume, where frequent stopping and sampling could be accomplished safely. Fire ant mounds were disturbed to cause the ants to come to the soil surface. On most occasions we used a modified cattle prod to electrocute the fire ants (Barr & Calixto 2005). This causes them to release alarm pheromone (Vander Meer et al. 2002), which apparently attracts the flies (Morrison & King 2004). Flies were detected by closely inspecting areas around disturbed ants for hovering flies. Flies were aspirated with a modified double chamber aspirator with an external collecting tube for easy removal. Flies were either identified in the field with a 10× hand lens, or brought into the lab for identification under dissecting or light microscope. The number of mounds inspected varied depending on the number of people involved and the availability of fire ant nests. Typically, at each survey location, 2-4 people observed between 5 and 20 nests total. Monitoring for flies was done when air temperatures were greater than 20°C. Usually observations were restricted to the period between 10 AM and 4 PM.

If no flies were observed, the total observation period was 30-45 min at one location. In locations where the decapitating flies were present, observations were interrupted as soon as one or more decapitating flies were confirmed. In these cases, the observation period may have been no longer than a few min. Survey sites were chosen in locations where fire ants were abundant. Geographical coordinates of the surveyed locations were determined with GPS equipment (GPS V, Garmin International, Inc., Olathe, KS), and survey locations were mapped by ArcGIS (ESRI, Redlands, CA).

In Nov 2005, *P. tricuspis* were observed in East-Central Florida in Seminole Co. near Sanford, FL, at a distance of approximately 145 km from the release sites around Gainesville (Fig. 1). This represents an average expansion rate of approximately 26 km/year since the fall of 2001. In the northeast direction from the release sites, flies were observed up to 275 km away, close to the town of Richmond Hill, just south of Savannah, GA. This represents an average expansion rate of 57 km/year since fall 2001. Northwest of Gainesville, *P. tricuspis* were observed in summer 2005 in northeast Jefferson Co. and also in Georgia up to Adel, approximately 200 km from the release sites in Florida (35 km/year expansion since 2001). Toward the Florida panhandle, flies were observed in Leon Co. up to the western border of Calhoun Co. on Route 20. Survey in the western direction was stopped because flies observed at these western sites could have been derived from a decapitating fly release near Dothan, AL.

These rates of expansion are approximately 20-180% faster than the respective rates observed in 2001 (Porter et al. 2004). Currently the flies occupy about 86,500 km^2 compared to the 8,100 km^2 in the fall of 2001. Higher rates of expansion could simply be the result of larger populations of flies or evolutionary selection of flies that disperse farther. Decapitating flies are expanding northward at higher rates than they are to the south, but the reason for this is uncertain (Porter et al. 2004). As the decapitating flies move further north, they will eventually encounter colder temperatures and shorter growing seasons which will permit fewer generations of flies per year and probably result in a slower rate of northward expansion.

Several successful releases have been made in South Florida, including in Bonita Springs (1999) and Sarasota, FL (2002). Either site could be responsible for the fly population found in Arcadia, FL in Nov 2005, approximately 100 and 70 km away, respectively. Releases in Dothan, AL (2000) may explain the flies found in Calhoun Co. in the Florida Panhandle, but recent field surveys have not recovered flies around Dothan (L. C. Graham,

