

ACTIVITIES REPORT 2007-08 FIELD SEASON

University of Georgia Hemlock Woolly Adelgid Predator Lab

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The UGA predator lab has had a busy field release season for 2007-08. Our previous lab coordinator, Tom Coleman, left for a position with the USDA Forest Service in San Bernardino, CA. He will be responsible for pest management activities in the San Bernardino National Forest and other nearby forests. He is currently dealing with a new problem of oak mortality caused by a Buprestid beetle (flat-headed wood borer) which is an *Agrilus* species. They do not know if this is a native pest or yet another introduced problem. We have a new lab coordinator to replace Tom. Dr. Gretchen Pettis is a graduate of the UGA Department of Entomology and she has considerable previous experience in rearing insects. Gretchen began work at the predator lab on July 1.

Most of the effort in the UGA lab has been directed toward rearing *Laricobius nigrinus* (Ln). Two additional predators were added to the rearing program in 2007. *Scymnus sinuanodulus* (Ss) and *Sassijscymnus tsugae* (St) were reared for release in winter and early spring (07-08). The St colony was developed for short term investigations and was planned to be a temporary effort. We are maintaining the Ss colony in the hope that it is likely to be adapted to our climate and therefore has a good chance for establishment.

Much of the effort in 2007-08 season was devoted to release of predators either as free releases or in field cages to evaluate predator establishment and performance. Releases of all three predators were conducted in hemlock stands with new, and building HWA populations. This current release strategy is a departure from the past practice of making predator releases in stands with moderate and high HWA populations. That practice, (although it seemed like a good idea at the time) was generally ineffective, apparently because trees quickly become too debilitated to support HWA infestations, and the

subsequent population crashes doomed any predator releases to failure. The current release protocol (and the rationale for its development) is described in an information release prepared by Mark Dalusky for our collaborators at the other predator labs. The text of that release is included here along with a table that details the releases from the UGA lab. There is some good news in that several Ln larvae were found in samples of HWA–infested foliage brought to the lab to feed predators. Some of this material was collected from an area in which no Ln had been released, suggesting that adults had flown to the area and deposited eggs. This is an encouraging sign, although it is not unequivocal proof that Ln is established in Georgia.

REVISED STRATEGY FOR HWA PREDATOR RELEASES IN GEORGIA

Mark J. Dalusky

2007: Early last year, Tom (UGA), LayLa (Clemson U) and I were considering a different approach to predator release that might improve chances for establishment. We agreed that tree health had to be good enough *and* HWA density low enough to insure that predators would have host insects for at least 3 years. In the past, we have made inundative releases on just a few trees in areas that had moderate HWA populations on most of the trees ('big bucket' release). These areas would frequently be trashed by HWA during the winter of the same year as the release. Tree health would be in serious decline over a large area, and by spring the HWA had begun to disappear. I think that our assessment of HWA populations as 'moderate' was inaccurate. Given this scenario, there is virtually no chance for predator establishment, even with supplemental releases. (No host prey, no establishment.) Seems pretty simple. So last year I identified 3 areas for an initial attempt at low level releases spread out over a much larger area at each release site. We were only dealing with *Laricobius* (Ln) last year, and chose an unproven method of release due to its ease of deployment. We decided to go predominantly with twigs on which Ln had deposited eggs (egg twigs) from our Ln oviposition jars, clipped onto the infested foliage at our release sites. Jerome had done a heap of work with *Sassijscymnus tsugae* (St) eggs that looked promising, and Paul had some impressive results with St egg hatch studies also. Tom had some preliminary sleeve cage work from early March '07 that suggested we had up to 60% survival to late instars with Ln egg twigs clipped onto infested hemlock foliage. We went with this method of release at Panther Creek (both upper and lower ends), Water-Dicks

Creek, Slaughter Creek (Winfield Scott), and an experimental site at Wolf Pen Gap. Infestations were low to very low and tree health was excellent. There were many apparently uninfested trees. Once again our perception of what constituted a 'low' HWA level betrayed us! The site at Slaughter Creek progressed to 'very high' with zero new growth over a large part of the watershed, by winter of 2008. The release season for 2007 drew to a close, and Layla and I resolved to come up with a workable strategy for low level predator releases which included piggy-backing all three available predator species- Ln, St and Scymnus (Ss)- into the same areas where possible.

