Zootaxa 1203: 1–38 (2006)
www.mapress.com/zootaxa/

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

1203

A key to the Mymaridae (Hymenoptera) egg parasitoids of proconiine sharpshooters (Hemiptera: Cicadellidae) in the Nearctic region, with description of two new species of *Gonatocerus*

SERGUEI V. TRIAPITSYN

Entomology Research Museum, Department of Entomology, University of California, Riverside, CA, 92521, USA. E-mail: serguei.triapitsyn@ucr.edu.

Table of contents

Accepted by M. Buffington: 18 Apr. 2006; published: 15 May 2006

Abstract

An illustrated identification key to the three genera and 14 named species of Mymaridae (Hymenoptera) egg parasitoids of the proconiine sharpshooters (Hemiptera: Cicadellidae: Cicadellinae: Proconiini) in the Nearctic region, is provided. Two new species, *Gonatocerus morgani* and *G. walkerjonesi*, are described from California, USA. A synopsis of the included species is given, with emphasis on their distributional records and known host associations.

Key words: Mymaridae, *Acmopolynema sema*, *Anagrus epos*, *Gonatocerus* spp., parasitoid, Cicadellidae, Proconiini

Introduction

Proconiine sharpshooters (Hemiptera: Cicadellidae: Cicadellinae: Proconiini) are represented by the following four genera in the Nearctic region (north of Mexico): *Cuerna* Melichar, *Homalodisca* Stål, *Oncometopia* Stål, and *Paraulacizes* Young. In addition, *Phera* Stål may marginally extend into this region from its mostly Neotropical range. The most notorious of them is the glassy-winged sharpshooter, *Homalodisca coagulata* (Say), which is a vector of plant diseases caused by the phytopathogenic bacterium *Xylella fastidiosa* (Blua *et al.* 1999). Glassy-winged sharpshooter is a self-introduced pest in California from southeastern USA (Blua *et al.* 1999). Turner and Pollard (1959) provided a brief overview of proconiine sharpshooter egg parasitoids (Mymaridae and Trichogrammatidae) in Georgia. Triapitsyn (2003) reviewed the trichogrammatid egg parasitoids of proconiine sharpshooters in southeastern USA. Here, the mymarid egg parasitoids of Proconiini are reviewed for the entire Nearctic region.

The establishment of *H. coagulata* in California in the 1990s, later in Hawaii and French Polynesia, and even more recently in Easter Island (Chile) (Pilkington *et al.* 2005) prompted interest in proconiine sharpshooter investigations, including studies of their egg parasitoids in North America (Triapitsyn and Phillips 1996, 2000; Triapitsyn *et al.* 1998; Phillips *et al.* 2001; Triapitsyn, Bezark and Morgan 2002; Triapitsyn, Hoddle and Morgan 2002), mainly for classical biological control purposes (Morgan *et al.* 2000; Jones 2001; Triapitsyn and Hoddle 2001, 2002; Morgan *et al.* 2002; Pilkington *et al.* 2004, 2005). Most of the reported mymarid egg parasitoids of *Homalodisca* and *Oncometopia* are members of *Gonatocerus* Nees (Turner and Pollard 1959; Triapitsyn *et al.* 1998, Triapitsyn and Phillips 2000; Triapitsyn, Bezark and Morgan 2002), particularly its *ater* species group (Triapitsyn 2002a, 2002b). All the North American *Gonatocerus* species that parasitize eggs of Proconiini are solitary parasitoids, with an exception of *G. fasciatus* Girault, which is a gregarious parasitoid (Triapitsyn *et al.* 2003). Parasitoids of *Cuerna*, the most speciose genus of Proconiini in the Nearctic region, are less known except for those of *C. costalis* (Fabricius) (Triapitsyn and Rakitov 2005). Tipping *et al.* (2006) recorded the first mymarid parasitoid of *Paraulacizes irrorata* (Fabricius) eggs in Florida.

Egg parasitoids of *Phera* are still unknown.

The large and increasing number of mymarids reared from eggs of Proconiini requires an updated key for use by non-specialists in mymarid taxonomy (Triapitsyn 2004). Huber's (1988) revision of the Nearctic species of the *ater* species group of *Gonatocerus* provided a good basis for this key. Besides allowing for recognition of both sexes of the included *Gonatocerus* species, the key presented here also includes representatives of two other mymarid genera with known Proconiini host associations, *Anagrus* Haliday and *Acmopolynema* Ogloblin.

Material and methods

Egg parasitoids of *H. coagulata* and other Proconiini in the United States were obtained through survey activities conducted by the author in California (Triapitsyn and Phillips 1996; Triapitsyn *et al.* 1998, Morgan *et al.* 2000; Phillips *et al.* 2001), northern Florida and Louisiana in 1997 (Triapitsyn *et al.* 1998), southeastern Texas during 1999–2001 (Triapitsyn and Phillips 2000), Louisiana, northern Florida, southern Georgia, and southeastern Texas in 2000 (Morgan *et al.* 2000 and S.V. Triapitsyn unpublished), throughout Florida and in Texas in 2001 (Triapitsyn and Hoddle 2001; Triapitsyn, Hoddle and Morgan 2002), Louisiana and Mississippi in 2002 (Triapitsyn and Hoddle 2002; Triapitsyn *et al.* 2003), Georgia, Illinois, Kentucky, North Carolina, South Carolina, and Tennessee (Hoddle and Triapitsyn 2003, 2004b). Surveys of egg parasitoids of Proconiini in the Nearctic part of northeastern Mexico (Coahuila, Nuevo León, northern and north-central Tamaulipas) were conducted by the author during 1999–2005 (Morgan *et al.* 2000; Triapitsyn and Phillips 2000, Triapitsyn and Hoddle 2001, 2002; Triapitsyn, Bezark and Morgan 2002; Hoddle and Triapitsyn 2004a; Pilkington *et al.* 2004, 2005). Numerous specimens were also given to me for identification by researchers at the University of California, California Department of Food and Agriculture, and United States Department of Agriculture, Agricultural Research Service in California and Texas.

All mymarid parasitoids resulting from those surveys were preserved in 70% or 95% ethanol and later point- and slide-mounted (in Canada balsam), examined (under Zeiss Axioskop 2 plus compound microscope using Nomarski differential interference contrast optics), and photographed (using Sony DSC-S75 digital still camera), identified, and deposited in the Entomology Research Museum, University of California at Riverside, California [UCRC]. I also examined voucher specimens of the mymarid parasitoids of Proconiini eggs from past research projects as well as some non-reared specimens belonging to the species of interest to this study. They are stored in UCRC and the following museum collections: Canadian National Collection of Insects, Ottawa, Ontario, Canada [CNCI]; California State Collection of Arthropods, California Department of Food and Agriculture, Sacramento, California [CSAC]; San Diego Natural History Museum, San Diego, California [SDMC]; Department of Entomology, Texas A&M University,

College Station, Texas [TAMU]; Bohart Museum, University of California at Davis, California [UCDC]; Universidad Autónoma de Nuevo León, Monterrey, Nuevo León, Mexico [UANL]; and National Museum of Natural History, Washington, D.C. [USNM].

Terms for morphological features in the taxonomic key and descriptions are those of Gibson (1997). Measurements (as length or length/width, where applicable) are given in micrometers (µm). An abbreviation used is: F = antennal funicle segment in females or antennal flagellar segment in males.

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

1 Tarsi 4-segmented 2
- Tarsi 5-segmented (*Gonatocerus* Nees) 4
2 Metasoma distinctly petiolate; forewing blade with dark bands and modified setae (Fig. 1) ..... *Acmopolynema sema* Schauff
- Metasoma sessile (Fig. 2); forewing blade without dark bands or modified setae (*Anagrus* Haliday) 3
3 Forewing narrow (Fig. 2), 8.0–9.5x as long as wide; clava of female antenna with 5 longitudinal sensilla ..... *Anagrus epos* Girault
- Forewing wide, 4.5–4.9x as long as wide; clava of female antenna with 6 longitudinal sensilla ..... *Anagrus stethynioides* S. Triapitsyn
4 Female (flagellum clavate, consisting of 8-segmented funicle and 1-segmented clava) 5
- Male (flagellum filiform, 11-segmented) 15
5 Propodeum distinctly rugose lateral to submedial carinae (Figs 4, 8, 11) (*morrilli* subgroup) 6
- Propodeum smooth lateral to submedial carinae (as in Fig. 23) (*ater* subgroup) 8
6 Body mostly dark brown to black; F5 brown basally and whitish or light brownish apically, F6 whitish-light brownish (Fig. 3) ..... *G. morgani* S. Triapitsyn, **sp. n.**
- Body mostly yellow-brown; both F5 and F6 white (as in Fig. 10) 7
7 Propodeum with submedial carinae parallel and closer to each other (Fig. 8) ..... *G. morrilli* (Howard)
- Propodeum with submedial carinae curved and more apart from each other (Fig. 11) ..... *G. walkerjonesi* S. Triapitsyn, **sp. n.**
8 Forewing with cubital row of microtrichia complete, extending to base of marginal vein (Figs 16, 17, 24, 27) 9
- 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) (Figs 28, 30) 13

9 F5–F7 distinctly lighter than other funicle segments (Fig. 15)..... *G. atriclavus* Girault
- F5–F7 more or less concolorous with other funicle segments 10
10 Forewing blade with a narrow, distinct brown fascia extending from stigmal vein to hind margin (Fig. 17) ..... *G. fasciatus* Girault
- Forewing blade without such a fascia or slightly, more or less uniformly, infumated 11
11 Head and mesosoma mostly yellow, with some brown (Fig. 20) ..*G. triguttatus* Girault
- Head and mesosoma mostly dark brown (as in Fig. 25) except mesosomal sternum with a distinct, well-defined yellow streak between each fore and middle coxae (Fig. 22) 12
12 F1 without longitudinal sensilla (Fig. 21); forewing almost hyaline, at most with a faint, uniform brownish tinge (Fig. 24)..... *G. ashmeadi* Girault
- F1 usually with 2 longitudinal sensilla (Fig. 26), rarely with 1 sensillum; forewing blade notably infuscated beyond venation, more conspicuously so behind tip of venation (Fig. 27) ..... *G. uat* S. Triapitsyn
13 Forewing blade with a distinct infumate spot just beyond apex of venation (Fig. 28) .. .. *G. novifasciatus* Girault
- Forewing blade without infumate spot (as in Fig. 30) (the *incomptus*/*impar* complex) 14
14 F3–F8 each with 2 longitudinal sensilla (Fig. 29)..... *G. incomptus* Huber
- At least one funicle segment among F3–F6 without longitudinal sensilla or only with 1 sensillum, in different combinations (Figs 31–34) .... *G. impar* Huber, *G.* sp(p). near *incomptus*/*impar*
15 Propodeum distinctly rugose lateral to submedial carinae (Figs 4, 8, 11) (*morrilli* subgroup) 16
- Propodeum smooth lateral to submedial carinae (as in Fig. 23) (*ater* subgroup) 18
16 Mesosoma dark brown to black; forewing blade hyaline (as in Fig. 5) .... *G. morgani* S. Triapitsyn, **sp. n.**
- Mesosoma yellowish-brown; forewing blade with an infumate spot (sometimes inconspicuous) just beyond venation (as in Fig. 12) 17
17 Propodeum with submedial carinae parallel and closer to each other (as in Fig. 8); apodeme of genital sternite almost as long as aedeagal apodemes (Fig. 9) .... *G. morrilli* (Howard)
- Propodeum with submedial carinae curved and more apart from each other (as in Fig. 11); apodeme of genital sternite notably longer than aedeagal apodemes (Fig. 14) .... *G. walkerjonesi* S. Triapitsyn, **sp. n.**
18 Forewing with cubital row of microtrichia complete, extending to base of marginal vein (Figs 16, 17, 24, 27) 19
- 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) (as in Figs 28, 30) 23

19 Forewing blade with a narrow, distinct brown fascia extending from stigmal vein to hind margin (as in Fig. 17) ..... *G. fasciatus* Girault
- Forewing blade without such a fascia or slightly, more or less uniformly, infumated 20
20 Mesosoma dorsally yellow-orange or light brown to brown 21
- Mesosoma completely dark brown 22
21 Mesosoma dorsally yellow-orange, with some brown..... *G. triguttatus* Girault
- Mesosoma dorsally light brown to brown, with some dark brown *G. atriclavus* Girault
22 Forewing almost hyaline, at most with a faint, uniform brownish tinge (as in Fig. 24) (widespread in southeastern USA, southern and south-central California, as well as in northeastern Mexico (Nuevo León and Tamaulipas North of [and including] Ciudad Victoria) ..... *G. ashmeadi* Girault
- Forewing blade notably infuscated beyond venation, more conspicuously so behind tip of venation (as in Fig. 27) (in the Nearctic region, occurring only in the southernmost Nearctic part of Tamaulipas, Mexico, South of [but excluding] Ciudad Victoria) .... *G. uat* S. Triapitsyn
23 Forewing blade with a distinct infumate spot just beyond apex of venation, not reaching anterior margin (as in Fig. 28)..... *G. novifasciatus* Girault
- Forewing blade hyaline, without infumate spot (as in Fig. 30) (the *incomptus/impar* complex)..... *G. incomptus* Huber, *G. impar* Huber, *G.* sp(p). near *incomptus* /*impar*

Acmopolynema sema Schauff, 1981
(Fig. 1)

Acmopolynema sema Schauff 1981: 447–449 + 450, 457 (illustrations).
Acmopolynema sema Schauff: Triapitsyn, Hoddle and Morgan 2002: 654–655 (distribution, host associations).

