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# Occurrence of some stink bug species (Hemiptera: Pentatomidae) associated with rice fields in Argentina

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**Abstract:** Stink bugs (Hemiptera: Pentatomidae) are a group of about 5,000 species distributed worldwide, many of them phytophagous with economic implications as crop pests. Rice (*Oryza sativa* L.) is one of the leading agricultural products for human consumption. In neotropical rice fields, hemipterans are the primary pests, with stink bugs being the worst affecting crop productivity, standing out the genus *Tibraca* Stål in terms of economic damage. In addition, rice crops may represent important feeding and mating sites for other stink bug species taxonomically related to *Tibraca*, which could play the role of potential pests, making it necessary to study the pentatomids associated with this crop in the Neotropics. This work aimed to report the presence of *Glyphepomis adroguensis* Berg, *Hypatropis inermis* (Stål) and *Paratibraca spinosa* (Campos & Grazia) associated with rice in the main rice-growing areas of Argentina. Material collected during 2017-2018 from commercial fields in northeastern Argentina, the central rice-producing region, was identified. The rice variety on which the specimens were collected, crop status (growing season - post-harvest) and crop phenology were considered. As a result, the association of the mentioned species with rice in the provinces of Chaco and Corrientes, Argentina, is reported. Moreover, the genus *Paratibraca* Campos & Grazia and the species *P. spinosa* are reported for the first time in the country.

**Key words:** *Oryza sativa*, *Tibraca limbativentris*, *Glyphepomis adroguensis*, *Hypatropis inermis, Paratibraca spinosa,* Stink bugs.

**Resumen: Ocurrencia de algunas especies de chinches (Hemiptera: Pentatomidae) asociadas a los arrozales en Argentina.** Los pentatómidos (Hemiptera: Pentatomidae) son un grupo de unas 5.000 especies distribuidas por todo el mundo, muchas de ellas fitófagas con implicaciones económicas como plagas de cultivos. El arroz (*Oryza sativa* L.) es uno de los productos agrícolas más relevantes para el consumo humano. En los arrozales neotropicales, los hemípteros son las principales plagas, siendo los pentatómidos los que más afectan a la productividad del cultivo, destacando el género *Tibraca* Stål en cuanto al impacto económico. Además, los cultivos de arroz pueden representar importantes sitios de alimentación y apareamiento para otras especies de chinches taxonómicamente relacionadas con *Tibraca*, que podrían desempeñar el papel de potenciales plagas, lo que hace necesario el estudio de los pentatómidos asociados a este cultivo en el Neotrópico. Este trabajo tuvo como objetivo reportar la presencia de *Glyphepomis adroguensis* Berg, *Hypatropis inermis* (Stål) y *Paratibraca spinosa* (Campos & Grazia) asociadas al arroz en las principales zonas productoras de Argentina. Se identificó el material recolectado durante 2017-2018 en arrozales comerciales del Noreste argentino, principal región productora. Asimismo, se consideró la variedad de arroz sobre la que se recolectaron los especímenes, el estado del cultivo (temporada de cultivo - postcosecha) y la fenología del cultivo. Como resultado, se reporta la asociación de las especies mencionadas con el arroz en las provincias de Chaco y Corrientes, Argentina. Además, se reporta por primera vez en el país el género *Paratibraca* Campos & Grazia y la especie *P. spinosa*.

**Palabras clave:** *Oryza sativa*, *Tibraca limbativentris*, *Glyphepomis adroguensis*, *Hypatropis inermis, Paratibraca spinosa,* pentatómidos.

## INTRODUCTION

Stink bugs (Hemiptera: Pentatomidae) are a worldwide distributed group that includes around 5000 species (Schuh & Weirauch, 2020), of which 279 are represented in Argentina (Dellapé, 2021). Except for asopines (predators), most stink bugs are phytophagous, feeding on non-cultivated and economically important cultivated plants. These insects can feed on leaves, stems, and roots; however, they are most often associated with developing seeds, fruits or growing shoots (McPherson, 2018; Panizzi *et al*., 2021). Therefore, they may have economic implications as agricultural pests, and many species of agricultural interest are mainly associated with rice and other grasses (Panizzi *et al*., 2000).