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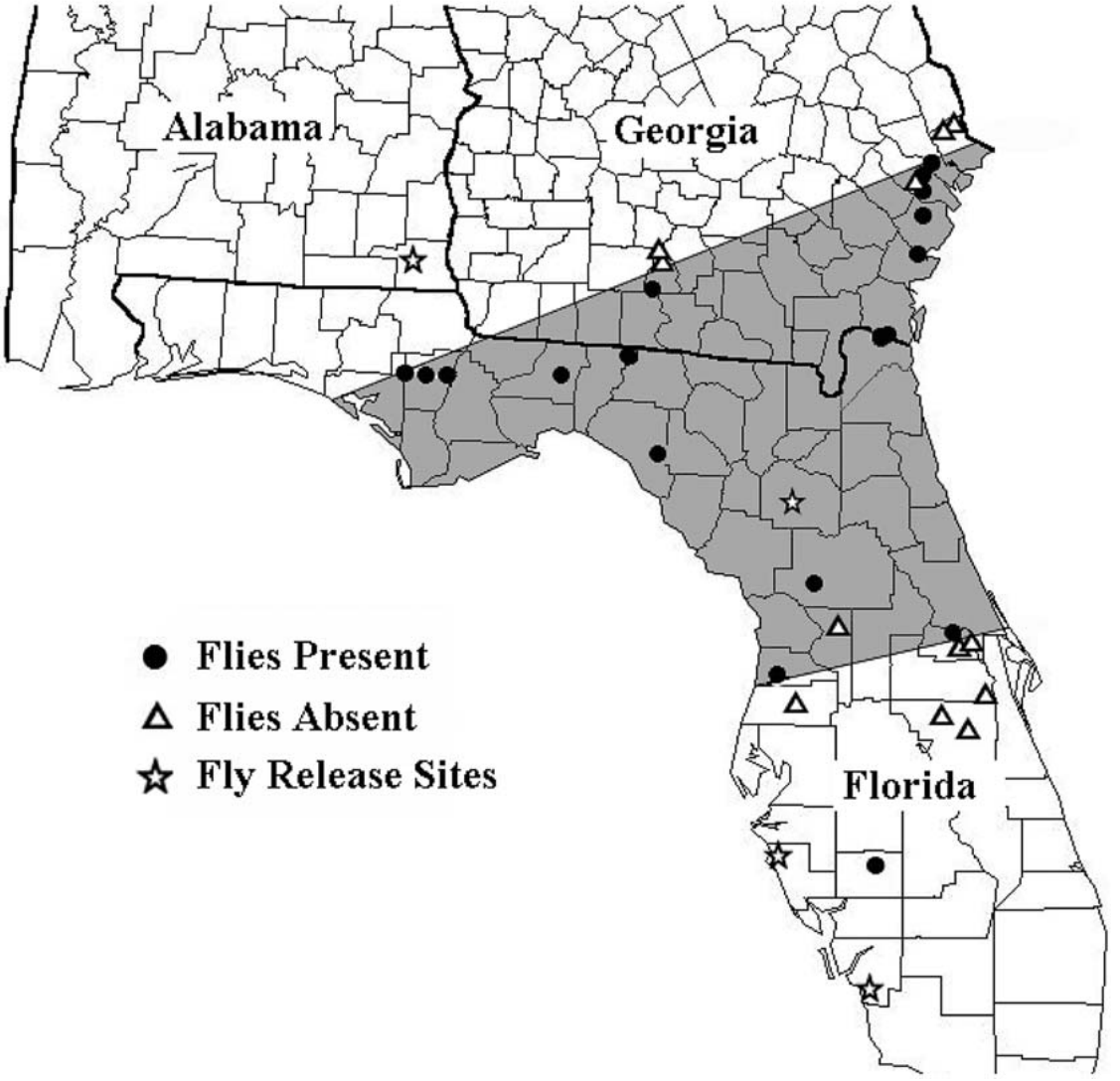


Fig. 1. Range of the fire ant decapitating fly *Pseudacteon tricuspis* 8-9 years after releases in North Florida.

Auburn University, personal communication). Flies found in Calhoun Co. also could have originated in Gainesville, FL, based on the rate of expansion up the east coast of Georgia. Considering the observed expansion rates and the additional successful releases of *P. tricuspis* in southern Florida and elsewhere in the state, it is likely that almost all of Florida will have resident populations of *P. tricuspis* in the next 3 to 5 years.

Researchers have not been able to measure an impact of *P. tricuspis* on fire ant populations (Morrison & Porter 2005). However, the decapitating flies work as a species complex in South America, with each fly species taking advantage of a portion of the niche available for fire ant parasitoids (e.g., different ant sizes, habitats, attack times, etc.). Consequently, several additional species of flies, and perhaps other natural enemies may be necessary for measurable impacts on the US fire ant population (Porter 2000). As other species of the decapitating flies are released and expand their range, possibly at rates comparable to those reported here and elsewhere (Graham et al. 2003), the impacts of these parasitoids on the fire ant populations may become clearer.

We are grateful to Mr. David Milne, Ms. Rebecca Blair, and Ms Damali Kelly for good eyes, great attitude, and efforts in locating fire ant mounds and decapitating flies in the field. We thank Drs. David Oi (USDA-ARS) and Fudd Graham (Auburn Univ.) for critical reviews and comments that helped improve this manuscript. The

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Summary

In the fall of 2005 and the spring of 2006, the fire ant decapitating fly *Pseudacteon tricuspis* (Diptera: Phoridae) was observed 145-275 km out from the original release sites in northern Florida, occupying an area of about 86,500 km^2. Average expansion rates of 26-57 km/year were considerably faster than previous observations. Considering these rates and other releases, we estimate that almost all of the state of Florida will harbor resident populations of *P. tricuspis* in the next 3 to 5 years.

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