

**PREPARING AND SUBMITTING FOR PUBLICATION A PICTORIAL, ANNOTATED KEY TO
GONATOCERUS SPECIES AND OTHER GENERA AND SPECIES OF MYMARIDAE (HYMENOPTERA) –
EGG PARASITOIDS OF HOMALODISCA SPP. AND OTHER PROCONIINE SHARPSHOOTERS
IN NORTH AMERICA, WITH EMPHASIS ON THE SPECIES NATIVE OR INTRODUCED TO CALIFORNIA**

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ABSTRACT

This is the final report on this 1.5 yearlong taxonomic project (it was extended at no cost from 1 July 2005 till 31 December 2005). Two scientific papers, one (Triapitsyn et al. in review) with the description of a new species of *Gonatocerus* from Mexico and South America and the other (Triapitsyn in review) with an annotated, illustrated key to *Gonatocerus* species and two other genera and species of Mymaridae (Hymenoptera) – egg parasitoids of *Homalodisca* spp. and other proconiine sharpshooters (Hemiptera: Cicadellidae: Proconiini) in North America, have been submitted for publication in *Zootaxa* (a WWW-based taxonomic journal). Following their publication (if accepted), the electronic reprints of both will be made available online with free access to anyone at <http://www.mapress.com/zootaxa/>, with interactive links from the CDFA Pierce's Disease Control Program and the UC ANR GWSS Workgroup websites. In this report, a tentative key (which excludes the descriptions of the new species from Mexico and South America and also two new species from California, both from the *morrilli* subgroup of the *ater* species group of *Gonatocerus*) is given to facilitate recognition of the genera and species of Mymaridae that are known parasitoids of proconiine sharpshooter eggs in the Nearctic region.

INTRODUCTION

In North America, egg masses of proconiine sharpshooters, which are known or potential vectors of *Xylella fastidiosa*, are parasitized by various Mymaridae and Trichogrammatidae. An illustrated, annotated key to the genera and species of such Trichogrammatidae was already published (Triapitsyn 2003). However, a pictorial key, which could be used by non-taxonomists for recognition of the genera and species of Mymaridae, which are largely responsible for native biological control of proconiine sharpshooters in California, was lacking. In addition to the native mymarid parasitoids, several exotic species of *Gonatocerus* have been released recently in California as part of a classical biological control program against the glassy-winged sharpshooter (GWSS), *Homalodisca coagulata* (Say), conducted by University of California, Riverside (UCR), CDFA, and USDA researchers. The forthcoming key (Triapitsyn in review) will be a useful tool to distinguish them from other species of the same genus with similar host associations.

Moreover, because of the easy availability of proconiine sharpshooter eggs in California due to the establishment and outbreak of GWSS, there is a real possibility of non-intentional introductions of exotic egg parasitoids from countries in Central and South America. It is possible that one of the species to be described in the forthcoming publication (Triapitsyn in review) from California could be one of such self-introduced species.

Egg masses of the closely related *Homalodisca* and *Oncometopia* species, including GWSS, are parasitized by many species of *Gonatocerus*, all of which are members of the *ater* species group. *Acropolynema* is the other mymarid genus that parasitizes eggs of *Homalodisca*. One species of *Anagrus*, *A. epos* Girault, has been recently discovered as yet another genus of Mymaridae capable of parasitizing eggs of proconiine sharpshooters (Triapitsyn & Rakitov 2005). All mymarids, including *Gonatocerus*, are difficult to determine to species without expensive and labor-intensive preparation procedures such as critical point drying and slide-mounting, and their males were not easily recognizable prior to this study. A tentative key to the mymarid genera and both sexes of the already described species of *Gonatocerus* presented here would in most cases allow for a correct identification of the most common mymarid parasitoids of *Homalodisca* and other proconiine sharpshooters directly in ethanol, although dry- or slide-mounting may be necessary for correct identification of some specimens.