2008: We soon found that our new release strategy required substantial scouting of potential release areas. When HWA populations are low to very low, it helps to have pre-flagged your release branches. By spending heaps of time in several of the USFS Hemlock Conservation Areas (HCA) early in '08, we encountered several recognizable stand conditions that seemed promising as candidate release areas for the revised strategy. Frequently we would work in the side drainages off the main creek, flood plains or transition zones where the hemlock resource went from sparse to dominant, or where the hemlock hit some sort of bottleneck due to topography or competing vegetation. For instance, as you climbed out of a generally infested flood plain along the main channel, HWA level might moderate as you gained elevation, frequently dropping to a low level. Side drainages were frequently heavily infested at the juncture with the main stream, but quickly fell to low level with distance from the main stream. Even along the main stream channel, zones of infestation could be identified where HWA level dropped from very high to moderate to low over a surprisingly short distance. Unfortunately, there is no good way to predict this without a lot of 'boot leather' touring of the area. We were also surprised at how spotty any given infestation can be, with heavily infested trees mixed in with low and apparently uninfested trees. After expending considerable effort, we came up with some general guidelines for small-number predator releases in low-level HWA populations:

- Characterize the release area: is the infestation progressing upstream or downstream (?), upslope or downslope (?), is it uniform or spotty (?), are there recognizable infestation zone changes from high to moderate to low or spotty (?), are there topographical or vegetative bottlenecks that can be taken advantage of (?); flag potential release branches!!
 - Area should have enough lightly infested or uninfested hemlocks to insure host material for our predators for 3 years; 2 years of supplemental releases should be made unless there are obvious mitigating circumstances.

- Release predators in low enough numbers to not overwhelm the adjacent host resource and spread your releases out over a large area and number of trees
- Target zones of change in HWA population level, taking advantage of side drainages, elevation change or other bottlenecks.
- Take advantage of heavily infested trees that are interspersed to do some 'big bucket' releases of St; these types of releases can also be done where HWA level goes from high to moderate or spotty.
- Odd stands of healthy hemlock that are completely surrounded by generally infested stands probably won't be good release sites due to tremendous HWA pressure from all sides.
- Release in areas with uniform, ultra-low HWA populations if any suitable branches are found, to get a jump-start in these areas.
- Layer all 3 predator species into the same areas; avoid releasing directly over the top of a previous release; the size of your release will dictate the number of HWA ovisacs needed on any release branch; we like to see a couple dozen at least (for low level Ln release)

These are current guidelines and this is definitely a work in progress!

In support of (or in spite of!) our revised strategy, we have made the first ever recoveries of Ln F1 larvae in the deep South. This may be the first recovery of free-released predator F1's from any of the predator species (someone please correct me if I'm wrong on that) in the deep South. Sleeve cage monitored reproduction does not count! We recovered F1 larvae from foliage collected by our GFC partners from the Wolf Pen Gap release area, and from Lake Winfield Scott. This last recovery is of particular interest as the nearest free-release was at least 0.75 miles away on the Slaughter Creek HCA.

UGA, Clemson, NGCSU, and YHC have made substantial releases this year in conjunction with USFS personnel (Jim Wentworth, Tammy Thatcher, and others). The attached table provides a synopsis of the releases from the UGA lab. LayLa Burgess (Clemson), Sarah Osicka (North Georgia College) and Paul Arnold (Young Harris) have conducted and facilitated numerous additional releases, many of which are piggy-backed in with the UGA releases. We have applied this revised strategy in 13 HCA's this year: 4 in the eastern District and 9 on the western front of the infestation.

