

Multi-state buprestid collections resulting from the development of a purple-colored sticky trap

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Introduction

Buprestids can be significant pests of woody ornamentals in landscapes and nurseries. Damage by buprestids usually occurs within the first two years after transplanting, due to establishment stress. Nursery surveys found attack rates from 0 – 26% in the first growing season (Oliver et al. unpublished data). The *Chrysobothris femorata* complex is an important group of nursery attacking buprestids (Oliver et al. unpublished data).

In 2001, studies were initiated to develop an effective buprestid trap to monitor adult activity and identify important buprestid species in nurseries of Middle Tennessee.

The data presented in this poster is a compilation of multiple-years of testing and the progression in development of a purple-colored buprestid trap.

2001

Unpainted Wallpaper Test (UWT)

In May 2001, trapping was initiated at the Tennessee State University Otis L. Floyd Nursery Research Center (TSU NRC) in McMinnville, TN. The traps consisted of colored (blue, gray, green, red, white, and yellow) wallpaper species sheathed over metal nursery stakes. The traps were 7 cm wide and 0.9 m tall and functioned to mimic the silhouette of a nursery tree trunk. Traps were set up in complete randomized design (CRD) with 25 reps per color. Traps were covered with sticky glue (Pestik Insect Glue) and checked for buprestids weekly. Trapping was terminated on September 5, two weeks after the collection of the last buprestid.

295 buprestids were collected, representing seven genera and 17 species. 34.9% of the total catch belonged to the *Chrysobothris femorata* complex. Red-colored traps collected 38.6% of the total catch. We concluded that the traps were effective at capturing buprestids and the buprestids were 'attracted' to red-colored traps.

2002

Unpainted Wallpaper Test (UWT)

In 2002, the UWT was initiated on April 15 and continued until October 7. Trap location, type, and procedures were conducted in the same manner as 2001.

210 buprestids were collected representing five genera and twelve species. 27.1% of the total catch belonged to the *Chrysobothris femorata* complex. 32.9% of the total catch was caught on the red colored traps.

The same results from 2001 were concluded.

Painted Wallpaper Test (PWT)

Other 'red'-like colors were also evaluated in 2002 including light pink, medium pink, dark pink, bright red, magenta, orange, purple, brown, white, and red (used in 2001 and 2002 UWT) wallpaper traps. Colors were arbitrarily selected from a diverse range of 'red'-like colors in a color guide (Royal Horticultural Society). Colors were scanned and matched by a paint supply store and used to paint white wallpaper sleeves. Painted wallpaper sleeves were sheathed over metal stakes, as previously described, and arranged in a CRD at the TSU NRC.

614 total buprestids were collected. Nine genera and 24 species were trapped with *C. femorata* complex comprising 46.8% of the catch. The purple-colored traps captured 19.7% of the catch, while the red-colored trap used in 2001 and 2002 UWT captured only 5.6%.

Of the ten colors tested, the purple- and magenta-colored traps collected 37.4% of the buprestids. The purple- and magenta-colored traps out-collected the red-colored traps used in the 2001 and 2002 UWT.

Knoxville Test (KT)

Dr. William Klingemann initiated this comparison test in Knoxville, TN, at the University of Tennessee Arboretum. Pink- and white-colored wallpaper strips were tested on metal nursery stakes as previously described (PWT).

A total of sixteen buprestids were collected representing two genera and four species. All buprestids were collected on the pink traps.

We concluded that pink-colored traps were more effective at collecting buprestids than white-colored traps and to test different colors in 2003.

2003

Painted Wallpaper Test (PWT)

The PWT was repeated in 2003. Trap location, type, and procedures were the same as in 2002. Trapping in 2003 was initiated on April 14 and terminated on June 30.

779 total buprestids were collected. Eleven genera and 30 species were trapped. *C. femorata* complex comprised 13.2% of the catch while *Acmaeodera tubulus* Fab. comprised 48.8%. The purple-colored traps captured 20.4% of the catch, while the red-colored trap used in 2001 and 2002 UWT tests captured 12.6%.

Of the ten colors tested, the purple-colored traps out-collected the other nine colors tested. Thus, purple was the focus color of continued buprestid trapping studies.