OBJECTIVES

1. Prepare and submit for publication a pictorial, annotated key to mymarid egg parasitoids (mainly *Gonatocerus* spp.) of proconiine sharpshooters in North America, with emphasis on the species native or introduced to California. The experimental procedures used to accomplish this objective can be found in Triapitsyn (2004).

RESULTS

Currently, we are at the final stage of this project (preparatory and curatorial work with voucher and other museum specimens has been mostly completed). Preliminary work on this project has taken much more time than had been anticipated, because of the large number of specimens that had to be sorted, curated, and identified in the UCR and other taxonomic collections in the USA and northern Mexico. Hundreds of specimens from UCR have been point-mounted from alcohol, labeled, and identified. Slide mounts of selected species have been made. Numerous specimens of egg parasitoids from the CDFA surveys in California (assembled by Dr. David Morgan) have also been identified. Scanning electron micrographs of selected species and all the illustrations have been made. A manuscript with the description of one new species of *Gonatocerus* from Mexico and South America was prepared and submitted for publication (Triapitsyn et al. in review). A scientific paper with a key to the mymarid egg parasitoids of the proconiine sharpshooters in the Nearctic region was completed (Triapitsyn in review). A preliminary key to the mymarid genera and both sexes of *Gonatocerus* spp. (excluding the three new species to be described elsewhere) follows.

Key to genera and species of Mymaridae, egg parasitoids of Proconiini (Cicadellidae) in the Nearctic region

1 Tarsi 4-segmented.....	2
- Tarsi 5-segmented (<i>Gonatocerus</i> Nees)	3
2 Metasoma distinctly petiolate; forewing blade with dark bands and modified setae.....	<i>Acmopolynema sema</i> Schauff
- Metasoma sessile; forewing blade without dark bands and modified setae	<i>Anagrus epos</i> Girault
3 Female (flagellum clavate, consisting of 8-segmented funicle and 1-segmented clava)	4
- Male (flagellum filiform, 11-segmented)	11
4 Propodeum (laterad of submedial carinae) distinctly rugose (<i>morrilli</i> subgroup)the <i>G. morrilli</i> (Howard) complex, etc.
- Propodeum (laterad of submedial carinae) smooth (<i>ater</i> subgroup)	5
5 Forewing with cubital row of microtrichia complete, extending to base of marginal vein.....	6
- Forewing with cubital row of microtrichia incomplete, not extending to base of marginal vein (no microtrichia behind marginal vein, at most a few microtrichia just behind apex of venation)	9
6 F5-F7 distinctly lighter than other funicle segments	<i>G. atriclavus</i> Girault
- F5-F7 more or less concolorous with other funicle segments	7
7 Forewing blade with a narrow, distinct brown fascia extending from stigmal vein to hind margin.....	<i>G. fasciatus</i> Girault
- Forewing blade without such a fascia, hyaline or slightly, more or less uniformly, infumated	8
8 Head and mesosoma mostly yellow, with some brown	<i>G. triguttatus</i> Girault
- Head and mesosoma mostly dark brown	<i>G. ashmeadi</i> Girault
9 Forewing blade with a distinct infumate spot just beyond apex of venation, not reaching anterior margin.....	<i>G. novifasciatus</i> Girault
- Forewing blade without infumate spot (<i>G. incomptus/impar</i> complex)	10
10 F3-F8 each with 2 longitudinal sensilla.....	<i>G. incomptus</i> Huber
- At least one funicle segment among F3-F6 without longitudinal sensilla or only with 1 sensillum, in different combinations	<i>G. impar</i> Huber, ? <i>G. sp(p)</i> . near <i>incomptus/impar</i>
11 Propodeum (laterad of submedial carinae) distinctly rugose (<i>morrilli</i> subgroup)the <i>G. morrilli</i> (Howard) complex, etc.
- Propodeum (laterad of submedial carinae) smooth (<i>ater</i> subgroup)	12
12 Forewing with cubital row of microtrichia complete, extending to base of marginal vein.....	13
- Forewing with cubital row of microtrichia incomplete, not extending to base of marginal vein (no microtrichia behind marginal vein, at most a few microtrichia just behind apex of venation)	16