Type locality

Fort Valley, Peach Co., Georgia, USA.

Material examined [UCRC]

USA. GEORGIA: Houston Co., near Centerville, 32°38’03.3’’N, 83°43’06.4’’W, 131 m, 21.vi.2004, S.V. Triapitsyn, T. Cottrell (collected together with adults of *H. insolita* on grasses) [1 female]. Peach Co., Byron, 3.viii.2005, T. Cottrell (emerged 4–9.viii.2005 in the University of California, Riverside (hereafter UCR) quarantine from eggs of *H. insolita* on grass) [26 females, 5 males].

Diagnosis

Well described and illustrated by Schauff (1981). The main distinguishing features of this species are as follows. Body length 1000–1300. Body brown to dark brown; several

antennal and leg segments, and petiole yellow to light brown. Forewing (Fig. 1) with two large brown bands, enlarged modified discal setae restricted to the proximal large band.

Distribution

Florida, Georgia, and Texas (Schauff 1981; Triapitsyn, Hoddle and Morgan 2002); common and widespread in southeastern USA; also occurs in Mexico and southeastern Canada (V.V. Berezovskiy and S.V. Triapitsyn, unpublished).

Hosts

Homalodisca insolita (Walker); under laboratory conditions, *A. sema* was also briefly reared (with limited success) on eggs of *Homalodisca coagulata* (Say) (Triapitsyn, Hoddle and Morgan 2002).

Comments

The host of *A. sema*, *H. insolita*, is a common grass-feeding species in southeastern USA and Mexico (Turner and Pollard 1959; Tipping *et al.* 2005).

***Anagrus epos* Girault, 1911**

(Fig. 2)

Anagrus epos Girault 1911: 292–293.
Anagrus epos Girault: Triapitsyn 1998: 99–103 (redescription, diagnosis, distribution, host associations); Hoddle and Triapitsyn 2004b: 343.

Type locality

Centralia, Marion Co., Illinois, USA.

Material examined

USA. CALIFORNIA: Riverside Co., Riverside, UCR Quarantine Lab., numerous females and males from the colony on *Homalodisca coagulata* (Say) eggs in leaves of *Euonymus japonica*, reared during vi–ix.2004 by V.V. Berezovskiy and S.V. Triapitsyn and since ix.2004 by R. Krugner; originally from: MINNESOTA, Clay Co., ca. 4 mi. SEE Glyndon, Bluestem Prairie (Nature Conservancy Preserve, moist tallgrass prairie), 46.85521°N, 96.47353°W, 31.v–1.vi.2004, R.A. Rakitov (ex. egg masses of *Cuerna fenestella* Hamilton on *Solidago* sp. and *Zigadenus* sp.; emerged in UCR quarantine 8–14.vi.2004, coll. by S.V. Triapitsyn and V.V. Berezovskiy) [numerous females and males, UCRC]. MASSACHUSETTS, Middlesex Co., Cambridge, 27.viii.1942, H.L. Dozier ("reared from blackberry infested with *Erythroneura maculata*") [1 female, USNM]. MINNESOTA, Clay Co., ca. 4 mi. SEE Glyndon, Bluestem Prairie (Nature Conservancy Preserve, moist tallgrass prairie), 46.85521°N, 96.47353°W, 1–3.vi.2004, R.A. Rakitov [1 male, UCRC].

Diagnosis

Body length 300–600. Body mostly yellow, with a conspicuous dark band across the gaster in the specimens from Minnesota (Fig. 2). Female antenna with F1 subglobular, less than half length of pedicel; F2–F5 usually subequal, F6 longest of funicular segments; F3–F5 usually with 1 longitudinal sensillum each, F6 with 2, and clava with 5 longitudinal sensilla. Mesoscutum with a pair of adnotaular setae. Forewing 8.0–9.5x as long as wide; with 1 to 3 irregular rows of discal setae (1 such row on basal 1/3 of blade beyond venation), leaving a well differentiated bare area in broadest part of blade near posterior margin. Ovipositor at least slightly, sometimes markedly exserted beyond apex of metasoma. Outer plates of ovipositor each with 3 setae, rarely with 2. Ovipositor: foretibia ratio 2.4–3.1:1. Male similar to female except for normal sexually dimorphic characters and a darker body color.

FIGURES 1, 2. 1. Forewing of *Acmopolynema sema* (female). 2. *Anagrus epos* (female).

Distribution

Mexico (Baja California and Sonora) and USA (Colorado, Illinois, Kentucky, Massachusetts (new record), Minnesota, New Mexico, and New York) (Triapitsyn 1998). Recently released in California against *H. coagulata* (Pilkington *et al.* 2005).

Hosts

Cuerna fenestella Hamilton (Triapitsyn and Rakitov 2005) as well as *Dikrella* sp.,

Erythroneura aclys McAtee, *E. bistrata* McAtee, *E. comes* (Say), *Erythroneura maculata* Gillette (new record), *E. variabilis* Beamer, *E. vulnerata* Fitch, and undetermined *Erythroneura* spp. (Triapitsyn 1998); also *Homalodisca coagulata* (Say) (under laboratory conditions only) (Hoddle and Triapitsyn 2004b; Triapitsyn and Rakitov 2005).

Comments

A colony of this species successfully reproduced on *H. coagulata* eggs at UCR Quarantine Laboratory and is considered a potentially promising biological control agent for introduction against glassy-winged sharpshooter in California (Hoddle and Triapitsyn 2004b). The colony was established from the specimens collected in Minnesota, which emerged in UCR quarantine (see "Material Examined"); mated females were then exposed to fresh eggs of *H. coagulata* (laid in leaves of *Euonymus japonica*) on 9.vi.2004, and the next generation emerged 29–30.vi.2004 (vouchered in UCRC are 5 females and 1 male of these first generation wasps).

***Anagrus stethynioides* S. Triapitsyn, 2002**

Anagrus stethynioides Triapitsyn 2002c: 216, 221.

Type locality

Chylla, Sacatepequez, Guatemala.

Diagnosis

This peculiar species has a very wide forewing (4.5–4.9x as long as wide), with the longest marginal setae subequal to or slightly longer than the maximal forewing width; clava of the female antenna with 6 longitudinal sensilla (Triapitsyn 2002c).

Distribution

Argentina, Guatemala, Mexico (Nuevo León and Yucatán), Trinidad and Tobago, and USA (Texas) (Triapitsyn 2002c).

Host

Homalodisca coagulata (Say) in Gillespie Co., Texas, USA (Lauzière & Hassell 2006).

***Gonatocerus morgani* S. Triapitsyn, sp. n.**

(Figs 3–7)

Type material

Holotype female on slide [UCRC]: USA. CALIFORNIA: Orange Co., Irvine, Irvine

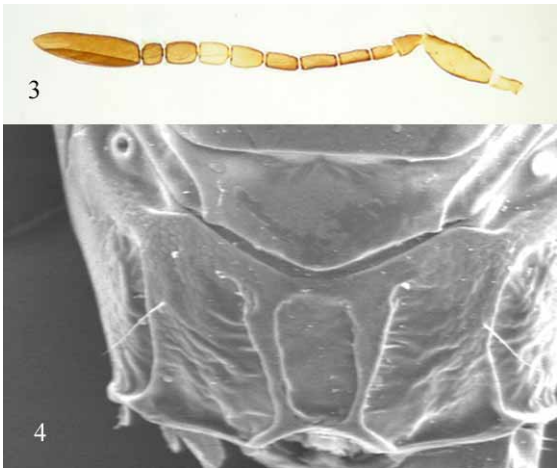
Ranch (Old Irvine Ranch Rd.), 17.ix.2003, L. Higgins, ex. egg mass of *Homalodisca coagulata* (Say) on lemon leaf, emerged at CDFA GWSS biocontrol facility (i.e., the California Department of Food and Agriculture Mt. Rubidoux Field Station in Riverside, California, date of emergence 26.ix.2003, preserved by D.J.W. Morgan). Paratypes: same data as the holotype [1 female on slide as well as 1 female on card, 1 male on slide, and 2 females in 95% ethanol stored in a freezer at -20°C for use in molecular studies, UCRC]; Riverside Co., Riverside, 45 Glenwood Drive, California Department of Food and Agriculture Mt. Rubidoux Field Station, 14.x.2003, D.J.W. Morgan [8 females and 4 males on points, 1 female on slide (except mesosoma on stub for SEM), as well as 1 male on slide (first generation progeny of holotype and paratypes, CNCI, CSAC, UCRC, USNM].

Additional material examined

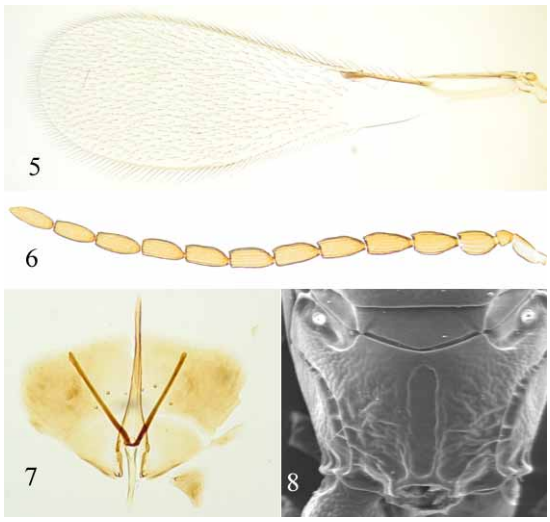
USA. CALIFORNIA, San Diego Co., San Marcos, 20.iv.2005, J. Nichols [5 females, ex. *H. coagulata* eggs, preserved in ethanol for molecular studies, California Department of Food and Agriculture Mt. Rubidoux Field Station, Riverside, California]. Because these specimens are likely to be destroyed and are not kept in a museum collection, they are not designated as paratypes.

Description

FEMALE (holotype and paratypes). Body length 1420–1760. Body mostly dark brown except for face (mostly brown but yellow around and above toruli), petiole (light brown), gastral sterna, and first gastral tergum (brown). Inner surface of scape brown, outer surface brownish yellow; pedicel and flagellum brown to dark brown except for F5 (brown basally and whitish or light brownish apically) and F6 (pale light brownish). Coxae brown basally as well as metatibia, metatarsus, and apical tarsomeres of foreleg and middle leg; remainder of leg segments yellow to yellowish brown.



FIGURES 3, 4. *Gonatocerus morgani* (female). 3. Antenna. 4. Propodeum.



FIGURES 5–8. *Gonatocerus* spp. 5–7. *G. morgani*. 5. Forewing (female). 6. Antenna (male). 7. Genitalia (male). 8. Propodeum of *G. morrilli* (female).

Antenna (Fig. 3) with radicle about 2.2 x as long as wide, scape about 2.7 x as long as wide, almost smooth; pedicel longer than F1; F1–F4 narrower than F5–F8, F3 longest, F1 and F8 shortest of funicle segments; F1 without sensilla, F2 usually with 1 longitudinal sensillum but sometimes without sensilla, F3–F8 each with 2 longitudinal sensilla; all funicle segments densely setose; clava with 8 longitudinal sensilla, 3.0–3.3 x as long as wide, longer than combined length of F1–F3, its ventral surface covered with numerous minute, short setae and placoid sensilla, its dorsal surface densely covered with longer setae.

Mesosoma. Pronotum reticulate; mesoscutum, scutellum, axillae, and dorsellum almost smooth. Each lobe of pronotum with 2 strong dorsal and 2 weak lateral setae. Mesoscutum wider than long, a little shorter than scutellum; midlobe of mesoscutum with a pair of strong setae. Dorsellum rhomboidal. Propodeum (Fig. 4) with well-developed lateral carinae and submedial carinae, almost smooth between submedial carinae and notably wrinkled between submedial and lateral carinae and also lateral to lateral carinae. Foretibia with 2 or 3 conical sensilla. Forewing (Fig. 5) 3.2–3.3 x as long as wide; marginal cilia short, the longest marginal cilia about 1/5 maximum wing width. Forewing blade hyaline, bare behind venation except for several scattered microtrichia behind stigmal and apex of marginal veins, remainder of blade densely setose. Submarginal vein with 1 macrochaeta and 2 microchaetae, marginal vein with 4 or 5 strong setae between proximal and distal macrochaetae; hypochaeta about half way between these macrochaetae. Hind wing 17–18 x as long as wide; blade bare except for complete rows of microtrichia along margins and several scattered discal setae beyond tip of venation.

Metasoma. Petiole short, a little wider than long, trapezoidal. Ovipositor about 7/10 length of gaster, barely exserted beyond its apex. Ovipositor: mesotibia ratio about 1.2:1.

Outer plates of ovipositor each with 1 distal seta.

Measurements of the holotype. Body: total body length: 1760; head 198; mesosoma 646; petiole 61; gaster 861; ovipositor 640. Antenna: radicle 82; scape 203; pedicel 76; F1 67; F2 85; F3 94; F4 88; F5 88; F6 79; F7 82; F8 61; clava 297. Forewing 1556:473; longest marginal cilia 100. Hind wing 1113:64; longest marginal cilia 127.

MALE (paratypes). Body length 1350–1650. Similar to female in coloration except vertex pale or yellowish brown (ocellar triangle dark brown), flagellum entirely dark brown, and petiole brown. Antenna (Fig. 6) with scape about 2 x as long as wide; pedicel very small, F1 notably shorter than following flagellar segments, all flagellomeres with numerous longitudinal sensilla. Genitalia (Fig. 7) typical of the *morrilli* subgroup of the *ater* species group.

