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Source: Florida Entomologist, 103(2) : 293-295

Published By: Florida Entomological Society

URL: <https://doi.org/10.1653/024.103.0222>

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First record of *Ooencyrtus nezarae* (Hymenoptera: Encyrtidae), a parasitoid of *Megacopta cribraria* (Hemiptera: Plataspidae) in Florida

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The kudzu bug *Megacopta cribraria* (F.) (Hemiptera: Plataspidae) is a pest of concern for farmers in many legume-producing states (Gardner et al. 2013a). Since it was first detected in Georgia in 2009, *M. cribraria* has rapidly expanded its range across the Southeast (Eger et al. 2010; Gardner et al. 2013a). With a high reproductive potential, *M. cribraria* is able to complete up to 3 generations per yr in Asia (Tayutivutikul & Yano 1990), and 2 generations per yr in the southeastern USA (Zhang et al. 2012). *Megacopta cribraria* is known for its potential to reduce the biomass of kudzu (*Pueraria montana* var. *lobata* (Willd.) Sanjappa & Pradeep; Fabaceae) up to 33% (Zhang et al. 2012), but it also attacks soybeans (*Glycine max* [L.] Merr.; Fabaceae) and other legumes (Del Pozzo-Valdivia & Reisig 2013; Medal et al. 2013).

Megacopta cribraria is a phloem feeder, and feeding by nymphs and adults on leaves, petioles, and stems weakens plants and reduces yield (Seiter et al. 2013). In the southeastern USA, *M. cribraria* was reported to reduce crop yields of soybeans in untreated fields upwards of 47%, although the average yield loss was 18% (Ruberson et al. 2013); in contrast, losses from controlled experimental plots approached 60% (Seiter et al. 2013).

In 2013, native natural enemies provided little control of kudzu bugs, but other strategies such as introduction of parasitoid wasps (Ruberson et al. 2013) and the fungus *Beauveria bassiana* (Bals.-Criv.) Vuill. (Cordycipitaceae) showed promise as natural controls (Seiter et al. 2014). Two important families of hymenopteran egg parasitoids are found on *M. cribraria* within its native range. Females of both *Ooencyrtus nezarae* Ishii (Hymenoptera: Encyrtidae) and *Paratelenomus saccharalis* (Dodd) (Hymenoptera: Platygasteridae) (Fig. 1) attack eggs of *M. cribraria* in Asia (Hirose et al. 1996; Wu et al. 2006; Hoshino et al. 2017).

In 2013, 4 yr after the discovery of the kudzu bug in Georgia, *P. saccharalis* was found parasitizing kudzu bugs in Georgia and Alabama (Gardner et al. 2013b); in 2014, it was found in Florida (Medal et al. 2015). *Paratelenomus saccharalis* is host specific and attacks only members of the Plataspidae. In contrast, females of *O. nezarae* are generalists known to parasitize eggs of 13 hemipteran species in the families Plataspidae,

Pentatomidae, Coreidae and Alydidae (Zhang et al. 2005). Species of *Ooencyrtus* are distributed widely in Korea, Japan, and China (Hoshino et al. 2017), and have been reported recently in North America (Dhammi et al. 2016; Ademokoya et al. 2018) and India (Gupta & Sharanabasappa 2016). *Ooencyrtus* and *Paratelenomus* are known to co-exist (Hoshino et al. 2017), and a combined parasitism rate in China for a platygasterid and a species of *Ooencyrtus* (mainly *O. nezarae*) on *M. cribraria* in soybeans from May to Jun 2002 reached 95% (Zhang et al. 2003).

In our study of *P. saccharalis* on *M. cribraria* in Florida, we collected eggs of the kudzu bug from selected sites and host plants (kudzu, soybean, and catnip). We found unusual parasitic damage on *M. cribraria* egg masses, and the exit holes were at the base of the eggs (Fig. 2) instead of at the cap as in *P. saccharalis* (Fig. 2). We collected additional egg masses and placed them in plastic containers with ventilated covers to be transported to the laboratory for rearing to adult stage.

Two parasitoid species emerged from the egg masses: one was *P. saccharalis*, and the other was first identified as *Ooencyrtus* sp. by E. Talamas (Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Gainesville, Florida, USA), and we further identified it to be *O. nezarae*, based on details given in Ademokoya et al. (2018) and identical exit holes (Fig. 2). The level of parasitism was 24% for *O. nezarae* and 37% for *P. saccharalis* on 300 eggs tested. Both parasitoids did not emerge on the same day. Seventy percent (70%) of the time where both parasitoids parasitized a single egg mass, *O. nezarae* was the first to emerge. *Ooencyrtus nezarae* is a facultative gregarious egg parasitoid (Ademokoya et al. 2018).

