

First record of *Hadronotus obesum* Masner, 1983 (Hymenoptera: Scelionidae) parasitizing eggs of *Euschistus heros* Fabricius, 1798 (Hemiptera: Pentatomidae) on soybeans (*Glycine max*) in Mato Grosso do Sul, Brazil

Primer registro de *Hadronotus obesum* Masner, 1983 (Hymenoptera: Scelionidae) parasitando huevos de *Euschistus heros* Fabricius, 1798 (Hemiptera: Pentatomidae) en soja (*Glycine max*), en Mato Grosso do Sul, Brasil

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Abstract

This study records the identification, sexual dimorphism and first occurrence of the parasitoid *Hadronotus obesus* Masner, 1983 (Hymenoptera: Scelionidae) in eggs of *Euschistus heros* Fabricius, 1798 (Hemiptera: Pentatomidae) in soybean crop (*Glycine max*), in the municipality of Dourados, MS, Brazil, on January 8, 2021. Of the 31 eggs collected, 26 parasitoids emerged, with 83.87% parasitism and 111 generations since the date of field prospection.

Keywords: Biological control, Bio-input, Egg parasitoid.

Resumen

Este estudio recoge la identificación, el dimorfismo sexual y la primera aparición del parasitoide *Hadronotus obesus* Masner, 1983 (Hymenoptera: Scelionidae) en los huevos de *Euschistus heros* Fabricius, 1798 (Hemíptera: Pentatomidae) en un cultivo de soja (*Glycine max*), en el municipio de Dourados, MS, Brasil, el 8 de enero de 2021. De los 31 huevos recogidos, emergieron 26 parasitoides, lo que supone un porcentaje de parasitismo del 83,87 % y 111 generaciones desde la fecha de la prospección de campo.

Palabras clave: Control biológico, Insumo biológico, Parasitoide de huevos.

Resumo

Este trabalho registra identificação, dimorfismo sexual e primeira ocorrência do parasitóide *Hadronotus obesus* Masner, 1983 (Hymenoptera: Scelionidae) em ovos de *Euschistus heros* Fabricius, 1798 (Hemiptera: Pentatomidae) na cultura da soja (*Glycine max*), no município de Dourados, MS, Brasil, em 08 de janeiro de 2021. Dos 31 ovos coletados, emergiram 26 parasitoides, com 83,87% de parasitismo e 111 gerações desde a data de prospecção em campo.

Palavras-chave: Controle biológico, Bioinsumos, Parasitoide de ovos.

Introduction

Euschistus heros Fabricius, 1798 (Heteroptera: Pentatomidae) is a destructive agricultural pest that attacks the pods and seeds of the most important crop for Brazil and the world - soybeans - reducing both the quality and quantity of production. Current control practices rely primarily on conventional insecticides, which lead to increased production costs and negative impacts on natural enemies and human health (Stark and Banks 2003).

E. heros, commonly known as the brown stink bug, is a neotropical, polyphagous species widely distributed throughout South America and currently considered one of the main insects with pest potential for various crops such as soybeans, beans, cotton, corn, sunflowers, and numerous other plant species, including those in the Fabaceae and Brassicaceae families. In addition to cultivated species, it can thrive on important weeds such as *Euphorbia heterophylla*, *Conyza* spp., *Acanthospermum hispidum*, *Crotalaria* sp., and others (IRAC 2024). The damage causes a significant reduction in the yield of soybean crops and in grain quality, as well as in yield, reducing grain weight by up to 40%.

Current control practices rely primarily on conventional insecticides, which leads to increased production costs because of the loss of efficacy of the active ingredients and an increase in the number of applications. In recent years, IRAC (2024) has observed the presence and proliferation of the pest in

the field over a longer period, with high population levels, indicating the insects' resistance to control agents, which have negative impacts on natural enemies and human health (Stark and Banks 2003). The economic consequences caused by the brown stink bug are severe, and recently it has also had a negative impact on exports of Brazil's major agricultural commodities, harming the country's economy in the long term.

In recent years, the use of biological control agents has increased in Brazil. The Ministry of Agriculture, Livestock, and Supply (MAPA), through the National Bio-Inputs Program, has been promoting and encouraging the development of new biological control agents, with the aim of finding new alternatives for controlling the various stink bugs that directly affect grain quality (MAPA, 2020).

According to Melo et al. (2012), the number of hymenopterans worldwide is estimated to be between 110,000 and 130,000. According to Fernández (2006), there are approximately 23,324 described species of Hymenoptera in the Neotropical region, and in Brazil, approximately 10,000 species are known, though some estimates suggest a total of about 70,000 species.

Among the natural enemies of stink bugs, egg parasitoids have been observed in several countries and are, in many cases, considered the most important agents of natural mortality for these pests (Jones Jr., 1979).

Field studies in Brazil have reported several species of wasps associated with brown stink bug (*E. heros*) eggs: *Telenomus pidisi*

Ashmead, 1893 (Hymenoptera: Platygasteridae), *Neorileya* sp. (Chalcidoidea: Eurytomidae), (Medeiros et al., 1997; Godoy and Ávila, 2000; Peres and Corrêa-Ferreira, 2004; Godoy et al., 2005); *Trissolcus basalis* Wollaston, 1858 (Hymenoptera: Platygasteridae), *Ooencyrtus* sp., Ashmead, 1900 (Hymenoptera: Encyrtidae) (Medeiros et al., 1997; Wilsimar et al., 2004; Godoy et al., 2005). However, only *T. podisi* has been approved by the Ministry of Agriculture and Livestock (MAPA) for use in controlling this insect in the field.