Etymology

This species is named in honor of Dr. David J.W. Morgan (California Department of Food and Agriculture).

Diagnosis

This new species does not match with any species of *Gonatocerus* described from South America by A.A. Ogloblin (J.T. Huber, personal communication). The dark body color and the color of the flagellar segments of the female antenna distinguishes *G. morgani* from the other described species from the *morrilli* subgroup of the *ater* group, such as *G. annulicornis* (Ogloblin), *G. morrilli*, and *G. walkerjonesi* **sp. n.**, all of which have more or less yellow-orange bodies with some dark spots. However, *G. morgani* is somewhat similar to several undetermined and apparently undescribed species from Central America, which suggests that it could be self-introduced into California from that region following establishment of *H. coagulata* in southern California in the 1990s, when huge numbers of unparasitized egg masses of this host became easily available for any accidentally introduced *Gonatocerus* egg parasitoid of Proconiini. This species had never been collected in California before its type series was first reared in 2003. However, it might also be a native species that just had been missed by collectors.

Host

Homalodisca coagulata (Say). *Gonatocerus morgani* successfully reproduced under laboratory conditions (in cages at the California Department of Food and Agriculture Mount Rubidoux Field Station, Riverside, California) on eggs of this host (D.J.W. Morgan, personal communication).

***Gonatocerus morrilli* (Howard, 1908)**
(Figs 8, 9)

Cosmocomoidea morrilli Howard 1908: 69.

Gonatocerus morrilli (Howard): Huber 1988: 51–53 (subsequent references, redescription, diagnosis, distribution, host associations); Triapitsyn *et al.* 1998: 241–243; Triapitsyn, Bezark and Morgan 2002: 39–40 (distribution in Mexico, host associations); de León 2004b: 318–320 (molecular distinction between geographic populations); de León 2004c: 322–324 (molecular distinction between geographic populations); de León *et al.* 2005: 302–305 (molecular distinction between cryptic species); Hoddle and Stouthamer, 2005: 338–340 (molecular and morphological distinction between similar species).

Type locality

Orlando, Orange Co., Florida, USA.

Material examined

MEXICO. BAJA CALIFORNIA SUR, Las Barracas, ca. 30 km E of Santiago, 27°28'20''N, 109°27'10''W: 30.iv–14.v.1985, P. DeBach [3 females, UCRC]; 11–26.iv.1986, P. DeBach [2 females, UCRC]. MORELOS, Tlayacapan, 29.x.1982, J.T. Huber [1 female, UCRC]. NUEVO LEÓN: Municipio Allende, Raíces, Río Ramos, 9.vii.1983, A. González-Hernández, G. Gordh [5 females, UCRC]. Municipio El Carmen: El Carmen, 10.vii.1983, A. González-Hernández [6 females, 1 male, UCRC]; Hacienda Barnabe Villarreal, 10.viii.1983, M.A. Rodríguez-Pérez [1 male, UCRC]. SINALOA, 12 mi. N of Mazatlán, 24.x.1982, J.T. Huber [1 female, UCRC]. TAMAULIPAS: Gómez Farías, 23°02'56''N, 99°09'24''W, 13–15.iii.2003, S.V. Triapitsyn, E.Ya. Shouvakhina, S.N. Myartseva (ex. ?*Homalodisca* sp. or ?*Oncometopia* sp. on orange leaves) [1 female, 2 males, UCRC]. Llera de Canales, 23°19.023'N, 99°01.510''W: 7.iii.2005 (emerged 22.iii.2005 in UCR quarantine), L. Pilkington (ex. *Oncometopia* sp. eggs on orange leaf) [1 female, UCRC]; 26.iii.2005 (emerged 29–30.iii.2005 in UCR quarantine), S.N. Myartseva, S.V. Triapitsyn (ex. *Oncometopia* sp. eggs on hibiscus leaf) [1 female, UCRC]. Municipio Hidalgo, near Ejido Benito Juárez, 24°01'20''N, 99°16'08''W, Hotel Hacienda Santa Engracia, 12–14.iii.2003, S.V. Triapitsyn, E.Ya. Shouvakhina, S.N. Myartseva (ex. ?*Homalodisca* sp. or ?*Oncometopia* sp. on citrus leaf) [1 female, UCRC]. Ca. 5 km N of Valle Hermoso, 10.iii.2000, S.V. Triapitsyn (on hibiscus) [1 female, UCRC]. VERACRUZ, 85 km S of Veracruz, 31.vii.1984, G. Gordh [1 female, UCRC]. USA. ARIZONA, Cochise Co., Texas Canyon Rd., 32°02'20''N, 110°05'40''W, 11.xii.2001, A. Owen [1 female, UCRC]. CALIFORNIA, Riverside Co., Menifee Valley, 33°39'N, 117°13'W, 1800' el.: 8–13.viii.1981, J.D. Pinto [1 female, UCRC]; 18–28.viii.1981, J.D. Pinto [2 females, UCRC]. FLORIDA: Gadsden Co., Quincy, 29.vi.2005, C. Tipping (from lab. colony on *Oncometopia nigricans* (Walker) eggs on bean leaves, emerged in UCR quarantine 8.vii.2005) [5 females, 33 males, UCRC]; Jefferson Co., Monticello: 2.vii.1997, S.V. Triapitsyn (on grapevine) [1 female, UCRC]; 24–25.vii.2000, V.V. Berezovskiy, S.V. Triapitsyn [2 females, UCRC]; 25.vii.2000, S.V. Triapitsyn (emerged in UCR quarantine 2–4.viii.2000 from an egg mass of *H. coagulata*; adult glassy-winged sharpshooters sleeved on crape myrtle 18.vii.2000 by R. López, then sleeve removed and host eggs exposed 21.vii.2000) [2 females, UCRC]. Location not indicated, 31.viii.1952,

S. Flanders [1 female, UCRC]. LOUISIANA, Orleans Parish, New Orleans, Michoud, 4.vii.1934, H.L. Dozier [2 females, 1 male, USNM]. NORTH CAROLINA, Carteret Co., Morehead City, 20–27.viii.2000, M. Wuenschel [1 female, UCRC]. TEXAS. Hidalgo Co: Elsa, 14.iv.2000, W.C. Warfield (emerged 24.iv.2000 in UCR quarantine ex. *H. coagulata* eggs in *Sophora* sp. leaves) [4 females, 1 male, UCRC]. Weslaco: 12.iii.2001, W.C. Warfield (emerged 14.iii.2001 in UCR quarantine ex. *H. coagulata* eggs in *Sophora secundiflora* leaves) [2 females, UCRC]; 21.iii.2005, J.H. de León *et al.* (from lab. colony on *H. coagulata* eggs) [3 females, 2 males, UCRC].

Diagnosis

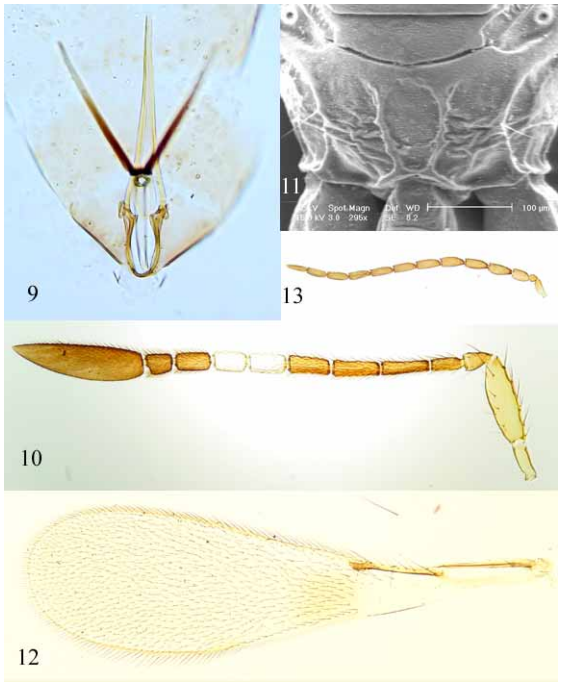
Very similar to *G. walkerjonesi* **sp. n.** described below. It differs by the parallel submedial carinae on the propodeum, with a narrower gap between them (Fig. 8). The petiole is generally relatively longer in *G. morrilli* (usually at least 1.5x as long as wide) than in *G. walkerjonesi* (usually about as long as wide). Males have a relatively shorter apodeme of the genital sternite, which is almost as long as the aedeagal apodemes (Fig. 9). This species belongs to a complex of similarly looking species within the *morrilli* subgroup of *Gonatocerus*, all of which have a mostly yellow-orange body and F5 and F6 of the female antenna white (F5 sometimes at least partially) (S. Triapitsyn *in* Hoddle and Stouthamer 2005). Using molecular methods, de León (2004b, 2004c) and de León *et al.* (2004, 2005) showed that the California (Orange and San Diego Counties) population of *G.* sp. near *morrilli* (i.e., *G. walkerjonesi* described in this communication) is significantly different genetically from the populations of *G. morrilli* from southern Texas and Florida. Specimens of *G. morrilli* from the Texas population are genetically identical to the specimens from Florida (de León *et al.* 2004), from where this species was originally described. They are also identical morphologically.

Distribution

Mexico and USA (Arizona [new record], California, Florida, Georgia, Louisiana, North Carolina [new record], Texas). Populations from Texas and Tamaulipas (Mexico) were supposedly introduced into California (Morgan *et al.* 2002; Triapitsyn, Bezark and Morgan 2002; Pilkington *et al.* 2005) although a later report (de León and Morgan 2005) indicated that it was the California native "California near *morrilli* species") (i.e., *G. walkerjonesi* **sp. n.** described below) that actually had been released in California due to contamination of the cultures of the insectary-reared *G. morrilli* with this similarly looking species. Thus, the three females collected in Menifee Valley, Riverside Co., in 1981 seem to be the only specimens from California that at least morphologically can be tentatively identified as *G. morrilli*. Unfortunately, attempts to extract DNA from these old, dry-mounted specimens for sequencing failed (H. van Oosten, personal communication). The identity of the only other California native specimen, a female collected at UCR campus, in Riverside, in 1984 (Huber 1988), cannot be verified because it could not be located in CNCI (J.T. Huber, personal communication).

Hosts

Homalodisca coagulata (Say), *H. liturata* Ball, *Oncometopia clarior* (Walker), *O. nigricans* (Walker), *O.* sp. near *nigricans* (Walker), and other *Oncometopia* spp., also likely including *O. orbona* (Fabricius).



FIGURES 9–13. *Gonatocerus* spp. 9. Genitalia of *G. morrilli* (male). 10–13. *G. walkerjonesi*. 10. Antenna (female). 11. Propodeum (female). 12. Forewing (female). 13. Antenna (male).

Gonatocerus walkerjonesi **S. Triapitsyn, sp. n.**

(Figs 10–14)

Gonatocerus morrilli (Howard): Phillips *et al.* 2001: 95 (misidentification of the specimens from Ventura Co., California, USA).

Gonatocerus sp. near *morrilli* (Howard): de León 2004b: 318–320 (molecular distinction between geographic populations, as "California *G. morrilli*"); de León 2004c: 322–324 (molecular distinction between geographic populations, as "California *G. morrilli*"); de León *et al.* 2005: 302–305 (molecular distinction between cryptic species); Hoddle and Stouthamer 2005: 338–340 (molecular and morphological distinction between similar species).

Type material

Holotype female on slide [UCRC]: USA. CALIFORNIA, Ventura Co., Fillmore, Young Rd. at Sycamore Canyon Rd., 11.vii.2001, P. Phillips *et al.* ("ex. eggs of glassy-winged sharpshooter, *Homalodisca coagulata* (Say) eggs on laurel sumac leaves"). Paratypes: USA. CALIFORNIA: Riverside Co., Riverside, UCR Campus: 20.x.2003 [1 female on point]; 10.ii.2005, S.V. Triapitsyn (emerged 25.ii.2005 ex. *H. coagulata* eggs on

red bud leaf) [1 female, 1 male on points, 1 female on slide, 2 females and 1 male in 75% ethanol stored in a freezer]. Ventura Co., Fillmore: 3.ix.1998, J. Dyckes (ex. *H. coagulata* eggs on macadamia leaves) [1 female on point as well as 1 female and 1 male on slides]; 2.vi.2000, R. Fenton (ex. *H. coagulata* eggs on avocado leaves) [2 females and 1 male on points]; 14.vi.2000, R. Fenton (ex. *H. coagulata* eggs on lemon leaves) [5 females on points]; 14.vi.2000, R. Fenton (ex. *H. coagulata* eggs on macadamia leaves) [2 females and 1 male on points]; 12.vii.2000, R. Fenton (ex. *H. coagulata* eggs on lemon leaves) [17 females and 5 males on points]; 26.vii.2000, R. Fenton (ex. *H. coagulata* eggs on Valencia orange leaves) [1 female and 1 male on points]; 9.viii.2000, R. Fenton (ex. *H. coagulata* eggs on lemon leaves) [1 male on slide]; 23.viii.2000, R. Fenton (ex. *H. coagulata* eggs on lemon leaves) [6 females and 2 males on points]; 23.viii.2000, R. Fenton (ex. *H. coagulata* eggs on Valencia orange leaves) [1 female and 1 male on points]; 4.x.2000, R. Fenton (ex. *H. coagulata* eggs on orange leaves) [1 female on slide]; 14.v.2001, R. Fenton (ex. *H. coagulata* eggs on lemon leaves) [1 female and 2 males on points] [all in UCRC]; 11.vii.2001, P. Phillips *et al.* (ex. *H. coagulata* eggs on laurel sumac leaves) [30 females and 2 males on points as well as 1 female and 2 males on slides (same data as the holotype), CNCI, CSAC, UCRC, USNM].