Knoxville Test (KT)

This test was conducted at the same location and in the same manner as in 2002. Pink- and purple-colored wallpaper strips were tested this year.

118 buprestids were collected. Five genera and 11 species were collected. 50.8% of the buprestids collected were *Acmaeodera tubulus*. 73.5% of the buprestids collected, were collected on the purple-colored traps.

We concluded that purple-colored traps were more effective at collecting buprestids than pink-colored traps and to retest these colors in 2004.

Michigan Test (MT)

A PWT was initiated near Detroit, MI in effort to identify an effective trap for the collection of *Agrilus plannipennis* Fairmaire (Emerald Ash Borer, EAB). Eleven colors were tested as previously described in the PWT.

77 buprestids were collected. Four genera and 14 species were collected. EAB comprised 24.7% of the buprestids collected. The purple-, pink-, and magenta-colored traps collected 53.0% of the EAB collected. We concluded the traps were able to collect borers in a non-nursery location, but the EAB catch was minimal. We also decided to repeat the test in 2004.

Buprestid Species

Buprestid Species	Tenn.	Tenn	NRIC	Michigan	Mississippi	Georgia
<i>Acmaeodera ornata</i> (F.)				XX		XX
<i>Acmaeodera pulchella</i> (Herbst)	XX	XX			XX	XX
<i>Acmaeodera tubulus</i> (F.)	XX	XX		XX	XX	XX
<i>Atenodes acornis</i> (Say)		XX	XX	XX	XX	XX
<i>Agrilus flavimela</i> (Dory)			XX	XX		
<i>Agrilus arcuatus</i> (Say)		XX	XX			
<i>Agrilus bilineatus</i> (Weber)		XX	XX	XX		XX
<i>Agrilus carolin</i> Knoll				XX		
<i>Agrilus colli</i> Knoll		XX				
<i>Agrilus cephalicus</i> LeConte		XX				
<i>Agrilus cupressinus</i> (Melsheimer)				XX		
<i>Agrilus cynoscepes</i> (Ratzeburg)				XX		
<i>Agrilus agenus</i> Gory		XX	XX			
<i>Agrilus fallax</i> Say		XX	XX	XX		
<i>Agrilus masculinus</i> Horn				XX		
<i>Agrilus lecontei</i> lecontei Saunders		XX	XX			
<i>Agrilus oblongus</i> Fisher				XX		
<i>Agrilus obsoletoguttatus</i> Gory		XX	XX	XX		
<i>Agrilus olivangulus</i> Champagnin and Knoll.		XX				
<i>Agrilus rotatus</i> Say		XX				
<i>Agrilus parvifoli</i> Knoll.				XX		
<i>Agrilus plannipennis</i> Fairmaire				XX		
<i>Agrilus pollus</i> (Say)		XX				
<i>Agrilus pullus</i> (Say)		XX				
<i>Agrilus ruficollis</i> (F.)		XX	XX			
<i>Agrilus suberosus</i> Gory				XX		
<i>Agrilus subrobustus</i> Saunders				XX		
<i>Agrilus spp.</i>	XX	XX	XX		XX	
<i>Amphisca opacata</i> (F.)		XX				XX
<i>Amphisca vindicoides</i> (Say)		XX				XX
<i>Amphisca vindicoides</i> Gory		XX				XX
<i>Amphisca cyaneola</i> Gory		XX				XX
<i>Amphisca queiroziana</i> Welling		XX				XX
<i>Brachys aerarius</i> Melsch.		XX	XX			
<i>Brachys aeruginosus</i> Gory		XX	XX			
<i>Brachys ovalis</i> (Weber)		XX	XX			
<i>Buprestis conspersa</i> Gory		XX	XX			XX
<i>Buprestis lineata</i> F.		XX	XX			XX
<i>Buprestis maculipennis</i> Gory		XX	XX			XX
<i>Buprestis rufipes</i> Oliver		XX	XX			XX
<i>Buprestis albivittata</i> Herbst		XX	XX			XX
<i>Chalcophora virginiana</i> Drury		XX	XX			XX
<i>Chrysobothris adspersa</i> Gem. & Harold		XX	XX			XX
<i>Chrysobothris azurea</i> LeConte		XX	XX			XX
<i>Chrysobothris chlorocapilla</i> Gory		XX	XX			XX
<i>Chrysobothris ciliaris</i> Mann		XX	XX			XX
<i>Chrysobothris dentipennis</i> (Germant)		XX	XX			XX
<i>Chrysobothris femorata</i> (Germant)		XX	XX			XX
<i>Chrysobothris femorata</i> complex		XX	XX			XX
<i>Chrysobothris ferruginea</i> Herbst		XX	XX			XX
<i>Chrysobothris pullus</i> Gory and Laporte		XX	XX			XX
<i>Chrysobothris rugosiceps</i> Melsch.		XX	XX			XX
<i>Chrysobothris saxigena</i> (Say)		XX	XX			XX
<i>Chrysobothris vindicoides</i> (Melsheimer)		XX	XX			XX
<i>Dicerca lurida</i> (F.)		XX	XX			XX
<i>Dicerca obscura</i> (F.)		XX	XX			XX
<i>Dicerca punctulata</i> (Sch.)Bohner		XX	XX			XX
<i>Dicerca fenebracea</i> Knoll/ Nelson		XX	XX			XX
<i>Pachyltelus laevigatus</i> (Say)		XX				
<i>Phaenocarpa aeneus</i> (Melsch.)		XX	XX			XX
<i>Phaenocarpa gibbocollis</i> (F.)		XX	XX			XX
<i>Spectracna gracilis</i> (Melsheimer)		XX	XX			XX
<i>Tachrocnema nigriceps</i> Oberholzer		XX	XX			XX
<i>Toxania campensis</i> (Say)		XX	XX			XX

