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First record of *Paratelenomus saccharalis* (Dodd, 1914) (Hymenoptera: Scelionidae) a natural enemy of the invasive species *Brachyplatys subaeneus* (Westwood, 1837) (Heteroptera: Plataspidae) in Panama and the Neotropical region

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Abstract. *Paratelenomus saccharalis* (Dodd) (Hymenoptera: Scelionidae) parasitizing *Brachyplatys subaeneus* (Westwood) eggs is reported for the first time for Panama. *Brachyplatys subaeneus* is an invasive species from Asia and is regarded as an important agricultural pest in the Americas.

Key words. *Cajanus cajan*, biological control, invasive species.

Resumen. Se reporta por primera vez para Panamá a *Paratelenomus saccharalis* (Dodd) (Hymenoptera: Scelionidae) parasitando huevos de *Brachyplatys subaeneus* (Westwood). *Brachyplatys subaeneus* es una especie invasora de Asia y una posible plaga para la agricultura en América.

Palabras claves. *Cajanus cajan*, control biológico, especie invasora.

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Introduction

The family Plataspidae (Hemiptera: Heteroptera) contains 66 genera and 606 species described (Rider et al. 2018), all distributed in the Old World, with the greatest diversity in Asia and Africa. Within this family, the genus *Brachyplatys* Boisduval, 1835 (Heteroptera: Plataspidae) has an Asian distribution with about 50 described species.

The species *Brachyplatys subaeneus* (Westwood, 1837) is distributed in the Indo-Malay biogeographic region, being reported from Bangladesh, Cambodia, China, the Philippines, India, Indonesia, Japan, Malaysia, Myanmar, Singapore, Sri Lanka, Thailand, Taiwan, and Vietnam, and is apparently restricted to tropical and subtropical humid deciduous forests (Rédei 2016). *Brachyplatys subaeneus* has been reported in the Americas from Panama (Aiello et al. 2016), the Dominican Republic (Pérez-Gelabert et al. 2019), Costa Rica (Carmona-Ríos 2019), Ecuador (Añino et al. 2020), and the United States (Eger et al. 2020).

In Panama, *B. subaeneus* was initially identified using molecular methods by Aiello et al. (2016) as *Brachyplatys vahlii* (Fabricius, 1787). However, Rédei (2016) correctly identified the species morphologically as *B. subaeneus*. This invasive species is a pest in various legume crops (Fabaceae), including *Cajanus cajan* (L.) Huth. (Fabaceae), and because it lacks natural enemies in Latin America, could multiply exponentially, affecting legumes on a wide scale (Eger et al. 2020). More research is needed on this crop (Gálvez et al. 2022). A recent survey of pests in *Cajanus cajan* discovered an egg parasitoid of *B. subaeneus*. Johnson (1996) reported known hosts for an egg parasitoid, *Paratelenomus saccharalis* (Dodd, 1914) (Hymenoptera: Scelionidae), which includes *Brachyplatys subaeneus* and *Megacopta cribraria* (Fabricius, 1798) (Heteroptera: Plataspidae).

The objective of this paper is to report on an egg parasitoid of *Brachyplatys subaeneus* in Panama, and to recommend it as a potential biological control agent for this species.

Materials and Methods

The study was conducted in *Cajanus cajan* fields located at the mangrove forests of Panama Bay, Don Bosco, Juan Díaz, Panama, Panama (9°00′57.6″N, 79°25′12.5″W) (Fig. 1), on April 13, 2022. Biological observations were performed on about 10 plants, which were infested by *Brachyplatys subaeneus*. The presence of eggs, nymphs and adults was observed, and 20–25 branches of *Cajanus cajan* were collected. Subsequently, the branches were brought into the Laborarorio de artropodos venenososo del Museo de Invertebrados G. B. Fairchild de la Universidad de Panamá for processing and monitoring the insect's development.

Insect breeding cages were used to maintain the material. Branches with eggs were placed in controlled experimental conditions of humidity and temperature. The eggs were incubated at 25 ± 2°C with a photoperiod of 12:12 and checked every 24 hours. Emerging parasitoids were preserved in 70% ethanol and identified using the key of Johnson (1996). Specimens from this study are deposited in the G. B. Fairchild Invertebrate Museum of the University of Panama (MIUP).

Results

Brachyplatys subaeneus (Westwood, 1837)

(Fig. 2A)

Eggs have an oval base and a flattened top, are white, and have an average size of 0.72 ± 0.03 mm long (n = 300) (Fig. 2B). Egg masses average 14 ± 5.2 eggs per mass, with a total of 55 eggs observed to be parasitized (= 5.7%). From these 55 eggs, parasitoid wasps of the species *Paratelenomus saccharalis* were obtained: 41 hatched and 14 unhatched (Fig. 3).

Paratelenomus saccharalis (Dodd, 1914)

(Fig. 4)

New record. PANAMA – Panama • Juan Díaz, Don Bosco; 9°00′57.6″N 79°25′12.5″W; 13.IV.2022; Santos M. & Abrego *leg*. 28 ♀, 13♂. [MIUP-001-SCE-2022].

Figure 1. Collection site of *Brachyplatys subaeneus* (Westwood) eggs in Panama.

