Research Article / Artículo de Investigación

Species of Reduviidae (Hemiptera: Heteroptera) associated with a canola crop (*Brassica napus* L. var. *oleifera;* Brassicales: Brassicaceae) in Passo Fundo, Rio Grande do Sul, Brazil

Especies de Reduviidae (Hemiptera: Heteroptera) asociadas al cultivo de canola (*Brassica napus* L. var. *oleifera*; Brassicales: Brassicaceae) en Passo Fundo, Rio Grande do Sul, Brasil

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Abstract. Predatory species of Reduviidae, Harpactorinae (Hemiptera: Heteroptera) collected in a canola experimental crop (*Brassica napus* L. var. *oleifera*, hybrid ALHT B4) in Passo Fundo, state of Rio Grande do Sul (28°14'S; 52°24'W), Brazil were recorded. The bugs were collected in 2019 when the crop was blooming and developing siliques. In total, we made 13 collections using entomological net, totaling 13 hours of sampling effort. Three of these species had their prey also recorded. The relative abundance (%) and identity of the reduviids found are as follows: *Apiomerus luctuosus* Costa Lima, Seabra & Hathaway, 1951 (0.45%), *Arilus carinatus* (Forster, 1771) (2.73%), *Atrachelus cinereus crassicornis* (Burmeister, 1835) (89.10%), *Cosmoclopius annulosus* Stål, 1872 (5.00%), *Harpactor tuberculosus* Stål, 1872 (0.45%), *Isocondylus elongatus* (Lepeletier & Serville, 1825) (0.45%), and *Repipta flavicans* (Amyot & Serville, 1843) (1.82%). The following prey (with the respective reduviid predator) were also recorded in the area: *Nezara viridula* (Linnaeus, 1758) (Hemiptera: Pentatomidae) by *Arilus carinatus*; *Astylus* (*Astylus*) *quadrilineatus* (Germar, 1825) (Coleoptera: Melyridae) by *Harpactor tuberculosus*, and *Diabrotica limitata* (Sahlberg, 1823) (Chrysomelidae: Galerucinae: Luperini) by *Repipta flavicans*.

Key words: Apiomerini; assassin bugs; behavior; Harpactorini.

Resumen. Se registraron especies depredadoras de Reduviidae, Harpactorinae (Hemiptera: Heteroptera) recolectadas en un cultivo experimental de canola (*Brassica napus* L. var. *oleifera*, híbrido ALHT B4) en Passo Fundo, estado de Rio Grande do Sul (28°14'S; 52°24'W), Brasil. Las chinches se recolectaron el año 2019 cuando el cultivo estaba floreciendo y desarrollando silicuas. En total, se realizaron 13 recolecciones mediante red entomológica, totalizando 13 horas de esfuerzo de muestreo. También se registraron presas de tres de los redúvidos. Las especies registradas y la abundancia relativa (%) fueron las siguientes: *Apiomerus luctuosus* Costa Lima, Seabra y Hathaway, 1951 (0,45%), *Arilus carinatus* (Forster, 1771) (2,73%), *Atrachelus cinereus crassicornis* (Burmeister, 1835) (89,10%), *Cosmoclopius annulosus* Stål, 1872 (5,00%), *Harpactor tuberculosus* Stål, 1872 (0,45%), *Isocondylus elongatus* (Lepeletier y Serville, 1825) (0,45%), y *Repipta flavicans* (Amyot y Serville, 1843) (1,82%). En el área se registraron las siguientes presas y sus respectivos depredadores redúvidos: *Nezara viridula* (Linnaeus, 1758) (Hemiptera: Pentatomidae) por *Arilus carinatus*; *Astylus* (*Astylus*) *quadrilineatus* (Germar, 1825) (Coleoptera: Melyridae) por *Harpactor tuberculosus*, y *Diabrotica limitata* (Sahlberg, 1823) (Chrysomelidae: Galerucinae: Luperini) por *Repipta flavicans*.

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Palabras clave: Apiomerini; chinches asesinas; comportamiento; Harpactorini.

Introduction

Canola, *Brassica napus* L. var. *oleifera* (Brassicaceae), is an oil plant whose grains contain around 36% to 42% oil and whose meal contain 36% to 39% protein (Canola Council of Canada 2020). In Brazil, it is used for human consumption and industrial purposes and also as a component of biofuel and animal food (De Mori *et al*. 2014). The Brazilian canola production is concentrated in the southern states of Rio Grande do Sul and Paraná, which produced 98.2% and 1.8% of the Brazilian canola harvest within the period of 2019 to 2022, respectively. In 2022, canola plantations in the country reached 65.8 thousand ha, yielding a harvest of 81.9 thousand tons of grain (CONAB 2023).

In Brazil, a great diversity of phytophagous insects is associated with the canola culture, among which caterpillars, ants, aphids, beetles and stink bugs stand out (Marsaro Júnior *et al.* 2017, 2020, 2021, 2023a; Bianchi *et al*. 2019; Marsaro Júnior and Pereira 2021).

