Biological Control Program
Report of Activities
July 1, 2010 – June 30, 2011

Cerceris fumipennis and Prey

Hemlock woolly adelgid

Imported Fire Ant and Phorid Fly

Kudzu Bugs

Mile-A-Minute Vine Weevil

Biological Control Program

The mission of the biological control program is to manage exotic pests using ecologically-based methods. We focus on "classical" biocontrol that is, reuniting exotic pests with the natural enemies that keep them below damaging levels in their home ranges. Although we are primarily an implementation program, conducting these projects requires research to ascertain the appropriateness of releasing biological control agents or to follow up on agents released. The biological control program of the NCDA&CS was founded in the 1970s to investigate and establish natural controls for the gypsy moth, a visionary undertaking in advance of the invasion of that pest. Today, our projects focus on a variety of exotic pests, and involve laboratory rearing of insects, field releases of natural enemies, surveying, and the operation of a USDA-inspected containment (quarantine) facility. Rooms in the containment facility are available to industry and university researchers for short-term use. Such cooperation allows projects to be completed in a secure environment, and provides the opportunity to work on potential pests before they are established in North Carolina. Six shipments of exotic material were received by the NCDA &CS Insect Quarantine Facility during 2010/2011.

Summary of Quarantine Activities 2010 - 2011

ID #	SPECIES	FAMILY	STAGE	#	ORIGIN	STATUS
Q08-3	*Striacosta albicosta*[1]	Noctuidae	Egg/larvae	6,663	IA	Insects maintained on artificial diet until pupal stage.
Q08/09-4	*Cactoblastis cactorum*[1]	Pyralidae	Egg/larvae	15,000	FL	Insects maintained on artificial diet until pupal stage.
Q10-1	*Megacopta cribraria*[2]	Plataspidae	Adults/ Eggs/larvae	1000	GA	Insects maintained on kudzu for host preference test.
Q11-9	*Sirex noctilio*[3]	Siricidae	Adults/ Eggs/larvae	30 logs	NY	Logs maintained in quarantine awaiting wasp emergence.

[1]Dr. Allen Cohen, Insect Diet & Rearing Research, LLC, is utilizing the NCDA&CS Beneficial Insects Quarantine Lab to develop artificial diets and rearing systems for *Cactoblastis cactorum* (prickly pear cactus moth) and *Striacosta albicosta* (western bean cutworm).

[2]Determine host preference of the recently found kudzu bug, *Megacopta cribraria.*

[3]Dr. Coby Schal, NCSU Entomology Dept., NCSU will utilize Sirex to develop semiochemical tools to facilitate early detection, population monitoring, and ultimate control of *Sirex noctilio*.

Development of the Wasp *Cerceris fumipennis* as a Biosurveillance Tool for Pest Buprestidae in North Carolina: 2010 Report of Activities

Christine A. Nalepa and Whitney Swink

The solitary ground nesting wasp *Cerceris fumipennis* is currently being utilized as a biosurveillance tool for the efficient collection of pest buprestid beetles in Canada and in several locations in the eastern United States. In 2010 we continued our studies of the wasp in North Carolina (NC), with the following **goals**, in order of priority:

1) To continue locating sites with high nesting activity throughout the state
2) To determine the timing of wasp activity in NC
3) To continue adding to the database of buprestid prey utilized by the wasp in NC
4) To continued our investigation of the regional biology and life history of the wasp
5) To conduct training and information sessions for potential cooperators and volunteers

A. NEST SURVEY

The wasp prefers to nest in hard-packed sandy soil in areas with direct sunlight and high human activity, features that are characteristic of baseball and softball diamonds. We were successful in locating nests during an initial survey of ball diamonds in 2009, and continued using them as survey units during 2010. Ball fields were located using Google Earth 5, and permission to survey specific fields was obtained from relevant schools or directors of Parks and Recreation.

To determine dates of first activity of *C. fumipennis* in Wake Co., on 16 May we began regularly surveying three local sites that were positive for nests in 2009. Active nests (n = 3) were first noted on 26 May at one site, and the statewide survey was then initiated. In general, the survey was conducted geographically from east to west.

Eastern counties were surveyed in June and included Johnston (initial visit on 7 June), Wayne (8 June), New Hanover (9-10 June), Pitt (17 June), and Beaufort (21 June). During the fourth week of June and throughout July, we surveyed counties in western NC, including Gaston (23 June), Surry (24 June), Watauga (30 June), Alleghany (30 June), Ashe (30 June), Wilkes (1 July), Jackson (7 July), Swain (8 July), and Buncombe (14-15 July). The survey ended on 3 August with a return trip to two positive sites in Wayne County.

A total of 363 ball diamonds in 177 sites across 15 counties were visited between 20 May and 3 August 2010 (Fig. 1).

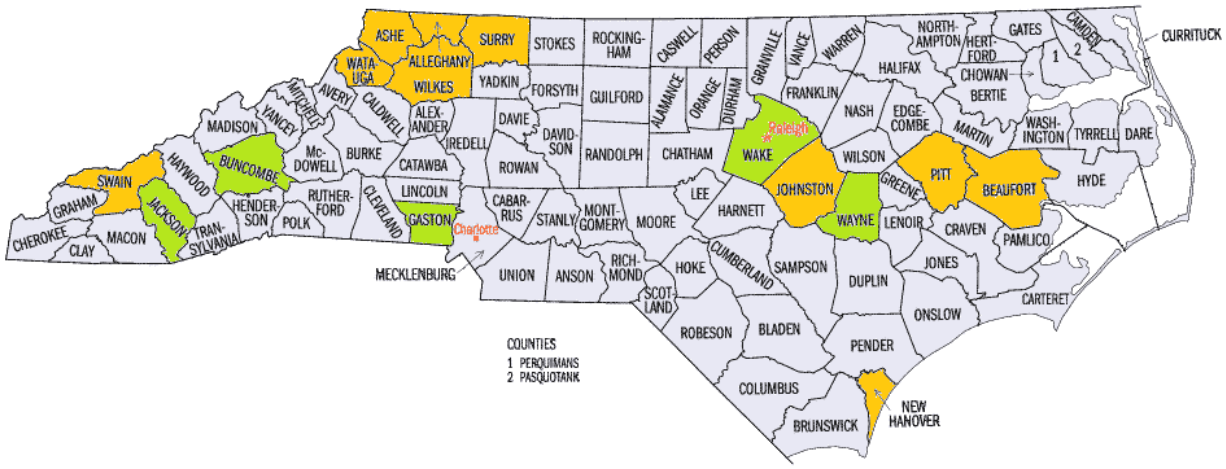

Figure 1. Map of *Cerceris fumipennis* survey in North Carolina in 2010; 15 counties were surveyed (highlighted). Gold = survey only; Green = survey and collection of buprestids from at least one site.

