BioOne COMPLETE

ERETMOCERUS RUI N. SP. (HYMENOPTERA: CHALCIDOIDEA: APHELINIDAE), AN EXOTIC NATURAL ENEMY OF BEMISIA (TABACI GROUP) (HOMOPTERA: ALEYRODIDAE) RELEASED IN FLORIDA

Authors: Zolnerowich, Gregory, and Rose, Mike

Source: Florida Entomologist, 87(3) : 283-287

Published By: Florida Entomological Society

URL: https://doi.org/10.1653/0015-4040(2004)087[0283:ERNSHC]2.0.CO;2

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

ERETMOCERUS RUI N. SP. (HYMENOPTERA: CHALCIDOIDEA: APHELINIDAE), AN EXOTIC NATURAL ENEMY OF *BEMISIA* (*TABACI* GROUP) (HOMOPTERA: ALEYRODIDAE) RELEASED IN FLORIDA

GREGORY ZOLNEROWICH[1] AND MIKE ROSE[2]
[1]Department of Entomology, 123 Waters Hall, Kansas State University, Manhattan, KS 66506-4004

[2]Department of Entomology, Leon Johnson Hall, Montana State University, Bozeman, MT 59717

ABSTRACT

Eretmocerus rui n. sp. imported from Hong Kong and released against *Bemisia* (*tabaci* group) in Florida is described. This thelytokous species was recovered after release, but it is unknown if it is established in Florida.

Key Words: biological control, *Eretmocerus*, Aphelinidae, *Bemisia*, Aleyrodidae.

RESUMEN

Se describe a *Eretmocerus rui* n. sp., especie introducida de Hong Kong y liberada en la Florida para el control de *Bemisia*. Esta especie telitóquica fue recapturada después de su liberación, pero se desconoce si está establecido en la Florida.

Translation provided by the authors.

Numerous populations of exotic parasitic Hymenoptera, primarily in the genera *Encarsia* and *Eretmocerus* (Hymenoptera: Chalcidoidea: Aphelinidae), were introduced during population explosions of *Bemisia* (*tabaci* group) (Homoptera: Aleyrodidae: Aleyrodinae) in the southern United States during the 1980s and 1990s. Introductions of *Eretmocerus* Haldeman (Haldeman 1850) were emphasized, as this genus is composed of primary parasites that attack Aleyrodidae (Rose et al. 1996). Zolnerowich & Rose (1998) characterized and described five of the introduced *Eretmocerus* species that were released in the U.S., while Rose & Zolnerowich (1997a, b) characterized and described species of *Eretmocerus* indigenous to, or naturally occurring in, the United States.

Most of the *Eretmocerus* populations released in the United States were introduced through the USDA-APHIS quarantine laboratory in Mission, Texas (Goolsby 1996; Goolsby et al. 1998). However, biological control researchers in Florida also introduced natural enemies of *Bemisia* (*tabaci* group) through the quarantine laboratory in Gainesville. One of these is an undescribed species of *Eretmocerus* that F. D. Bennett (Nguyen & Bennett 1995) discovered attacking a *Bemisia* species in Hong Kong. This thelytokous species (McAuslane & Nguyen 1996) was consigned from quarantine, reared in culture, and released in Florida. We describe that species here to aid in determination of the *Eretmocerus* species complex attacking *Bemisia* (*tabaci* group) in Florida, efficacy evaluations of the same, and discovery of possible utilization of non-target whitefly hosts by exotic *Eretmocerus* species released in Florida.

MATERIALS AND METHODS

Terminology and measurements follow those used by Rose & Zolnerowich (1997a). Measurements of 61 morphological features were taken from 10 females in the type series that were mounted in balsam or Hoyer's. Measurements were made with a customized data acquisition program written for an Apple Macintosh computer, and linked to a digitizing tablet and Zeiss compound microscope equipped with Nomarski contrast enhancement. In the description, stated lengths are means.