Rice (*Oryza sativa* L.) is one of the most important agricultural commodities produced for human consumption, providing 20% of the world's total vegetable calorie intake and being the primary nutritional source for more than half of the global population (Seck *et al*., 2012; Zeigler & Barclay, 2008). This cereal also provides a large number of calories per hectare cultivated, being a vital food resource within the plans developed to contribute to global food security (FAO, 2013; Gnanamanickam, 2009). In neotropical rice fields, hemipterans are the primary pests (Schaefer & Panizzi, 2000), with the Pentatomidae family containing the most economically important ones, such as the stink bugs *Tibraca limbativentris* Stål, *Oebalus poecilus* (Dallas) and *O. ypsilongriseus* (DeGeer), which are widely distributed in rice fields in the region and represent a serious challenge for pest management (Didonet *et al*., 2001; Kruger & Burdyn, 2015; Pantoja *et al*., 1997). These three species are significant because they generate large losses in irrigated rice cultivation, reducing yields and causing the low quality of commercial rice (Pantoja *et al*., 1997, 2000; Santana *et al*., 2018).

The rice crops may represent important feeding and mating sites of other stink bug species taxonomically related to *Tibraca* Stål (Barros *et al*., 2020a); as is the case for *Hypatropis inermis* (Stål), and several species of *Paratibraca* Campos & Grazia and *Glyphepomis* Berg in Brazil (Campos & Grazia, 1998; Pantoja *et al*., 2005; Farias *et al*., 2012; Klein *et al*., 2013; Krinski *et al*., 2015). According to Farias *et al*. (2012) and Krinski *et al*. (2015), further studies are needed to determine the presence of these species in rice and to assess whether they could be pests of this crop in the future.

This work aimed to report the presence of *Hypatropis inermis*, *Glyphepomis adroguensis* Berg and *Paratibraca spinosa* (Campos & Grazia) associated with rice in the main rice-growing areas of Argentina. As mentioned above, the occurrence of these species in rice fields is relevant due to their potential role as crop pests. On the other hand, the genus *Paratibraca* and the species *P. spinosa* were reported for the first time in Argentina.

## MATERIAL AND METHODS

The study was conducted in twelve commercial rice fields in northeastern Argentina (Chaco and Corrientes provinces: 26°44'S to 27°50'S, 58°50'W to 57°20'W), the main rice-producing region (BCSF *et al*., 2021). The irrigation system in selected rice fields uses water extracted from the Paraná River, one of the largest river systems in the Neotropics, whose floodplain supports a vast drainage area that includes natural wetlands and rice paddies (Benzaquén *et al*., 2017; Neiff, 1996). The samplings were carried out during 2017-2018, throughout the whole rice growing season: tillering, stem elongation (vegetative phenology), flowering and ripening (reproductive phenology) (Degiovanni *et al*., 2004; Kruger & Burdyn, 2015). Also, qualitative post-harvest sampling of rice stubble was carried out in the same plots. The specimens were collected manually at each site in 250cm$^3$ containers, and using an entomological net. The rice cultivar planted in each studied area, Fortuna INTA (Doble Carolina rice variety, tall plants) and short variety IRGA 424 (long thin rice variety, lower plants), were also recorded.

All collected specimens were preserved in 96% ethanol, and hemipterans were separated from the other orders. Pentatomidae specimens were identified using appropriate keys and literature (Grazia & Schwertner, 2008; Rolston *et al*., 1980; Rolston & McDonald, 1981, 1984). All the specimens studied were deposited in the entomological collection of the Museo de La Plata, Buenos Aires, Argentina. Digital photographs were taken using a Leika EZ4 stereomicroscope, and images were processed with CorelDraw© X7 graphic suite software. The map was created with the Google Maps web mapping platform (https://www.google.com/maps) and edited with CorelDraw© X7.