Of the 177 sites surveyed, 68 sites (38%) were positive for *C. fumipennis*, i.e., one or more of the characteristic nests were present. Of these 68 sites, 27 (35%) had just 1-2 nests, and 47 (69%) had fewer than 10 nests. A total of 633 nests were recorded during initial site visits; a total of 1,342 nests were observed if repeat visits to positive sites are included. The highest nest numbers found during a single visit were at an elementary school in Buncombe Co. (n = 74), a community college in Wayne Co. (n = 65), a Christian academy in Wayne Co. (n = 60), a middle school in Surry Co. (n = 41), and a city park in Wake Co. (n = 33).

Nests were rarely found on fields that were too manicured (e.g., most colleges, large high schools, or large athletic parks), overgrown with grass (e.g., small, rural elementary schools), or surfaced with Red Ball Diamond Aggregate (RBDA - crushed red dolomite limestone). Nests were most commonly found on ball diamonds that were not well maintained during the *C. fumipennis* flight season, but were generally kept in good condition throughout the rest of the year. Grade schools (primarily elementary and middle schools) yielded the most nests per site overall.

Timing of nesting and foraging. We made one or more return visits to sites where a high number of *C. fumipennis* nests (greater than 15) were found during the survey. Four sites in central NC were surveyed five or more times from May to August (Fig. 2). Plotting the number of nests at these sites over time gives a clear indication that the window of opportunity for working with the wasps in the piedmont of NC was a fairly narrow one in 2010. Activity peaked quickly in early June, then waned after mid-June.

The number of beetles collected from the wasps was generally correlated with the number of nests present at a site, but foraging activity was close to non-existent in July, even if nests were present. We collected no beetles from the Coastal Plains region; about 20 beetles were collected in the Mountains Region (late-June through July). Based on beetle data from 2010, we cautiously predict that the optimal time for collecting beetles in the Coastal Plain is mid-May and in the Mountains is late-June to early-July.

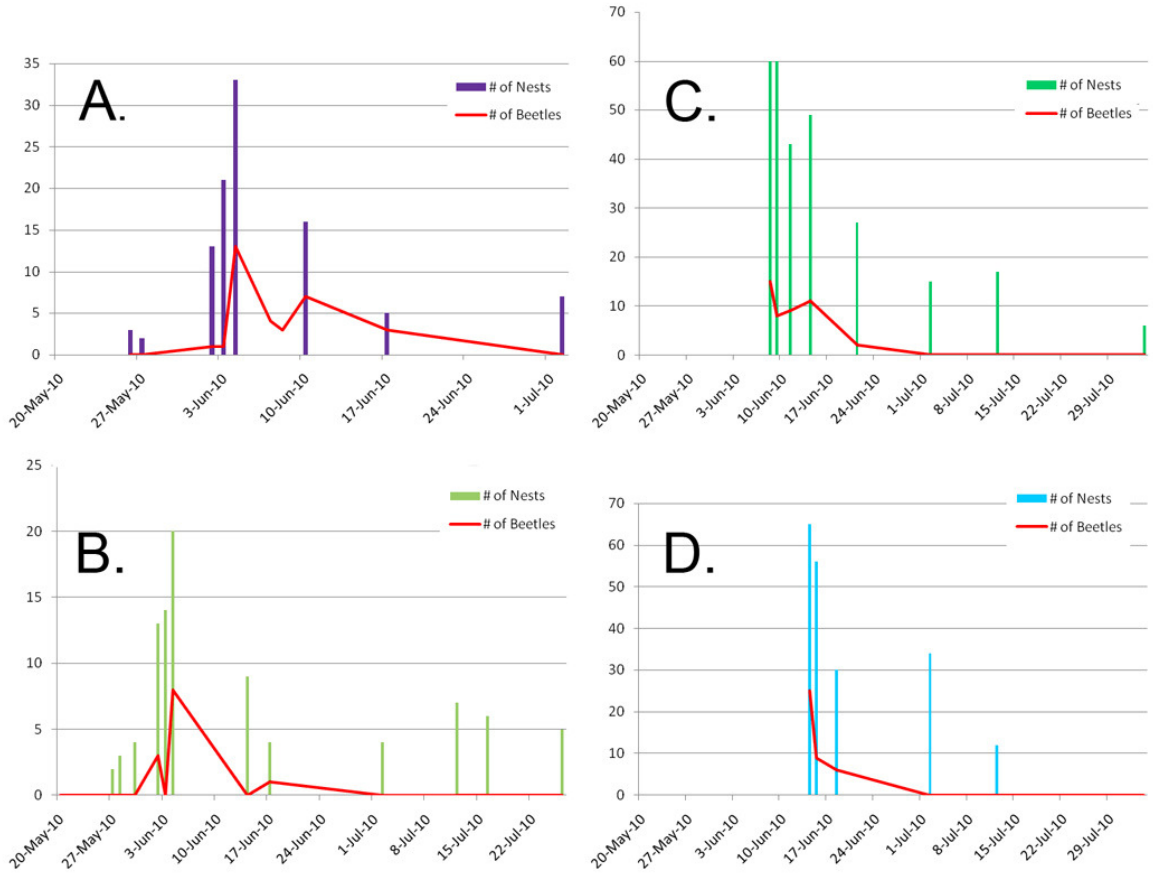

Figure 2. Timing of nesting and foraging of *Cerceris fumipennis* in four sites in the Piedmont of North Carolina. A) Wake Co. Jaycee Park; B) Wake Co. Lake Lynn; C) Wayne Co. Faith Christian Academy; D) Wayne Co. Wayne Community College. Note that the scale of the axes differ among graphs.