FIGURE 14. Genitalia of *Gonatocerus walkerjonesi* (male).

Additional material examined

NICARAGUA. MASAYA, Las Flores, 12°00.208'N, 86°01.190'W, 410' el., 16.iii.2004, M.S. Hoddle (ex. egg mass of a proconiine sharpshooter on avocado leaf) [4 females, 2 males, UCRC]. USA. CALIFORNIA, Riverside Co., Riverside, UCR campus, 20.x.2003, J. Ng (on lemon) [1 female, originally in UCRC, then destroyed for molecular study).

Description

FEMALE (holotype and paratypes). Body length 1400–1850. Body and appendages mostly yellowish-orange-light brown except for the following: F5 and F6 white; pedicel, two spots on basal gastral tergum, several spots on distal gastral terga, and metatibia brown; trabeculae, ocellar triangle, F1–F4, F7, F8, clava, and a wide band on medial metasomal terga dark brown.

Antenna (Fig. 10) with radicle about 2.5 x as long as wide, scape 3.1–3.2 x as long as

wide, lightly longitudinally striate; pedicel as long as F1; F2 as long as F3, both the longest funicle segments; F8 shortest funicle segment; F1 without sensilla, F2–F8 each with 2 longitudinal sensilla; all funicle segments densely setose; clava with 8 longitudinal sensilla, about 3.7 x as long as wide, about as long as combined length of F1–F3, its ventral surface covered with numerous minute, short setae and placoid sensilla, its dorsal surface densely covered with longer setae.

Mesosoma. Pronotum, mesoscutum, scutellum, and axillae lightly punctate; dorsellum smooth. Each lobe of pronotum with 2 strong dorsal and 3 weak lateral setae. Mesoscutum wider than long, a little shorter than scutellum; midlobe of mesoscutum with a pair of strong setae. Dorsellum rhomboidal. Propodeum (Fig. 11) with well-developed lateral carinae and subparallel (slightly curved medially) submedial carinae, notably wrinkled (less so between submedial carinae). Foretibia with 3 or 4 conical sensilla. Forewing (Fig. 12) 3.5–3.7 x as long as wide; marginal cilia short, longest marginal cilia about 1/5 maximum wing width. Forewing blade slightly infumated beyond venation, with conspicuous dark spot just beyond tip of venation (not reaching anterior margin); bare behind venation except for several scattered microtrichia behind stigmal and apex of marginal veins, remainder of blade densely setose. Submarginal vein with 1 macrochaeta and 2 microchaetae; marginal vein usually with 6, sometimes with 5, strong setae between proximal and distal macrochaetae; hypochaeta closer to distal macrochaeta than to proximal macrochaeta. Hind wing 18–22 x as long as wide; blade bare except for complete rows of microtrichia along margins and an incomplete row of discal setae starting just beyond tip of venation.

Metasoma. Petiole relatively short, usually about as long as wide but sometimes either slightly wider than long or longer than wide, trapezoidal. Ovipositor about 3/4 length of gaster, not or barely exserted beyond its apex. Ovipositor: mesotibia ratio about 1.0:1. Outer plates of ovipositor each with 1 distal seta.

Measurements of the holotype. Body: total body length: 1688; head 200; mesosoma 769; petiole 92; gaster 830; ovipositor 627. Antenna: radicle 115; scape 261; pedicel 90; F1 90; F2 144; F3 144; F4 127; F5 112; F6 100; F7 106; F8 82; clava 388. Forewing 1974:547; longest marginal cilia 115. Hind wing: 1446:79; longest marginal cilia 140.

MALE (paratypes). Body length 1450–1720. Body mostly light brown to dark brown (more so dorsally), with yellowish spots; antenna brown to dark brown, legs light brown to brown. Antenna (Fig. 13) with scape about 2 x as long as wide; pedicel very short, F1 a little shorter and wider than following flagellar segments which are more or less subequal in length; all flagellomeres with numerous longitudinal sensilla. Forewing 3.3–3.6 x as long as wide. Genitalia (Fig. 14) typical of the *morrilli* subgroup.

Etymology

This species is named in honor of Dr. Walker A. Jones (United States Department of Agriculture — Agricultural Research Service).

Diagnosis

This new species is very similar to *G. morrilli*. It differs by the propodeum with the submedial carinae curved and more apart from each other (Fig. 11). Male genitalia of these two species are also different: in *G. walkerjonesi*, the apodeme of the genital sternite is notably longer than the aedeagal apodemes (Fig. 14). *Gonatocerus walkerjonesi* is even more similar morphologically (especially the carinae on the propodeum) and apparently more closely related genetically to *G. annulicornis* (Ogloblin) from Argentina (Hoddle and Stouthamer 2005), which lacks the dark cloud on the forewing in both sexes and whose males have relatively shorter antennae and are generally lighter colored (particularly the mesosomal dorsum) than those of *G. walkerjonesi*.

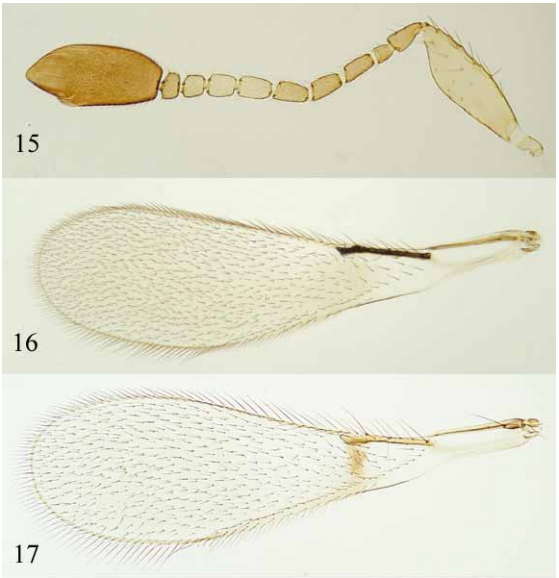
Hosts

Homalodisca coagulata (Say) and *H. liturata* Ball.

***Gonatocerus atriclavus* Girault, 1917**

(Figs 15, 16)

Gonatocerus triguttatus atriclavus Girault 1917: 19 (as a new variety).
Gonatocerus triguttatus atriclavus Girault: Huber 1988: 57.
Gonatocerus atriclavus Girault: Triapitsyn, Bezark and Morgan 2002: 35–38 (lectotype designation, redescription, diagnosis, distribution, host associations, failed rearing attempts on eggs of *H. coagulata*).



FIGURES 15–17. *Gonatocerus* spp. 15, 16. *G. atriclavus* (female). 15. Antenna. 16. Forewing. 17. Forewing of *G. fasciatus* (female).

Type locality

Mitan, Trinidad Island, Trinidad and Tobago.

Material examined [UCRC]

ARGENTINA. JUJUY, Santa Clara, 13.iv.2003, G. Logarzo (ex. egg of a proconiine sharpshooter on mandarin) [1 female]. MEXICO. VERACRUZ: Tamos, 27.iii.2001, D. Morgan, C. Pickett, S.M. Myartseva, A. Ríos (ex. eggs of *Homalodisca* sp. on hibiscus leaf) [5 females]. Temiahua, 14–15.ii.2001, G. Simmons, A. Ríos (ex. egg mass of an unknown proconiine sharpshooter on a salt marsh shrub leaf) [8 females].

Diagnosis

Body length 1580–1900. Female coloration as follows. Head pale except upper face and ocellar triangle brown, trabeculae and occiput dark brown, eyes and ocelli dusky. Antenna with scape yellow to light brown; pedicel, F1–F3, F4 (basally) and F7 brown; F4 (distally), F5 and F6 light brown; F8 dark brown; clava black. Neck pale, pronotum pale brown with darker spots; mesoscutum orange-brown anteriorly and yellowish posteriorly, notauli black; anterior scutellum light brown to brown; axilla brown with darker spot at middle; posterior scutellum yellowish-orange-brown; dorsellum, propodeum, pro-, meso-, and metapleura brown; lateral panels of metanotum and propodeal carinae dark brown. Legs yellowish-brown except all tarsi, meso- and metatibiae brown. Wings hyaline; venation brown to dark brown. Petiole dark brown; gaster pale to light yellow with dark brown bands on terga; ovipositor plates brown. Male coloration as follows. Antenna brown to dark brown except base of scape yellow; face brown; ocellar triangle and occiput dark brown, remainder of vertex and gena light brown; eyes and ocelli pinkish brown. Neck light brown; pronotum, mesoscutum (except light brown edges of lateral lobes), axilla, anterior and posterior scutellum, dorsellum, and propodeum shining brown; mesosomal pleura light brown. All legs light brown except mesotibia and meso- and metatarsi slightly darker, metatibia brown. Petiole brown, gaster light brown with several dark cross-bands on terga. Female antenna (Fig. 15) with a dilated scape and very long clava; longitudinal sensilla present on F2–F8. Submedial carinae on the propodeum complete, reaching the dorsellum. Forewing (Fig. 16) with cubital row of microtrichia complete, extending to base of marginal vein.

Distribution

Argentina (new record), Mexico, Trinidad and Tobago. In the Nearctic region, this species was recorded only from Ciudad Victoria in Tamaulipas, Mexico (Triapitsyn, Bezark and Morgan 2002).

Hosts

Homalodisca sp., *Oncometopia clarior* (Walker), and unknown species of proconiine sharpshooters.

***Gonatocerus fasciatus* Girault, 1911**
(Figs 17, 18)

Gonatocerus fasciatus Girault 1911: 265–266.
Gonatocerus fasciatus Girault: Huber 1988: 57–58 (redescription, diagnosis, distribution, host associations); Triapitsyn *et al.* 1998: 242; Triapitsyn *et al*. 2003: 75–76 (biology, distribution, host associations).

Type locality

Arlington, Arlington Co., Virginia, USA.

Material examined

USA. CALIFORNIA, Siskiyou Co., Hwy. 3, 4.7 km SW of Yreka, 41°40’39’’N, 122°43’23’’W, 1.v.2005, R.A. Rakitov [1 female, 1 male, UCRC]. DISTRICT OF COLUMBIA, Washington, Rock Creek Park, 38°55’23’’N, 77°02’55’’W, 25.v.2004, E.F. Drake [2 females, 1 male, UCRC]. FLORIDA: Jefferson Co., Monticello, 1.xi.2001, R. Mizell, III [1 female, UCRC]. GEORGIA: Houston Co., near Centerville, 32°38’03.3’’N, 83°43’06.4’’W, 131 m, 21.vi.2004, S.V. Triapitsyn, T. Cottrell [1 female, UCRC]. Peach Co., Byron, 22.vi.2004, S.V. Triapitsyn (emerged 24–30.vi.2004 at UCR quarantine from eggs of *H. coagulata* and *O. orbona* on leaves of crape myrtle, magnolia, etc.) [numerous females and males, UCRC]. ILLINOIS, Hardin Co., Elizabethtown, 5.viii.1932, H.L. Dozier [2 females, USNM]. KENTUCKY, Breckenridge Co., Axtel, 30.v–2.vi.2003, A. Ray, M. Buffington [2 females, UCRC]. MARYLAND: Frederick Co., Thurmont, 39°37’28’’N, 77°26’17’’W, 100’, 28.v.2004, E.F. Drake [1 male, UCRC]. Wicomico Co., Parsonsburg, 11–20.viii.2000, S. & M. Gondal [4 females, UCRC]. MISSISSIPPI, Washington Co., nr. Stoneville, Delta Exp. Forest, 33°29’N, 90°55’W, 20.iv–3.v.1999, N.M. Schiff [1 female, UCDC]. NORTH CAROLINA, Carteret Co., Morehead City, 20–27.viii.2000, M. Wuenschel [2 females, UCRC]. OHIO, Clermont Co., Williamsburg, 39°05’N, 84°02’W, 11–17.v.1997, D.E. Russell [1 female, UCDC]. PENNSYLVANIA, Montgomery Co., Lansdale, 30.vi–5.vii.2001, R. Kaufhold [1 female, UCRC]. TEXAS, numerous specimens of both sexes collected in various years during April-June in Bosque, Brazos, Polk, and Tyler Counties [TAMU].

Diagnosis

Body length 560–1320 (Triapitsyn *et al.* 2003). The main distinguishing features of this species are as follows (mostly after Huber 1988). Head and mesosoma brown to dark brown, gaster mostly yellow or pinkish (often in live or freshly preserved specimens) with brown bands on terga. Longitudinal sensilla present only on F5–F8 of the female antenna. Submedial carinae on the propodeum incomplete, not reaching the dorsellum. Forewing (Fig. 17) with a faint uniform brown tinge beyond venation and a distinct brown fascia between the stigmal vein and the wing’s posterior margin; cubital row of microtrichia complete, extending to base of marginal vein. Habitus of the female is shown in Fig. 18.

Distribution

USA (northern California [new record], District of Columbia [new record], Florida, Georgia, Illinois, Kentucky [new record], Louisiana, Maryland [new record], Mississippi [new record], Missouri, North Carolina [new record], Ohio [new record], Pennsylvania [new record], South Carolina [new record], Tennessee, Texas, Virginia). The species was first introduced into California from Louisiana (Triapitsyn *et al.* 2003) and later released there against *H. coagulata* (Pilkington *et al.* 2005).