Besides phytophagous insects, a high diversity of beneficial arthropods is related to this culture, the most important ones being the pollinating bees and the predators: ants, spiders and assassin bugs (Witter and Tirelli 2014; Marsaro Júnior *et al.* 2017, 2023a, b; Halinski *et al.* 2018; Bianchi *et al.* 2019; Fuzaro *et al.* 2019; Marsaro Júnior and Brescovit 2023).

Among the predatory true bugs already known for canola plantations, three species of Pentatomidae have been reported: *Podisus crassimargo* (Stål, 1860), *Podisus nigrispinus* (Dallas, 1851) and *Supputius cincticeps* (Stål, 1860) (Marsaro Júnior *et al.* 2017; Bianchi *et al.* 2019). Moreover, a species of Reduviidae has also been recorded (*Cosmoclopius annulosus* Stål, 1872) (Marsaro Júnior *et al*. 2022).

Reduviidae is one of the largest and most diverse family of predaceous Heteroptera, comprising approximately 7,000 species distributed across 20 subfamilies worldwide (Gil-Santana *et al*. 2015; Schuh and Weirauch 2020; Standring *et al.* 2023). The subfamily Harpactorinae has the greatest number of genera and species of Reduviidae in the Neotropical region and worldwide. The harpactorines are diurnal and found on plants where they catch their prey, being generally polyphagous. Only two of the seven recognized tribes of the subfamily, Apiomerini and Harpactorini, occur in the New World (Gil-Santana *et al.* 2015; Schuh and Weirauch 2020).

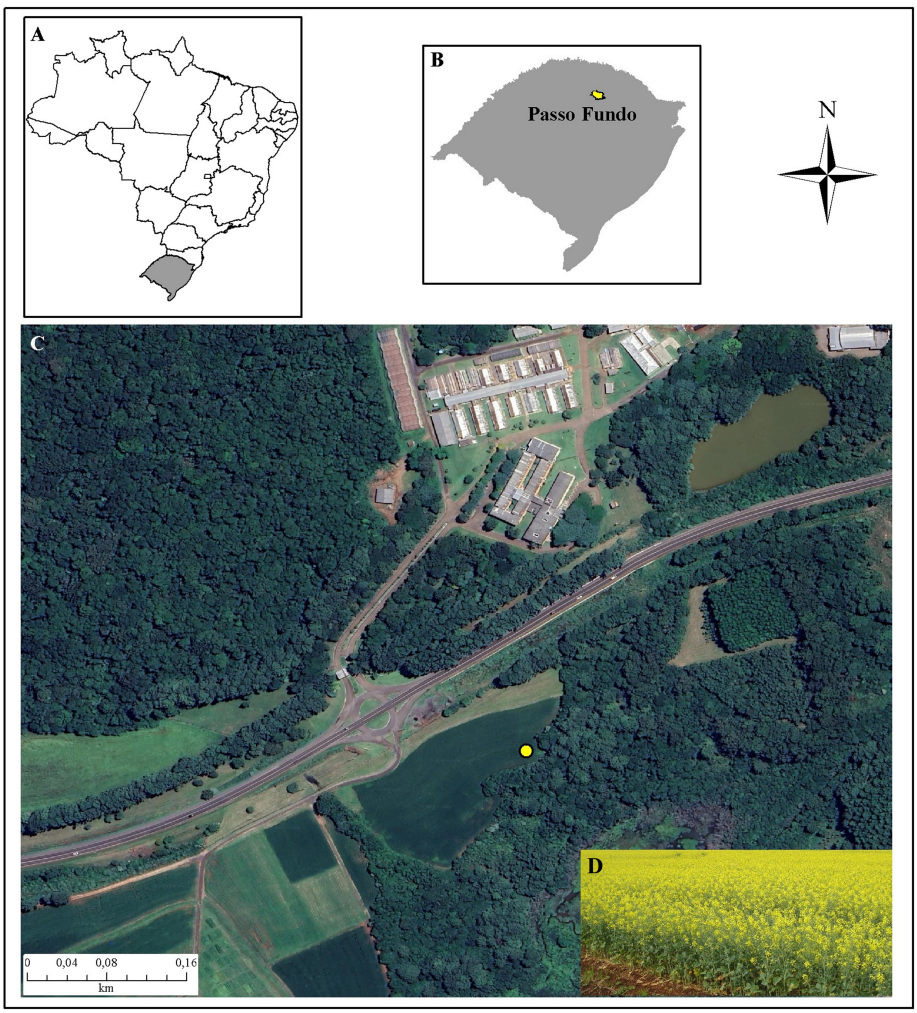
In Old World, particularly in India, numerous studies were developed to evaluate and try to develop methods of biological control with reduviids species from that region, but without getting a success as obtained with other groups of insects used in biological control as some species of parasitoids of order Hymenoptera. On the other hand, there is a lack of systematics studies involving reduviids as potential or proven agents of biological control in Neotropics, including Brazil. In the latter regions, biological control has been well stablished only with insects of other orders, such as some species of hymenopterans parasitoids, which are used in commercial scale, while in relation to reduviids, there have been only isolate records of predation or surveys of species found in some crops (Michel 1993; Ambrose 2000; Gil-Santana 2002; Jahnke *et al*. 2002; Parra *et al*. 2002; Marques *et al*. 2006; Dias *et al*. 2012; Souza *et al*. 2015; Sahayaraj and Balasubramanian 2016).