B. BUPRESTID PREY

Work on the diversity of buprestid prey utilized by *C. fumipennis* in NC was continued during 2010. We collected beetles directly from wasps returning from foraging trips as well as paralyzed prey that the wasps left outside of nest entrances.

In 2010, 155 beetles were collected from eight sites in five counties across the state (Fig. 1); this was more than twice the number of beetles collected in 2009. Five genera (*Actenodes*, *Agrilus*, *Buprestis*, *Chrysobothris*, *Dicerca*) and 21 species (Table 1) were represented among the collected beetles. Thirteen species collected in 2010 were not collected in 2009; three species collected in 2009 were not collected in 2010. The highest number of species collected at a given site was 11. Overall a total of 24 species have been collected from *C. fumipennis* in NC to date. Three are new state records (*Buprestis consularis, Chrysobothris trinervia* and *Agrilus quadriimpressus*) and three had not been previously recorded as prey of *C. fumipennis (Agrilus acutipennis, A. difficilis, A. quadriimpressus*). Of particular note is that we collected **seven species of *Agrilus*** in 2010, for a total of 8 *Agrilus* species taken from *C. fumipennis* in NC to date.

Table 1. Buprestid beetles identified as prey of *Cerceris fumipennis* during the 2010 North Carolina survey. ^ = new state record, * = new to *C. fumipennis.* Identifications by Steven Paiero (University of Guelph), and Whitney Swink (NCDA &CS).

Buprestid species collected 2010	# of specimens collected	# of Sites at which a given species was collected
Actenodes acornis	9	4
*Agrilus acutipennis**	1	1
Agrilus carpini	1	1
Agrilus cephalicus	1	1
*Agrilus difficilis**	2	1
Agrilus fallax	1	1
Agrilus fulgens	1	1
Agrilus quadriimpressus^*	1	1
Buprestis consularis	5	3
Buprestis lineata	11	4
Buprestis maculipennis	59	5
Buprestis rufipes	27	5
Buprestis striata	3	3
Chrysobothris cf. adelpha	1	1
Chrysobothris femorata	1	1
Chrysobothris sexsignata	2	2
Chrysobothris sp.	1	1
Chrysobothris trinervia	13	4
Dicerca asperata	1	1
Dicerca lurida	11	4
Dicerca obscura	2	1
Dicerca punctulata	1	1

C. BIOLOGY OF *CERCERIS FUMIPENNIS* IN NORTH CAROLINA

Foraging behavior. Multiple visits were made to a Wayne county site that had two adjacent ball diamonds. Bordering the outer edge of the first ball diamond (#1) was a stand of trees dominated by pines, and a stand of mostly hardwoods was adjacent to diamond #2. Despite the proximity of the two fields, the wasps travelled to the nearest treeline when foraging, a behavior that is reflected in the species diversity of their buprestid prey (Figure 3).

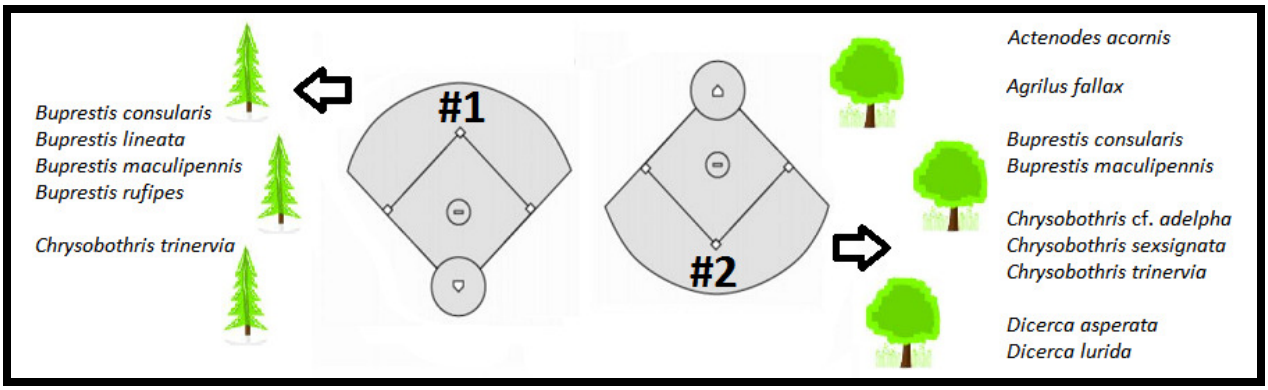

Figure 3. Schematic of two adjacent ball fields at a school in Goldsboro. Arrows indicate foraging direction of the wasps. Buprestid species collected from each field are listed (n = 20 and 25 beetles collected from field #1 and #2, respectively). Edges of the infields are approximately 100 feet apart.

Number of generations. Observations of wing wear of *C. fumipennis* females during 2009 suggested that there may be more than one generation per year in NC. During 2010 we followed up on the problem by conducting a more focused study in one Raleigh location. Beginning shortly after nests began appearing at the site (30 May), females were captured and given a unique mark on the thorax using DecoColor opaque paint markers (Fig. 4a). A picture of each marked female's right wing taken with a Sony Cybershot camera, and she was then released. A total of 11 visits were made to the site over the active season, and during each, an attempt was made to capture and examine all active wasps. If a female hadn't been previously captured, she was marked and her wing condition recorded. In all recaptured females, wing condition was documented if it had been more than 5 days since she was last seen. Four site visits were made during the first week of wasp activity; subsequently, visits were made at least every 2 weeks until the end of the active season (26 July).