Distribution. Widely distributed throughout eastern Palaearctic (Ruberson et al. 2013), it was reported in the Holarctic-Neotropical region specifically in the southeastern USA by Gardner et al. (2013; Alabama, Georgia) and Medal et al. (2015; Florida). For Panama, this is a new country record and the first for the Neotropics.

Discussion

Paratelenomus saccharalis is a parasitoid wasp of plataspid eggs and is known to develop on eggs of *Megacopta cribraria* and *Brachyplatys subaeneus* in Asia, and *Coptosoma scutellatum* (Geoffrey) in Italy (Ruberson et al. 2013). In the Americas, *Paratelenomus saccharalis* has been documented in the USA (Gardner et al. 2013; Medal et al. 2015) as an egg parasitoid of *Megacopta cribraria*. However, this is the first official record of *P. saccharalis* as an egg parasitoid of *Brachyplatys subaeneus* in Panama.

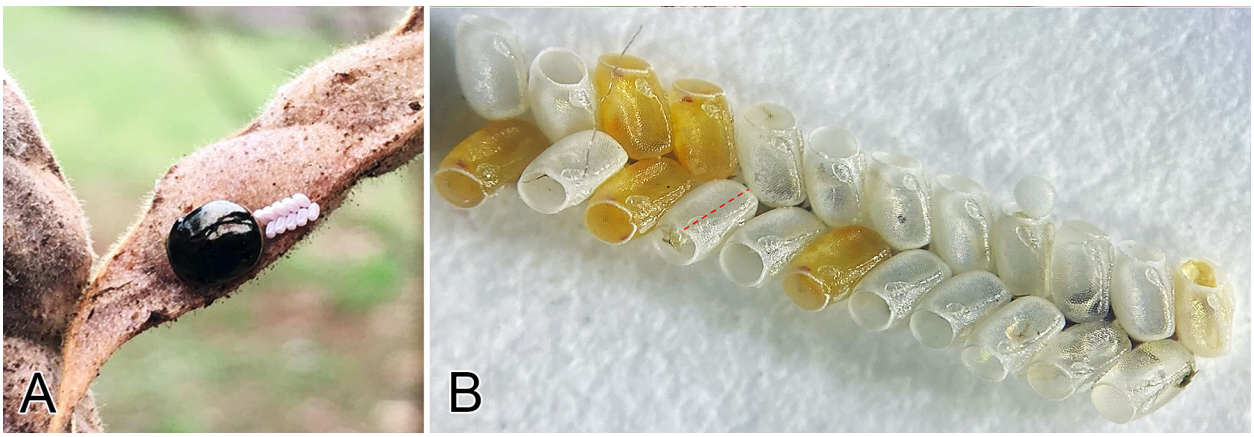

Figure 2. *Brachyplatys subaeneus* (Westwood) eggs. **A)** Adult laying eggs on *Cajanus cajan*. **B)** Eggs after hatching, dorsal-lateral view.

Figure 3. *Paratelenomus saccharalis* (Dodd) adult emerging from *B. subaeneus* egg and pharate adults in darkened eggs.

In the Neotropical region and in Panamá, to have parasitoids for potential use as biological control agents against pests like *B. subaeneus* is strategic, due to the socioeconomical importance of crops like *Cajanus cajan*. Ruberson et al. (2013) indicated *Paratelenomus saccharalis* as a specialist attacking eggs of the Plataspidae. We hypothesize the parasitoid entered Panama via port entry like *Brachyplatys subaeneus*.

Specialist parasitoids are important drivers of population dynamics, as supported both by applied biological control studies (Murdoch et al. 1985; Snyder and Ives 2001; Kenis et al. 2017) with population studied on a long-term basis (Berryman 1996; Tanhuanpaa et al. 1999; Myers and Cory 2013), and by theoretical models (Tanhuanpaa et al. 1999; Hassell 2000; Ruohomaki et al. 2000). Specialist parasitoids are a good ally to confront recent invasive species along with other regulatory activities (Heimpel and Mills 2017; Myers 2018).

Classical biological control focused on the role of introduced specialist enemy. However, many current studies suggest both specialist parasitoids and generalist predators can affect population dynamics of many phytophagous insects (Symondson et al. 2002; Klemola et al. 2014; Vidal and Murphy 2018). Together, specialists and generalists interact to keep populations at lower densities (Hochberg et al. 1990; Snyder and Ives 2003; Hajek and Eilenberg 2018; Murphy et al. 2018). This highlights the importance of specialist parasitoids in their control of invasive species but can overlook interactions with native natural enemies (Broadley et al. 2022).

The parasitization rate obtained in this present study (5.7%) contrasts with other published data which report about 22.97 ± 6.41% (Tagaki and Murakami 1997; Gardner et al. 2013). Other authors (Tagaki and Murakami 1997; Gardner et al. 2013) reported similar observations regarding egg size and coloration of the parasitized and non-parasitized *B. subaeneus* eggs.

According to our evidence, *Paratelenomus saccharalis* is a potential biological control for the invasive pest *Brachyplatys subaeneus* at a 5.7% parasitization rate. We hypothesize the implementation of specialized biological control methodologies will increase this rate and be an effective method for reducing populations of *B. subaeneus*. More research is needed regarding the parasitization of *Paratelenomus saccharalis* on the invasive pest *Brachyplatys subaeneus*.

Figure 4. *Paratelenomus saccharalis* (Dodd): lateral view, female.

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