Because information on the predatory true bugs associated with canola plantations in Brazil are scarce, this study aimed to survey the Reduviidae species present in a canola cultivated area in Passo Fundo, Rio Grande do Sul state.

Additionally, objectives of this study were to present a list of species of Reduviidae collected in a canola plantation, with their abundance data, as well as to record concise morphological characteristics of the species, their geographic distribution and some information about their predatory behavior or of their associated prey.

Material and Methods

The study was conducted at the Embrapa Trigo experimental station, in Passo Fundo, Rio Grande do Sul state (28°14'S; 52°24'W) (Figs. 1A-D). An area of 800 m^2 was sown with canola, *Brassica napus* L. var. *oleifera*, hybrid ALHT B4 in July 2019. We performed 13 collections in the area when the plantation was blooming and developing siliques (Figs. 1C-D), which occurred from August 27th to November 12th. In total, a sampling effort of 13 hours was made. The collections were performed between 10 a.m. and 11 a.m., in sunny days, using entomological nets. The collected reduviids were conserved inside glasses filled with alcohol 70% until their identification. No pesticides were applied in this experimental area.



Figures 1A-D. Sampling site of Reduviidae in canola cultivation area. **A.** Map of Brazil, state of Rio Grande do Sul highlighted in gray. **B.** Map of state of Rio Grande do Sul with Passo Fundo municipality highlighted in yellow. **C.** Embrapa Trigo experimental area, yellow circle marks the place where the collections were carried out. **D.** Detail of canola cultivation in flowering stage. / **Figuras 1A-D.** Sitio de muestreo de Reduviidae en zona de cultivo de canola. **A.** Mapa de Brasil, estado de Rio Grande do Sul, resaltado en gris. **B.** Mapa del estado de Rio Grande do Sul con el municipio de Passo Fundo resaltado en amarillo. **C.** Área experimental de Embrapa Trigo, el círculo amarillo marca el lugar donde se realizaron las colectas. **D.** Detalle del cultivo de canola en etapa de floración.

The climatological variables temperature and rainfall records during the study were obtained from the Conventional Surface Observation Metereological Station - INMET – 83914, located at Embrapa Trigo, Passo Fundo/RS. The average temperature and accumulated precipitation were, respectively, the following: August (19 °C, 29 mm), September (16 °C, 56 mm), October (19 °C, 337 mm), and November (21 °C, 84 mm).

The specimens were identified by the second author (HRG-S) based on the literature cited below for each species, by direct examination using a stereoscope microscope (Zeiss Stemi). The specimens were pinned and dried and labelled for permanent preservation.

The Fig. 1 was produced by Aldemir Pasinato, analist of systems of Embrapa Trigo. The photographs of the specimens were taken by the first (ALMJ) (Figs. 3D-E, 4A-B) and second (HRG-S) (Figs. 3A-C, 3F-H, 4C-D) authors. Voucher specimens will be deposited at the Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil (MNRJ).

Following the identification of the specimens of Reduviidae collected in this study, the abundance and relative abundance (%) of each species were calculated using the Microsoft Excel® program.

Results

A total of 220 true bugs belonging to the subfamily Harpactorinae (Reduviidae) were collected. They belong to seven species: *Apiomerus luctuosus* Costa Lima, Seabra & Hathaway, 1951 (Apiomerini), *Arilus carinatus* (Forster, 1771), *Atrachelus cinereus crassicornis* (Burmeister, 1835), *Cosmoclopius annulosus* Stål, 1872, *Harpactor tuberculosus* Stål, 1872, *Isocondylus elongatus* (Lepeletier & Serville, 1825) and *Repipta flavicans* (Amyot & Serville, 1843) (Harpactorini) (Tab. 1, Fig. 2). The most abundant taxon was *At. cinereus crassicornis*, which represented 89.10% of all collected specimens (males were more abundant than females). *Apiomerus luctuosus*, *H. tuberculosus* and *I. elongatus* were the least abundant, with only 1 specimen each. The only two nymphs in our sampling were identified as *Ar. carinatus* and *At. cinereus crassicornis* (Tab. 1).

Table 1. Species of Reduviidae (Hemiptera: Heteroptera) collected in 2019 in a canola experimental crop (*Brassica napus* L. var. *oleifera*, hybrid ALHT B4) in Passo Fundo, Rio Grande do Sul, Brazil. / **Tabla 1.** Especies de Reduviidae (Hemiptera: Heteroptera) recolectadas en 2019 en un cultivo experimental de canola (*Brassica napus* L. var. *oleifera*, híbrido ALHT B4) en Passo Fundo, Rio Grande do Sul, Brasil.