A total of 32 females were marked between 30 May and 12 July, and in 23 (72%) the wing was completely undamaged when the female was first captured. Nearly half (47%) of marked females were never recovered. Eight females were recaptured between 10 and 18 days later. One was found dead on the field 4 days after marking, apparently stomped by a young ball player. Wing damage in these nine wasps was analyzed using the before and after photographs, based on the technique of Lehnert (2010).

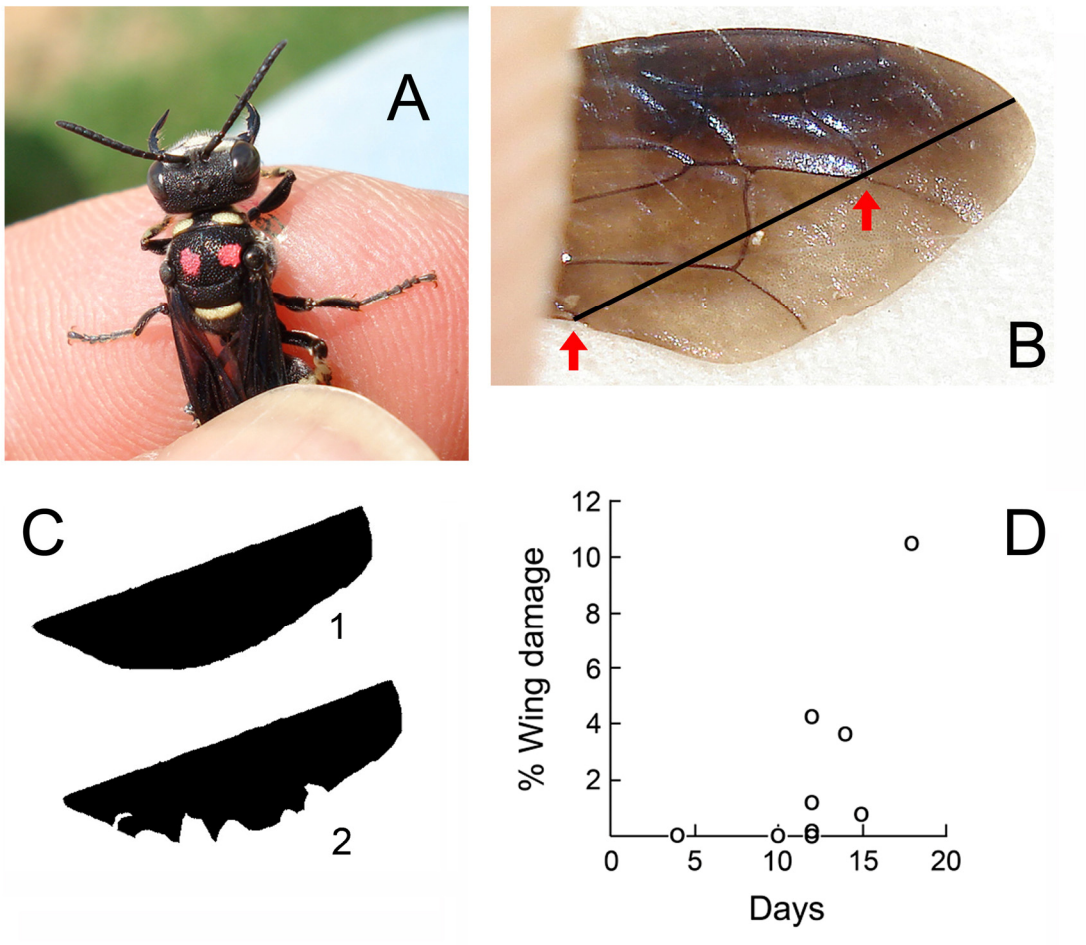

Figure 4. Attempt to determine number of *Cerceris fumipennis* generations per year based on wing wear. A) Marked female; B) Field photograph of right wing, showing reference points for analysis; C_1) Undamaged wing of Female #2 (30 May); C_2) Damaged wing 18 days later. D) Plot of percent wing damage over time in 9 females, based on pixel counts of damaged vs. undamaged wings.

Wing analysis. In Adobe Photoshop, a standard portion of the wing was delineated by drawing a line through two reference points: where vein Cu_{1b} meets the wing margin, and at the junction of *M* and *3r-m* (Fig. 4b). That portion of the image was excised, converted to black and white, and the contrast adjusted so that it appeared black on a white background (Fig. 4c). ImageJ software (National Institute of Health, public domain) was then used to compare pixel counts in the 'before' and 'after' wing tips and obtain an estimated percent wing damage. Percent damage was plotted against the number of days elapsed between the two photographs to determine if wing damage is a reasonable estimate of a given female's age.

Results: The relationship between days elapsed and percent wing damage was not consistent (Fig. 4d). A few females contributed to a nice trend of increased damage with time, but in others, the wings remain intact or nearly so over the same time frame. The wings of two females were completely unchanged over a 10-12 day interval.

Conclusions: The technique of assessing wing damage worked beautifully, but the results indicate that it is of little using in assessing *C. fumipennis* age and consequently the number of generations of the wasp in central NC. It is assumed that wing damage results from digging and maintaining a nest or perhaps intraspecific aggression; it is therefore likely to be correlated with variation in behavior of the wasps. Females obtain nests by reusing their natal nest, digging a new one, or usurping one from another female (Mueller et al. 1992). They would therefore be subjected to different levels of wing wear depending on their strategy. We also had some evidence of aggression. The thorax and head of one marked female was found buried in the turret of a nest across the field from the nest where she was originally collected. We currently have no further plans for trying to assess the number of generations of *C. fumipennis* that occur in the state.