Hosts

Homalodisca coagulata (Say), *Oncometopia orbona* (Fabricius) (Triapitsyn *et al.* 2003), and *Paraulacizes irrorata* (Fabricius) (Tipping *et al.* 2006). Some aspects of the biology of *G. fasciatus* were studied by Irvin and Hoddle (2005a, b).

Comments

This is the only known gregarious species among the North American *Gonatocerus* egg parasitoids of Proconiini (Triapitsyn *et al.* 2003). Its exit holes can be easily recognized by their number (two, rarely three) and position (at the opposite ends of the host egg if only two holes are present) per each host egg (Fig. 19). By finding old, parasitized egg masses of Proconiini with such exit holes I was able to document during August 2004 presence of *G. fasciatus* in Yamassee, South Carolina (in eggs of *H. coagulata* and *O. orbona* on crape myrtle) and also at several locations in North Carolina: Garner (in eggs of *H. coagulata* on crape myrtle), near Greensboro (in eggs of *O. orbona* on crape myrtle), and near Warsaw (in eggs of *H. coagulata* on an undetermined tree).

FIGURES 18, 19. 18. *Gonatocerus fasciatus* (female). Photo by Jack Kelly Clark, University of California. 19. Exit holes of *G. fasciatus* (parasitized egg mass of *Oncometopia orbona* on gardenia leaf).

The recent discovery of *G. fasciatus* in northern California among the specimens collected near Yreka, Siskiyou Co. by R.A. Rakitov at a site where a native sharpshooter, *Cuerna unica* Nielson, occurs (R.A. Rakitov, personal communication), suggests that this species is native there (also because it is very far away from the areas of southern California where it was released against *H. coagulata*).

Gonatocerus triguttatus Girault, 1916
(Fig. 20)

Gonatocerus triguttatus Girault 1916: 297–298.
Gonatocerus triguttatus Girault: Huber 1988: 55–57 (lectotype designation, redescription, diagnosis, distribution); Triapitsyn and Phillips 2000: 201–202 (distribution, first known host record from eggs of *H. coagulata*); Triapitsyn, Bezark and Morgan 2002: 40 (distribution, host associations); Triapitsyn, Hoddle and Morgan 2002: 654 (distribution, host associations); Logarzo *et al.* 2004: 486 (distribution, host associations).

Type locality

Caroni, Trinidad Island, Trinidad and Tobago.

Material examined

ECUADOR. ZAMORA, Chinchire, Río Bombuscaro, 4.12°S, 78.98°W, 1100 m, 26.iv–4.vii.1986, P. Hibbs [1 female, CNCI]. MEXICO. NUEVO LEÓN, Monterrey, Ciudad Universitaria, 20.vii.1983, M.A. Rodríguez-Pérez [6 females, 6 males, UANL]. TAMAULIPAS: Gómez Farías: 26.iii.2001, D. Morgan, C. Pickett, S.M. Myartseva, A. Ríos (ex. eggs of *Oncometopia* sp. on an undetermined plant) [1 female, UCRC]; 26.iii.2001, D. Morgan, C. Pickett, S.M. Myartseva, A. Ríos (ex. eggs of *Homalodisca* sp. on coffee) [4 females, UCRC]; 23°02’56’’N, 99°09’24’’W, 13–15.iii.2003, S.V. Triapitsyn, E.Ya. Shouvakhina, S.N. Myartseva (ex. ?*Homalodisca* sp. or ?*Oncometopia* sp. on orange) [1 female, UCRC]. Llera de Canales, 23°19.023’N, 99°01.510’W, 26.iii.2005 (emerged 13.iv.2005 in UCR quarantine), S.V. Triapitsyn (ex. *H. coagulata* eggs on orange leaf) [3 females, UCRC]. Municipio Hidalgo, near Ejido Benito Juárez, 24°01’20’’N, 99°16’08’’W, Hotel Hacienda Santa Engracia: 15.iv.2002 (emerged 1–2.v.2002 in UCR quarantine), S.N. Myartseva (ex. ?*O. clarior* egg mass on orange leaf) [3 females, 1 male, UCRC]. 12–14.iii.2003, S.V. Triapitsyn, E.Ya. Shouvakhina, S.N. Myartseva (ex. ?*Homalodisca* sp. or ?*Oncometopia* sp. on citrus leaf) [2 females, UCRC]. VERACRUZ: Tampico, 13.ii.2001, G. Simmons, A. Ríos (ex. *Oncometopia* sp. eggs on hibiscus leaf) [2 females, UCRC]. NICARAGUA. MASAYA, Las Flores, 12°00.208’N, 86°01.190’W, 410’ el., 16.iii.2004, M.S. Hoddle (ex. egg mass of a proconiine sharpshooter on avocado leaf) [2 females, 1 male, UCRC]. USA. CALIFORNIA, Riverside Co., Riverside, i.2002, D.J.W. Morgan et al. (from CDFA Mt. Rubidoux Field Station insectary colony on *H. coagulata* eggs, originally from Tamaulipas, Mexico) [10

females, 6 males, UCRC]. TEXAS: Brazos Co., College Station, Texas A&M University campus, 25.viii.2001, S.V. Triapitsyn, V.V. Berezovskiy (ex. *H. coagulata* eggs on crape myrtle) [7 females, 4 males, UCRC]. Cameron Co., Sabal Palm Grove Sanctuary: 6.vii.1982, G. Gibson [1 female, CNCI]; 21.vii.1997, M.W. Gates [1 female, UCRC]. Hidalgo Co, Weslaco: 20.iii.2001, W.C. Warfield (ex. *H. coagulata* egg mass) [1 female, UCRC]; 4.iv.2001, W.C. Warfield (ex. *H. coagulata* eggs on *Sophora* sp. leaves) [1 female, 2 males, UCRC]; 9.iv.2001, W.C. Warfield (ex. *H. coagulata* eggs on *Sophora secundiflora* leaf) [2 females, UCRC]; 17.iv.2001, W.A. Jones (ex. *H. coagulata* egg mass on *Sophora secundiflora*) [1 female, UCRC]; 21.iii.2005, J.H. de León *et al.* (from lab. colony on *H. coagulata* eggs) [3 females, 2 males, UCRC].

Diagnosis

The main distinguishing features of this species are as follows (mostly after Huber 1988). Body length (female) 1520–1880. Head and mesosoma of female generally yellow, gaster light yellow with brown bands on terga. Mesonotum of male slightly darker, with light brown or brown areas. Longitudinal sensilla present on all funicle segments (F1–F8) of the female antenna. Submedial carinae on the propodeum thick, distinct, reaching the dorsellum. Wings hyaline; cubital row of microtrichia on forewing blade complete, extending to base of marginal vein. Habitus of the female is shown in Fig. 20. *Gonatocerus triguttatus* is closely related to *G. uat* S. Triapitsyn and *G. ashmeadi* Girault (see cladogram in Triapitsyn *et al.* 2006).

FIGURE 20. *Gonatocerus triguttatus* (female). Photo by Jack Kelly Clark, University of California.

Distribution

Ecuador (new record), Mexico, Nicaragua (new record), Peru (Logarzo *et al.* 2004), Trinidad and Tobago, USA (Florida, Texas). Introduced into California against *H. coagulata* (initially from Tamaulipas, Mexico and then from Texas) and established there

(Morgan *et al.* 2000; Morgan *et al.* 2002; Triapitsyn, Bezark and Morgan 2002; Pilkington *et al.* 2005).

Hosts

Homalodisca coagulata (Say), *H. liturata* Ball (under laboratory conditions and also likely in the field following introduction into southern California), *Oncometopia clarior* (Walker), *O. nigricans* (Walker), *Oncometopia* sp., and *Pseudometopia amblardii* (Signoret) or *P. phalaesia* (Distant). Some aspects of the biology of *G. triguttatus* were studied by Irvin and Hoddle (2004; 2005a, b).

***Gonatocerus ashmeadi* Girault, 1915**
(Figs 21–25)

Gonatocerus dolichocerus var. *ashmeadi* Girault 1915: 8.

Gonatocerus ashmeadi Girault: Girault 1929: 25; Huber 1988: 53–55 (subsequent references, lectotype designation, redescription, diagnosis, distribution, host associations); Triapitsyn and Phillips 1996: 10; Triapitsyn *et al.* 1998: 241–242 (distribution, host associations); Triapitsyn, Bezark and Morgan 2002: 38–39 (distribution, host associations); Vickerman *et al.* 2004: 338–344 (biological, morphological, and molecular distinction between populations; distribution); de León 2004a: 314–317 (molecular distinction between populations); Hoddle and Triapitsyn 2004b: 342–343 (distribution, host associations); de León and Jones 2005: 1–7 (molecular distinction between populations); Triapitsyn *et al.* 2006: 60–62 (illustrations, comparison with *G. uat* S. Triapitsyn).

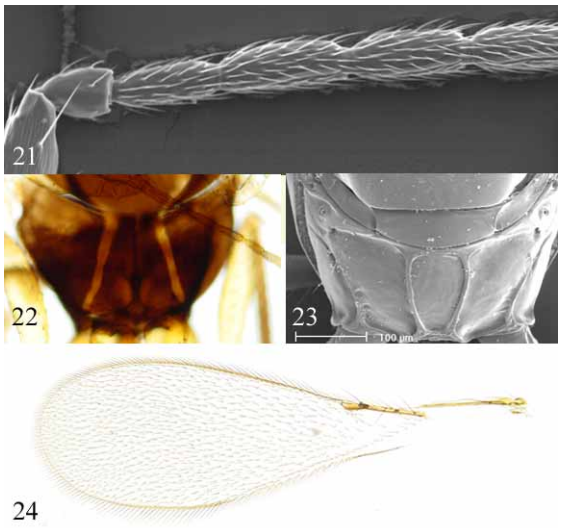
Type locality

An unspecified locality in Texas, USA.

Material examined

EASTER ISLAND (CHILE). Rano-Kau, 1.iii.2006, M. Beeche C. (ex. eggs of *H. coagulata*) [3 females, 1 male, UCRC]. HAWAIIAN ISLANDS (USA, HAWAII). Oahu Island, Keehi Lagoon, 3.xii.2004, R. Bautista (ex. eggs of *H. coagulata* on African tulip) [1 female, 3 males, CNCI]. MEXICO. TAMAULIPAS, Universidad Autónoma de Tamaulipas campus, 25.iii.2005 (emerged 1.iv.2005 in UCR quarantine), S.V. Triapitsyn (ex. egg mass of *Oncometopia* sp. on hibiscus leaf) [1 female, UCRC]. USA. CALIFORNIA: Riverside Co., Riverside, UCR campus, 23.vii.1996, M. Grebus (ex. *Homalodisca* sp. eggs) [5 females, 5 males, UCRC]. Ventura Co., Fillmore: 12.vii.2000, R. Fenton (ex. *H. coagulata* eggs on lemon leaves) [11 females, 4 males, UCRC]; 23.viii.2000, R. Fenton (ex. *H. coagulata* eggs on lemon) [1 female, 1 male, UCRC]; 23.viii.2000, R. Fenton (ex. *H. coagulata* eggs on Valencia orange) [6 females, 4 males, UCRC]. FLORIDA: Jefferson Co., Monticello, 25.vii.2000, S.V. Triapitsyn (emerged in UCR quarantine 2–4.viii.2000 from an egg mass of *H. coagulata*; adult glassy-winged sharpshooters sleeved on crape myrtle 18.vii.2000 by R. López, then sleeve removed and

host eggs exposed 21.vii.2000) [7 females, UCRC]. GEORGIA: Houston Co., near Centerville, 32°38'03.3''N, 83°43'06.4''W, 131 m, 21.vi.2004 (emerged 22–30.vi.2004 in UCR quarantine), S.V. Triapitsyn, T. Cottrell (ex. proconiine sharpshooter egg masses on grasses) [numerous females and males, UCRC]. Peach Co., Byron, 21–22.vi.2004, S.V. Triapitsyn (emerged 24.vi–6.vii.2004 at UCR quarantine from eggs of *H. coagulata* and *O. orbona* on leaves of crape myrtle, magnolia, etc.) [numerous females and males, UCRC]. NORTH CAROLINA, Carteret Co., Morehead City, 20–27.viii.2000, M. Wuenschel [3 females, UCRC]. SOUTH CAROLINA, Charleston Co., Charleston, 22–23.vi.2004 (emerged 25–29.vi.2004 in UCR quarantine), S.V. Triapitsyn (ex. *H. coagulata* eggs on crape myrtle) [numerous females and males, UCRC].



FIGURES 21–24. *Gonatocerus ashmeadi* (female). 21. Pedicel and basal funicle segments. 22. Mesosomal sternum. 23. Propodeum. 24. Forewing.

Diagnosis

The main distinguishing features of this species are as follows (mostly after Huber 1988). Body length (female) 1280–1760. Head and mesosoma generally dark brown, legs and gaster mostly yellow with brown bands on gastral terga; gaster may be almost completely dark brown in some males. Longitudinal sensilla present on F2–F8 of the female antenna; F1 without sensilla (Fig. 21). Mesosomal sternum with a distinct, well-defined yellow streak between each fore and middle coxae (Fig. 22). Submedial carinae on the propodeum thick, distinct, reaching the dorsellum (Fig. 23). Forewing (Fig. 24) hyaline or at most with a faint uniform brown tinge; cubital row of microtrichia on forewing blade complete, extending to base of marginal vein. Habitus of the female is shown in Fig. 25. *Gonatocerus ashmeadi* is most closely related to *G. uat* S. Triapitsyn (Triapitsyn *et al.* 2006), from which it can be distinguished using the characters indicated in the key. Among the unrelated North American species of *Gonatocerus*, *G. ashmeadi* can be quite easily

confused with another common and superficially very similarly looking (especially the coloration) species, *G. dolichocerus* Ashmead, which belongs to the *bucculentus* subgroup of the *ater* species group (Huber 1988). Besides the subspecies-group distinguishing features indicated in Huber's (1988) key to the North American species of the *ater* species group of *Gonatocerus*, females of *G. dolichocerus* can be separated from those of *G. ashmeadi* by a relatively shorter F1. I myself accidentally misidentified several specimens of *G. dolichocerus* as *G. ashmeadi* (Vickerman *et al.* 2004), with the following label data: USA: Louisiana, East Baton Rouge Parish, Baton Rouge, 2–4.iv.2002, S.V. Triapitsyn [3 females, UCRC]; Missouri, St. Clair Co., Chapel View Prairie, 29.vi.1999, M.W. Gates [1 female, UCRC].

