

# ENVIRONMENTAL RISK ASSESSMENT OF EGG PARASITOIDS FROM SOUTH AMERICA: NONTARGET FIELD AND LABORATORY HOST RANGE IN ARGENTINA AND THE UNITED STATES

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## ABSTRACT

Specific areas in South America were surveyed from 2000-2005 for egg parasitoids of sharpshooters that are pre-adapted to California's climate and glassy-winged sharpshooter (GWSS) habitats. At least 20 species were collected; 4 from Argentina readily attacked and bred on GWSS eggs in quarantine. To ensure that the most promising exotic species do not also attack nontarget leafhoppers and other taxa, tests were conducted in both Argentina and the United States to determine effective host range. Laboratory tests with native fauna in Argentina demonstrated that one promising species, *Gonatocerus tuberculifemur*, did not attack leafhoppers or other insects outside the sharpshooter tribe, Proconiini. Similar results were found in U.S. quarantine using California and Texas leafhoppers. Field host range tests in Argentina showed that *G. tuberculifemur* emerged from small numbers of leafhoppers within a different tribe (Cicadellini). Questions regarding the taxonomic status of this parasitoid must be resolved. It is that *G. tuberculifemur* can attack GWSS but not unrelated leafhoppers.

## INTRODUCTION

Egg parasitoids are the most important known natural enemies of the glassy-winged sharpshooter (GWSS) across its native range through the Gulf States to northeastern Mexico. To be equally effective in their California environment, these parasitoids need to possess the ability to suppress populations of the GWSS under this region's unique array of climatic conditions. Since leafhoppers related to GWSS (Tribe Proconiini) uniquely occupy subclimate areas in South America that are identical to those of California, parasitoids from this region might be better preadapted to California and thus possibly more effective if they readily attack GWSS. Beginning in 2000, collections of egg parasitoids from leafhoppers closely related to GWSS were made in climate-matched areas in South America to determine if any would attack GWSS under quarantine conditions (Jones 2001).

Collections in Argentina, Chile, and Peru yielded 20 species of parasitoids from eggs of proconiine sharpshooters: 12 *Gonatocerus* spp., 1 *Polynema* sp. (Mymaridae), 1 *Paracentrobia* sp., 2 *Oligosita* spp., and 2 *Zagella* spp. (Trichogrammatidae), and 1 species of Aphelinidae (Logarzo et al. 2005, Virla et al. 2005). *Gonatocerus tuberculifemur* Ogloblin was the most abundant species within the best climate match, while *G. annulicornis* (Ogloblin) was the most abundant parasitoid recovered from citrus.

In U.S. quarantine, 4 of the imported *Gonatocerus* spp. readily accepted GWSS eggs: *G. tuberculifemur*, *G. annulicornis*, *G. metanotalis* (Ogloblin), and *Gonatocerus* sp. Since these exotic parasitoids would represent new associations, a rigorous screening for environmental risks associated with possible release into the North American environment was initiated. Thus, host range testing was begun for nontarget taxa in both South and North America.

## OBJECTIVE

1. Determine potential host range of the most promising South American parasitic wasps found to successfully attack GWSS eggs in U.S. quarantine.

## RESULTS AND CONCLUSIONS

Nontarget tests were conducted in both Argentina and the U.S. Laboratory host range studies in Argentina were conducted using *G. tuberculifemur* to test for oviposition and successful development in eggs of 20 species among the orders Hemiptera, Lepidoptera and Coleoptera. *G. tuberculifemur* successfully attacked only the eggs of the 4 included Argentine proconiine leafhoppers; no other taxa were attacked.

