Pseudoscymnus tsugae (Coleoptera: Coccinellidae), a predator of Adelges tsugae (Homoptera: Adelgidae) on Tsuga canadensis in the landscape.

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Introduction

*Tsuga canadensis* (L.) Carrière is considered among the most graceful and beautiful of the evergreen conifers. Eastern hemlock is one of the most common woody ornamental in the landscape and in nursery production. It is used extensively in foundation, hedge, and screening plantings. Despite its popularity, the future ornamental use of *T. canadensis* is bleak because of *A. tsugae*. *Adelges tsugae* (Homoptera: Adelgidae) is native to Asia. It was introduced into Richmond, Virginia around 1950 and has spread to northeastern states without its endemic enemies. *Adelges tsugae* is readily distributed with the help of wind patterns, wildlife and humans. Damage is caused by adelgid feeding at the base of hemlock needles with piercing sucking mouthparts. Such feeding leads to discoloration and death of hemlock needles. Infected trees generally die within 4–6 years without control measures.
*Pseudoscymnus tsugae* Sasaji and McClure (Coleoptera: Coccinellidae) was discovered in Honshu, Japan in 1992, belongs to the tribe Scymnini, which holds characteristically small coccinellids, that feed on homopteran pests.
Research Question:

Can *Pseudoscymnus tsugae* provide effective biological control on recently infested Eastern hemlocks in the landscape setting?

Hemlocks in the landscape
Materials and Methods

In March of 2000, twenty-five 6 ft., non-infested Eastern hemlocks were transplanted to University of Rhode Island’s Agronomy and Peckham farm. The hemlocks were planted in the fence-rows or at the woods edge, and separated by 100 meters from any other...
On 6 April 2000, all trees were inoculated with *A. tsugae* eggs. Each tree received twenty 30cm twigs. Each was affixed by two wire wrap ties.

On May 24, 2000 the first nymphal instar of *A. tsugae* was observed. Ten branches were randomly marked and a pre-release sample of *A. tsugae* was taken. The total number of nymphs on the underside of 30 cm new growth was recorded.
On June 8, 2000, 3,750 adult *P. tsugae* were released on 26 trees. Release quantities included: 0, 50, 100, 200, and 300 per tree. There were five replicates of each treatment level. All *P. tsugae* were reared in the URI Insect Quarantine Laboratory.
Post release *A. tsugae* samples were take in September and November 2000. Sampling for *P. tsugae* was conducted in July, September and November of 2000.
Results and Conclusions

The release of *P. tsugae* was successful in establishing populations of the predator on release trees for at least 18 days. Predator populations measured on June 26 were significantly correlated (P=0.05) with release densities on June 8 (Fig. 2). It is not clear what happened to these predators since then: we have recovered only a few adults (and no beetle larvae) in samples taken in July, September, and November.

The predators released on trees significantly impacted the change in adelgid numbers between June and September. In Fig. 1 there is a net increase of about 25 adelgids per branch on the control trees, decreasing to about zero at 50 or more predators per tree. ANOVA results indicate a significant treatment effect and a LSD test indicates that the control is significantly different from all treatments (P=0.05).
It is not clear if *P. tsugae* will result in long term control of *Adelges tsugae* on these trees. We will continue sampling in the next field season for predators and adelgids.