13 Forewing blade with a narrow, distinct brown fascia extending from stigmal vein to hind margin	14
- Forewing blade without such a fascia, hyaline or slightly, more or less uniformly, infumated.....	14
14 Mesosoma dorsally mostly yellow-orange or light brown to brown, with some dark brown	15
- Mesosoma completely dark brown	15
15 Mesosoma dorsally mostly yellow-orange, with some brown and dark brown	15
- Mesosoma dorsally mostly light brown to brown, with some dark brown	15
16 Forewing blade with a distinct infumate spot just beyond apex of venation, not reaching anterior margin	16
- Forewing blade hyaline, without infumate spot (the <i>G. incomptus/impar</i> complex).....	16
.....	16

CONCLUSIONS

Research resulting from this project would be of significant benefit to biological control (especially to the CDFA/Pierce's Disease Biological Control Program) specialists, ecologists, and vineyard supervisors that manage the Pierce's disease (PD) threat posed by GWSS. The forthcoming key (Triapitsyn in review) would enable even non-taxonomists to quickly identify both sexes of mymarid egg parasitoids of *Homalodisca* spp. in California, differentiate native vs. introduced species of *Gonatocerus*, provide information on candidate species of Mymaridae for introduction as part of biological control programs, facilitate surveys for assessing levels of egg parasitism of *H. coagulata* in the vineyards and orchards in California, and indicate all known host associations of the mymarid species important for native or classical biological control of GWSS and related species and genera of sharpshooters.

REFERENCES

- Triapitsyn, S. V. An annotated key to the fairyfly (Hymenoptera: Mymaridae) egg parasitoids of proconiine sharpshooters (Hemiptera: Cicadellidae: Proconiini) in the Nearctic region, with description of two new species of *Gonatocerus* Nees from California. *Zootaxa (In Review)*.
- Triapitsyn, S. V. 2003. Taxonomic notes on the genera and species of Trichogrammatidae (Hymenoptera) - egg parasitoids of the proconiine sharpshooters (Hemiptera: Clypeorrhyncha: Cicadellidae: Proconiini) in southeastern USA. *Transactions of the American Entomological Society* 129 : 245-265.
- Triapitsyn, S. V. 2004. Preparing and submitting for publication a pictorial, annotated key to *Gonatocerus* species and other genera and species of Mymaridae (Hymenoptera) – egg parasitoids of *Homalodisca* spp. and other proconiine sharpshooters in North America, with emphasis on the species native or introduced to California, pp. 382-384. *In: Proceedings of the 2004 Pierce's Disease Research Symposium, December 7-10, 2004, Coronado Island Marriott Resort, Coronado, California, organized by California Department of Food and Agriculture (compiled by M. Athar Tariq, S. Oswalt, P. Blincoe, A. Ba, T. Lorick and T. Esser), Copeland Printing, Sacramento, California, 391 p.*
- Triapitsyn, S. V. and Rakitov, R. A. 2005. Egg parasitoids (Hymenoptera: Mymaridae and Trichogrammatidae) of *Cuerna* sharpshooters (Hemiptera: Cicadellidae) in the USA. Abstracts, [Poster - Ecology] P-10-11, 12th International Auchenorrhyncha Congress and 6th International Workshop on Leafhoppers and Planthoppers of Economic Significance, University of California, Berkeley, 8-12 August 2005.
- Triapitsyn, S. V., D. B. Vickerman, J. M. Heraty and G. A. Logarzo. A new species of *Gonatocerus* (Hymenoptera: Mymaridae), egg parasitoid of the proconiine sharpshooters (Hemiptera: Cicadellidae) in the New World. *Zootaxa* (in review).

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