N O T E

Discovery of *Paratelenomus saccharalis* (Dodd) (Hymenoptera: Platygastridae), an Egg Parasitoid of *Megacopta cribraria* F. (Hemiptera: Plataspidae) in its Expanded North American Range [1]

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Megacopta cribraria F. (Hemiptera: Plataspidae), commonly known as the kudzu bug or bean plataspid, was first discovered in the Western Hemisphere in October 2009 (Eger et al. 2010. Insecta Mundi 121:1 - 11). The plataspid quickly spread from the 9 northeastern Georgia counties in which it was initially confirmed into 383 additional counties in Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia by the end of 2012 (Gardner et al. 2013. J. Entomol. Sci. 48:118 - 127). Subsequent reports show that the insect has now been confirmed in 4 additional states – Delaware, Kentucky, Louisiana, and Maryland – and the District of Columbia, bringing the total number of confirmed states to 12 (W.A. Gardner, unpubl. data).

Ruberson et al. (2013, Appl. Entomol. Zool. 48:3 - 13) reported that several existing generalist predators and a single entomogenous pathogen had been recorded as attacking *M. cribraria* in its expanded range in the southeastern U.S. They also reported a tachinid, *Phasia robertsonii* (Townsend), parasitizing a single adult *M. cribraria* in 2012, but no parasitism of eggs or immatures was observed in their 2010 and 2011 surveys in Georgia. Golec and Hu (2013, J. Entomol. Sci. 48: In Press) discovered *Strongygaster triangulifer* (Loew) (Diptera: Tachnidae) parasitizing individual adults (mean parasitism = 5.14%; n = 214) collected from soybean, *Glycine max* (L.) Merr.,

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in Auburn, AL, in April 2013. Ruberson et al. (2013) concluded that parasitism of *M. cribraria* eggs did not appear to be occurring in its expanded North American range based on the lack of egg parasitoids reported in their study as well as the lack of egg parasitism observed by Zhang et al. (2012, Environ. Entomol. 41:40 - 50) in their 2010 study in northeastern Georgia. Futhermore, research conducted at the USDA-ARS National Biological Control Laboratory in Stoneville, MS, confirmed that *M. cribraria* eggs were not attacked by 11 species of native egg parasitiods (8 from Pentatomidae and 1 each from Coreidae, Reduviidae, and Rhopalidae) plus 4 species of exotic egg parasitoids being assessed for the brown marmorated stink bug, *Halyomorpha halys* Stål, host range project (W.A. Jones, unpubl. data).

On 30 May 2013, 2 *M. cribraria* egg masses with several abnormally dark-colored eggs were collected by Joni L. Blount (UGA) from kudzu, *Pueraria montana* Lour. (Merr.) variety *lobata* (Willd.), growing on the University of Georgia Campus in Griffin (Spalding Co.). Microscopic examination of the masses showed that some of the eggs were a reddish color, others were a charcoal gray color, and others were the normal salmon color. The egg masses were placed in a single No. 1 Gelatin Capsule (Eli Lilly and Company, Indianapolis, IN) and held at ambient room conditions. Two weeks later, 3 small hymenopterans were discovered in the gelatin capsule with the egg masses. Microscopic examination of the egg masses confirmed that the wasps had emerged from 3 of the previously discolored egg capsules. An egg mass of 22 eggs collected 2 July 2013 from kudzu in the same vicinity exhibited the same coloration and subsequently yielded 18 parasitoids.

In June 2013, egg masses oviposited by *M. cribraria* adults in soybean growing on the Auburn University Campus in Auburn (Lee Co.), AL, were observed with a gray coloration. On 17 July 2013, 4 egg masses (mean number eggs per mass ± SD = 22.25 ± 1.89) were collected by Julian R. Golec (Auburn Univ.) at that location, placed in a Petri dish, and maintained at 25°C in an environmental chamber. Forty-eight wasps emerged from 3 of the 4 egg masses on 23 July 2013 with parasitism rates of 95.4% ($n = 22$), 95.2% ($n = 21$), and 52.4% ($n = 21$). Eleven egg masses were subsequently collected from the same location on 5 August 2013, with all but 1 of those masses being parasitized (84.8% egg parasitism, overall). Microscopic examination of the parasitized eggs showed that the grayish coloration was caused by the either black coloration of the developing parasitoid within the cream-colored host egg capsule or discoloration of the lining of the egg capsule (Fig. 1). This grayish-coloration is distinctive for parasitism and serves as an aid in identifying parasitized eggs in the field.

Jannelle Couret (Emory Univ.) observed adult parasitoids under magnification probing and ovipositing into *M. cribraria* eggs collected from kudzu on and near the Emory University campus in Dekalb Co., GA (metropolitan Atlanta), in late June. Parasitized eggs were maintained in Petri dishes in environmental chambers. Adult parasitoids were later observed emerging from the egg masses and, specifically, from the gray-colored eggs. The gray eggs that did not hatch were dissected to find parasitoid larvae and adults that had not successfully emerged.