We wish to express our gratitude to USDA-APHIS and USDA-ARS for funding and overall support, and the Center for Biological Control, College of Agriculture and Food Sciences, Florida A&M University. We thank E. Talamas, Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Gainesville, for assistance in parasitoid identification. Special thanks also to Janice Peters for her assistance throughout this project, and Rodrigue Pierre, Walker Jones, Danielle Wolaver, Neil Miller, and Andrew Merwin for technical assistance with this study.

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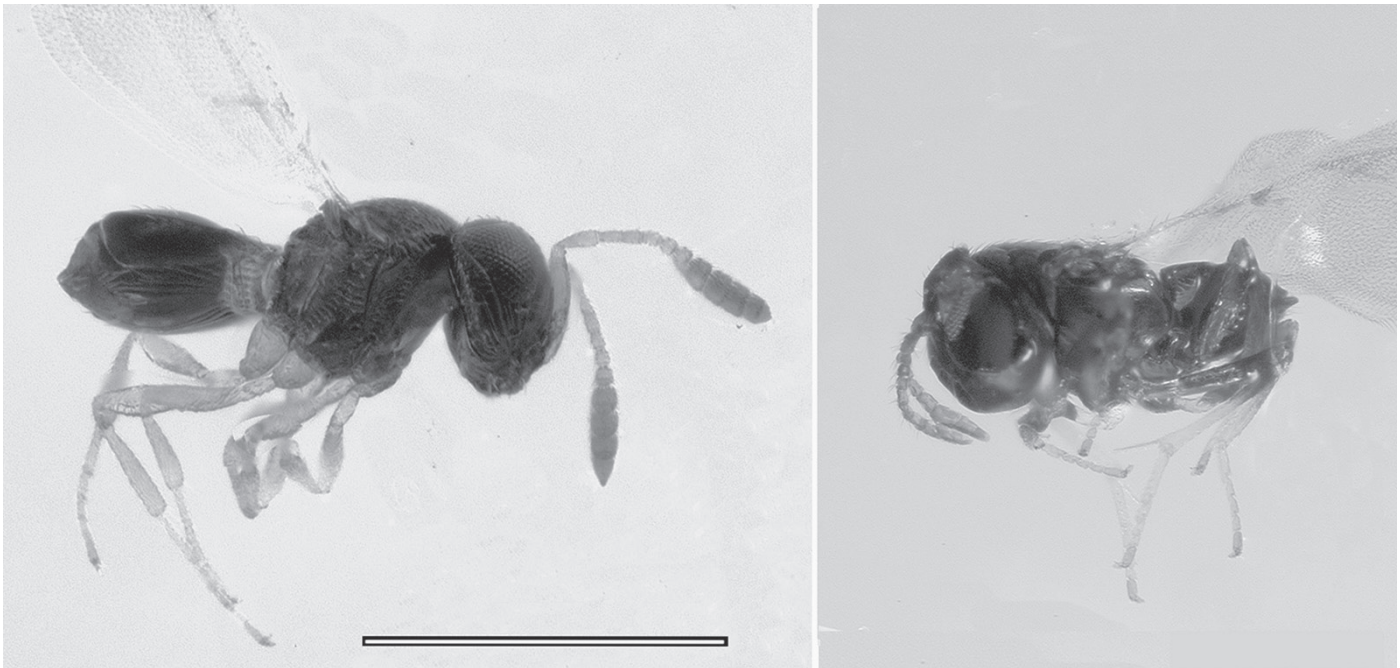


Fig. 1. Female parasitoids of kudzu bug eggs found in north Florida: left, *Paratelenomus saccharalis*; right, *Ooencyrtus nezarae*. Scale bar = 0.5 mm.

Summary

During our study on egg parasitoids of the kudzu bug in Florida, we collected egg masses of *Megacopta cribraria* on kudzu and catnip for laboratory rearing. We found a new egg parasitoid, *Ooencyrtus nezarae* on *M. cribraria*, which represents the first Florida record of this parasitoid species. The wasp is widely distributed in Asia, and it will strengthen biological control of the kudzu bug in Florida. Future studies will assess comparative parasitism levels of *Paratelenomus saccharalis* and *O. nezarae*, as well as the dynamics of populations of these biological control agents.

