

# HEMLOCK WOOLLY ADELGID AND ITS NATURAL ENEMIES IN YUNNAN PROVINCE, CHINA: FIRST-YEAR (2005) RESULTS

Li Li<sup>1</sup>, Wenhua Lu<sup>2</sup>, Michael Montgomery<sup>3</sup>, Roy Van Driesche<sup>2</sup> and Scott Salom<sup>4</sup>

<sup>1</sup>Research Institute of Resource Insects, Chinese Academy of Forestry,  
Kunming, Yunnan, 650244, China

<sup>2</sup>Department of Plant, Soil, and Insect Sciences, University of Massachusetts  
Fernald Hall, Amherst, MA 01003

<sup>3</sup>USDA Forest Service, 51 Millpond Road, Hamden, CT 06514

<sup>4</sup>Department of Entomology, Virginia Tech University, Blacksburg, VA 24061

## ABSTRACT

Chinese and American institutions formed a partnership in 2005 for the purpose of studying and obtaining natural enemies for biological control of *Adelges tsugae* Annand, the hemlock woolly adelgid (HWA), in the eastern United States. We report here the first 6 months (June–November) of studies conducted in Yulong (Lijiang) County in Yunnan Province. Previously, *Scymnus sinuanodulus*, *S. camptodromus* and *S. yunshanpingensis* had been collected there for shipment to the United States. There are four study sites between altitudes of 2600 and 3200 meters in transitional forest. Besides the hemlocks, *Tsuga dumosa* or *T. forrestii*, spruce, fir, pine, *Keteleeria*, and *Taxus* are present along with hardwoods such as oak, birch and poplar.

Monitoring of HWA life stages began in June, when the progrediens generation was almost completed. Developing sistens generation nymphs were observed in September and oviposition by sistens adults started in November. We measured the percentage of 1-year-old terminal branchlets

that were infested and found a greater percentage of infested shoots on the north (16.4%) and south (14.4%) sides of a tree than on the east (6.4%) and west (5.3%) sides, and more infested shoots on the lower (13.2%) than on the upper (8.0%) crown.

Predators were sampled monthly by beating hemlock and pine foliage over an inverted umbrella. The Coccinellidae was the most speciose (34 species) and abundant (51% of specimens) group of the 103 morph species and 703 specimens collected. The most abundant lady beetles in Yunnan were *Scymnus camptodromus* and *S. sinuanodulus*, which were recovered in about equal numbers overall. These two species seem segregated by site characteristics, such as the presence of five-needle pine infested with adelgid, which the latter species frequents more than the former. An anthocorid, *Tetraphleps galchanoides*, was collected in one of the Yunnan sites and exported to the United States.