Egg masses were collected from 5 locations in Dekalb Co. on 24 July 2013. These masses were transported to the Department of Entomology Laboratory on the UGA Griffin Campus where numbers of eggs per mass were counted and the masses were placed individually into 2-dram glass vials. The vials were stoppered with cotton and placed in an environmental chamber maintained at 28°C with 70 - 80% RH and on a 12:12 h photoperiod. Vials were examined periodically for parasitoid emergence. In

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Fig. 1. Eggs of *Megacopta cribraria* parasitized (gray coloration) and unparasitized (salmon coloration) by *Paratelenomus saccharalis* (Image by J. Golec, Auburn Univ.).

total, 91 egg masses were collected from those 5 sites on that date with a mean (±SD) number of eggs per mass of 13.3 ± 5.1. Seventy-eight of those 91 masses (85.7%) were eventually confirmed as parasitized. Parasitism rates averaged 69.0% (n = 159), 77.9% (n = 144), 72.0% (n = 507), 66.7% (n = 310), and 55.9% (n = 109) at the individual collection sites.

Ten egg masses (21.2 ± 7.0 eggs per mass) were collected on 23 July 2013 from soybean growing on the UGA Bledsoe Research Farm in Pike Co., a county adjacent to Spalding Co. where the parasitoid was initially discovered. All but 1 of those masses was confirmed as parasitized with an overall 47.5% level of egg parasitism.

Microscopic comparison of the adult parasitoids from the Dekalb Co. sites (Emory Univ.) with those from the UGA sites in Spalding and Pike counties indicated all were the same species. Specimens from these sites were identified by Walker A. Jones (USDA-ARS) as *Paratelenomus saccharalis* (Dodd) (Hymenoptera: Platygastridae) using the taxonomic key of Johnson (1996, Can. Entomol. 128:273 - 291); they also appeared identical to specimens from a colony of *P. saccharalis* maintained in quarantine at the USDA-ARS National Biological Control Laboratory in Stoneville, MS. Voucher specimens from Georgia and Alabama sites were sent to Matthew L. Buffington and Elijah J. Talamas of the Systematic Entomology Laboratory at the National Museum of Natural History (Smithsonian Institute, Washington, DC); Talamas confirmed the identification as *P. saccharalis* using the key of Johnson (1996). Images accompanying confirmation of the identity were provided by E.J. Talamas (Fig. 2).

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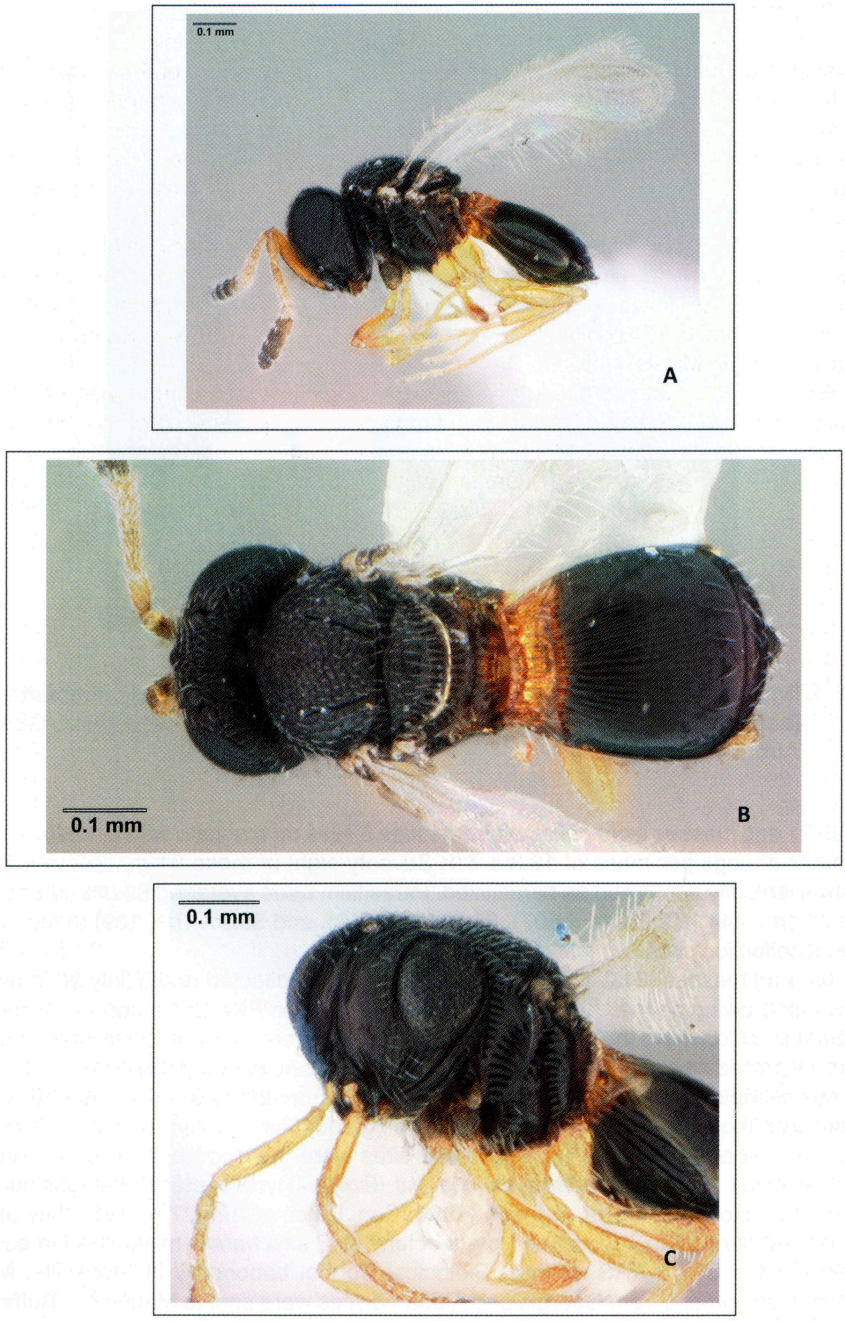

