# Special Technology Development Program
# Progress Report

**PROJECT NUMBER:** NA-2001-05

**PROJECT TITLE:** Field evaluation and establishment of the lady beetle, *Scymnus ningshanensis*, for biological control of the hemlock woolly adelgid

**PROJECT STATUS:** Continuing

**EXPECTED PROJECT DURATION:** 2 years

**EXPECTED COMPLETION DATE OF THE PROJECT:** Sept 30, 2002

**SUBJECT: (mark all that apply using 1 for primary category and 2 for secondary categories)**:
Biological Control_1_ Invasive Species_1_ Methyl Bromide Alternatives___ Models___ Monitoring___ Organism Biology___ Pesticides: Microbial ___ Pesticides: Synthetic___ PTIPS___ Population___ Risk and Hazard___ Remote Sensing___ Semiochemicals___ Silvicultural Technology___ Social Values___ Spray Technology___

**STATUS OF SUBJECT SPECIES:** The hemlock woolly adelgid is a non-native noxious pest, currently spreading and causing increasing mortality of eastern hemlock.

**PROJECT OBJECTIVES:** (1) Define an optimal strategy for release of *Scymnus ningshanensis*; (2) define the effectiveness of this lady beetle under various environmental conditions; (3) produce sufficient numbers of predators for mass releases in 2003.

**BRIEF DESCRIPTION OF THE PROJECT:** Activities during 2001 (April-September) include preparation of an environmental assessment for release of the lady beetle, a caged field study to document the lady beetles efficacy as a biological control, and development of improved rearing protocols.

The field study compared the performance of two species of lady beetles, *S. ningshanensis* and *Pseudoscymnus tsugae*. A male and a female of each species were enclosed in a nylon mesh bag on a hemlock branch where the number of HWA ovisacs had been previously counted. There were 25 replicates of three treatments, the two species of lady beetle and a control with no beetles. The treatments were placed in the field on 4 May and removed on 10 July. By counting the initial adelgid population (=end of the sistens generation) and the end of the following generation (progrediens), we were able to determine the net per capita change in the adelgid population. The adelgids in the control bags increased 62%, the increase was 19% with *P. tsugae* in the bags, and with *S. ningshanensis* the adelgid population decreased 13%. This experiment indicates that both species of lady beetles can reduce the population growth of the lady beetle, but, in this case, only *S. ningshanensis* actually reduced the density of the adelgid.

As observed in previous years, the growth of the adelgid population was influenced by the initial density of the adelgid and the proportion of new foliage that produced new growth. The lady beetles in turn seem to respond also to the quality of the foliage and also to pre-conditioning before they are placed in the field. We are still analyzing the effects of these on the effectiveness of the lady beetles. It is apparent that both species of lady beetles are influenced by pre-conditioning prior to release and that the timing of release is also important. Therefore, we intend to examine these factors in more detail this coming season.

Rearing of *S. ningshanensis* has been improved. Previous protocol held beetles at 5°C beginning as early as August. We have had much less mortality holding the beetles at 15-20°C. After as little as one month in cold they will initiate egg laying when returned to warmer temperatures. It is thus possible to begin production of new beetles as early as December and to produce two generations in one year (we still regard the beetles as univoltine in nature). For reproduction, the beetles still require HWA eggs as food. We can induce HWA to produce HWA eggs by late December and can hold HWA eggs in the cold until October; thus, we can have an almost continuous supply of HWA eggs. We believe that our

current rearing environment is satisfactory and will focus on effects of mating and food quality on *S. ningshanensis* reproduction in the coming season.

**CHANGES TO ORIGINAL PROJECT SCOPE OR OBJECTIVES**: *Pseudoscymnus tsugae*, a lady beetle already released, has been included in the field studies of this project. This was done to compare the performance of *S. ningshanesnis* and *P. tsugae*.