D. TRAINING AND OUTREACH

We (WGS and CAN) attended a *Cerceris* training session conducted by Philip Careless at Archbold Biological Station (Florida) in May, and in turn conducted two training sessions in NC: one in Wake Co. (for APHIS/NCSU) and one in Johnston Co. (for NC Division of Forest Resources). Talks on the *Cerceris* biosurveillance program were given at the SAFEPS meeting (Crossnore), the SFIWC meeting (Wilmington), to Forestry Continuing Education (Marion and Asheboro) and to the Forestry class at Wayne Community College.

Acknowledgments

We thank Philip Careless and Steve Paiero for advice, Steve Paiero for identifying/confirming the insects, Lynn Warren and the Raleigh Parks and Recreation Department for permission to work on local baseball diamonds, and Rebecca Norris, Jason Moan, and Steve Bambara for help with survey and monitoring. Walter Sloan of Faith Christian Academy, Edward Farris of Wayne Community College, James Hayes of Meadowview Middle School, and Cynthia Sellinger of Vance Elementary School were particularly generous in allowing us to work on their property. This work is supported by a grant from The United States Forest Service, Forest Health Protection Program.

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8 February 2011

Update: *Cerceris fumipennis* in North Carolina

The native ground-dwelling wasp, *Cerceris fumipennis,* provisions its nest with buprestids, including the invasive forest pest Emerald Ash Borer (EAB) (*Agrilus planipennis*) when present. The wasp is much more efficient than humans at finding EAB, and is proving to be a reliable way to monitor for this pest. It is a solitary, ground-nesting wasp that lives in diffuse colonies in sparsely vegetated, open spaces with hard-packed, sandy soil. Colonies are almost always found in full sunshine near wooded areas in places of human activity. In 2008, the Beneficial Insects Laboratory (BIL) of the NCDA initiated a project to locate nests of *C. fumipennis* for use in surveying for EAB and other pest buprestids; this program has continued until the present. The program is funded by Forest Health Protection, USDA Forest Service.

A full report of the 2010 season was distributed in February 2011. In late May 2011 we began monitoring sites known to be positive for *C. fumipennis* in the piedmont of the state, to determine first emergence of the wasp and to begin collecting their beetle prey. We concentrated on two sites in Wayne County and two sites in Wake County. Currently (9 June 2011) we have collected more than 200 beetle prey; these are being pinned and identified. We plan to concentrate our continued survey for new nest sites of the wasp in the western part of the state, as EAB is currently in Tennessee.

We have begun attempting to establish nests of *C. fumipennis* in an abandoned cold frame on the grounds of the NCDA Beneficial insects Laboratory (Fig. 1).

Fig. 1. Attempting to artificially establish nests of *Cerceris fumipennis*, Wake Co., NC 2011.

Hemlock Woolly Adelgid Predator Rearing

The hemlock woolly adelgid (HWA) occurs over multiple states, and is now distributed throughout the native range of the eastern and Carolina hemlock species. Hemlock is widespread in western North Carolina, and the loss of the hemlock will bring about major changes to those ecosystems. In addition to the loss of unique habitats, dead and dying trees are a safety hazard in recreation areas, as well as aesthetically unattractive. Chemical control is effective for managing HWA, but is impractical for widespread use in stands that are large, remote or located where streams may be damaged by insecticides. Therefore, a biological control program has been developed to release predators in state and national forests and parks to slow the progress of this devastating insect.

Fig. 1 Hemlock woolly adelgid and *Sasajiscymnus tsugae* larva (arrow)

The primary objective for this project was for NCDA&CS to operate a large-scale central rearing facility to provide biological control agents for the management of hemlock woolly adelgid (HWA). *Sasajiscymnus tsugae* (*St*), native to Japan, has been in mass production at the lab since December 2002. In May and July of 2008, newly collected *S. tsugae* from Japan were received in our quarantine facility to broaden the gene pool in the colony. Rearing this season concentrated on the new Japanese strain and a colony of hybrids between new and old beetles. Beetles produced are turned over to USDA-Forest Service personnel for release at selected field sites within North Carolina as well as other states.

The predator beetles are well synchronized with the lifecycle of the adelgid. After a summer of aestivation, the adelgid begins to mature and prepare for oviposition. Once this maturation begins in the field, adelgids on hemlock boughs which are cut and stored in spring-like conditions begin laying eggs. This stimulates reproduction in the beetles, and the mass rearing can proceed. Rearing continues until the adelgid completes two generations, usually by June. The adelgid aestivates as nymphs on new hemlock growth, and *St* feeds on these supplemented with honey in the lab.

For mass production of the colony, mating groups of beetles were placed in 3.8 l jars supplied with a bouquet of hemlock twigs (Fig. 1). Eggs (on the twigs) were removed weekly and put in rearing cages supplied with infested hemlock and water, and after 4 weeks, adult beetles collected and moved into storage cages (Fig. 3). Oviposition jars for the 2010-11 season were set up October 14, and significant oviposition began November 15. Egg production was halted 21 June 2011.

Fig. 2. Oviposition jar

During the rearing season, several measures of beetle health were recorded and compared to HWA: egg production, beetle weights, and percent completing development. These data are part of a

cooperative study with Allen Cohen (Insect Diet and Rearing Research) and Carole Cheah (CT Ag. Exper. Station).

Results of the season's production are shown in Figure 4. A total of 98,533 beetles were reared (68,406 of the 2008 Japanese strain). Approximately 66,600 were transferred to the USDA-FS and 10,000 beetles were sent to the Maine Department of Forestry for release. The remaining beetles are being maintained at the lab. Egg production and larval development is directly correlated with the quality of HWA and hemlock that is used in the rearing process. During the 2009-10 rearing season, HWA quality was poor, and production was very low. Combined with high mortality during the summer months, our colony was very small at the start of the rearing season. Peak adult production occurred during the oviposition period of the sistens[1] generation. In the field this occurs in the spring, but in the warmer lab conditions, HWA oviposition begins in January. A second peak of production occurred during the progrediens[2] generation oviposition period, but the return of adult beetles was much lower. These results are consistent with past rearing seasons. All of our rearing material is provided by USDA- FS personnel, and we are grateful to Virginia Gibbs for the excellent material she sent us. As HWA has spread throughout the natural range of hemlocks, adequate material has become harder to find. This underscores the need for a supplemental diet on which immature stages can develop.