Fig. 2. *Paratelenomus saccharalis* adult from lateral (A), dorsal (B), and frontal (C) views (Images by E. Talamas, USDA-ARS).

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Paratelenomus saccharalis is widely distributed in the Eastern Hemisphere (Ruberson et al. 2013), but this is the first report of this parasitoid in the Western Hemisphere. Ruberson et al. (2013) further noted that known hosts of *P. saccharalis* are restricted to the family Plataspidae. The only known hosts of *P. saccharalis* were listed as *M. cribraria*, *M. punctatissimum* (Montandon), and *Brachyplatys subaeneus* Westwood in Asia, and *Coptosoma scutellatum* (Geoffrey) in Italy. Given this level of host specificity, *P. saccharalis* would not be expected to occur in the Western Hemisphere prior to 2009 because the first known occurrence of any members of the family Plataspidae in the New World was in October 2009 with the discovery of *M. cribraria* in Georgia (Eger et al. 2010). Yet, since these initial independent discoveries of the parasitoid in Alabama and Georgia, *P. saccharalis* has been confirmed parasitizing *M. cribraria* eggs in 17 additional counties in Georgia, 8 additional counties in Alabama, and 1 county in Mississippi (unpubl. data).

Paratelenomus saccharalis was identified as a candidate for importation and release against *M. cribraria* in its expanded range in the U.S. because of its host specificity, wide geographic distribution in its native range, and its close biological association with *M. cribraria* (Ruberson et al. 2013). Walker A. Jones and Richard M. Evans have been assessing the host range of the parasitoid in quarantine (USDA-ARS National Biological Control Laboratory) for over 2 years and, based upon their data, prepared a petition to USDA-APHIS for release of the parasitoid.

The introduction and sudden appearance of this parasitoid in the expanded *M. cribraria* range might never be determined. Its appearance over a wide geographic area and at relatively high parasitism rates soon after its discovery are also puzzling. It is highly likely that the establishment of the parasitoid occurred after *M. cribraria* was established. Perhaps parasitized eggs were introduced and even dispersed on shipments of plants or nursery stock or on fresh food products. Regardless, this is not the first report of an inexplicable appearance of an egg parasitoid following the accidental introduction of a plataspid. Beardsley and Fluker (1967, Proc. Hawaiian Entomol. Soc. 19:367 - 372) reported the establishment of *Coptasoma xanthogramma* (White) (Hemiptera: Plataspidae) in September 1965 as the first plataspid discovered in Hawaii. They also reported that no parasitoids and only few predators were attacking the introduced pest in its expanded range in Hawaii. Notes from the 1968 meeting of the Hawaiian Entomological Society (1969, Proc. Hawaiian Entomol. Soc. 20:258 - 476) indicate that a parasitoid, presumably *Trissolcus* sp. (Hynenoptera: Platygastridae), was found parasitizing *C. xanthogramma* eggs at several locations and on multiple islands in early 1968. Interestingly, the reported appearance of the parasitized eggs, percent parasitism, and the developmental timing of the parasitoid are consistent with those reported by Tagaki and Murakami (1997, Appl. Entomol. Zool. 32:659 - 660) for *P. saccharalis*.

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