

## RESEARCH BRIEFS

### Biological Control of Emerald Ash Borer in North America: Current Progress and Potential for Success

The emerald ash borer (EAB) (*Agrilus planipennis*), a buprestid native to north-east Asia, was first discovered in North America near Detroit in 2002. EAB has since spread to at least 15 U.S. States and two Canadian provinces, threatening the existence of native ash trees (*Fraxinus* spp.). A classical biocontrol program was initiated by the USDA Forest Service and APHIS immediately following the discovery of EAB, and led to introduction of three species of hymenopteran parasitoids in 2007: *Spathius agrili* (Braconidae), *Tetrastichus planipennis* (Eupelmidae), and *Oobius agrili* (Encyrtidae). While the former two parasitoid species attack EAB larvae, the latter parasitizes EAB eggs.



**Figure 1:** An ovipositing female of *Spathius* sp. recently collected from the Russian Far East (Vladivostok) (Photographed by JJD, USDA ARS). Like its Chinese congener (*S. agrili*), this Russian *Spathius* is a gregarious ectoparasitoid attacking late-instar EAB larvae.

With the recent establishment of the USDA APHIS EAB biocontrol rearing facility in Brighton, Michigan in 2009, large numbers of introduced parasitoids have since been reared with field-collected EAB hosts and released in ash stands in 12 EAB-infested states. As of fall 2011, the results of field studies confirmed that at least one of these introduced Chinese parasitoids is successfully established in five states (Michigan, Maryland, Ohio, Illinois, and Indiana), although their combined impacts on EAB population growth or ash health are still unknown. We hope that populations of

these exotic parasitoids will establish themselves in more EAB-infested areas, increase over time, and exert significant control of EAB populations within next few years in the U.S.



**Figure 2** (above). An ovipositing female of *Atanycolus picipes* recently collected from the Russian Far East region (Vladivostok) (Photographed by JJD, USDA ARS). It is a solitary ectoparasitoid attacking 2<sup>nd</sup>- to 4<sup>th</sup>-instar EAB larvae.



**Figure 3.** An encyrtid egg parasitoid examining a freshly laid EAB egg. This egg parasitoid was recently collected from Vladivostok, Russia.

More recent foreign exploration conducted by the USDA researchers and collaborators in the Russian Far East (near Vladivostok) resulted in discovery of two additional Asiatic braconids attacking EAB larvae – *Spathius* sp. (Fig.1) and *Atanycolus picipes* Telenga (Fig.2), as well as one undescribed encyrtid egg parasitoid (Fig.3). These Russian parasitoids were imported to the USDA ARS/APHIS quarantine facilities and are being evaluated for host specificity and possible non-target effects. Climate-matching analyses suggested that parasitoids from the Russian Far East are more cold tolerant than those parasitoids from China, especially *S. agrili*, and these species will also be considered for introduction.

In addition to this classical biocontrol effort, extensive surveys of indigenous natural enemies were conducted in the U.S. Currently several indigenous hymenopteran parasitoids are known to attack larvae of EAB in Michigan, Pennsylvania, Ohio, and Maryland. The role of these indigenous parasitoids in suppressing EAB population growth and spread in North America is not clear and the observed parasitism is generally low. However, one group of North American native braconids (*Atanycolus* spp. – Fig. 4) in Michigan were found to inflict high (>50%) parasitism in some forest stands. Extensive field investigations into the potential roles of the introduced and indigenous natural enemies in suppressing EAB population growth and spread are ongoing in both the epicenter of the EAB infestation (Michigan) and in newly infested areas (Maryland and New York). The introduction and establishment of parasitoids from EAB's native range — China and Russia — will likely continue to be a critical component of EAB management strategies in North America.

Jian J. Duan, USDA ARS Beneficial Insects Introduction Research Unit, Newark, DE (correspondence: [jian.duan@ars.usda.gov](mailto:jian.duan@ars.usda.gov))

Leah S. Bauer, USDA Forest Service, Northern Research Station, East Lansing, MI

Juli R. Gould, USDA APHIS-PPQ, Center for Plant Health and Technology, Buzzards Bay, MA

Jonathan P. Lelito, USDA APHIS-PPQ, Emerald Ash Borer Biological Control Lab, Brighton, MI



**Figure 4.** An ovipositing female of native *Atanycolus cappaerti*, recently discovered in Michigan (Photographed by JJD, USDA ARS). This species along with several other congeners have become the most abundant parasitoids attacking emerald ash larvae in many forested areas in Michigan.