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***Tylospilus gaumeri* (DISTANT, 1889) comb.n. (Insecta: Hemiptera: Pentatomidae): new combination and revised status**

T. Roell*, H. Bruckner** & M. Duarte*

Abstract

The asopine *Podisus gaumeri* DISTANT, 1889 is removed from the synonymy with *Tyrannocoris jole* (STÅL, 1862) and transferred to the genus *Tylospilus* STÅL, 1870. This decision is based on the examination of type specimens of several species of *Tyrannocoris* THOMAS, 1992 and *Tylospilus*. *Tylospilus gaumeri* comb.n. et stat.rev. has the lateral margins of the pronotum sinuous, and the ostiolar peritreme reaches less than half of the metapleural width, which is in accordance with the generic characteristics of *Tylospilus*. On the other hand, *Tyrannocoris* is characterized by the lateral margins of the pronotum almost rectilinear and smooth, and the ostiolar peritreme reaches two-thirds of the metapleural width.

Key words: Asopinae, *Podisus*, taxonomy, *Tyrannocoris*.

Zusammenfassung

Die Asopinae *Podisus gaumeri* DISTANT, 1889, wird aus der Synonymie mit *Tyrannocoris jole* (STÅL, 1862) gelöst und in die Gattung *Tylospilus* STÅL, 1870, gestellt. Diese Entscheidung beruhte auf der Untersuchung von Typusexemplaren mehrerer Arten der Gattungen *Tyrannocoris* THOMAS, 1992 und *Tylospilus*. Bei *Tylospilus gaumeri* comb.n. et stat.rev. sind die seitlichen Ränder des Pronotum geschwungen und das ostiolare Peritrem nimmt weniger als die Hälfte der Metapleuronbreite ein, was mit den Gattungsmerkmalen von *Tylospilus* übereinstimmt. *Tyrannocoris* andererseits ist durch fast geradlinige und glatte Seitenränder des Pronotum und ein ostiolares Peritrem gekennzeichnet, das zwei Drittel der Metapleuronbreite einnimmt.

Introduction

The Asopinae is the only subfamily of Pentatomidae which is primarily predatory in habit, therefore some species are important for the biological control of agricultural pests around the world (THOMAS 1992, 1994, GRAZIA et al. 2015). The taxonomy of the Asopinae has received significant contributions by SCHOUTEDEN (1907) and THOMAS (1992, 1994), especially from the latter works which provided several identification keys for genera and species, and also descriptions of new taxa. *Tyrannocoris* is one of the genera proposed by THOMAS (1992), comprising *Tyrannocoris jole* (STÅL, 1862), *Tyrannocoris nigriceps* THOMAS, 1992, *Tyrannocoris rex* THOMAS, 1992, and *Tyrannocoris rideri* THOMAS, 1992. The genus occurs in the Neotropical Region, and is mainly characterized by the mandibular plates and clypeus being subequal in length, the lateral margins of the pronotum straight and smooth, and the ostiolar peritremes relatively long, reaching two-thirds of the metapleural width (THOMAS 1992).

* Talita Roell & Marcelo Duarte, Museu de Zoologia da Universidade de São Paulo, Av. Nazaré 481, São Paulo, SP, Brasil, 04263-000. – tali.roell@gmail.com; mduartes@usp.br

** Harald Bruckner, 2nd Zoological Department, Natural History Museum Vienna, Burgring 7, 1010 Vienna, Austria. – harald.bruckner@nhm-wien.ac.at