In U.S. quarantine (USDA, APHIS, Edinburg, TX), seven species of native Cicadellidae representing 3 subfamilies and 4 tribes were evaluated for susceptibility to parasitization by 2 species of South American wasps, *G. tuberculifemur* and *G. metanotalis* (Ogloblin) (Jones et al. 2005). From California: *Colladonus montanus* (Van Duzee) and *Euscelidius variegatus*

(Kirschbaum) [Dectocephalinae; Athysanini]; *Macrosteles fascifrons* Stål and *M. quadrilineatus* Forbes [Dectocephalinae; Macrostelini]; and *Homalodisca liturata* Ball [Cicadellinae; Proconiini]. From Texas: *Homalodisca insolita* (Walker) and *Oncometopia* sp. [Cicadellinae; Proconiini]. Both parasitoid species successfully attacked and emerged from *H. liturata* and *Oncometopia* sp. eggs. Eggs of the other species, including *H. insolita*, were not attacked.

Field host range tests in Argentina were conducted to determine if free-living parasitoids could locate and successfully parasitize eggs of 13 species among 4 subfamilies of Cicadellidae: 5 Cicadellinae; Cicadellini; 3 Cicadellinae; Proconiini; 3 Dectocephalinae; Macrostelini and Euscelini; 1 Agallinae; and 1 Xerophloeinae. Over 50% of the exposed egg masses of all 3 proconiine sharpshooters were attacked by 3 spp. of parasitic wasps, *G. tuberculifemur*, *G. annulicornis*, and *Gonatocerus* sp. Contrary to the laboratory host range studies, a small proportion (0.6%) of the 5 Cicadellini were successfully attacked by *G. tuberculifemur*.

Laboratory host range tests of South American *Gonatocerus* spp. showed that these wasps are evidently restricted to sharpshooters within the leafhopper tribe Proconiini in both South and North America. Field host range tests indicated that *G. tuberculifemur* can have limited development on some Cicadellini as well. The latter results suggest that the use of laboratory tests to determine host range might not be an accurate method for screening for nontarget hosts. However, separate biological and molecular studies suggest that there may be significant genetic variation among *G. tuberculifemur* populations in the test region, and that the conflicting host range results could be due to the existence of sympatric cryptic species of *G. tuberculifemur* in the test area. Future studies should be directed at resolving the taxonomic status of species selected as candidates for evaluation for release, identifying and rigorously screening any additional nontarget species of concern, and conducting interspecific competition tests between exotic and native parasitoids.

## REFERENCES

- Jones, W. A. 2001. Classical biological control of the glassy-winged sharpshooter, pp. 50-51. *In* Proceedings of the Pierce's Disease Research Symposium, December 5-7, 2001, Coronado Island Marriott Resort, San Diego, CA. California Department of Food and Agriculture.
- Jones, W. A., G. A. Logarzo, S. V. Triapitsyn, M. Casas, E. G. Virla and A. H. Purcell. 2005. Biology and host range of 2 South American egg parasitoids (Hymenoptera: Mymaridae), possible biocontrol agents for glassy-winged sharpshooter (Say) (Hemiptera: Cicadellidae; Proconiini). *In*: Proc. 12<sup>th</sup> International Auchenorrhyncha Congress and 6<sup>th</sup> International Workshop on Leafhoppers and Planthoppers of Economic Significance, August 7-12, University of California, Berkeley, Berkeley, California. *In press*.
- Logarzo, G. A., E. G. Virla and W. A. Jones. 2005. Egg parasitoids from Argentina, potential candidates for the biological control of glassy-winged sharpshooter *Homalodisca coagulata* (Cicadellidae) in the United States. Second International Symposium on Biological Control of Arthropods, 12-16 September 2005, Davos, Switzerland, USDA Forest Service, Morgantown, West Virginia, USA.
- Virla, E. G., G. A. Logarzo, W. A. Jones and S. Triapitsyn. 2005. Biology of *Gonatocerus tuberculifemur* (Hymenoptera: Mymaridae), an egg parasitoid of the sharpshooter, *Tapajosa rubromarginata* (Hemiptera: Cicadellidae). *Fla. Entomol.* 88 (1): 67-71.

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