Table 1. Complete list of Buprestids collected with sticky traps and trap locations



Conclusions

In total, 7,542 buprestids were collected on sticky traps in four states over six years. Sixteen genera and 64 species were collected. These traps were placed and collected buprestids in many sites and habitats, including commercial nurseries.

The successful collection of *Chrysobothris femorata* complex was a goal and was accomplished. Data collected from these traps has given important information on the seasonal and daily flight patterns of the collected buprestids.

The collection of introduced buprestids (*Agrilus plannipennis* and *Agrilus subrobustus*), demonstrated the potential use of these traps for the detection of exotic and pest buprestids.

Acknowledgements:

Our gratitude to Jason Basham, Jessie Basham, Joshua Basham, Jason Blalock, Meagan Broom, Bryan Brown, Jennifer Carroll, Damon Crook, P. Flanagan, David Lance, Stephen Lavallee, Crystal Lemings, Amy Lewis, Genji Moore, Kermis Myrick, Adam Newby, Heath Overby, Darin Pastorek, Samuel Patton, W. Powel, Caleb West, and Ellen Yanity for their help in the field (setup, monitoring, and photography) and laboratory (sorting, counting, and data entry). Special thanks to Rick Westcott, Henry Hensgenheide, and Ted MacRae for their help with the buprestid identifications.

2004

Trap Type Test (TTT)

On May 6, trapping was initiated at the Tennessee State University Otis L. Floyd Nursery Research Center (TSU NRC) in McMinnville, TN and continued until July 6. Thirteen trap types were tested (6 inch purple panel, 1.5 inch purple plastic panel with clear glue, 6 inch purple collaphone, 1X2 pine stake with metallic purple glue, 1X2 pine stake with purple glitter, 1X2 pine stake with clear glue, 1.5 inch purple plastic square with clear glue, 1.5 inch white plastic panel with purple glue, 1.5 inch white plastic panel with metallic purple glue, 12 inch purple panel, 1.5 inch white plastic panel with purple glitter, 1.5 inch white plastic panel with clear glue, 1X2 pine stake with purple glue). Plastic panels were constructed with purple-colored chloroplast corrugated plastic and were 30 inches tall. Traps were set up in a randomized complete block design (RCBD) with 5 reps per trap type.