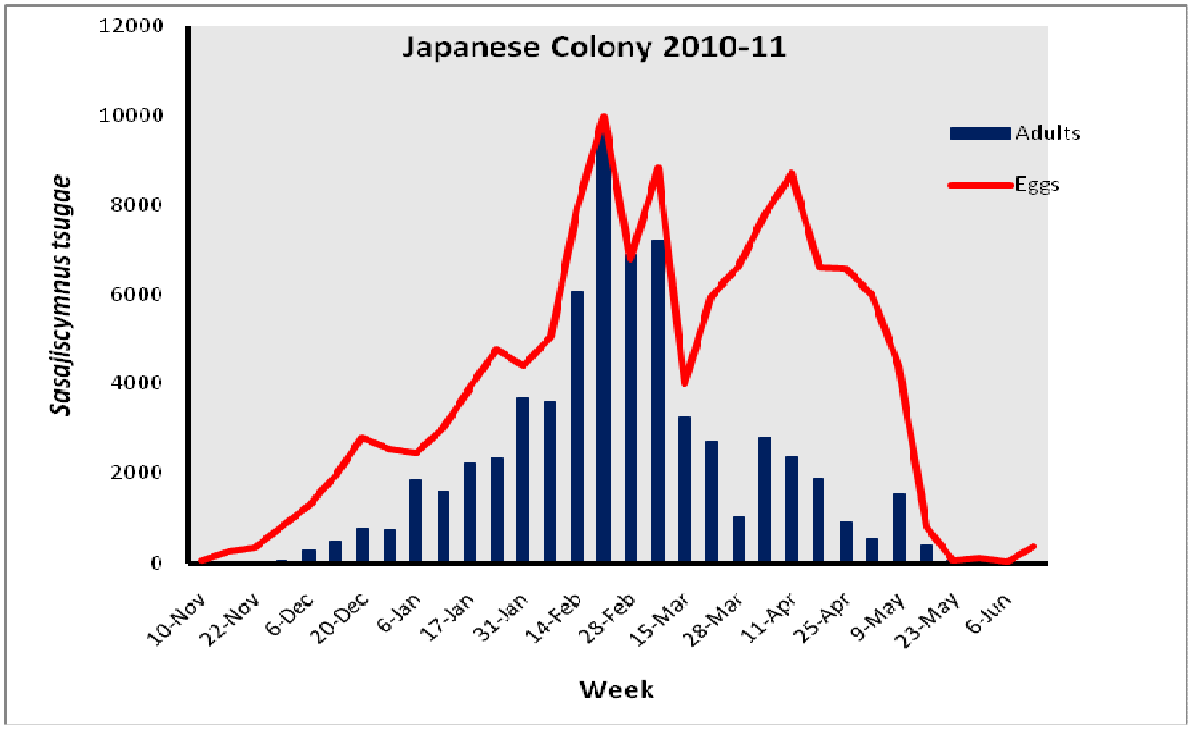
Personnel assigned to the project include Anitha Boniface, Research Specialist, full time, Rebecca Fergus, Research Specialist ¾ time, and Whitney Swink and Jesse Anderson, Research Specialists, temporary employees.

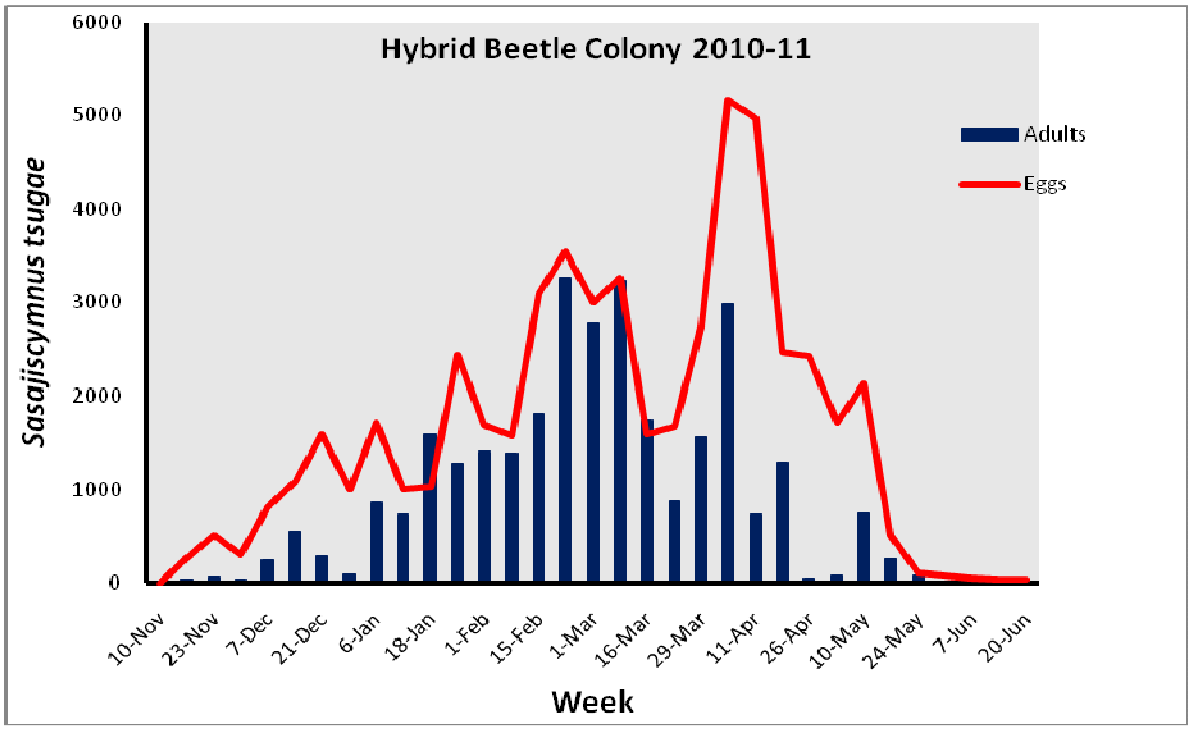
Fig. 3. Pupa (left) and adult (right*) S. tsugae* on hemlock

[1] Terminology used to describe adelgids..The sistens generation aestivates during the summer, completes its development in the fall and winter, and oviposits in the early spring.