Eretmocerus rui Zolnerowich and Rose, new species (Figs. 1-3, 5)

Diagnosis

Females of *Eretmocerus rui* can be identified by the presence of 3 setae on each parapsis, the presence of 6 setae on the mesoscutum, a very elongate, cylindrical antennal club that is 6.88-8.06× as long as wide (Fig. 1), a long ovipositor approximately the same length as the club, and a long, narrow forewing about 2.7× as long as wide (Fig. 2).

Of the *Eretmocerus* species known from the U.S. (Rose & Zolnerowich 1997a, b; Zolnerowich & Rose 1998) only *E. furuhashii* Rose and Zolnero-

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

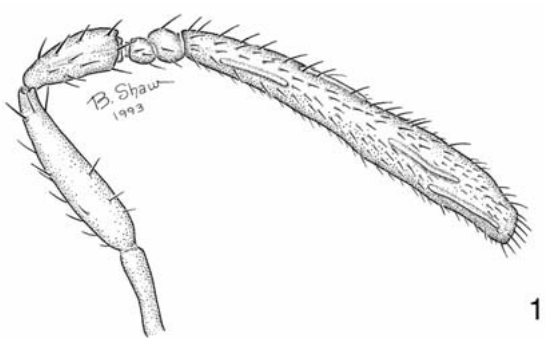


Fig. 1. *Eretmocerus rui*, female antenna.

wich bears 3 setae on the parapsis. However, females of *E. furuhashii* bear 4 setae on the mesoscutum and have much shorter (about 4.3-5× as long as wide) antennal clubs that are clavate with slightly deflected (rostrate) apices.

All other nominal exotic *Eretmocerus* species introduced and released against *Bemisia* (*tabaci* group) in the United States bear 4 setae on the mesoscutum and 2 setae on the parapsis. Those species are *E. emiratus* Zolnerowich and Rose, *E. hayati* Zolnerowich and Rose, *E. melanoscutus* Zolnerowich and Rose, and *E. mundus* Mercet.

Female

Length of specimens in Hoyer's 0.575-0.75 mm (n = 10). Holotype female 0.75 mm. Body light yellow. Head amber. Antennae pale amber. Legs pale yellow. Wings hyaline.

Face and occiput with transverse substrigulate sculpture, interscrobal area vertically substrigulate. Antenna (Figs. 1 and 3) with radicle 3.7× as long as wide; scape 5.08× times as long as wide, 2.31× as long as radicle, 2.01× length of pedicel, 0.55× length of club; pedicel 2.6× as long as wide, 1.12× as long as radicle, 0.50× length of scape. Funicle I triangular, dorsum 0.21× length of venter. Funicle II subquadrate, somewhat compressed, dorsum 0.73× length of venter. Club cylindrical, narrowed at apex, 7.4× as long as greatest width, 14.3× as long as narrowest width, 1.83× length of scape, 3.69× length of pedicel.

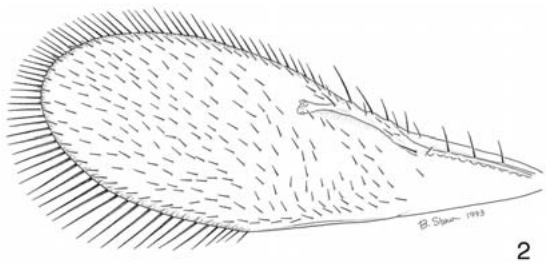


Fig. 2. *Eretmocerus rui*, female forewing.

Mesoscutum trapezoidal with 6 setae, anterior ¼ with cellular reticulate sculpture, remainder with faint elongate reticulations. Parapsis with 3 setae, anterior margins with elongate cellular reticulations; axilla with 1 seta, faintly reticulate. Scutellum with 4 setae, anterior pair shorter, 2 placoid sensilla lateral and closer to the posterior pair of setae, and with faint, elongate reticulations. Metanotum slightly more narrow in longitudinum than propodeum; propodeum with faint transverse reticulations, central lobe broad and smooth, reaching ½ distance into gastral tergite II. Endophragma extending into gastral tergite II.