Key Words: kudzu bug; egg parasitoid

Resumen

Durante nuestro estudio sobre los parasitoides de huevos del chinche del kudzu en la Florida, recolectamos masas de huevos de *Megacopta cribraria* sobre el kudzu y la hierba gatera para la cría en

laboratorio. Encontramos un nuevo parasitoide de huevo, *Ooencyrtus nezarae* en *M. cribraria*, que representa el primer registro de esta especie parasitoide en la Florida. La avispa está ampliamente distribuida en Asia y fortalecerá el control biológico del chinche del kudzu en la Florida. Los estudios futuros evaluarán los niveles de parasitismo comparativo de *Paratelenomus saccharalis* y *O. nezarae*, así como la dinámica de las poblaciones de estos agentes de control biológico.

Palabras Claves: chinche del kudzu; parasitoide de huevo

References Cited

- Ademokoya B, Balasu R, Ray C, Mottern J, Fadamiro H. 2018. The first record of *Ooencyrtus nezarae* (Hymenoptera: Encyrtidae) on kudzu bug (Hemiptera: Plataspidae) in North America. *Journal of Insect Science* 18: 1–7.
- Del Pozo-Valdivia AI, Reisig DD. 2013. First-generation *Megacopta cribraria* (Hemiptera: Plataspidae) can develop on soybeans. *Journal of Economic Entomology* 106: 533–535.
- Dhammi A, van Krestchmar JB, Ponnusamy L, Bachelier JS, Reisig DD, Herbert A, Del Pozo-Valdivia AI, Roe RM. 2016. Biology, pest status, microbiome and

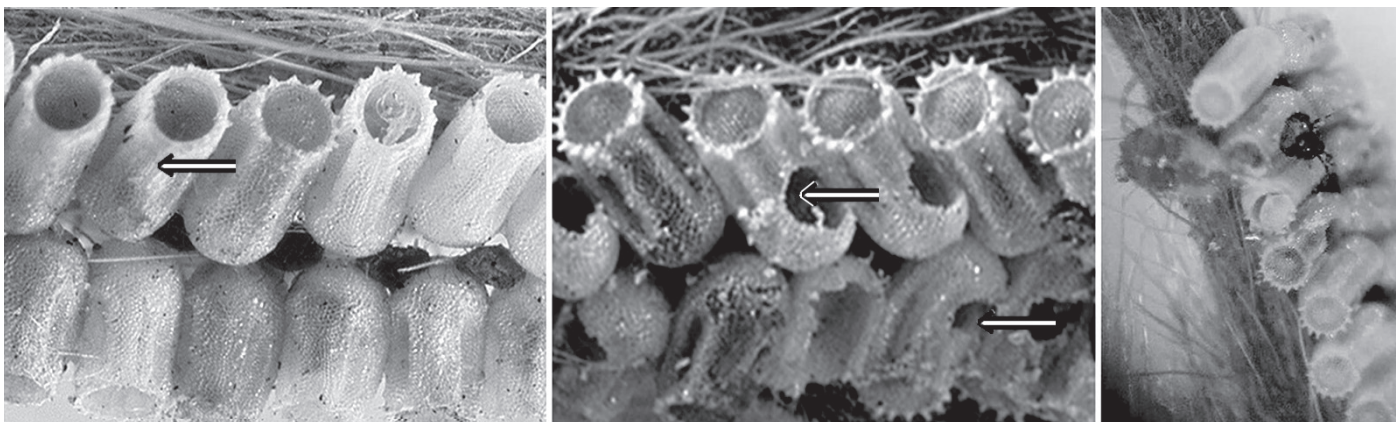


Fig. 2. Exit holes of parasitoids on eggs of kudzu bugs: left, *Paratelenomus saccharalis*; center, *Ooencyrtus nezarae*; right, juvenile kudzu bug and emerging *O. nezarae*.