[2] The progrediens generation begins in the late spring or early summer and completes its life cycle within the same season. Adults lay eggs, and the resulting nymphs settle onto new hemlock growth to become the sistens generation.

Figure 4. Production of *Sasajiscymnus tsugae* 2010-2011. Data shown represent production between November 10, 2010 and June 20, 2011.





Field Release and Monitoring Phorid Flies for Management of Imported Fire Ant
Rebecca Norris

Since the discovery of the Imported Fire (IFA) in NC in 1953 it has spread to 71 of 100 counties. In an effort to slow the spread and decrease population size, phorid flies, *Pseudacteon* spp (Diptera: Phoridae), natural enemies of the IFA were released in NC beginning in 2000 through cooperative efforts between NCDA&CS and USDA-ARS. The phorid fly, also known as the decapitating fly, lays its eggs in foraging ants. After hatching, the larva move into the IFA's head where it secretes an enzyme that causes its head to fall off. Three species of phorids, *Pseudacteon tricuspis, P. curvatus,* and *P. obtusus* have been released in the state. The species of phorid flies selected for release at each locality was based on the most prevalent IFA type present: monogyne colonies with a single queen or polygyne colonies with multiple queens. *P. tricuspis* and *P. obtusus* typically attack larger workers found in the monogyne colonies whereas *P. curvatus* shows a preference for smaller workers common to polygyne colonies. Locations and species released are shown in Table 1.

Table 1. Releases of phorid flies in North Carolina, 2000-2010.

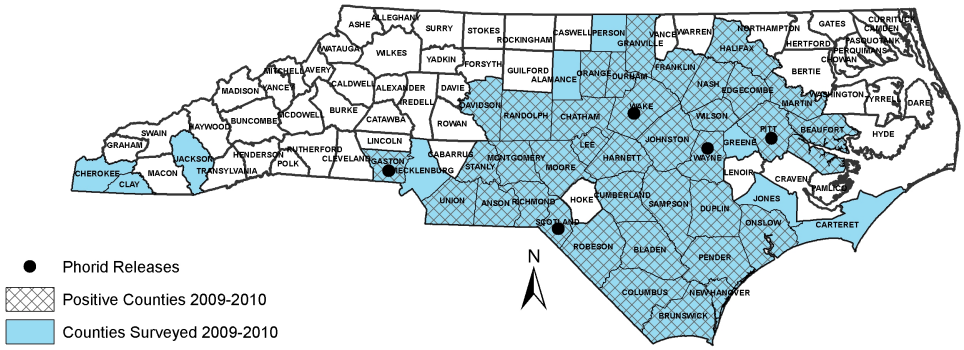
Species	County	Year	Site
Pseudacteon tricuspis	Beaufort	2000	Fallow land
	Duplin	2002	Rest area
	Robeson	2003	Fallow land
	Wayne	2004	Pasture
	Pitt	2006	Pasture
	Scotland	2007	Pasture
P. curvatus	Wake	2006	Naturalized area
	Scotland	2007	Pasture
	Wayne	2008	Pasture
	Gaston	2009	Pasture
	Pitt	2010	Fairgrounds
P. obtusus	Pitt	2010	Fairgrounds

Delimiting surveys to monitor establishment and spread of phorid fly species started July 28 and ended on October 18, 2010. Surveys are conducted in the fall when populations had time to increase. Since 2009 phorid flies have been found in thirty seven out of the forty-six counties surveyed. All of the counties surveyed were positive for *P. curvatus* (See Map). Only one sustained *P. tricuspis* population was found, in Pitt County.

A new species of phorid fly, *P. obtusus* was introduced into Pitt County in the fall of 2010. This species is more likely to attack the foraging ants instead of being attracted to mound disturbance like the other two species released. Approximately 1,100 *P. obtusus* and 12,000 *P. curvatus* were released in Pitt County over a three week period starting September 8. Monitoring confirmed the presence of *P. curvatus* in Pitt county in the Fall of 2010 Monitoring for *P. obtusus* will commence next fall after populations have had time to increase.

Steven Troxler, Commissioner

Counties surveyed for the phorid fly
Pseudacteon curvatus



Source: NCDA&CS Plant Industry Division

This map was prepared by Ken Ahlstrom on January 12, 2011

Megacopta cribaria, the Bean Plataspid or Kudzu Bug

An exotic hemipteran, *Megacopta cribaria*, was found feeding on Georgia kudzu (*Pueraria montana* var. *lobata)* and aggregating on buildings in the fall of 2009. In the summer of 2010, the insect was found feeding on soybean (*Glycine max)* in Georgia and South Carolina. Reports from Asian literature indicate that it may feed on soybean and other related legumes, but this host association is unclear. We proposed testing the insect in the NCDA&CS Quarantine Facility to determine host preferences.

Work began after funding was approved on June 17, 2010. The initial goal was to establish two separate colonies, based on host plant, allow the bugs to reproduce, and conduct feeding tests with individuals of approximately the same age. The first shipment of insects arrived July 29, 2010, and was placed in the Quarantine Facility. Insects were collected from soybean (370 bugs) and kudzu (486) in Georgia, and placed in separate cages with pots of lablab (*Lablab purpureus* (L.) Sweet) seedlings and a pot of their plant of origin (soybean or kudzu). Lablab was selected because it is reported to be a preferred host, and for its ease of propagation. A second shipment of bugs was received on September 8 (350 from soybean and ca. 1300 from kudzu) (Fig. 1). The majority of those in the kudzu group died within a few days, but better survivorship was seen in the soy group. A third shipment was received into quarantine on September 28. Plants were checked daily for egg masses, and foliage with eggs was removed and placed in individual petri dishes with moist filter paper and a new leaf. Hatching was monitored then nymphs transferred to new plants.