Forewing (Fig. 2) 3.09× as long as wide between points on wing margin immediately above apex of stigmal vein and at distal apex of frenal fold; 2.73× as long as maximum width of disc (the area distad of an imaginary line extending from the distal apex of the frenal fold to the wing margin immediately above the distal apex of the stigmal vein). Longest anterior alary fringe 0.15× width of disc, longest posterior alary fringe 0.32× width of disc. Base of wing with 1 seta, distal portion of costal cell with 3 setae. Marginal vein with 3 longer setae, 8-16 setae between marginal vein and partial linea calva; setae often interspersed above tubercles and extending about ⅔ distance to proximal advent of frenal fold. Partial linea calva closed posteriorly by setae, including those just described, with 13-14 tubercles on ventral surface near posterior end; a group of 19-29 setae, depending on size of specimen, including those closing the distal margin of the linea calva, generally point toward the anterior margin of the wing; 102-130 setae, depending on size of specimen, in disc (excluding a row of setae around the interior margin) generally point toward distal apex of wing. Submarginal vein 2.78× as long as marginal vein and 3.62× length of stigmal vein. Marginal vein 1.31× length of stigmal vein.

Hind wing 7.31× as long as wide with 0-2 setae in disc.

Gastral tergite I with reticulations on lateral anterior margins, remaining tergites appear smooth; gastral tergites I-IV with paired setae as follows: 1, 1, 2, 2, 2, 2. Syntergum with 4 setae.

Ovipositor prominent, exserted, nearly equal (1.01×) to length of club, 1.85× length of scape, 1.13× length of midtibia.

Male

There is only one male known, and this specimen is uniquely different from nominal exotic biparental *Eretmocerus* species in the United States in its overall paucity of pigment (see Zolnerowich & Rose 1998).

Specimen mounted in Hoyer's with head amber; antennae pale fuscous overall, pedicel and multiporous plate sensilla slightly darker. Pronotum pale fuscous, propodeum and anterolateral

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

portion of gastral tergite I pale fuscous, remainder of dorsal habitus pale. Forewing with submarginal vein fuscous, remaining veins and proximal ⅓ of costal cell pale fuscous, becoming slightly darker in a narrow band proximal to frenal fold; frenal fold fuscous; all setae in forewing dark; pale fuscous band around forewing margin. Hind wing venation fuscous. Coxa and trochanter pale, with femur, tibia, and tarsi pale brown on all legs. Aedeagus pale fuscous.

Host

Bemisia (*tabaci* group) on *Hibiscus* sp. in laboratory culture in Gainesville, FL.

Etymology

This species is named for our colleague, Ru Nguyen, Research Entomologist for the Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Gainesville. Nguyen undertook the rearing and release program for *E. rui* in Florida and conducted biological studies on this species. He is currently undertaking field recovery sampling for *Eretmocerus* spp. attacking *Bemisia* (*tabaci* group) and other whitefly genera in Florida. He was instrumental in successful biological control programs directed against the citrus whitefly, *Dialeurodes citri* (Ashmead) (Aleyrodidae: Aleyrodinae) in Florida, and the citrus blackfly, *Aleurocanthus woglumi* (Ashby) (Aleyrodidae: Aleyrodinae) in Florida and elsewhere. Nguyen also facilitated the successful introduction of *Entedononecremnus krauteri* Zolnerowich and Rose (Hymenoptera: Chalcidoidea: Eulophidae) against the invading giant whitefly, *Aleurodicus dugesii* Cockerell (Aleyrodidae: Aleurodicinae) in Florida.