Predator Releases 2008

(tw= egg/larval twigs; ad= adults; twa= egg/larval twigs plus adults)

Location a	Date	Species (Ln, Ss, St)	Type (Tw, Ad)	Number	Supplemental Year
Lower Panther Creek Trail	2-10-08	Ln	twig	700 twigs	1 (init yr: 2007)
Panther Creek Trail	2-15-08	Ln	twig	600 twigs	1(init. Yr. 2007)
Davidson Creek	2-20-08	Ln	twig	250 twigs	NA; first year
Soque River	2-21-08	Ln, Ss	twig	35 tw Ln 65 tw Ss	NA; first year
Davidson Creek	2-29-08	Ln	twig	360 twigs	NA; first year
Soque River	3-5-08	Ln, Ss	twig	140 tw Ln 13 tw Ss	NA; first year
Davidson Creek	3-6-08	Ln, Ss, St	twig (adult St too)	36 tw Ln 33 tw Ss 160 twa St	NA; first year
Waters-Dicks Creek	3-10-08	Ln	twigs	150 tw Ln	1 (init. yr. 2007)
Davidson Creek	3-11-08	Ln, Ss, St	twig Adult St	80 tw Ln 40 tw Ss 2500 ad St	NA; first year
Panther Creek Trail	3-12-08	Ln, Ss, St	twig adult St	150 tw Ln 6 tw Ss 60 twa St 225 ad St	1(init. Yr. 2007)
Lake Dockery	3-20-08	Ln, Ss	twigs	150 tw Ln 70 tw Ss	NA; first year
Panther Creek Trail	3-26-08	Ln, Ss	twigs	60 tw Ln 20 tw Ss	1(init. Yr. 2007)
Soque River	3-26-08	Ln, Ss	twigs	30 tw Ln 32 tw Ss	NA; first year
Waters-Dicks Creek	3-27-08	Ln, Ss	twigs	12 tw Ln 42 tw Ss	1 (init. yr. 2007)

Lake Dockery	3-27-08	Ln	twigs	110 tw Ln	NA; first year
Location	Date	Species (Ln, Ss, St)	Type (Tw, Ad)	Number	Supplemental Year
Blackwell Creek	3-27-08	Ln	twigs	20 tw Ln	NA; first year
Lake Dockery	4-03-08	Ln, Ss	twigs	45 tw Ss 35 tw Ln	NA (first year)
Lower Panther Creek Trail	4-08-08	Ln	twigs	94 tw Ln	1 (init. Yr 2007)
Canada Creek 1	4-09-08	Ln, Ss	twigs	120 tw Ln 72 tw Ss	NA (first year)
Lake Dockery	4-09-08	Ln, Ss	twigs	50 tw Ln 40 tw Ss	NA (first year)
Canada Creek 1	4-16-08	Ln, Ss	twigs	56 tw Ln 100 tw Ss	NA (first year)
Wolf Pen Gap	4-24-08	Ln, Ss	twigs	54 Ln tw 51 Ss tw	1 (init. Yr 2007)
Soque River	4-29-08	Ss	twigs	32 Ss tw	NA (first year)
Boggs Creek	4-30-08	Ln, Ss	twigs	46 Ln tw 50 Ss tw	NA (first year)
Waters Creek	4-30-08	Ss	twigs	15 Ss	1 (init. yr. 2007)
Lower Panther Creek Trail	5-1-08	Ln, Ss	twigs	24 Ln tw 8 Ss tw	1 (init. Yr 2007)
Wolf Pen Gap	5-1-08	Ln, Ss	twigs	27 Ln tw 12 Ss tw	1 (init. Yr 2007)
Wolf Pen Gap	5-7-08	Ln, Ss	twigs	42 Ln tw 24 Ss tw	1 (init. Yr 2007)
Boggs Creek 2	5-8-08	Ln, Ss	twigs	45 Ln tw 32 Ss tw	NA (first year)
Canada Creek 2	5-8-08	Ln	twigs	22 Ln tw	NA (first year)
Slaughter Creek	5-13-08	Ln, Ss	twigs	61 Ln tw 37 Ss tw	1 (init. Yr 2007)
Wolf Pen Gap	5-13-08	Ln, Ss	twigs	38 Ln tw 29 Ss tw	1 (init. Yr 2007)
Canada Creek 2	5-13-08	Ln, Ss	twigs	24 Ln tw 22 Ss tw	NA (first year)
Cooper Creek	5-14-08	Ln, Ss	twigs	30 Ln tw 15 Ss tw	NA (first year)