Megacopta on soybean laid 16 egg masses (191 eggs), with a hatching rate of 70.7%. Those on kudzu laid 3 egg masses (10 eggs) with a hatch rate of 50%. To improve oviposition and survival rates we are trying different methods of transferring eggs and different sizes of plants.

Choice Tests. A choice test was established September 23, using adults of unknown ages from both kudzu and soybean groups. Adults were held without food in small petri dishes for 24 hours prior to starting the test. Small plants of cotton, kudzu or soybean were offered in pairs to bugs originating from kudzu or soybean. Each treatment (kudzu vs. cotton and soybean vs. cotton) was repeated with the plants in opposite positions (front and back of cage) Controls of two kudzu or two soybean plants were included. Plants were positioned in the cages, and a dish containing 3 females and one male bug was placed on the floor of the cage between plants. The test was repeated with bugs from the third shipment beginning October 1, using 2 females and 2 males for each cage. Results were inconclusive. Plataspids fed readily on soybean, but the majority of the kudzu group died leaving little evidence of feeding on the plants. One plataspid was observed on cotton during one observation period, but no feeding damage was found. The cotton was paired with kudzu, which did show evidence of feeding with a maximum of 2 (of 4) bugs on the plant at one time. This was the only kudzu cage that showed feeding damage.

A no-choice test with nymphs was conducted by placing 2 nymphs each on five different plants, lablab, soybean, kudzu, cowpea, and lima bean. All nymphs died before the trial was complete.

All individuals had died by December 10. Several difficulties were experienced during the course of this study; they included obtaining same age individuals, propagating kudzu from cuttings, spider mite infestations of plants, and overwintering the plataspids.

In the spring of 2011 reports of bugs present in the southern border counties of NC were received. Surveys by Erica Scocco of Wingate University and Jack Bacheler and Dan Mott of NCSU along with individual reports confirmed 35 of 100 counties as infested by June 30. Personnel from the BIL

collected bugs from Richmond and Anson Counties on June 9 to begin a colony in quarantine, and Katharine Ellison of USDA in Georgia sent bugs from kudzu on June 21. Egg laying began within a few days and egg masses were monitored for hatching. One replication of a choice test using adults has been run to date; results will be reported when more replications are complete.

This exotic insect has been found feeding on kudzu, wisteria, and soybean in North Carolina. Although it may reduce growth of wild kudzu to some extent, its feeding on soybean is of particular concern to producers of organic soybeans for consumption as edamame. Also of concern is its habit of flying to and entering buildings to overwinter. When this occurs, the bug does not cause economic damage due to feeding, but becomes a nuisance pest, disturbing residents with its presence and even more so with the odor it emits when disturbed.

Table 1. Number of Egg Masses and Hatched Eggs, 2010.

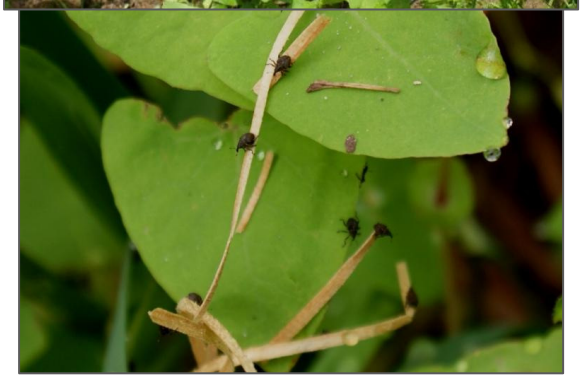
Shipment	Host	# Egg Masses	# Eggs Hatched
1	Kudzu	3	5/10
2	Kudzu	0	
3	Kudzu	0	
1	Soybean	16	135/191
2	Soybean	4	22/43
3	Soybean	0	

Figure 1. Life stages of *Megacopta cribraria*, Adults, Eggs, and Nymphs.

Mile-A-Minute Vine Biological Control

In the fall of 2010, an infestation of mile-a-minute vine (MAM) was reported in Alleghany Co by a student from Appalachian State University (ASU). In cooperation with the NCDA & CS Weed Program, delimiting surveys were conducted by Plant Industry field specialists, and showed several concentrations of the weed, primarily along the drainage of Elk Creek. Although some roadside plantings were designated for herbicide treatment, other areas along the creek were selected for biological control using a host-specific weevil, *Rhinoncomimus latipes.* The extensive distribution, its growth in the midst of native plants, and its preference for riparian habitat made this weed an ideal target for biological control methods.

The MAM weevil is native to China, and was identified by entomologists from the USDA Forest Service and the University of Delaware. The weevil is host-specific and during extensive lab and field testing did not complete its development on other plants, even those closely related to MAM. The weevils are now being reared at the Philip Alampi lab of the New Jersey Department of Agriculture. Experimental plots were established May 11 in one area of Alleghany Co. by ASU ecologists, and a total of 1000 weevils released. These plots will be monitored to determine the biology and spread of weevils in western NC. An additional 200 weevils were released May 26 along Elk Creek approximately 4 miles to the northeast (as the crow flies) of the experimental plots. This release is being monitored for establishment and spread along the creek.. Additional infestations have been identified in other western counties. A site near Burnsville, Yancey Co., along Coxes Creek was also selected for biological control and is being monitored. More infestations of MAM will likely be identified, and we hope to obtain more weevils for release in 2012. We will track the spread of the weevil from the 2012 release sites and document the progress in managing this weed.



Mile-a-minute vine (left) with other vegetation; MAM weevils (below left); MAM weevil feeding (below).