Materials and Methods

The study was conducted on January 8, 2021, in an experimental soybean (*Glycine max*) field located at the Experimental Farm for Agricultural Sciences of the Federal University of Grande Dourados (FAECA/UFGD), in the municipality of Dourados, state of Mato Grosso do Sul, Brazil (22°13'58.2" S, 54°59'38.6" W; 418 m above sea level). During monitoring activities associated with a biological control trial, six egg masses of *Euschistus heros* (Fabricius, 1798) showing signs of parasitism were randomly collected. The egg masses were manually removed from soybean leaves and transported to the Laboratory of Biological Control of Insects (LECOBIOL) at the Federal University of Grande Dourados for processing and follow-up.

In the laboratory, each cluster of eggs was placed in individual test tubes that were properly labeled and sealed with cotton.

The specimens were kept in a climate-controlled chamber under conditions of 25±2 °C, 60±10% relative humidity, and a 12-hour photoperiod. The eggs were inspected daily to record the emergence of host nymphs or parasitoids. The parasitism rate was determined based on the number of emerged parasitoids relative to the total number of eggs collected. Subsequently, the resulting adults were maintained in the laboratory using eggs of *E. heros*, *Diceraeus melacanthus* (Dallas, 1851), and *Chinavia pengue* (Rolston, 1983) as alternative hosts for colony maintenance. For taxonomic identification, 20 specimens were selected and sent to the Campinas Biological Institute, where they were examined based on specialized morphological characters by Dr. Valmir Antonio Costa. The final identification was *Hadronotus obesum* Masner, 1983 (Hymenoptera: Scelionidae), and the sex ratio of the analyzed individuals was also recorded.

Results and Discussion

As a result of the initial report, 9 females and 11 males were identified among the 20 specimens of parasitoids that had emerged at Lecobiol and were sent for identification to the Biological Institute in Campinas, São Paulo, under the supervision of Dr. Valmir Antonio Costa. Initially, on March 14, 2022, the parasitoids were identified only to the genus level as *Gryon* sp. (Hymenoptera: Scelionidae) (Masner, 1979). Subsequently, the same taxonomist identified the parasitoid species as belonging to another genus, *Hadronotus obesum* (Masner, 1983) (Hymenoptera: Scelionidae) (Figure 1). This change occurred because the genus *Gryon* underwent a

thorough taxonomic reassessment in 2021; based on molecular and morphological analyses of specimens from a wide geographic area, some species were transferred to different genera. Thus, the species **obesum**, which previously belonged to the genus **Gryon**, now belongs to the genus **Hadronotus** (Talamas et al., 2021).



Figure 1. *Hadronotus obesum*, female, side view. Source: Valmir Antonio Costa. Collection: Biological Institute.



Figure 2. Sexual dimorphism in *Hadronotus obesum*. Source: Heloisa Martins. Collection: Sistêmica Kovê Ltda.

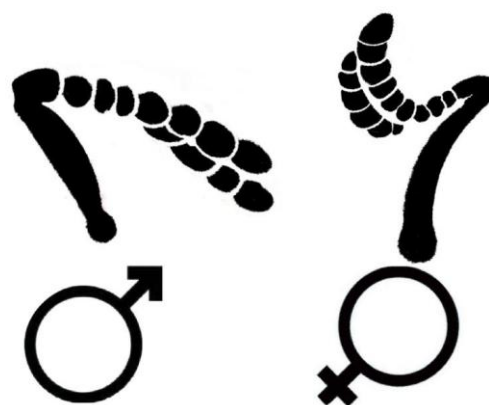


Figure 3. Diagram of sexual dimorphism in antennae. Source: Heloisa Martins. Collection: Sistêmica Kovê Ltda.

The species **obesum** has previously been described as parasitizing the eggs of **Euschistus heros**, **Nezara viridula**, and **Piezodorus guildinii** in the state of Paraná (Corrêa Ferreira and Moscardi, 1995) and also the eggs of **H. halys** in the United States (Cornelius et al., 2016; Herlihy et al., 2016; Ogburn et al., 2016; Dieckhoff et al., 2016; Jones et al., 2017; Tillman et al., 2020).

This is the first record of the species *H. obesum* in *Euschistus heros* eggs in the city of Dourados in the state of Mato Grosso do Sul, Brazil. Reports such as this one contribute to our understanding of the diversity of parasitoids found in the region. Since this group consists of natural enemies of agricultural pests, there is potential for their use in integrated pest management programs as biological control agents in crops infested by this phytophagous insect, which, when its population reaches high levels, can cause significant losses in various crops.

Conclusions

This study provides the first record of *Hadronotus obesum* Masner, 1983 parasitizing eggs of *Euschistus heros* in soybean fields in Mato Grosso do Sul, Brazil, thereby expanding current knowledge of the geographic distribution and host-parasitoid associations of this species in Brazilian agroecosystems. The emergence of 26 parasitoids from 31 collected eggs, corresponding to a parasitism rate of 83.87%, demonstrates the successful development of this hymenopteran parasitoid on one of the most important soybean pests. Furthermore, this finding contributes valuable information to the inventory of local natural enemies and highlights the potential of *H. obesum* as a promising biological resource for integrated pest management programs. These results provide a foundation for future studies aimed at evaluating its biology, parasitism efficiency, and suitability as a biological control agent in soybean production systems within the region.

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