## RESULTS

The species of economic importance and main pests of rice fields are *T. limbativentris*, *O. poecilus* and *O. ypsilongriseus* (Dellapé *et al*., 2022; Kruger & Burdyn, 2015). However, in this work, we report the occurrence of three other stink bug phytophagous species in Argentine rice fields: *Glyphepomis adroguensis*, *Hypatropis inermis*, and *Paratibraca spinosa*, which are relevant given their role as potential rice pests in other countries such as Brazil (Fig. 1). The following key includes these six species of economic importance for the crop.

**Key to the stink bug species, both pests and potential pests of rice, from Argentina**

1- Anterolateral margins of pronotum straight and crenulated in anterior part; humeral angles not developed..... .....*Hypatropis inermis* (Fig. 1B)

1´- Anterolateral margins of pronotum sinuous to concave, not crenulated ..... 2

2- Mandibular plates subequal to clypeus; antennomere 2 longer than antennomere 1 ..... 3

2´- Mandibular plates smaller than clypeus; clypeus robust and raised above mandibular plates; antennomere 2 shorter than antennomere 1..... 4

3- Apex of radial vein of corium with a large pale yellow callosity; body ferruginous to dark castaneous, with one pair of yellow callosities on pronotum; if humeral angles are developed into a spine, then spine directed laterally..... .....*Oebalus poecilus* (Fig. 1D)

3´- Apex of radial vein of corium without callosity; body castaneous, with one pair of small yellow spots, not callosities, on pronotum; if humeral angles are developed into a spine, then spine directed anterolaterally..... .....*Oebalus ypsilongriseus* (Fig. 1E)

4- Large specimens (body length more than 11 mm); antennomere 4 cylindrical; femurs of metathoracic legs uniformly castaneous; connexivum with dark castaneous macule on anterior angles...*Tibraca limbativentris* (Fig. 1F)

4´- Small specimens (body length less than 11 mm); antennomere 4 conical; femurs of metathoracic legs with proximal part of light coloration and distal part dark; connexivum concolorous with abdomen..... 5

5- Humeral angles slightly developed..... .....*Glyphepomis adroguensis* (Fig. 1A)

5´- Humeral angles forming an acute spine directed anterolaterally..... .....*Paratibraca spinosa* (Fig. 1C)

The species of Pentatomidae reported for the first time in Argentinean rice crops are presented below. The authors undertake to notify the authorities of the Servicio Nacional de Sanidad y Calidad Agroalimentaria (SENASA), through the "SINAVIMO" network of the Dirección Nacional de Protección Vegetal - SENASA (DNPV).

### ***Glyphepomis adroguensis* Berg**
(Fig. 1A)

This species is distributed in Brazil, Uruguay and Argentina (Dellapé, 2021; Dellapé *et al*., 2022). Along with other species of the genus, such as *G. setigera* Kormilev & Pirán and *G. pelotensis* Campos & Grazia, it has been reported on rice crops in Brazil (Campos & Grazia, 1998; Farias *et al*., 2012, Bianchi *et al*., 2016). While in Argentina, *G. adroguensis* was collected hibernating on *Paspalum quadrifarium* Lamb. (Poaceae) (Kormilev & Pirán, 1952), and here it is reported on rice fields in the country for the first time.

The species was recorded during the tillering and flowering stages in plots of both rice varieties in rice fields of Corrientes province (Fig. 2). Adults were found at the base of the plants between the stems.

**Material examined. Argentina. Corrientes**: Empedrado (INTA), 29/XI/2017, Daniela Fuentes-Rodríguez leg., Tillering, manual sampling, 1 female; Empedrado (INTA), 9/II/2018, Daniela Fuentes-Rodríguez leg., Flowering, manual sampling, 4 males, 3 females; Berón de Astrada (Adeco1), 11/I/2018, Daniela Fuentes-Rodríguez leg., Tillering, manual sampling, 2 males, 1 female; Empedrado (Bomb2), 12/I/2018, Daniela Fuentes-Rodríguez leg., Tillering, entomological net, 1 female.

### ***Hypatropis inermis* (Stål)**
(Fig. 1B)

*Hypatropis inermis* is distributed in Suriname, Brazil, Uruguay and Argentina (Dellapé *et al*., 2022). This species was reported on rice and overwintering on *Andropogon bicornis* L. (Poaceae) in Brazil (Klein *et al*., 2013; Krinski *et al*., 2015). While in Argentina, this is the first record of *H. inermis* on rice.