Species	Males	Females	Nymphs	Total	Relative abundance (%)
Apiomerus luctuosus Costa Lima *et al*. 1951	0	1	0	1	0.45
Arilus carinatus (Forster, 1771)	1	4	1	6	2.73
Atrachelus cinereus crassicornis (Burmeister, 1835)	135	60	1	196	89.10
Cosmoclopius annulosus Stål, 1872	3	8	0	11	5.00
Harpactor tuberculosus Stål, 1872	0	1	0	1	0.45
Isocondylus elongatus (Lepeletier & Serville, 1825)	1	0	0	1	0.45
Repipta flavicans (Amyot & Serville, 1843)	1	3	0	4	1.82
Total	141	77	2	220	100.00

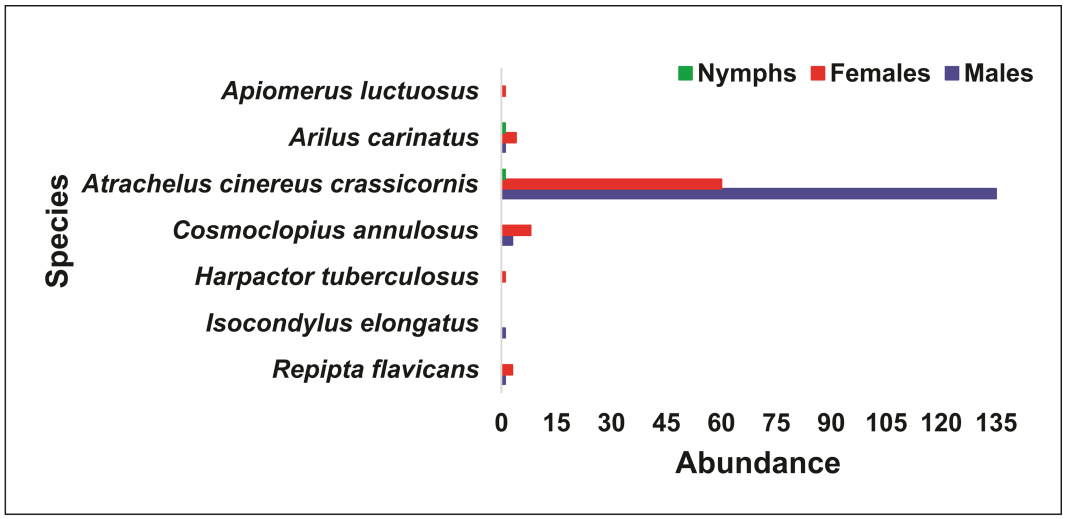


Figure 2. Abundance of Reduviidae species (Hemiptera: Heteroptera) collected in 2019 in the experimental canola crop (*Brassica napus* L. var. *oleifera*, hybrid ALHT B4) in Passo Fundo, Rio Grande do Sul, Brazil. / **Figura 2.** Abundancia de especies de Reduviidae (Hemiptera: Heteroptera) recolectadas en 2019 en el cultivo experimental de canola (*Brassica napus* L. var. *oleifera*, híbrido ALHT B4) en Passo Fundo, Rio Grande do Sul, Brasil.

Reduviidae

Harpactorinae

Apiomerini

Apiomerus luctuosus Costa Lima, Seabra & Hathaway, 1951

Apiomerus luctuosus was described based on specimens from the Brazilian and Peruvian Amazon (Costa Lima *et al*. 1951). Gil-Santana *et al.* (2006) synonymized under it five other species of *Apiomerus* described by Costa Lima *et al*. (1951), upon considering them color morphs of the same taxon. Gil-Santana *et al.* (2006) based their assertion not only on the examination of type specimens, but mainly on a group of specimens collected from the same population in the Brazilian state of Mato Grosso, with specimens showing the whole range of color variation that previously separated the six species which are now *Ap. luctuosus*. According to the literature, individuals of *Ap. luctuosus* have, in general, a total length of approximately 15-20 mm (females), 14-17 mm (males) (from the frons to tip of the hemelytra), with a blackish to dark general coloration. The corium of the hemelytra is variably paler, as well as basal portions of the legs, variable in location and extension among individuals (Fig. 3A) (Gil-Santana *et al*. 2006). Recently, this reduviid was reported as a predator of *Euglossa* spp. (Apinae: Euglossini) orchid bees in the Brazilian Amazon (Marsaro Júnior *et al.* 2022).

Species of *Apiomerus* Hahn, 1831 prey upon insects of diverse orders (Marques *et al*. 2003), but most predation activity seems to occur on bees (Hymenoptera: Apidae). This fact has conferred them the title of "bee assassins" (Gil-Santana *et al.* 2003; Marques *et al.* 2003). Synopsis of *Apiomerus* spp. general predation reports were provided by Gil-Santana (2002). Summaries on their predation on bees can be found in Marques *et al.* (2003) and Gil-Santana *et al.* (2015).

Distribution. Bolivia, Peru, Brazil (states of Amazonas, Bahia, Espírito Santo, Mato Grosso, Pará, Rio de Janeiro and Rondônia) (Costa Lima *et al*. 1951); Brazil (state of Rio Grande do Sul, **new state record**); Nicaragua (Bérenger 1995).