Distribution

Mexico (Nuevo León and Tamaulipas) and USA (California, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Texas); its occurrence in Alabama and southern Arkansas, although not documented, is also very likely. The southern and southeastern USA strains of *G. ashmeadi* were released in California against *H. coagulata* (Morgan *et al.* 2002; Pilkington *et al.* 2005). Self-introduced into Oahu Island, Hawaii (USA), where *G. ashmeadi* provides a good control of *H. coagulata*; intentionally and successfully introduced into Tahiti, Society Islands, French Polynesia, for biological control against *H. coagulata* (Mark S. Hoddle, personal communication). Self-introduced into Easter Island (Chile) (new record), probably from French Polynesia; specimens were sent to me for identification by Sandra Ide Mayorga (Santiago, Chile). Triapitsyn *et al.* (2006) provided label data for the specimens of *G. ashmeadi* from Honolulu, Oahu Island, Hawaii (USA) that were sequenced for the molecular comparison with the North American specimens of this species and also with *G. uat* S. Triapitsyn.

FIGURE 25. *Gonatocerus ashmeadi* (female). Photo by Jack Kelly Clark, University of California.

Hosts

Cuerna costalis (Fabricius), *Homalodisca coagulata* (Say), *H. liturata* Ball, *Oncometopia clarior* (Walker), *O. orbona* (Fabricius), and *Oncometopia* sp. Biological traits of *G. ashmeadi* are well known (Irvin and Hoddle 2004; 2005a, b; Velema *et al.* 2005).

Comments

It can be supposed that *G. ashmeadi* might not be native to California; rather, it probably had accidentally introduced itself into California from somewhere in southern or southeastern USA long ago (before the 1980s) and established there on eggs of *H. liturata*, the local proconiine sharpshooter. Following establishment of *H. coagulata* in southern and central California during the 1990s, *G. ashmeadi* simply switched back to its natural host, providing good control of the summer brood of the glassy-winged sharpshooter. The molecular data reported by Vickerman *et al.* (2004) and de León and Jones (2005) may support such an assumption.

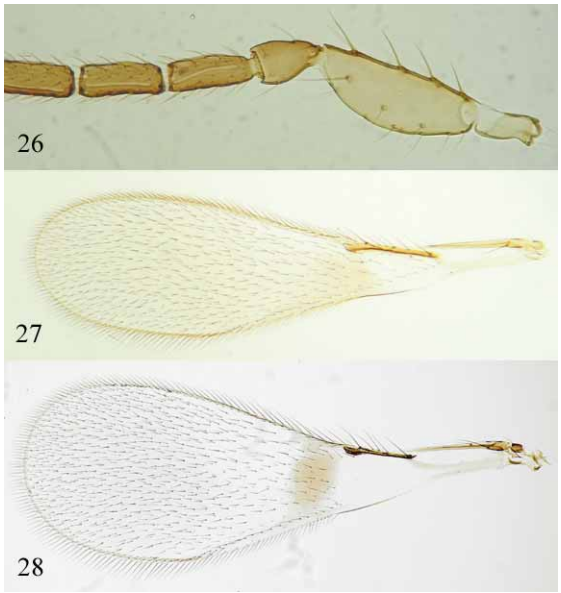
***Gonatocerus uat* S. Triapitsyn, 2006**

(Figs 26, 27)

Gonatocerus uat S. Triapitsyn *in* Triapitsyn *et al.* 2006: 58–62.

Type locality

Ciudad Valles, San Luis Potosí, Mexico.



FIGURES 26–28. *Gonatocerus* spp. 26, 27. *G. uat* (female). 26. Pedicel and basal funicle segments. 27. Forewing. 28. Forewing of *G. novifasciatus* (female).

Diagnosis

Gonatocerus uat is very similar to *G. ashmeadi*, from which it can be distinguished by F1 of the female antenna usually having 2 (rarely 1) longitudinal sensilla (Fig. 26) (always none in *G. ashmeadi*, Fig. 21) and also by the forewing blade being notably infuscated beyond venation, more conspicuously so behind the tip of the marginal vein (Fig. 27) (at

most with a faint, uniform brownish tinge in *G. ashmeadi*, Fig. 24). Triapitsyn *et al.* (2006) also provide molecular evidence of the clear separation between *G. ashmeadi* and *G. uat*.

Distribution

Argentina, Mexico (Tamaulipas, San Luis Potosí), and Peru (Triapitsyn *et al.* 2006). In the Nearctic region, it is known only from Llera de Canales in Tamaulipas, Mexico, just north of the "border" between the Nearctic and Neotropical regions.

Hosts

Homalodisca sp., *Oncometopia* spp., *Pseudometopia amblardii* (Signoret) and *P. phalaesia* (Distant), as well as *Tapajosa rubromarginata* (Signoret) (Triapitsyn *et al.* 2006).

***Gonatocerus novifasciatus* Girault, 1911**

(Fig. 28)

Gonatocerus novifasciatus Girault 1911: 266–267.

Gonatocerus novifasciatus Girault: Huber 1988: 63–65 (redescription, diagnosis, distribution, host associations); Triapitsyn *et al.* 1998: 241, 243 (host association in California).

Type locality

An unspecified locality in Tennessee, USA.

Material examined

HAWAIIAN ISLANDS (USA, HAWAII). Oahu Island, Kakului Airport, 14.i.2000, 17.ii.2000 and 1.iii.2000, F. Howard, D. Preston, F. Starr, K. Martz [3 females, CNCI]. MEXICO. BAJA CALIFORNIA SUR, 10 km N of La Paz, 28.x.1983, J.D. Pinto [2 females, UCRC]. COAHUILA, Saltillo, Los Valdez, 30.vii.1987, A. González-Hernández [1 female, 1 male, UANL]. DISTRITO FEDERAL, 12 mi. W of Texcoco, 2300 m, 28.x.1982, J.T. Huber [1 female, UCRC]. MORELOS, Amatlán, 14 km N of Yautepec, 29.x.1982, J.T. Huber, A. González-Hernández [3 females, UCRC]. NUEVO LEÓN: Monterrey, Chipinque, 1000 m, 2.xi.1982, J.T. Huber, A. González-Hernández [3 females, UCRC]. Municipio Allende, Raíces, Río Ramos, 9.vii.1983, F. Reyes-Vélez [1 female, UCRC]. Municipio El Carmen, El Carmen, 10.vii.1983, A. González-Hernández, F. Reyes-Vélez [3 females, 6 males, UCRC]. Municipio Guadalupe, Rincón de la Sierra, 11.vii.1983, A. González-Hernández [1 female, UCRC]. Municipio Santiago, El Cercado, Hacienda Las Tres Blanquitas, 9.vii.1983, M.A. Rodríguez-Pérez [6 females, UCRC]. VERACRUZ, Fortín de las Flores, 30.x.1982, J.T. Huber, A. González-Hernández [11 females, 1 male, UCRC]. HONDURAS. OLANCHO, Montaña del Malacate, 15°08'04''N, 85°35'36''W, 3.vii.2002, D. Yanega [1 female, UCRC]. USA. CALIFORNIA: Los Angeles Co., Monrovia: 28.xi–7.xii.2004, B.V. Brown, 1 female;

14–21.xii.2004, B.V. Brown [4 females, 1 male, UCRC]. Santa Monica Mountains, Big Rock Rd., 34°02'N, 118°37'W, 12–18.vi.1997, M.E. Irwin [6 females, 1 male, UCDC]. Riverside Co.: Riverside: UCR campus, 1.v.2001, A. Al-Wahaibi (emerged 5–9.v.2001 from *Homalodisca* sp., likely *H. liturata*, egg mass on jojoba) [1 male, UCRC]; 22.iv.2002, T. Pinkard (on citrus) [1 female, 2 males, UCRC]; 26.iv.2002, B. Carey (on citrus) [1 female, UCRC]. Temecula, 22.vi.1999, M. Blua (ex. *H. coagulata* eggs on grapefruit) [3 females, UCRC]. San Diego Co., San Diego, 28.iii.1977 (ex. leafhopper eggs on citrus) [2 females, SDMC]. Ventura Co.: Fillmore: 1.v.1997, J. Dyckes (ex. *H. coagulata* eggs on laurel sumac) [1 female, UCRC]; 4.vi.1998, J. Dyckes (ex. *H. coagulata* eggs on lemon) [4 females, 1 male, UCRC]; 18.vi.1998, J. Dyckes (ex. *H. coagulata* eggs on laurel sumac) [1 female, UCRC]; 20.v.1999, R. Fenton (ex. *H. coagulata* eggs on laurel sumac) [4 females, 2 males, UCRC]; 3.v.2001, P. Phillips *et al.* (ex. *H. coagulata* eggs on lemon) [1 female, UCRC]; 26.ii.2002, P. Thalken (from *H. coagulata* eggs on eucalyptus) [numerous females, CSAC]. Near Santa Paula, 30.iii–5.iv.2001, B. Carey (from *H. coagulata* egg) [1 female, UCRC]. Ventura, 25.iii.2002, C. Payne (from *H. coagulata* eggs on sapote) [numerous females, UCRC]. FLORIDA, Jefferson Co., Monticello: 2.vii.1997, S.V. Triapitsyn (on cultivated grapes) [4 females, UCRC]; 19.v.2001, R. Mizell, III [2 females, UCRC]; 12.iv.2002, R. Mizell, III [1 male, UCRC]; 2.iv.2002, R. Mizell, III [1 female, UCRC]. ILLINOIS, Hardin Co.: Elizabethtown, 5.viii.1932, H.L. Dozier [1 female, USNM]. Shawnee National Forest, ca. 2 mi. W of Cadiz Camp, 13–14.iv.2004, S.V. Triapitsyn [1 female, UCRC]. LOUISIANA, East Baton Rouge Parish, Baton Rouge, adult *H. coagulata* caged on crape myrtle leaves 10.vi.2003, cage removed and eggs exposed 15.vi.2003, leaves with parasitized eggs removed and sent to UCR quarantine 23.vi.2003 by D.V. Chouljenko, parasitoid emerged in UCR quarantine 3.vii.2003, coll. D. Vickerman [1 female, UCRC]. MARYLAND, Montgomery Co., Silver Spring, 7–11.vii.1980, E.E. Grissell [1 female, UCRC]. Wicomico Co., Parsonsburg, 11–31.viii.2000, S. & M. Gondal [2 females, 1 male, UCRC]. NEW YORK, Queens Co., Long Island, North Floral Park: 2.vi.1984, D. Yanega [1 female, UCRC]; 8.v.1985, D. Yanega [1 female, UCRC]. WEST VIRGINIA, Cabell Co., Barboursville, 8.vii.1998, J.D. Pinto [1 male, UCRC].

Diagnosis

The main distinguishing features of this species are as follows (after Huber 1988). Body length (female) 912–1232. Body generally dark brown. Longitudinal sensilla usually present on F3–F8 of the female antenna (F4 rarely lacking sensilla); F1 and F2 usually without sensilla (F2 rarely with 1 longitudinal sensillum). Submedial carinae on the propodeum prominent, uniformly thickened, reaching the dorsellum. Forewing (Fig. 28) hyaline or with a faint uniform brown tinge, and usually with a distinct infumate spot just beyond the stigmal vein; microtrichia of blade absent behind venation except for a few setae behind apex of stigmal vein.

Distribution

Canada (Nova Scotia), Mexico, Honduras (new record), and USA (Arkansas, Arizona, California, Florida, Georgia, Hawaii [new record], Illinois, Kansas, Louisiana, Maryland, Missouri, Mississippi, New York [new record], Pennsylvania, Tennessee, Texas, Virginia, West Virginia [new record]).

Hosts

Graphocephala coccinea (Förster), *G. versuta* (Say), *Homalodisca coagulata* (Say), *H. liturata* Ball, and very likely (although not yet documented) *Oncometopia orbona* (Fabricius). This very distinctive species usually attacks mostly the first (early spring) brood of *H. coagulata* in southern California.

***Gonatocerus incomptus* Huber, 1988**

(Figs 29, 30)

Gonatocerus incomptus Huber 1988: 67–69 (description, diagnosis, distribution, host associations).
Gonatocerus capitatus Gahan: Triapitsyn *et al.* 1998: 241, 242 (misidentification).
Gonatocerus incomptus Huber: Triapitsyn *et al.* 1998: 241, 242 (host association in California).