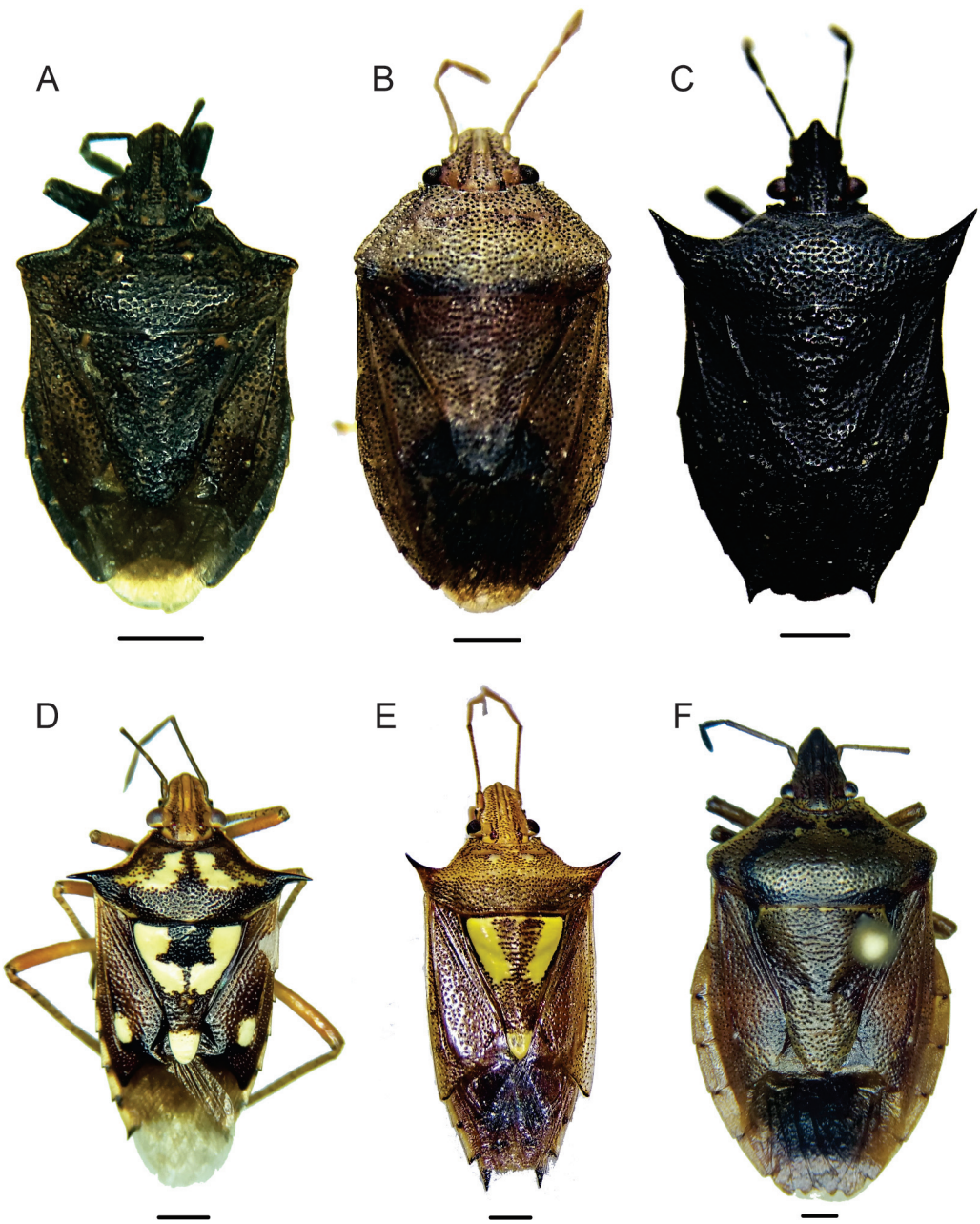


Fig. 1. Species of Pentatomidae reported for the first time in Argentinean rice crops and currently stated pest species. (A) *Glyphepomis adroguensis*. (B) *Hypatropis inermis*. (C) *Paratibraca spinosa*. (D) *Oebalus poecilus*. (E) *Oebalus ypsilongriseus*. (F) *Tibraca limbativentris*. Scale: 1mm.

