

NATURAL ENEMIES OF THE EMERALD ASH BORER IN MICHIGAN AND CHINA

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Abstract

In 2002, regulatory agencies in the United States and Canada adopted a strategy of eradication for the emerald ash borer (EAB), *Agrilus planipennis*, in an effort to protect New World ash (*Fraxinus* spp.). Should eradication fail, however, conventional biological control will be needed to suppress the populations of this invasive buprestid. To this end, we are studying the natural enemies of EAB in Michigan and in China, where EAB is a periodic pest of their native ash, as well as two locally planted New World ash species: *F. velutina* and *F. pennsylvanica*. Virtually nothing was known of EAB natural enemies until the recent report of *Spathius* sp. (Braconidae), a gregarious ectoparasitoid of EAB larvae in China (Xu Gongtian 2003).

In a woodlot in Livonia, Michigan, we surveyed the insect natural enemies and entomopathogenic fungi attacking EAB from August 2002 through July 2003. The most prevalent natural enemies were five species of fungi, although less than 2% of immature EAB were infected. Fungal species included: *Beauveria bassiana* (24 isolates), *Paecilomyces farinosus* (30 isolates), *Paecilomyces fumosoroseus* (7 isolates), *Verticillium lecanii* (36 isolates), and *Metarhizium anisopliae* (2 isolates). One egg parasitoid, *Pediobius* sp. (Eulophidae), was reared from 0.3% of EAB eggs collected in early July 2003. Seven potential larval parasitoids included *Heterospilus* sp. (Braconidae); *Phasgonophora sulcata* (Chalcidae); *Balcha* sp. and *Eupelmus* sp. (both in Eupelmidae). Two other parasitoids, reared from EAB-infested logs cut in different woodlots, included *Atanycolus* sp. and *Spathius simillimus* (both in Braconidae). The most prevalent parasitoid was *Balcha* sp., a solitary ectoparasitoid that we successfully reared to adult in the laboratory. This parasitoid is native to Asia and was recently discovered in Maryland and Virginia (Michael Gates, USDA SEL, personal communication). Coleopteran predators

included *Enoclerus* sp. (Cleridae), *Catogenus rufus* (Passandridae), and *Tenebroides* sp. (Trogossitidae); these predaceous beetles consume EAB during both larval and adult stages. Other EAB mortality factors included woodpecker predation, starvation, desiccation, and cannibalism, especially in heavily infested logs. Our results revealed that mortality of EAB in Michigan due to parasitoids is low compared to that reported for some of our native *Agrilus* spp.

In north and northeastern China, ash trees in woodlots, cities, roadsides, and nurseries were surveyed for EAB and its natural enemies in Heilongjiang, Jilin, Liaoning, Hebei, Tianjin, and Shandong Provinces from late October and early November 2003 (H. Liu and T. Petrice). The previously reported *Spathius* sp. was collected at two locations, with 1 to 50% parasitism of EAB larvae. We also discovered an unknown gregarious endoparasitoid of EAB larvae in Changchun City in Jilin Province (Oct. 25), and Benxi County in Liaoning Province (Oct. 30), with a parasitism rate of 2.7 to 50% (H. Liu). Mature larvae, pupae, and adults were collected and later identified as *Tetrastichus* sp. (Eulophidae) (M. Gates, USDA ARS SEL). The numbers of *Tetrastichus* from each parasitized EAB larva ranged from 4 to 29. We gave specimens of this *Tetrastichus* to Prof. Dawei Huang at the Institute of Zoology, Chinese Academy of Sciences, Beijing, China for identification or description. Based on the results of the 2003 survey, we established plots in Jilin and Liaoning Provinces, in cooperation with local foresters, to survey EAB natural enemies during the 2004 EAB season.

Xu Gongtian. 2003. *Agrilus marcopoli* Obenberger, pp. 321-322, In Xu G-T (ed.), Atlas of ornamental pests and diseases. China Agriculture Press, Beijing, China.