- control of kudzu bug (Hemiptera: Heteroptera: Plataspidae): a new invasive pest in the US. *International Journal of Molecular Sciences* 17: 1570. doi:10.3390/ijms17091570
- Eger Jr JE, Ames LM, Suiter DR, Jenkins TM, Rider DA, Halbert SE. 2010. Occurrence of the Old World bug *Megacopta cribraria* (Fabricius) (Heteroptera: Plataspidae) in Georgia: a serious home invader and potential legume pest. *Insecta Mundi* 121: 1–11.
- Gardner WA, Blount LJ, Golec JR, Jones WA, Hu XP, Talamas EJ, Evans RM, Dong X, Ray CH, Buntin GD, Gerardo NM, Couret J. 2013b. Discovery of *Parateleonomus saccharalis* (Dodd) (Hymenoptera: Platygasteridae), an egg parasitoid of *Megacopta cribraria* F. (Hemiptera: Plataspidae) in its extended North American range. *Journal of Entomological Science* 48: 355–359.
- Gardner WA, Peeler HB, LaForest J, Roberts PM, Sparks Jr AN, Greene JK, Reising DD, Suiter DR, Bacheiler JS, Kidd K, Ray CH, Hu XP, Kemerait RC, Scocco EA, Eger Jr JE, Ruberson JR, Sikora EJ, Herbert Jr DA, Campana C, Halbert S, Stewart SD, Buntin GD, Toews MD, Barger CT. 2013a. Confirmed distribution and occurrence of *Megacopta cribraria* (F.) (Hemiptera: Heteroptera: Plataspidae) in the southeastern United States. *Journal of Entomological Science* 48: 118–127.
- Gupta A, Sharanabasappa. 2016. First record of *Ooencyrtus pallidipes* (Ashmead) (Hymenoptera: Encyrtidae) parasitizing eggs of *Erionota torus* Evans (Lepidoptera: Hesperidae) in India. *Journal of Biological Control* 30: 217–219.
- Hirose Y, Takasu K, Takagi M. 1996. Egg parasitoids of phytophagous bugs in soybean: mobile natural enemies as naturally occurring biological control agents of mobile pests. *Biological Control* 7: 84–94.
- Hoshino K, Adati T, Olson DM, Takasu K. 2017. Seasonal occurrence and interspecific interactions of egg parasitoids of *Megacopta cribraria* (Hemiptera: Plataspidae) in Japan. *Environmental Entomology* 46: 487–493.
- Medal J, Halbert S, Smith T, Santa Cruz A. 2013. Suitability of selected plants to the bean plataspid *Megacopta cribraria* [sic] (Hemiptera: Plataspidae) in no-choice tests. *Florida Entomologist* 96: 631–633.
- Medal J, Santa Cruz A, Williams K, Fraser S, Wolaver D, Smith T, Davis BJ. 2015. First record of *Parateleonomus saccharalis* (Hymenoptera: Platygasteridae) on kudzu bug *Megacopta cribraria* (Heteroptera: Plataspidae) in Florida. *Florida Entomologist* 98: 1250–1251.
- Ruberson JR, Takasu K, Buntin DG, Eger Jr JE, Gardner AW, Greene KJ, Jenkins MT, Jones AW, Olson MD, Roberts MP, Suiter RD, Toews DM. 2013. From Asian curiosity to eruptive American pest: *Megacopta cribraria* (Hemiptera: Plataspidae) and prospects for its biological control. *Applied Entomology and Zoology* 48: 3–13.
- Seiter NJ, Grabke A, Greene JK, Kerrigan JL, Reay-Jones FRP. 2014. *Beauveria bassiana* is a pathogen of *Megacopta cribraria* (Hemiptera: Plataspidae) in South Carolina. *Journal of Entomological Science* 49: 326–330.
- Seiter NJ, Greene JK, Reay-Jones FPF. 2013. Reduction of soybean yield components by *Megacopta cribraria*. *Journal of Economic Entomology* 106: 1676–1683.
- Tayutivutikul J, Yano K. 1990. Biology of insects associated with the kudzu plant, *Pueraria lobata* (Leguminosae). 2. *Megacopta punctissimum* (Hemiptera, Plataspidae). *Japanese Journal of Entomology* 58: 533–539.
- Wu MX, Wu QZ, Hua MS. 2006. A preliminary study on some biological characters of the globular stink bug, *Megacopta cribraria* and its two egg parasitoids. *Journal of Fujian Agriculture and Forestry University, Natural Science Edition* 2006: 147–150.
- Zhang YL, Hanula J, Horn S. 2012. The biology and preliminary host range of *Megacopta cribraria* (Heteroptera: Plataspidae) and its impact on kudzu growth. *Environmental Entomology* 41: 40–50.
- Zhang YT, Du XG, Dong M, Shei W. 2003. A preliminary investigation of egg parasitoids of *Megacopta cribraria* in soybean fields. *Entomological Knowledge* 40: 443–445.
- Zhang YZ, Li W, Huang DW. 2005. A taxonomic study of Chinese species of *Ooencyrtus* (Insecta: Hymenoptera: Encyrtidae). *Zoological Studies* 44: 347–360.