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**TIPHIA VERNALIS (HYMENOPTERA: TIPHIIDAE)
PARASITIZING ORIENTAL BEETLE, ANOMALA ORIENTALIS
(COLEOPTERA: SCARABAEIDAE) IN A NURSERY**

Michael E. Reding and Michael G. Klein¹

Tiphia vernalis Rohwer is native to China, Japan, and Korea where it is an external parasite of *Popillia* spp. (King 1931). It was released into the United States from China and Korea during the mid-1920s through early 30s (Fleming 1968). After it became established in the United States, releases were made from domestic sources beginning in 1931 (King et al. 1951). *Tiphia vernalis* was released into Ohio sporadically during 1936-1953 (King et al. 1951). *Tiphia vernalis* has been reported parasitizing *Popillia* spp. (*P. quadriguttata* (Fabricius) in Korea; *P. chinensis* (Frivaldsky) and *P. formosana* (Arrow) in China; and *P. japonica* Newman in Japan) exclusively in the field (Balock 1934, Fleming 1968). It accepted *Anomala* (= *Exomala*) *orientalis* Waterhouse (oriental beetle) as a host in the laboratory and cocoons were obtained (King et al. 1927, Balock 1934), but there are no previously published reports of *T. vernalis* parasitizing *A. orientalis* in the field.

In the spring of 2001 we found numerous *A. orientalis* grubs parasitized by *T. vernalis* at a commercial nursery in Lake County, OH. This nursery has only field planted trees and shrubs with no containerized material. Established blocks (> 1 year old) have trees and shrubs planted in weed-free strips with primarily grass between the rows. We found parasitized *A. orientalis* at two locations in this nursery about 300 m apart. One site (site-1) bordered a newly planted (2001) block of trees. The sample site contained a mixture of alfalfa, various grasses, wild flowers, and weeds. The second site (site-2) was within a block of maple trees that were planted in 1998. Samples were collected from the grass areas between the rows. Each site was sampled twice (site-1, sampled 5 and 7 June; site-2, sampled 7 and 12 June).

The *Tiphia* at this nursery in the spring were previously identified as *T. vernalis*. Moreover, the location on the grubs where the parasites attached, which is considered characteristic in *Tiphia* spp., was consistent with *T. vernalis* (Clausen et al. 1927). Eggs of *T. vernalis* are placed in the suture between the third thoracic segment and the first abdominal segment (Clausen et al. 1927). The most common white grubs in this nursery were in descending order *A. orientalis*, *Maladera castanea* Arrow (Asiatic garden beetle), *Rhizotrogus majalis* Razoumowsky (European chafer), and *Popillia japonica* Newman (Japanese beetle). The numbers of *P. japonica* grubs were relatively low compared to the other grub species. Therefore, we were surprised to see large numbers of male *T. vernalis* casting (wide zigzag flight) back and forth over the ground searching for females. In addition, we regularly found male and female *T. vernalis* in nearby maple and crabapple trees. Because the large population of *T. vernalis* was apparently inconsistent with the small population of *P. japonica*, we began examining all grub species for the presence of *T. vernalis* eggs/larvae. Parasitized *A. orientalis* grubs were first detected in the 5 June sample at site-1, but rate data was not recorded. Parasitization rate for the 7 June sample at this site was 6.4%. At site-2 parasitization rates were 23.1 and 9.1% for the 7 and 12 June samples, respectively, with a combined rate of 14.3%. Five *P. japonica* grubs were found versus 134 *A. orientalis* grubs (all samples combined), with one *P. japonica* parasitized. None of the *M. castanea* or *R. majalis* were parasitized.

The rate of parasitization suggests that *T. vernalis* may be a significant mortality factor of *A. orientalis* in this nursery. This discovery should encourage

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surveys in other locations where both *T. vernalis* and *A. orientalis* occur. In addition, redistribution of *T. vernalis* from sites where they are found to parasitize *A. orientalis* to locations where *A. orientalis* occur, but *T. vernalis* is absent, may be useful for managing *A. orientalis*.

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