Harpactorini

***Arilus carinatus* (Forster, 1771)**

Because of the outstanding shape of their pronotum and large size, species of *Arilus* Hahn, 1831 stand out for laymen. However, the species included in this genus need revision. The species separation is still based on old compilations of short diagnoses, such as that of Stål (1872).

Arilus carinatus is frequently found on vegetation; their early instar nymphs have a blackish head and the pronotum, legs and abdomen mostly reddish, while the coloration of last instar nymphs is more similar to the adults, but with a flat pronotum. The characteristically enlarged, rounded, subhemispherical and denticulated dorsal protusion of the pronotum (in lateral view) is present in the adults only (Fig. 3C). The general coloration of the latter is dark brownish, with variable reddish tinge on the femora, the tibiae being paler. Larger individuals may reach about 30 mm in length (Figs. 3B-C). The species of *Arilus* are generalist insect predators (see Laiton-J. *et al*. 2021 for a synthesis of the literature). A female of *Ar. carinatus* was recorded preying on a specimen of *Nezara viridula* (Linnaeus, 1758) (Hemiptera: Pentatomidae) (Figs. 3D-E). It should be pointed out that *N. viridula* is one of the principal phytophagous Heteroptera associated with canola plantations in Brazil (Marsaro Júnior *et al.* 2017; Bianchi *et al.* 2019).

Distribution. Brazil, Ecuador, Peru (Maldonado Capriles 1990), Paraguay (Michel 1993).

***Atrachelus cinereus crassicornis* (Burmeister, 1835)**

This is a species of small reduviids, with about 7 to 8 mm in length. Their dorsal body surface is mostly brownish with several small pale markings, mainly on the legs. Males are recognized by the enlargement of the third antennal segment (first flagellomere) (Fig. 3F). Michel (1993) stated that the species is common in cotton plantations, and it was already recorded in rice crops too (Souza *et al*. 2015).

Distribution. It is a species of wide geographical distribution which extends from Southern (Neotropical) part of Mexico to Argentina (Elkins 1954; Maldonado and Brailovsky 1985).

***Cosmoclopius annulosus* Stål, 1872**

Cosmoclopius Stål, 1866 currently includes eight species and is largely distributed from Curaçao to Argentina, including Brazil (Cobben and Wygodzinsky 1975; Melo and Coscarón 2004; Varela and Melo 2021).

The specimens of *C. annulosus* measure about 12 mm in length (Stål 1872), and display a mostly pale coloration (yellowish, greenish or reddish) with several dark rings on the legs, which are less marked on the fore femora (Fig. 3G).

The species of this genus are polyphagous predators. While there are several records of prey of *C. nigroannulatus* Stål, 1872 summarized by authors such as Jahnke *et al*. (2002) and Marques *et al*. (2006), there is a lack of information about *C. annulosus*, which has only been recorded preying on *Ceratina rupestris* Holmberg, 1884 bees (Apinae: Xylocopini: Ceratinina) (Marsaro Júnior *et al*. 2022).

Distribution. *Cosmoclopius annulosus* was described from specimens from Santa Catarina, Brazil (Stål 1872). It has also been recorded to Argentina (Melo and Coscarón 2004) and recently to the state of Rio Grande do Sul, Brazil (Marsaro Júnior *et al*. 2022).

Harpactor tuberculosus Stål, 1872

Wygodzinsky (1947) provided a synopsis of *Harpactor* Laporte, 1832 and a key to its species along with summarized information about them. Among its four species, prey and biology records exist only for *H. angulosus* (Lepeletier & Serville, 1825), as summarized by Costa *et al*. (2022).

Harpactor tuberculosus Stål, 1872 usually has a length of 20 mm and may be recognized, among other characteristics, by the process on the median portion of the collar of the pronotum fore lobe (Wygodzinsky 1947) and the shape of the connexivum (Fig. 3H). In the present study, an individual of *Astylus* (*Astylus*) *quadrilineatus* (Germar, 1825) (Coleoptera: Melyridae) was recorded being preyed by a female of *H. tuberculosus* (Figs. 4A-B). Adults of *A.* (*A.*) *quadrilineatus* are pollinators, and have hairy bodies to which pollen adheres, aiding in its transport from flower to flower.

Distribution. Argentina and Brazil (Wygodzinsky 1947).

Isocondylus elongatus (Lepeletier & Serville, 1825)