**ADDITIONS TO ORIGINAL PROJECT SCOPE OR OBJECTIVES:**. Last years results indicate that that pre-conditioning and timing are important factors influencing the post-release performance of both species of lady beetles. Therefore, we propose that the field studies include side-by-side comparisons of both species in the coming year. Rather than making one or two releases of *S. ningshanensis* in very high numbers, we feel that several releases should be made under a variety of conditions so that more information can be obtained on optimal conditions (release date, pre-conditioning, and host quality).

**FHP LEAD CONTACT:**

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**PRINCIPAL INVESTIGATOR(S):**

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**COOPERATORS:**

| Name | Affiliation (Office or Dept.) | Phone, E-mail, Fax |
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**COOPERATOR INVOLVEMENT:**

| Name | Role | Time Commitment |
|---|---|---|
| Joseph Elkinton | data collection, numerical impact analysis | 10%, student 50% |

**PRODUCTS AND DUE DATES:** Environmental Assessment completed and reviewed by public, FONSI issued – February 2001; Methods development progress – October 2001; Methods for release finalized – September 2002; Distribution of predators/release methods – March 2003

**STATUS OF PRODUCTS/PRESENTATIONS:** EA prepared, scoped by several state officials and forest health specialists, and FONSI issued prior to start of field work. Additionally, we prepared handouts that explained what we are doing to the public. Collection and summary of the data has just been completed. A presentation including this work was made to the IPM Advisory Committee, Pennsylvania Department of Agriculture, Harrisburg. Additional presentations will be made in January and February. Sufficient lady beetles have been reared for 2002 field evaluations.

**Products: see above**

**Publications: none at this date**

**Technology Transfer: see above**

**FIRST FISCAL YEAR FUNDED:** 2001

**FUNDS OBLIGATED FROM BEGINNING OF PROJECT THROUGH CURRENT FISCAL YEAR:**

| | Item | Requested Funding | Received Funding | Expended Funding |
|---|---|---|---|---|
| **PREVIOUS YEAR FY 2001** | | | | |
| **Administration** | Salary | $22,000 | $22,000 | $55,091 |
| | Overhead | | | $11,928 |
| | Travel | $ 4,000 | $ 4,000 | $ 4,000 |
| **Procurements** | Contracting | | | $18,981 |
| | Equipment | | | |
| | Supplies | $ 1,000 | $ 4,000 | $ 5,000 |
| **YEAR TOTALS** | | **$27,000** | **$27,000** | **$94,928** |

| | | | | |
|---|---|---|---|---|
| **CURRENT YEAR FY 2002** | | | | |
| **Administration** | Salary | $50,000 | | |
| | Overhead | | | |
| | Travel | | | |
| **Procurements** | Contracting | | | |
| | Equipment | | | |
| | Supplies | | | |
| **YEAR TOTALS** | | **$50,000** | | |

**FUNDS NOT USED FROM PREVIOUS FISCAL YEAR**

| Fiscal Year | STDP Funding Allocated | Funds Obligated | Funds Unused |
|---|---|---|---|
| **2001** | **$27,000** | **$27,000** | **$0** |
| | | | |

**EXPECTED BUDGET FOR NEXT FISCAL YEAR:**

| FY 2002 | Item | Requested FHP STDP Funding | Other-Source Funding | Source |
|---|---|---|---|---|
| **Administration** | Salary | $50,000 | $20,000 | NE-4501 |
| | Overhead | | $7,668 | NE-4501 |
| | Travel | | $4,000 | NE-4501 |
| **Procurements** | Contracting | | | |
| | Equipment | | | |
| | Supplies | | $4,000 | NE-4501 |
| | | | | |
| **Totals** | | **$50,000** | **$35,668** | |

**DIFFERENCE BETWEEN ORIGINAL AND AMENDED REQUESTS:** none

**STDP FUNDING NEEDED:**

| Fiscal Year | STDP Funding | Other-Source Funding | Source |
|---|---|---|---|
| **2002** | **$50,000** | **$35,668** | **NE-4501** |
| | | | |