
UPDATE ON EMERALD ASH BORER NATURAL ENEMY SURVEYS IN MICHIGAN AND CHINA

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ABSTRACT

We began research on natural enemies of emerald ash borer (EAB), *Agrilus planipennis* soon after its discovery in Michigan and Ontario in 2002. Regulatory agencies in the United States and Canada adopted a strategy of eradication for EAB in an effort to protect New World ash. Should eradication fail, however, conventional biological control will be needed to suppress populations of this invasive buprestid. To this end, we are studying the natural enemies of EAB in Michigan and in China.

In 2003, we reported results from our 2002-2003 study of EAB natural enemies in a woodlot in Livonia, Michigan. Briefly, the most prevalent natural enemies of immature EAB were five species of insect pathogenic fungi, causing mortality in approximately 2 percent of EAB. Potential larval-pupal parasitoids of immature EAB causing mortality in approximately 0.05 percent of EAB were three braconids (*Atanycolus* sp., *Heterospilus* sp., and *Spathius simillimus*), one chalcid (*Phasgonophora sulcata*), and an exotic eupelmid (*Balcha* sp.). A eulophid wasp, *Pediobius* sp., parasitized approximately 0.3 percent of EAB eggs.

This year we expanded our study of EAB insect parasitoids by sampling infested trees throughout southeastern Michigan's EAB infestation. In early spring, we cut 2-3 trees into logs from each of 14 study sites, stored the logs in a coldroom, and placed logs in cardboard emergence tubes; all insects emerging from the logs were counted each day. During July, we collected approximately 6,000 EAB eggs on small bark flakes from infested ash trees in each study site; the eggs were returned to the laboratory, placed in petri dishes sealed with parafilm, and held until hatch and parasitoid emergence was complete. Many of the hymenopterans are tentatively identified to family, although we have not yet sent out specimens for identification. Besides the same potential larval-pupal parasitoids found last year, we found an additional four unknown ichneumonids, three unknown braconids, one unknown pteromalid, and two other unknown species. *Pediobius* sp. was the most prevalent egg parasitoid. Other hymenopterans emerging from egg/bark flakes include one encyrtid, two mymarids (*Ooconus* and an unknown specie), two scelionids, two trichogrammids, and one unknown specie; their status as EAB egg parasitoids is unknown.

We surveyed ash for EAB infestation at sites in Heilongjiang, Jilin, Liaoning, Hebei, Tianjin, and Shandong Provinces in October-November 2003 to locate study sites for EAB natural enemy research. Plantings of Korean ash (*F. rhynchophylla*), Chinese ash (*F. chinensis*), Manchurian ash (*F. mandchurica*), green ash (*F. pennsylvanica*), and velvet ash (*F. velutina*) were dissected for EAB in urban and rural areas along roadsides and fields and in parks and woodlots. We also looked for EAB attacking Korean and Manchurian ash in natural forests in Heilongjiang, Jilin, and Liaoning Provinces. EAB was present in each Province except Shandong, where velvet ash, a nearctic species, is extensively planted due to its tolerance of saline soils. We learned the nearctic ash species planted in China require pest management for EAB due to high susceptibility, and early efforts to maintain white ash (*F. americana*) in China failed due to EAB (Liu 1966). In general, native ash species in China sustain greater EAB infestation when transplanted than when grown in a natural forest.

During our initial survey, we found *Spathius* sp. (Braconidae) parasitizing 1 to 50 percent of the EAB larvae at sites in Changchun (Jilin Province) and Guangang (Tianjin Province). We also discovered an unknown gregarious endoparasitoid of EAB larvae at sites in Benxi (Liaoning Province) and Changchun (Jilin Province) and with a parasitism rate of 2.7 to 50 percent. Mature larvae, pupae, and adults were collected and later identified as *Tetrastichus* sp. (Eulophidae).

Based on these results, we established our 2004 study sites in Jilin and Liaoning Provinces in cooperation with local foresters to determine the species composition and seasonal abundance of EAB natural enemies. Larval parasitoids were similar to those species found at these sites in 2003. In addition, egg parasitoids reared from EAB eggs were identified as the encyrtid *Avetianella* sp.

Liu, Yiguo. 1966. A Study on the Ash Buprestid Beetle, *Agrilus* sp., in Shenyang. Annual Report. Shenyang Municipal Institute of Gardening-Forestry Science, Shenyang, Liaoning Province, China <http://www.ncrs.fs.fed.us/4501/eab/translations/>