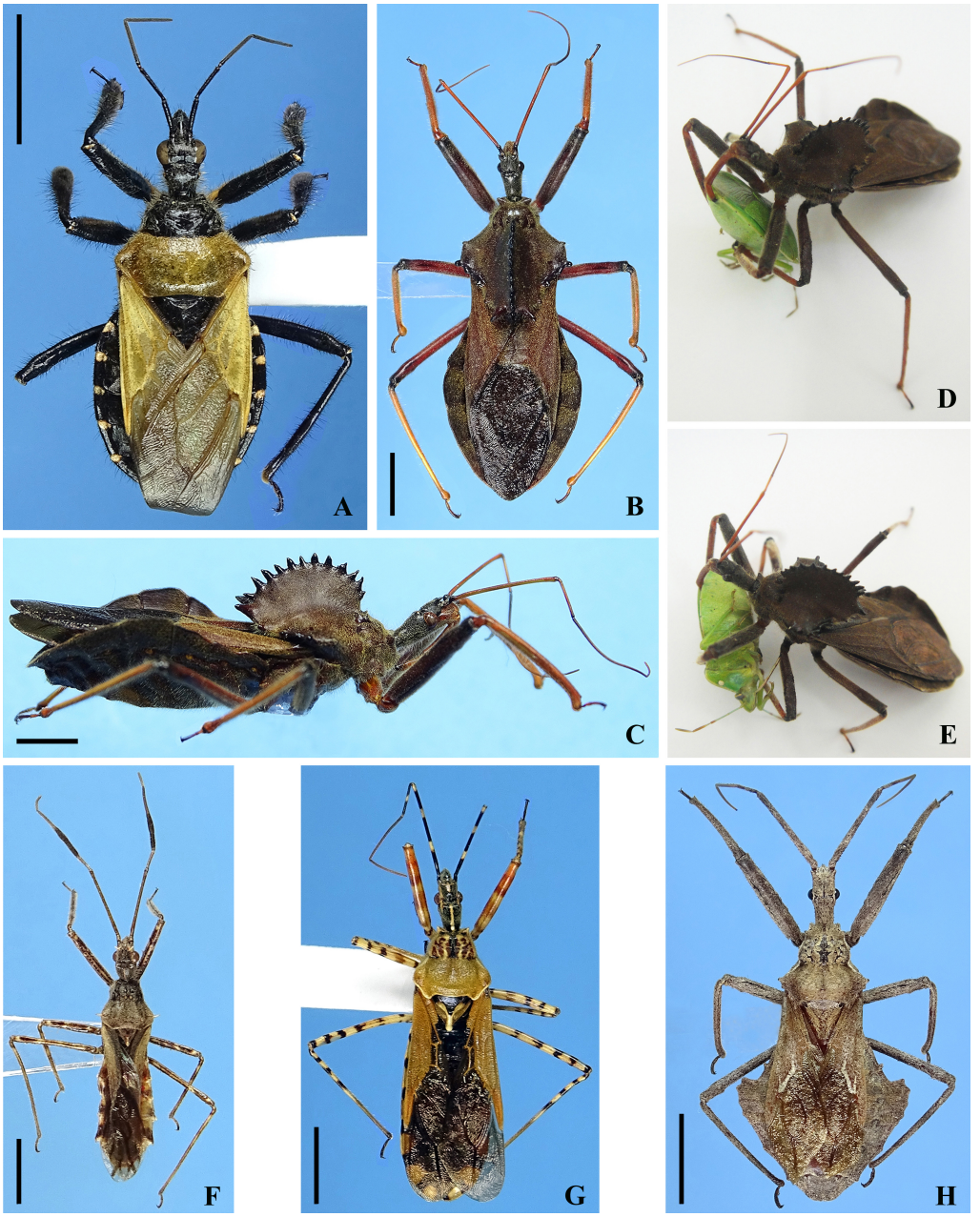
Isocondylus elongatus is the only species of *Isocondylus* Amyot & Serville, 1843, and both were redescribed by Coscarón *et al*. (2008). Both the genus and the species are recognized by generic characteristics such as the short postantennal tubercles, an unarmed hind lobe disk in the pronotum (Stål 1872) and a flat scutellum (Coscarón *et al*. 2008). Additionally, the elongated body, measuring about 20 to 30 mm in length (Coscarón *et al.* 2008; HRG-S pers. obs.) and the general coloration and structure make its identification easy (Fig. 4C). As a result of field observations, Gil-Santana and Zeraik (2003) suggested that adults of *I. elongatus*, when disturbed, vibrate their wings and abdomen, similarly to the behavior of wasps occurring in the same region [*e.g*., *Apoica pallens* (Fabricius, 1804); Hymenoptera: Vespidae]. They stated that similarities of the coloration seemed to reinforce the apparent mimicry. No record of prey of this species was found in the literature.

Distribution. Argentina, Brazil and Bolivia (Maldonado Capriles 1990), Colombia (Forero 2006), Venezuela (Coscarón *et al*. 2008) and French Guiana (Gil-Santana 2022).