Krinski *et al*. (2015) reported that rice might be an important feeding and mating host for this species in Brazil. Because of this, monitoring is recommended. The species was recorded during tillering and flowering in the two rice varieties sampled in rice fields of Corrientes province (Fig. 2). Also, the species were detected during post-harvest hibernating on rice stubble.

**Material examined. Argentina. Corrientes**: Empedrado (Bomb), 12-VII-2017, Daniela Fuentes-Rodríguez leg., post-harvest, manual sampling, 1 male; Berón de Astrada (Cach1),


Fig. 2. Presence of the species *Glyphepomis adroguensis, Hypatropis inermis,* and *Paratibraca spinosa* in target rice fields of northeastern Argentina.

1-XI-2017, Daniela Fuentes-Rodríguez leg., Tillering, manual sampling, 2 males; Empedrado (INTA), 9-II-2018, Flowering, manual sampling, Daniela Fuentes-Rodríguez leg., 2 females; Berón de Astrada (Adeco), 14-VII-2017, Daniela Fuentes-Rodríguez leg., post-harvest, manual sampling, 1 male.

### ***Paratibraca spinosa* (Campos & Grazia)**
(Fig. 1C)

The genus *Paratibraca* is distributed in Central and South America (Grazia *et al*., 2022) and is reported for the first time in Argentina through this work.

Along with the genera *Glyphepomis*, *Hypatropis* Bergroth and *Tibraca*, among others, *Paratibraca* is part of the Mecocephala group, which has been widely studied for presenting many species that are important pests of rice and other crops (Rizzo, 1976; Schaefer & Panizzi, 2000; Panizzi, 2015; Barros *et al*., 2020a, 2020b). *Paratibraca spinosa* has been collected on rice in several Brazilian states (Campos & Grazia, 1998; Grazia *et al*., 2022), and the species is reported here for the first time on rice crops in Argentina.

In Brazil, *P. spinosa* is considered a pest of rice because when *T. limbativentris* is found in low quantity, it can reach similar densities to this pest and cause high economic losses (Alves *et al*., 2012). Because of this, monitoring is suggested. The species was recorded in rice fields of Corrientes and Chaco provinces (Fig. 2) during the tillering, flowering and ripening stages, mainly in plots of the Fortuna INTA variety. Also, the species were detected during postharvest hibernating on rice stubble. Adults were found at the base of the plants between the stems and were observed on rice stems in the typical feeding position described for *T. limbativentris*, with

the head pointed downward (Ferreira & Martins, 1984).

**Material examined. Argentina. Corrientes**: General Paz (DonL), 5/IV/2018, Daniela Fuentes-Rodríguez leg., post-harvest, manual sampling, 1 male; General Paz (DonL), 30/I/2018, Daniela Fuentes-Rodríguez leg., Ripening, entomological net, 1 male; Ramada Paso, 4/VIII/2017, Daniela Fuentes-Rodríguez leg., post-harvest, manual sampling, 1 female; Empedrado (Bomb1), 31/I/2018, Daniela Fuentes-Rodríguez leg., Flowering, entomological net, 1 female; Empedrado (Bomb1), 16/II/2018, Daniela Fuentes-Rodríguez leg., Ripening, entomological net, 1 female; Berón de Astrada, 22/II/2017, Solange Martínez leg., Flowering, 1 male; **Chaco**: Chaco (Gral. Mansilla) 7/II/2019, Daniela Fuentes-Rodríguez leg., Tillering, manual sampling, 1 male.

Given the economic relevance of rice crops and the potential role of these three species of stink bugs as crop pests in neighboring countries such as Brazil, we recommend more exhaustive monitoring and field studies to determine these species' abundance in Argentinean rice fields and to assess whether they could be pests of this crop in the future.

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