Discussion

Eretmocerus rui was originally reared from *Bemisia* sp. collected on *Emilia* sp. (Asteraceae) in 1992 by F. D. Bennett during searches for natural enemies of *Bemisia* (*tabaci* group) in Hong Kong. Nguyen & Bennett (1995) discussed the importation, release, and recovery of natural enemies of *Bemisia* (*tabaci* group) in Florida. *Eretmocerus rui* was released in 10 Florida counties, and specimens were recovered a few weeks after release. However, it is not known if *E. rui* is permanently established in Florida. Sampling of *Bemisia* (*tabaci* group) and other whitefly genera in Florida to recover *Eretmocerus* species, and to elucidate species and species complexes associated with whitefly species is underway.

McAuslane & Nguyen (1996) discussed the reproductive biology and behavior of *E. rui* (their *Eretmocerus* sp.), and noted the significance of thelytoky to applied biological control. Although we describe the single male specimen of *E. rui*, males are not necessary for reproduction.

De Barro et al. (2000) compared sequences of the D2 expansion segment of the 28S ribosomal RNA gene between an unnamed species of *Eretmocerus* from Hong Kong and *Eretmocerus queenslandensis* Naumann and Schmidt (in De Barro et al. 2000), which was described from *Bemisia tabaci* in Queensland, Australia. Out of 590 positions, they found the sequence from the Hong Kong *Eretmocerus* differed from *E. queenslandensis* by a single mutation at position 206, and suggested the two were conspecific. There is a possibility that the species of *Eretmocerus* from Hong Kong they used is the same as *E. rui*, but unfortunately, preserved specimens or voucher material from their analysis are not available.

However, there are a number of striking morphological differences between *E. rui* and *E. queenslandensis* which lead us to believe that if the *Eretmocerus* from Hong Kong used by De Barro et al. was indeed *E. rui*, the two are not conspecific. The most obvious difference lies in the amount of pigmentation, with unmounted females of *E. queenslandensis* being fuscous, with this dark pigmentation also very evident on cleared, slide-mounted specimens (Fig. 6). Females of *E. rui* have the head and antennae amber, the legs and body are light yellow, and there are no fuscous markings (Fig. 5). Additional morphological differences include: the club of *E. queenslandensis* is 4.8-6.4× as long as wide (Fig. 4), the club of *E. rui* is 6.88-8.06× as long as wide (Figs. 1 and 3); the parapsis of *E. queenslandensis* has 2-3 setae, that of *E. rui* has 3 setae; the placoid sensilla on the scutellum are very close to the posterior pair of scutellar setae in *E. queenslandensis* (Fig. 6), while in *E. rui* they are usually more anterior and lateral to the posterior setae (Fig. 5). There are other morphological differences, but the ones given here are the most obvious to the untrained eye.

Material Examined

Holotype female in balsam with 3 other females on a single slide with a single right-hand label with the following data: Hong Kong, 14 VII 1992, FD Bennett 1312, Bemisia tabaci, lab culture F1, Eretmocerus rui, Zol.& Rose 2003, HOLOTYPE (in red ink, author's note). The left side of the slide is frosted glass upon which is written: 1312, Eret., 4 V. Written in black ink on the glass below the coverslip is: balsam. The coverslip is ringed with red Glypt. The holotype is the bottom left specimen. The specimens are mounted with the heads facing the bottom of the slide.

The paratype series consists of three females mounted in balsam on a single slide with the holotype, 13 females and one male individually mounted on slides in Hoyer's with two labels each that bear the following data: Left label: Name:

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

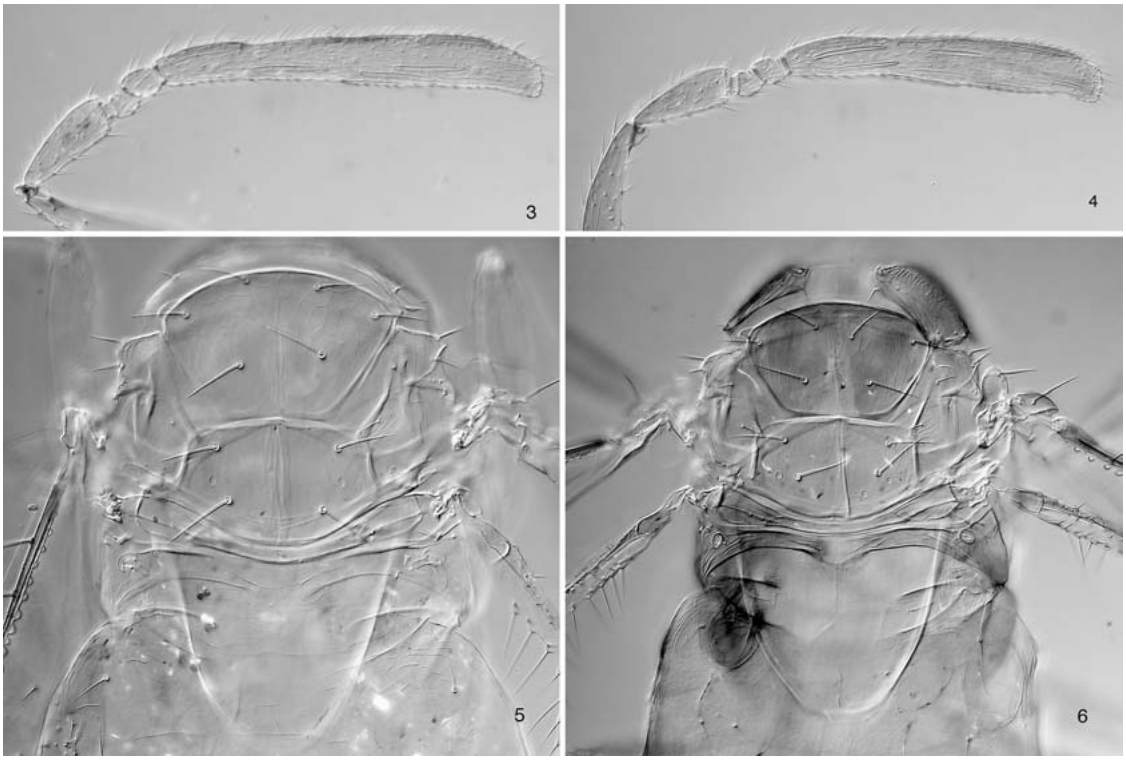


Fig. 3. *Eretmocerus rui*, female antenna.
Fig. 4. *Eretmocerus queenslandensis*, female antenna.
Fig. 5. *Eretmocerus rui*, female thorax and metasoma.
Fig. 6. *Eretmocerus queenslandensis*, female thorax and metasoma.

Eretmocerus rui, paratype (in red ink), Det. Rose and Zol. 2002, Coll. R. Nguyen, No., Corr. R. Nguyen II-18-93. Right label: Loc. (Hong Kong), Univ. Fl. Gainesville, Date: II-18-1993, Host: Bemisia (culture), Det., On: Hibiscus.

The holotype female and three paratype females on a single slide and single male paratype specimen will be deposited in the USDA-ARS Systematic Entomology Laboratory at the U.S. National Museum, Washington, D.C. The remaining type slides and additional specimens will remain with the authors while ongoing systematic studies on *Eretmocerus* species recovered from whitefly in the U.S. are in progress.

Additional Material Examined

USA: Florida: Gainesville DPI, XII.2.1994, lab culture on Hibiscus, R. Nguyen (25 females); USA: Florida: Gainesville, II.15.1995, Bemisia lab culture, cage 2, R. Nguyen (10 females).