Type locality

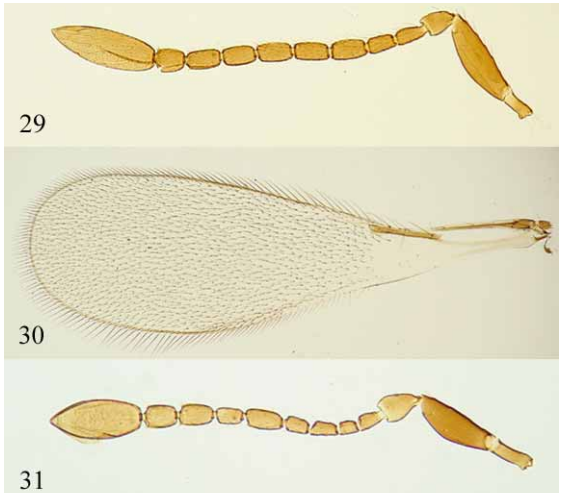
Riverside, Riverside Co., California, USA.

Material examined [UCRC]

USA. CALIFORNIA: Riverside Co.: Riverside, 13.iii.1981, J.T. Huber (emerged 20–31.iii. 1981 from *H. liturata* eggs on lemon) [11 females, 4 males]; 22.iv.2002, T. Pinkard (on citrus) [1 female]. Ventura Co.: Fillmore: Bardsdale, 13.iii.1997, J. Dyckes (ex. *H. coagulata* egg on macadamia nut tree leaf) [1 female, 1 male]; 27.iii.1997, J. Dyckes (ex. *H. coagulata* eggs on laurel sumac) [3 males]; 17.iv.1997, J. Dyckes (ex. *H. coagulata* eggs on orange) [2 females, 1 male]; 17.iv.1997, J. Dyckes (ex. *H. coagulata* eggs on sycamore) [1 female]; 4.iv.1996, P. Phillips (ex. *H. coagulata* eggs) [2 females]. OREGON, Jackson Co., 2 mi. S of exit 6 on I5, 42.0477°N, 122.6052°W, 4.v.2005, R.A. Rakitov [7 females, 8 males].

Diagnosis

The main distinguishing features of this species are as follows (after Huber 1988). Body length (female) 1232–1344. Body very dark brown to black. Longitudinal sensilla usually present on F2–F8 of the female antenna but F2 sometimes lacking sensilla (Fig. 29). Submedial carinae on the propodeum thick, distinct, parallel, almost reaching the dorsellum. Forewing (Fig. 30) hyaline or with a faint uniform brown tinge; microtrichia of blade absent behind venation except for a few setae behind stigmal vein.



FIGURES 29–31. *Gonatocerus* spp. 29, 30. *G. incomptus* (female). 29. Antenna. 30. Forewing. 31. Antenna of *G. impar* (female).

Distribution

USA: reliable records from California, Georgia, Oregon (new record), and also Texas (Lauzière & Hassell 2006).

Hosts

Cuerna costalis (Fabricius), *Homalodisca coagulata* (Say), and *H. liturata* Ball.

***Gonatocerus impar* Huber, 1988**

(Fig. 31)

Gonatocerus impar Huber 1988: 69–70 (description, diagnosis, distribution).

Type locality

Menifee Valley, Riverside Co., California, USA.

Material examined

USA. ARIZONA, Cochise Co., Coronado National Forest, Chiricahua Mountains, Pinery Canyon, 31°56’54’’N, 109°18’25’’W, 6000’, 21.viii.2000, B. Rodríguez-Velez [1 female, TAMU]. CALIFORNIA: Riverside Co.: Menifee Valley, 33°39’N, 117°13’W, 1800’, 28.vi–12.viii.1995, J.D. Pinto [1 female, UCRC]. San Bernardino Co.: Green Springs Creek, 34°13’07’’N, 116°48’18’’W, 9.vi.2005, J.D. Pinto [1 female, UCRC]. Ironwood Campground, 34°18’15’’N, 117°00’44’’W, 2130 m, 22.vii.1999, M. Gates [1 female, UCRC].

Diagnosis

The main distinguishing features of this species are as follows (after Huber 1988). Body length (female) 848–1152. Head and mesosoma dark brown, metasoma brown. Female antenna (Fig. 31) with longitudinal sensilla usually present on F3, F5, F7, and F8 but F3 sometimes lacking sensilla. Submedial carinae on the propodeum fine, subparallel, almost reaching the dorsellum. Wings hyaline; microtrichia of forewing blade absent behind venation except for a few setae behind stigmal vein.

Distribution

USA (Arizona [new record], California).

Host

Unknown.

Gonatocerus sp(p). near *incomptus* Huber, 1988/*impar* Huber, 1988 complex
(Figs 32–34)

Gonatocerus sp. near *impar* Huber: Triapitsyn and Rakitov 2005: P11–12 (host: *Cuerna balli* Oman & Beamer in Joseph City, Arizona).

Gonatocerus sp. near *incomptus* Huber: Triapitsyn and Rakitov 2005: P11–12 (host: *Cuerna* sp. [*C. alpina* Oman & Beamer or *C. septentrionalis* (Walker)] in Treasure Co., Montana).

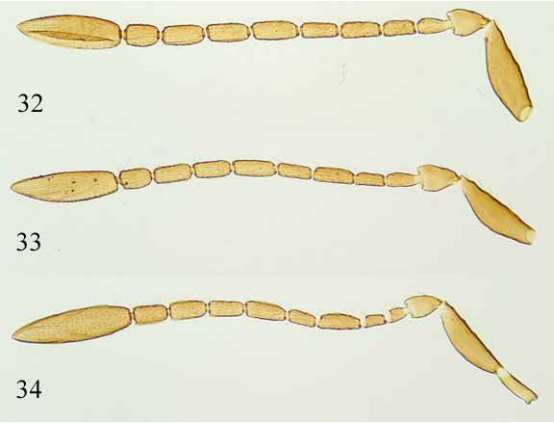
Material examined [UCRC]

USA. ARIZONA: Navajo Co., Joseph City, 34.99652°N, 110.32393°W, 4988', 30.vi.2004, R.A. Rakitov, A. Hicks (ex. *Cuerna balli* Oman & Beamer eggs on *Atriplex* sp.) [2 females, 1 male]. CALIFORNIA: Mendocino Co., Hopland, 19.v.2003, L. Varela (ex. *?Pagaronia* sp. eggs) [6 females]. Riverside Co., Temecula: 8.vi.1999, M. Blua (ex. *H. coagulata* eggs on grapefruit) [3 females, 1 male]; 22.vi.1999, M. Blua (ex. *H. coagulata* eggs on grapefruit) [2 females]. Siskiyou Co., Hwy. 3, 4.7 km SW of Yreka, 41°40'39''N, 122°43'23''W, 1.v.2005, R.A. Rakitov [1 female, 1 male]. OREGON: Jackson Co., 10.5 mi. E of Ashland, 42.2404°N, 122.5263°W, 4.v.2005, R.A. Rakitov [numerous females and males]. MONTANA: Treasure Co., I-94, S side, milepost 54, 46.15687°N, 107.42937°W, 830 m, 28.v.2004, R.A. Rakitov (ex. egg nest of *Cuerna* sp. [*C. alpina* Oman & Beamer or *C. septentrionalis* (Walker)] on *Heterotheca villosa*, dry roadside hill) [1 female].

Comments

These forms belong to the *Gonatocerus incomptus/impar* complex discussed under *G. impar* by Huber (1988). It is unclear at this point whether they, together with *G. incomptus* and *G. impar*, represent just a single, morphologically variable species (especially in the

presence or absence of longitudinal sensilla on F2–F6 of female antennae, as shown in Figs 32–34) or a complex of sibling species. A combined biological, morphological, and molecular study based on freshly collected specimens and live cultures, similar to that on *G. ashmeadi* by Vickerman *et al.* (2004), would be necessary to resolve the identification problems within this complex. My guess would be that they all might belong to the same species, because their males are practically indistinguishable morphologically, and also because the presence or absence of longitudinal sensilla on female funicle segments is known to vary quite significantly in some other species of *Gonatocerus* (e.g., in *G. ater* Förster and *G. uat* S. Triapitsyn). That may be sometimes host- and/or size-related (Triapitsyn *et al.* 2006). Thus, *G. impar* could be just smaller individuals of *G. incomptus* that lack longitudinal sensilla on F4 and F6 of the female antenna.



FIGURES 32–34. *Gonatocerus* spp. 32. Antenna of *G.* sp. near *impar* (female, Temecula, California). 33. Antenna of *G.* sp. near *impar/incomptus* (female, Hopland, California). 34. Antenna of *G.* sp. near *impar* (female, Pinery Canyon, Chiricahua Mountains, Arizona).

Acknowledgments

I thank John T. Huber (CNCI) for valuable discussions and suggestions. David J.W. Morgan (California Department of Food and Agriculture), Roman A. Rakitov (Center for Biodiversity, Illinois Natural History Survey), Walker A. Jones (USDA-ARS) and many others kindly made specimens available for this study. Vladimir V. Berezovskiy (UCRC) point- and slide-mounted the specimens and made scanning electron micrographs. I am thankful to my wife Tatiana for tolerating my frequent absences during the out-of-state biological control exploratory expeditions. This project was sponsored by a grant from the California Department of Food and Agriculture Pierce's Disease Control Program.

References

Blua, M.J., Phillips, P.A. & Redak, R.A. (1999) A new sharpshooter threatens both crops and ornamentals. *California Agriculture*, 53(2), 22–25.

de León, J.H. (2004a) Genetic differentiation among geographic populations of *Gonatocerus ashmeadi*, a primary egg parasitoid of the glassy-winged sharpshooter, pp. 314–317. *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. A. Tariq, S. Oswalt, P. Blincoe, A. Ba, T. Lorick & T. Esser), Copeland Printing, Sacramento, California, 391 p. Available online at http://www.cdfa.ca.gov/phpps/pdcp/ResearchSymposium/gw2004symp.htm.

de León, J.H. (2004b) Molecular distinction between populations of *Gonatocerus morrilli*, egg parasitoids of the glassy-winged sharpshooter, from Texas and California, pp. 318–321. *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. A. Tariq, S. Oswalt, P. Blincoe, A. Ba, T. Lorick & T. Esser), Copeland Printing, Sacramento, California, 391 p. Available online at http://www.cdfa.ca.gov/phpps/pdcp/ResearchSymposium/gw2004symp.htm.

de León, J.H. (2004c) Sequence divergence in two mitochondrial genes (COI and COII) and in the ITS2 RDNA fragment in geographic populations of *Gonatocerus morrilli*, a primary egg parasitoid of the glassy-winged sharpshooter, pp. 322–325. *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. A. Tariq, S. Oswalt, P. Blincoe, A. Ba, T. Lorick & T. Esser), Copeland Printing, Sacramento, California, 391 p. Available online at http://www.cdfa.ca.gov/phpps/pdcp/ResearchSymposium/gw2004symp.htm.

de León, J.H. & Jones, W.A. (2005) Genetic differentiation among geographic populations of *Gonatocerus ashmeadi*, the predominant egg parasitoids of the glassy-winged sharpshooter, *Homalodisca coagulata*. *Journal of Insect Science*, 5(2), 1–9.

de León, J.H., Jones, W.A. & Morgan, D.J.W. (2004) Molecular distinction between populations of *Gonatocerus morrilli*, egg parasitoids of the glassy-winged sharpshooter from Texas and California: Do cryptic species exist? *Journal of Insect Science*, 4(39), 1–7.

de León, J.H., Jones, W.A., Sétamou, M. & Morgan, D.J.W. (2005) Discovery of a cryptic species complex in *Gonatocerus morrilli*, a primary egg parasitoid of the glassy-winged sharpshooter, pp. 302–305. *In*: Proceedings of the 2005 Pierce's Disease Research Symposium, December 5–7, 2005, San Diego Marriott Hotel & Marina, San Diego, California, organized by California Department of Food and Agriculture (compiled by M. A. Tariq, P. Blincoe, M. Mochel, S. Oswalt & T. Esser), Copeland Printing, Sacramento, California, 399 p. Available online at http://www.cdfa.ca.gov/phpps/pdcp/ResearchSymposium/gw2005symp.htm.

de León, J.H. & Morgan, D.J.W. (2005) Small scale post-release evaluation of *Gonatocerus morrilli* program in California against the glassy-winged sharpshooter: Utility of developed molecular diagnostic tools, pp. 306–309. *In*: Proceedings of the 2005 Pierce's Disease Research Symposium, December 5–7, 2005, San Diego Marriott Hotel & Marina, San Diego, California, organized by California Department of Food and Agriculture (compiled by M. A. Tariq, P. Blincoe, M. Mochel, S. Oswalt & T. Esser), Copeland Printing, Sacramento, California, 399 p. Available online at http://www.cdfa.ca.gov/phpps/pdcp/ResearchSymposium/gw2005symp.htm.

Gibson, G.A.P. (1997) Chapter 2. Morphology and terminology, pp. 16–44. *In*: G.A.P. Gibson, J.T. Huber and J.B. Woolley, eds. Annotated keys to the genera of Nearctic Chalcidoidea (Hymenoptera). NRC Research Press, Ottawa, Ontario, Canada, 794 pp.

Girault, A.A. (1911) Descriptions of North American Mymaridae with synonymic and other notes on described genera and species. *Transactions of the American Entomological Society*, 37, 253–324.

Girault, A.A. (1915 [1916]) Notes on North American Mymaridae and Trichogrammatidae (Hym.). *Entomological News*, 27(1), 4–8.

Girault, A.A. (1916) New miscellaneous chalcidoid Hymenoptera with notes on described species. *Annals of the Entomological Society of America*, 9(3), 291–308.

Girault, A.A. (1917) Descriptiones stellarum novarum. Privately printed, 22 pp.