1,260 buprestids were collected by this test. Seven genera and 29 species were trapped with *C. femorata* complex comprising 29.1% of the catch. The 1.5 inch purple square with clear glue traps collected 16.9% of the catch. Traps with colored glue (purple, metallic purple and purple glitter) and traps with clear glue collected similar quantities of buprestids (579 and 646, respectively). The 1.5 inch pine 1X2 with metallic purple glue out-collected the 1.5 inch pine 1X2 with clear glue (107 vs 17, respectively).

We concluded that addition of purple pigment to clear glue did not affect the trap collection and the silhouette alone of the 1X2 pine stake did not attract buprestids. We also concluded that larger width traps were effective at collecting buprestids. This test will be repeated in 2005 with fewer treatments.

Knoxville Test (KT)

This test was conducted at the same location and in the same manner as 2002 and 2003. Pink- and purple-colored wallpaper strips were tested this year.

113 buprestids were collected. Only two genera and five species were collected. 55.8% of the buprestids collected were *Chrysobothris azurea* LeConte. 76.8% of the buprestids were collected on the purple-colored traps.

We concluded that purple-colored traps were more effective at collecting buprestids than were pink-colored traps.

Michigan Test (MT)

The PWT was repeated as described in the 2003 MT.

Excluding EAB, 77 buprestids were collected. Four genera and 10 species were collected. 83.1% of the buprestids collected were *Agrilus spp.*

We concluded the traps were able to collect borers in a non-nursery location, but the EAB catch was minimal.

2005

Trap Type Test (TTT)

In 2005, the TTT was conducted in the same manner as the 2004 TTT. The test began on May 2 and ended on August 1. Seven trap types were tested (6 inch purple plastic triangle with clear glue, 6 inch purple plastic panel with clear glue, 1.5 inch purple plastic panel with clear glue, 1.5 inch white plastic panel with purple glue, 1X2 pine stake with clear glue, 1X2 pine stake with purple glue, and a 1.5 inch purple square with clear glue). All traps were 30 inches tall.

301 buprestids were collected. Six genera and 21 species were trapped with *C. femorata* complex comprising 33.6% of the catch. The 6 inch purple plastic triangle trap with clear glue and the 1.5 inch purple square trap with clear glue collected 40.9% of the catch. The 1.5 inch purple plastic panel with clear glue and the 1.5 inch white plastic panel with purple glue captured similar numbers of buprestids (51 and 59, respectively). The 1.5 inch pine 1X2 with purple glue out-collected the 1.5 inch pine 1X2 with clear glue by a factor of 9.

We concluded that addition of purple pigment to clear glue did not affect the trap catch and the silhouette alone of the 1X2 pine stake did not attract buprestids. Larger trap widths are effective at collecting buprestids.

Mississippi Test (MT)

Dr. David Boyd initiated this test in Mississippi, at the Southern Horticultural Laboratory in Poplarville and in a commercial nursery in Perkinston. Both sites are located on the Southern coastal plain. Traps were 1.5 inch purple plastic panel with clear glue and were setup throughout the research station and nursery.

185 buprestids were collected, represented by four genera and nine species. *Chrysobothris cribraria* Mann comprised 95.7% of the total catch. The high catch of *C. cribraria* can be explained by the fact that it is a pine-attacking species and the trap locations are surrounded by pine.

2006

Georgia Test (GT)

The Georgia test was initiated to test a new prototype buprestid trap. The traps were constructed of purple colored chloroplast corrugated plastic. The 18 traps were set up in Chattooga County near Villanova on U.S. Forest Service Land. Traps were set up on April 18 and taken down on August 7. Data will be presented for April 18 to July 15.

3,502 buprestids were collected at this site. Ten genera and 25 species were collected with *A. tubulus* comprising 77.9%. As we have many unidentified *Agrilus* and *Chrysobothris* species, the number of species collected will increase as specimens are identified. Of special note is the collection of *Agrilus subrobustus* Saunders (three specimens). This is the first documented report of this species in the United States. It is native to China, Japan, North Korea, South Korea, and Taiwan. USDA-APHIS has been informed of the detection. The species is not predicted to have the impact of other non-native *Agrilus* species like *A. plannipennis*, because it is a dead wood feeder.

The collection of a non-native buprestid validates the value of this trap as a survey tool for the detection of invasive buprestids.