Acknowledgments

This study was supported by the USDA-CSREES-National Research Initiative. The authors express their appreciation to Ru Nguyen for providing specimens of *Eretmocerus* used in this study. The authors express their gratitude to Ben Shaw, Lucid Art, for the drawings, and to Jack McShea, Cinnabar Macintosh, Livingston, Montana, for developing the digitizing software (Rosebud II) used for data acquisition and analysis. This article is Contribution No. 03-362-J from the Kansas Agricultural Experiment Station (KAES) and was supported in part by KAES Hatch Project No. 583, Insect Systematics.

References Cited

De Barro, P. J, F. Driver, I. D. Naumann, G. M. Clarke, S. Schmidt, and J. Curran. 2000. Descriptions of three species of *Eretmocerus* Haldeman (Hymenoptera: Aphelinidae) parasitising *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae) and *Trialeurodes vaporariorum* (Westwood) (Hemiptera: Aleyrodidae) in Australia based on morphological and molecular data. Australian J. Entomol. 39: 259-269.

Goolsby, J. A. 1996. Biological control of sweetpotato whitefly. pp. 37-57 *In* L. E. Wendel 1996, Annual Report of USDA-APHIS, Mission Texas Plant Protection Center (Technical Report).

Goolsby, J. A., M. A. Ciomperlik, B. C. Legaspi, Jr., J. C. Legaspi, and L. E. Wendel. 1998. Laboratory and field evaluation of parasitoids of exotic parasitoids of *Bemisia tabaci* (Gennadius) (Biotype "B") (Homoptera: Aleyrodidae) in the Lower Rio Grande Valley of Texas. Biol. Control 12: 127-135.

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

HALDEMAN, S. S. 1850. On four new species of Hemiptera of the genera *Ploiaria*, *Chermes*, *Aleurodes*, and two new Hymenoptera, parasitic on the last named genus. Amer. J. Sci. 9: 108-111.

MCAUSLANE, H. J., AND R. NGUYEN. 1996. Reproductive biology and behavior of a thelytokous species of *Eretmocerus* (Hymenoptera; Aphelinidae) parasitizing *Bemisia argentifolli* (Homoptera: Aleyrodidae). Ann. Entomol. Soc. Amer. 89: 686-693.

NGUYEN, R., AND F. D. BENNETT. 1995. Importation and field release of parasites against silverleaf whitefly, *Bemisia argentifolli* (Bellows and Perring) in Florida from 1990-1994. Proc. Florida State Hort. Soc. 108: 43-47.

ROSE, M., AND D. ROSEN. 1991-92. *Eretmocerus debachi* n. sp. (Hymenoptera: Aphelinidae), an effective parasite of *Parabemisia myricae* (Homoptera: Aleyrodidae). Israel Jour. Entomol. 25/26: 199-207.

ROSE, M., AND G. ZOLNEROWICH. 1997a. *Eretmocerus* Haldeman (Hymenoptera: Aphelinidae) in the United States with descriptions of new species attacking *Bemisia* (*tabaci* complex) (Homoptera: Aleyrodidae). Proc. Entomol. Soc. Washington 99: 1-27.

ROSE, M., AND G. ZOLNEROWICH. 1997b. The Genus *Eretmocerus* (Hymenoptera: Aphelinidae): Parasites of Whitefly (Homoptera: Aleyrodidae). Special Publication, California Department of Food and Agriculture. 8 pp.

ROSE, M., G. ZOLNEROWICH, AND M. S. HUNTER. 1996. Systematics, *Eretmocerus* and Biological Control, pp. 477-498 *In* D. Gerling and R. T. Mayer. *Bemisia* 1995: Taxonomy, Biology, Damage, Control and Management. Intercept Ltd. 702 pp.

ZOLNEROWICH, G., AND M. ROSE. 1998. *Eretmocerus* Haldeman (Hymenoptera: Aphelinidae) imported and released in the United States for control of *Bemisia* (*tabaci* complex) (Homoptera: Aleyrodidae). Proc. Entomol. Soc. Washington 100: 310-323.

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use