Girault, A.A. (1929) North American Hymenoptera Mymaridae. Privately printed, Brisbane, 29 pp.

Hoddle, M.S. & Stouthamer, R. (2005) Is the glassy-winged sharpshooter parasitoid *Gonatocerus morrilli* one species or a complex of closely related sibling species?, pp. 338–340. *In*: Proceedings of the 2005 Pierce's Disease Research Symposium, December 5–7, 2005, San Diego Marriott Hotel & Marina, San Diego, California, organized by California Department of Food and Agriculture (compiled by M. A. Tariq, P. Blincoe, M. Mochel, S. Oswalt & T. Esser), Copeland Printing, Sacramento, California, 399 p. Available online at http://www.cdfa.ca.gov/phpps/pdcp/ResearchSymposium/gw2005symp.htm.

Hoddle, M.S. & Triapitsyn, S.V. (2003) Searching for and collecting egg parasitoids of the Glassy-winged Sharpshooter in the central and eastern USA, pp. 261–262. *In*: Proceedings of the Pierce's Disease Research Symposium, December 8–11, 2003, Coronado Island Marriott Resort, Coronado, California. Organized by California Department of Food and Agriculture (compiled by M. A. Tariq, S. Oswalt, P. Blincoe, R. Spencer, L. Houser, A. Ba & T. Esser), Copeland Printing, Sacramento, California, 323 p. Available online at http://www.cdfa.ca.gov/phpps/pdcp/ResearchSymposium/gw2003symp.htm.

Hoddle, M.S. & Triapitsyn, S.V. (2004a) Searching for and collecting egg parasitoids of the Glassy-winged Sharpshooter and other *Homalodisca* species in southeastern and southwestern Mexico, pp. 339–341. *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. A. Tariq, S. Oswalt, P. Blincoe, A. Ba, T. Lorick & T. Esser), Copeland Printing, Sacramento, California, 391 p. Available online at http://www.cdfa.ca.gov/phpps/pdcp/ResearchSymposium/gw2004symp.htm.

Hoddle, M.S. & Triapitsyn, S.V. (2004b) Searching for and collecting egg parasitoids of Glassy-winged Sharpshooter in the central and eastern USA, pp. 342–344. *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. A. Tariq, S. Oswalt, P. Blincoe, A. Ba, T. Lorick & T. Esser), Copeland Printing, Sacramento, California, 391 p. Available online at http://www.cdfa.ca.gov/phpps/pdcp/ResearchSymposium/gw2004symp.htm.

Howard, L.O. (1908) A new genus and species of Mymaridae. *Proceedings of the Entomological Society of Washington*, 10, 68–70.

Huber, J.T. (1988) The species groups of *Gonatocerus* Nees in North America with a revision of the *sulphuripes* and *ater* groups (Hymenoptera: Mymaridae). *Memoirs of the Entomological Society of Canada*, 141, 1–109.

Irvin, N.A. & Hoddle, M.S. (2004) Oviposition preference of *Homalodisca coagulata* for two *Citrus limon* cultivars and influence of host plant on parasitism by *Gonatocerus ashmeadi* and *G. triguttatus* (Hymenoptera: Mymaridae). *Florida Entomologist*, 87(4), 504–510.

Irvin, N.A. & Hoddle, M.S. (2005a) Determination of *Homalodisca coagulata* (Hemiptera: Cicadellidae) egg ages suitable for oviposition by *Gonatocerus ashmeadi*, *Gonatocerus triguttatus*, and *Gonatocerus fasciatus* (Hymenoptera: Mymaridae). *Biological Control*, 32, 391–400.

Irvin, N.A. & Hoddle, M.S. (2005b) The competitive ability of three mymarid egg parasitoids

(*Gonatocerus* spp.) for glassy-winged sharpshooter (*Homalodisca coagulata*) eggs. *Biological Control*, 34, 204–214.

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, California. California Department of Food and Agriculture, Copeland Printing, Sacramento, California, 141 pp. Available online at http://www.cdfa.ca.gov/phpps/pdcp/gwSymposium.htm.

Lauzière, I. & Hassell, A. (2006) Exploration for leafhoppers yields a broad array of parasitoid species in Central Texas. Poster, available online at http://piercesdisease.tamu.edu/ (accessed 24 March 2006).

Logarzo, G., Triapitsyn, S.V. & Jones, W.A. (2004 [2003]). New host records for two species of *Gonatocerus* (Hymenoptera: Mymaridae), egg parasitoids of proconiine sharpshooters (Hemiptera: Clypeorrhyncha: Cicadellidae), in Peru. *Florida Entomologist*, 86(4), 486–487.

Morgan, D.J.W., Simmons, G.S., Higgins, L.M. & Shea, K. (2002) Glassy-winged sharpshooter biological control in California: building framework for active adaptive management, pp.140–143. *In*: [Proceedings] 3rd California Conference on Biological Control, held August 15–16, 2002 at the University of California at Davis (M.S. Hoddle, ed.), 162 pp.

Morgan, D.J.W., Triapitsyn, S.V., Redak, R.A., Bezark, L.G. & Hoddle, M.S. (2000). Biological control of the glassy-winged sharpshooter: current status and future potential, pp.167–171. *In*: [Proceedings] California Conference on Biological Control II, held July 11–12, 2000 at the historic Mission Inn, Riverside, California (M.S. Hoddle, ed.), 205 pp.

Phillips, P., Triapitsyn, S. & Hoddle, M.S. (2001) Survey for egg parasitoids of glassy-winged sharpshooter in California, p. 95. *In*: Proceedings of the Pierce's Disease Research Symposium, December 5–7, 2001, Coronado Island Marriott Resort, San Diego, California. California Department of Food and Agriculture, Copeland Printing, Sacramento, California, 141 pp. Available online at http://www.cdfa.ca.gov/phpps/pdcp/gwSymposium.htm.

Pilkington, L.J., Irvin, N., Boyd, E.A., Hoddle, M.S., Triapitsyn, S., Carey, B.G., Jones, W.A. & Morgan, D.J.W. (2004) Biological control of glassy-winged sharpshooter in California, pp. 133–136. *In*: [Proceedings] California Conference on Biological Control IV, held July 13–15, 2004 at UC Berkeley, California (M. S. Hoddle, Ed.), 152 pp.

Pilkington, L.J., Irvin, N.A., Boyd, E.A., Hoddle, M.S., Triapitsyn, S.V., Carey, B.G., Jones, W.A. & Morgan, D.J.W. (2005) Introduced parasitic wasps could control glassy-winged sharpshooter. *California Agriculture*, 59(4), 223–228.

Schauff, M.E. (1981) A review of Nearctic species of *Acmopolynema* Ogloblin (Hymenoptera: Mymaridae). *Proceedings of the Entomological Society of Washington*, 83(3), 444–460.

Tipping, C., Triapitsyn, S.V. & Mizell III, R.F. (2005) A new host record for the egg parasitoid *Paracentrobia americana* (Girault) (Hymenoptera: Trichogrammatidae) of the proconiine sharpshooter *Homalodisca insolita* (Walker) (Hemiptera: Clypeorryncha: Cicadellidae). *Florida Entomologist*, 88(2), 217–218.

Tipping, C., Triapitsyn, S.V. & Mizell III, R.F. (2006) First record of an egg parasitoid for the North American proconiine sharpshooter *Paraulacizes irrorata* (Fabricius) (Hemiptera: Cicadellidae), with notes on rearing techniques. Florida Entomologist, in press.

Triapitsyn, S.V. (1998) *Anagrus* (Hymenoptera: Mymaridae) egg parasitoids of *Erythroneura* spp. and other leafhoppers (Homoptera: Cicadellidae) in North American vineyards and orchards: a taxonomic review. *Transactions of the American Entomological Society*, 124(2), 77–112.

Triapitsyn, S.V. (2002a) Species-level taxonomy of Mymaridae (Hymenoptera): current status and implications for biological control of leafhoppers of economic importance, pp. 89–94. *In*: Melika, G. & Thuróczy, C. (Ed.), *Parasitic wasps: Evolution, systematics, biodiversity and biological control. International Symposium: "Parasitic Hymenoptera: taxonomy and biological control" (14–17 May 2001, Köszeg, Hungary)*. Agroinform Kiadó és Nyomda Kft., Budapest,

480 pp.
Triapitsyn, S.V. (2002b) Taxonomy and host associations of *Gonatocerus* spp. (Mymaridae) — egg parasitoids of proconiine leafhoppers. *Egg Parasitoid News*, 14, 10.
Triapitsyn, S. V. (2002c). Descriptive notes on a new and other little known species of *Anagrus* Haliday, 1833 (Hymenoptera: Mymaridae) from the New World tropics and subtropics. *ENTOMOTROPICA*, 17(3), 213–223.
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(2), 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. A. Tariq, S. Oswalt, P. Blincoe, A. Ba, T. Lorick & T. Esser), Copeland Printing, Sacramento, California, 391 p. Available online at http://www.cdfa.ca.gov/phpps/pdcp/ResearchSymposium/gw2004symp.htm.
Triapitsyn, S.V., Bezark, L.G. & Morgan, D.J.W. (2002) Redescription of *Gonatocerus atriclavus* Girault (Hymenoptera: Mymaridae), with notes on other egg parasitoids of sharpshooters (Homoptera: Cicadellidae: Proconiini) in northeastern Mexico. *Pan-Pacific Entomologist*, 78(1), 34–42.
Triapitsyn, S.V. & Hoddle, M.S. (2001) Search for and collect egg parasitoids of glassy-winged sharpshooter in southeastern USA and northeastern Mexico, pp. 133–134. *In*: Proceedings of the Pierce's Disease Research Symposium, December 5–7, 2001, Coronado Island Marriott Resort, San Diego, California. California Department of Food and Agriculture, Copeland Printing, Sacramento, California, 141 pp. Available online at http://www.cdfa.ca.gov/phpps/pdcp/gwSymposium.htm.
Triapitsyn, S.V. & Hoddle, M.S. (2002) Search for and collect egg parasitoids of glassy-winged sharpshooter in southeastern USA and northeastern Mexico, pp. 94–95. *In*: Proceedings of the Pierce's Disease Research Symposium, December 15–18, 2002, Coronado Island Marriott Resort, San Diego, California. California Department of Food and Agriculture, Digital Logistix, Sacramento, California, 177 pp. Available online at http://www.cdfa.ca.gov/phpps/pdcp/gw2002symp.htm.
Triapitsyn, S.V., Hoddle, M.S. & Morgan, D.J.W. (2002) A new distribution and host record for *Gonatocerus triguttatus* in Florida, with notes on *Acmopolynema sema* (Hymenoptera: Mymaridae). *Florida Entomologist*, 85(4), 654–655.
Triapitsyn, S.V., Mizell, III, R.F., Bossart, J.L. & Carlton, C.E. (1998) Egg parasitoids of *Homalodisca coagulata* (Homoptera: Cicadellidae). *Florida Entomologist*, 81(2), 241–243.
Triapitsyn, S.V., Morgan, D.J.W., Hoddle, M.S. & Berezovskiy, V.V. (2003) Observations on the biology of *Gonatocerus fasciatus* Girault (Hymenoptera: Mymaridae), egg parasitoid of *Homalodisca coagulata* (Say) and *Oncometopia orbona* (Fabricius) (Hemiptera: Clypeorrhyncha: Cicadellidae). *Pan-Pacific Entomologist*, 79(1), 75–76.
Triapitsyn, S.V. & Phillips, P.A. (1996) Egg parasitoid of glassy-winged sharpshooter. *Citrograph*, 81(9), 10.
Triapitsyn, S.V. & Phillips, P.A. (2000) First host record of *Gonatocerus triguttatus* (Hymenoptera: Mymaridae) from eggs of *Homalodisca coagulata* (Homoptera: Cicadellidae), with notes on the distribution of the host. *Florida Entomologist*, 83(2), 200–203.
Triapitsyn, S.V. & Rakitov, R.A. (2005) Egg parasitoids (Hymenoptera: Mymaridae and Tri-

chogrammatidae) of *Cuerna* sharpshooters (Hemiptera: Cicadellidae) in the USA, Posters P11–12. *In*: Poster Abstracts P1–P43, 12th International Auchenorrhyncha Congress and 6th International Workshop on Leafhoppers and Planthoppers of Economic Significance, University of California, Berkeley, 8–12 August 2005. Available online at http://nature.berkeley.edu/hoppercongress/.

Triapitsyn, S.V., Vickerman, D.B., Heraty, J.M. & Logarzo, G.A. (2006) A new species of *Gonatocerus* (Hymenoptera: Mymaridae) parasitic on proconiine sharpshooters (Hemiptera: Cicadellidae) in the New World. *Zootaxa*, 1158: 55–67.

Turner, W.F. & Pollard, H.N. (1959) Life histories and behavior of five insect vectors of phony peach disease. *Technical Bulletin, United States Department of Agriculture*, 1188, 1–28.

Velema, H.-P., Hemerik, L., Hoddle, M.S. & Luck, R.F. (2005) Brochosome influence on parasitisation efficiency of *Homalodisca coagulata* (Say) (Hemiptera: Cicadellidae) egg masses by *Gonatocerus ashmeadi* Girault (Hymenoptera: Mymaridae). *Ecological Entomology*, 30, 485–496.

Vickerman, D.B., Hoddle, M.S., Triapitsyn, S. & Stouthamer, R. (2004) Species identity of geographically distinct populations of the glassy-winged sharpshooter parasitoid *Gonatocerus ashmeadi*: morphology, DNA sequences, and reproductive compatibility. *Biological Control*, 31(3), 338–345.