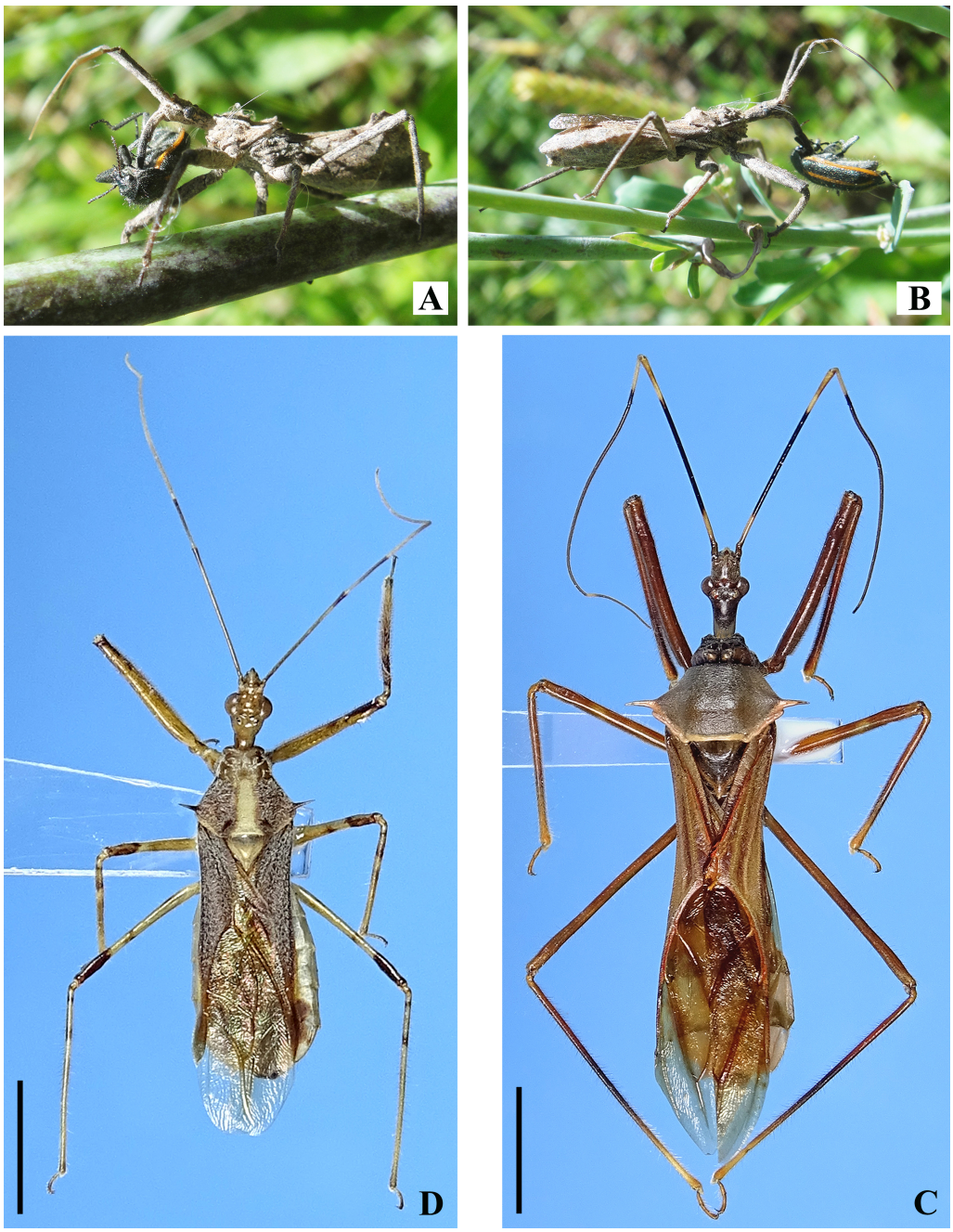
Repipta flavicans (Amyot & Serville, 1843)

Repipta Stål, 1859 was revised by Martin-Park *et al*. (2012), with the redescription of its species, including *R. flavicans*, a somewhat common reduviid in many Neotropical countries. Gaméz-Virués *et al*. (2003) described the immature stages and life cycle of *R. flavicans*. The specimens of *R. flavicans* measure approximately between 10 to 12 mm in length, with wide variation in color (Martin-Park *et al*. 2012), although the pronotum hind lobe usually presents a pale longitudinal medial area (HRG-S pers. obs.) (Fig. 4D). In this study, this species was observed in the field preying on an adult of *Diabrotica limitata* (Sahlberg, 1823) (Coleoptera: Chrysomelidae: Galerucinae: Luperini). *Diabrotica* Chevrolat, 1837 encompasses more than 300 species (Wilcox 1972) of essentially polyphagous beetles, that is, they feed on various families and species of plants (Jolivet 1987); *D. limitata* is no different – it feeds on many host plants, several of which are crops.

Distribution. Argentina, Brazil, Bolivia, Costa Rica, Colombia, Cuba, Guatemala, French Guiana, Honduras, Mexico, Nicaragua, Panama, Paraguay and Uruguay (Martin-Park *et al*. 2012).



Figures 3A-H. A-E. Females. **A-B.** Dorsal view. Scale: 5.0 mm. **A.** *Apiomerus luctuosus*. **B-E.** *Arilus carinatus* **C.** Lateral view. Scale: 2.0 mm. **D-E.** Specimen preying on an individual of *Nezara viridula* (Hemiptera: Pentatomidae). **F-H.** Dorsal view. **F.** *Atrachelus cinereus crassicornis*, male. Scale: 2.0 mm. **G-H.** Females. **G.** *Cosmoclopius annulosus*. Scale: 3.0 mm. **H.** *Harpactor tuberculosus*. Scale: 5.0 mm. / **Figuras 3A-H. A-E.** Hembras. **A-B.** Vista dorsal. Escala: 5,0 mm. **A.** *Apiomerus luctuosus*. **B-E.** *Arilus carinatus*. **C.** Vista lateral. Escala: 2,0 mm. **D-E.** Espécimen depredando un individuo de *Nezara viridula* (Hemiptera: Pentatomidae). **F-H.** Vista dorsal. **F.** *Atrachelus cinereus crassicornis*, macho. Escala: 2,0 mm. **G-H.** Hembras. **G.** *Cosmoclopius annulosus*. Escala: 3,0 mm. **H.** *Harpactor tuberculosus*. Escala: 5,0 mm.



