HEMLOCK WOOLLY ADELGID AND ITS NATURAL ENEMIES IN SICHUAN PROVINCE, CHINA, 2005

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ABSTRACT

A partnership of Chinese and American institutions was formed in 2005 to obtain 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 done at three sites in Kangding and Baoxing Counties in Sichuan Province. Previously, *Scymnus camptodromus* and *Laricobius* spp. had been collected there for shipment to the United States. The hemlock *Tsuga chinensis* grows at two of the sites and *T. dumosa* at one. Also present are spruce, fir, and five-needle pine, which are attacked by other species of adelgids.
When monitoring of HWA development began in June, both wingless and winged adults of the progrediens generation were present. By late summer, mostly aestivating neosistens nymphs were present, but some egg-laying adults and developing nymphs were also found, suggesting that some neosistens had an abbreviated diapause. HWA distribution in tree crowns was light and uniform; percentages of HWA-infested terminal shoots on the four cardinal directions were 6.0 percent, 7.1 percent, 5.9 percent, and 5.4 percent, with 6.9 percent and 5.2 percent in the lower and upper crown, respectively.

Predator diversity was assessed monthly by beating hemlock and pine foliage over an inverted umbrella. The Coccinellidae was the most speciose (28 species) and abundant (43% of specimens) group of the 1418 specimens and 127 morph species collected. *Scymnus* lady beetles dominated at each site but the dominate species varied; *S. camptodromus* dominated at Nibagou; *S. geminus* and *S. lycotropus* at Simaqiao; *S. ancontophyllus, S. camptodromus*, and *S. huashansong* at Yangcanggou. Nibagou had the least diverse and Yancanggou the most diverse guild of Coccinellidae. *S. camptodromus* was found mostly on hemlock, *S. geminus* was found mostly on pine, and *S. lycotropus* was found more on hemlock than pine in June but mostly on pine in July, when HWA was aestivating and adelgids on pine were growing and ovipositing. Another noteworthy family of predators was Anthocoridae (Hemiptera): seven species were found, mostly late in the season.