Summary Report - August 1998

Project: Laboratory Rearing of Hemlock Woolly Adelgid Predator
Grant No: NA-98-0041 also referred to as NA-1998-01

Phillip Alampi Beneficial Insect Laboratory
New Jersey Department of Agriculture
Principal Investigators: D. Palmer and M. Mayer

Objective:

The primary goals of the present project were to develop an efficient mass production technique for the hemlock woolly adelgid predator *P. tsugae* and, if successful, to provide sufficient predators to begin inoculating HWA-infested areas in New Jersey in an effort to establish field populations of the beetle and to begin evaluating their effect on HWA infestations.

Work Accomplished:

Phase 1 - Laboratory Rearing

(1.) The laboratory succeeded in developing a practical and labor-efficient rearing technique that produced 85,000 *P. tsugae* from the initial stock of 100 individuals received from the Connecticut Agricultural Experiment Station in May, 1997. Although further improvements are expected, the technique consistently yielded 5,000 to 7,000 beetles per week from January to June.

Of the 85,000 beetles produced, 75,000 were released in New Jersey, 5,000 were given to Dr. Mark McClure for release in Connecticut, and 5,000 were held as rearing stock to be used when the beetle's oviposition begins again in October as the adelgid emerges from summer dormancy.

(2.) Up to the present, a storage technique that would reliably return a high percentage of the stored beetles and that would require a minimum of maintenance has not been available. The Alampi Laboratory has developed a technique that returned 100 percent of the stored beetles - some stored for up to five months - and required little maintenance.

(3.) One of the most labor-intensive aspects of rearing *Pseudoscymnus* to date has been searching hemlock needles and branches for newly-emerged or stored beetles during collecting operations in the laboratory colony. The laboratory has devised a method using manipulation of temperature to induce beetle adults to leave the foliage and collect on the walls of the rearing enclosure for easy and rapid aspiration. Collecting operations that previously took hours now take minutes.

(4.) Basing mass production of a predator on field-collected host material leaves the rearing program vulnerable to uncontrollable influences and limits the rearing laboratory's ability to predict with any reliability what production capacity may be. From the earliest days working with *Pseudoscymnus*, the Alampi Laboratory has had an interest to explore the feasibility of maintaining an HWA colony on which to wholly or partially base the beetle's production. To that end, we have now gained initial experience in growing hemlocks in containers, have learned how to produce an 18-inch plant from a 4-inch bare-root seedling in approximately a year, and have now established 2,000 potted hemlocks in various stages of growth. Very early work to inoculate those plants with HWA has begun and will be an important focus of our work when the adelgid emerges from estivation.

(5.) Because the imperative of this year's work has been to develop a mass rearing technique and to produce as many predators as possible, evaluation of alternative food sources for *Pseudoscymnus* has been carried out only within the context of what was necessary to develop a production technique. After screening other substances, we have added undiluted honey and a mixture of casein, yeast extract, sugar and water as food supplements for *Pseudoscymnus* adults and larvae. They are readily eaten by both insect stages and have been present in all steps of our rearing procedure. The extent to which they are essential to achieving the current level of production is not known.

For the present, the evaluation of other host insects as alternate food sources has become secondary to the need for getting rearing operations underway.

Phase 2 - 1998 *Pseudoscymnus tsugae* Releases

- Site, date of Release, and Number of *P. tsugae* released

County	**Site**	**1998 Release Dates**	**Total No. *P. tsugae* released**
Sussex	Wawayanda State Park[1]	5/12	10,000
Sussex	Kittatinny Valley State Park[2]	5/13, 5/15	10,000
Warren	Jenny Jump State Forest[2]	5/13, 5/20	10,000
Sussex	Stokes State Forest[2]	5/15, 5/20	10,000
Sussex	Johnson Lake PSP	5/22	3,000
Morris	Lake Valhalla PSP	5/22, 6/24	5,000
Monmouth	Walnridge Farm PSP	5/27	3,000
Sussex	Sparta Glen	5/29, 6/10	6,000
Monmouth	Deep Cut Park	6/1	500

(cont.) County	Site	1998 Release Dates	Total No. *P. tsugae* released
Warren	Worthington State Forest PSP	6/10, 6/17	5,000
Warren	Shades of Death PSP	6/12	2,500
Monmouth	Freer Preserve	6/5	4,500
Mercer	Washington Crossing State Park	7/1	1,000
Mercer	Princeton Battlefield State Park	7/1	1,500
Morris	Schooley's Mountain PSP	7/24	3,000

[1]Cooperative Site with Dr. Mark McClure
[2]NJDA evaluation sites, intensive data collection

We have released 75,000 *P. tsugae* in 14 sites in anticipation that the beetles will establish and overwinter. Data from the Wawayanda site will be added to information collected from release sites in Connecticut and Virginia as part of a cooperative project with Dr. Mark McClure. Three other sites, Stokes State Forest, Kittatinny Valley State Park, and Jenny Jump State Forest will be intensively monitored for *P. tsugae* and hemlock woolly adelgid populations and tree vigor. The sites with the ending "PSP" are the hemlock stands from which we have been collecting HWA impact data since 1988. The PSP sites will be used to evaluate the before and after effects of beetle releases. The four sites that have received 10,000 beetles represent a cross section of HWA densities from light to heavy.

At the Wawayanda collaborative site, the beetles have dispersed about 15-20 m from the release tree. Visually, the hemlock woolly adelgid population has been considerably reduced on the release tree. At all the other sites we have readily found adult *P. tsugae* on the release trees as late as August 4.