Figures 4A-D. A-B. *Harpactor tuberculosus*, female preying on a specimen of *Astylus* (*Astylus*) *quadrilineatus* (Coleoptera: Melyridae). **C-D.** Dorsal view. **C.** *Isocondylus elongatus*, male. Scale: 5.0 mm. **D.** *Repipta flavicans*, female. Scale: 3.0 mm. / **Figuras 4A-D. A-B.** *Harpactor tuberculosus*, hembra depredando un espécimen de *Astylus* (*Astylus*) *quadrilineatus* (Coleoptera: Melyridae). **C-D.** Vista dorsal. **C.** *Isocondylus elongatus*, macho. Escala: 5,0 mm. **D.** *Repipta flavicans*, hembra. Escala: 3,0 mm.

Discussion

We observed that *At. cinereus crassicornis* was the most abundant species in the experimental canola plantation studied. It must be, therefore, the leading species

contributing to pest control in this context. This species has already been recorded in cotton and rice crops (Michel 1993; Souza *et al*. 2015). Hence, the presence of this reduviid in canola shows it can contribute to the pest control of plants cultivated both in the hottest and coldest seasons, as is the case of canola in South Brazil.

The second most abundant species found, *C. annulosus*, should also be an important predator in canola plantations. Species of this genus are generalist predators, and studies with *C. nigroannulatus* revealed that this species stood out as a predator of several pests in tobacco plantations (Jahnke *et al*. 2002; Marques *et al*. 2006).

As earlier stated, the canola plantation exhibits a considerable diversity of predaceous true bugs (Pentatomidae - Asopinae and Reduviidae) which prey on both beneficial insects (pollinators such as bees) and pests, having a crucial role in the control of the latter. Therefore, it is vital that the plantation management (especially regarding the use of pesticides) is done carefully to cause as little damage as possible to these biological control agents. This would guarantee the preservation of these insects not only in canola plantations, but also in others crops which integrate the diverse agroecosystems found in Brazil.

Taking into account the diversity of species of Reduviidae and their role in the predation of pests in canola crops, and also because there is currently no sufficient scientific knowledge in Neotropics about the biology, behavior and predation efficiency of these true bugs to allow the rearing, augmentation and release in under field conditions, it is extremely important that farmers adopt practices that aim to preserve them in agroecosystems. Among these practices, we can highlight the maintenance of the native vegetation, legal reserves, areas of permanent preservation ("APPs") and riparian forests. These spots of natural vegetation besides providing shelter and preys to reduviids during agricultural off-season periods, may allow them to remain close to the crops, ensuring their role as biological pest control agents.

As reported, canola plants are visited by a large diversity of arthropods (phytophagous, pollinators and predators) throughout their development. Among the predators, studies have revealed an increasing number of species associated with this plant species, as reported here for true bugs. It is likely that canola plantations house other species of predaceous true bugs still unreported. Thus, further studies are needed to understand more precisely their real diversity associated with canola and how exactly each of these species interact with the other arthropods visiting the plantations.

Furthermore, more studies are needed to understand the population dynamics of reduviids in canola plantations, as well as the biotic and abiotic factors that affect their populations throughout the crop cycle.

In summary, the present work recorded the occurrence of seven species of Reduviidae in a canola crop (with larger abundance of *Atrachelus cinereus crassicornis*), expanded the knowledge about the geographic distribution of these species, reported predation of three reduviid species and presented management strategies aimed to the preservation, conservation and maintenance of these predators in agroecosystems.

The results obtained is a contribution to the knowledge about the diversity and ecology of reduviid species that occur in canola crop, including the choosing of preys by them as well as their climatic adaptability taking into account that the species were collected both in cold and warmer months.

On the other hand, in spite of the relevance of the results presented in this study, the small number of samples and short survey period seem not to be enough to express the full diversity of reduviids that may be potentially present in a canola crop. Therefore, more exhaustive surveys are necessary, including larger areas and different cultivation regions, to record which are the most common and abundant species of Reduviidae that live in the canola agrosystem. Furthermore, future studies can investigate the pest predation capacity of reduviid species occurring in canola and which may be useful for biological control programs. In the latter case, possibly for future mass releases of these predators in the field.

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Author Contributions

ALMJ, HRG-S: Conceptualization, methodology, software, photographs of the species. **HRG-S, LAM:** Taxonomic identification of species. **ALMJ, HRG-S, LAM:** Data curation, writing- original draft preparation. **ALMJ, HRG-S:** Visualization, investigation. **ALMJ, HRG-S:** Supervision, writing and editing.

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