The taxonomy of Asopinae, however, still needs attention, since type-material could not be consulted for all species revised by SCHOUTEDEN (1907) and THOMAS (1992, 1994), including species of *Tylospilus* STÅL, 1870, for example. *Tylospilus* is also a Neotropical genus, and it includes species which have the mandibular plates and clypeus subequal in length, the lateral margins of the pronotum sinuous, and the ostiolar peritremes relatively short, reaching less than half of the metapleural width (THOMAS 1992). This genus has received recent attention by BRUGNERA et al. (2020), who synonymized *T. armatus* THOMAS, 1992 with *T. nigrobinotatus* (BERG, 1879), and described the new species *T. armatusimilis* BRUGNERA, PAIM & GRAZIA, 2020. Currently, *Tylospilus* contains eight species: *T. acutissimus* (STÅL, 1870), *T. armatusimilis*, *T. chilensis* (SPINOLA, 1852), *T. cloelia* (STÅL, 1862), *T. distans* (BERGROTH, 1891), *T. megaspilus* (WALKER, 1867), *T. nigrobinotatus*, and *T. peruvianus* (HORVÁTH, 1911) (THOMAS 1992, BRUGNERA et al. 2020).

While studying type material of Asopinae from several collections, it became apparent that *Podisus gaumeri* DISTANT, 1889, which was synonymized with *Tyrannocoris jole* by THOMAS (1992) is not conspecific with its senior synonym. In this work, we investigate the taxonomic status of *Podisus gaumeri*, transfer it to the genus *Tylospilus*, and provide a redescription of it. *Tyrannocoris jole* is also redescribed.

Material and methods

We examined the type specimens of the species of *Tyrannocoris* and *Tylospilus* conserved in the following collections:

AMNH American Museum of Natural History, New York, USA.

HNHM Hungarian Natural History Museum, Budapest, Hungary.

NHMUK The Natural History Museum, London, United Kingdom.

NHMW Naturhistorisches Museum Wien, Austria, Wien.

NHRS Naturhistoriska riksmuseet, Stockholm, Sweden.

MLPA Museo de la Plata, Universidad Nacional de La Plata, La Plata, Argentina.

MNHN Muséum national d'Histoire naturelle, Paris, France.

MZSP Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil.

The only species for which we could not locate type-material was *Tylospilus distans* BERGROTH, 1891. Bergroth originally indicated that this species was based upon at least one male specimen belonging to Fallou. Specimens from Fallou's collection should be deposited in MNHN (RIDER 2020), where HILDEBRAND (1987) studied one specimen that was inadvertently designated as the lectotype by referring to it as "holotype" (ICZN 1999: Art. 74.6). However, the curator of Heteroptera of the MNHN, Dr. Eric Guilbert (personal communication), was unable to find any type material for this species. Specimens from Bergroth's collection were normally deposited in the Finnish Museum of Natural History University of Helsinki, Finland (RIDER 2020), but no type material was found there either (Dr. Heidi Viljanen, personal communication). We were able to examine a non-type specimen at MZSP, identified by comparing it with the original description (BERGROTH 1891) and the identification key provided by THOMAS (1992).

Photographs were taken by the first author at the NHMUK, MLPA, MNHN, and MZSP, and by the second author at NHMW. Ruth Salas and Steve Thurston sent photographs of type specimens deposited in the AMNH, Péter Kóbor of specimens deposited in HNHM, and Gunvi Lindberg of specimens deposited in NHRS.

The terminologies of ZHOU & RÉDEI (2020) and KMENT & VILÍMOVÁ (2010) were adopted for genitalic structures and for the external scent efferent systems of the metathoracic scent gland, respectively.

Taxonomy

Tylospilus gaumeri (DISTANT, 1889) comb.n. et stat.rev. (Figs. 1, 3)

Podisus gaumeri DISTANT, 1889: 320, pl. 30 fig. 16. Here removed from the synonymy with *Tyrannocoris jole* (STÅL, 1862). Lectotype female from Temax, Mexico (NHMUK) inadvertently designated by THOMAS (1992: 126).

Podisus gaumeri: UHLER 1894: 172.

Apateticus (Eupodisus) gaumeri: SCHOUTEDEN 1907: 71.

Apateticus (Podisus) gaumeri: KIRKALDY 1909: 19.

Podisus gaumeri: THOMAS 1992: 126 (as synonym of *Tyrannocoris jole* (STÅL, 1862)).

Redescription: Body oval. Head subrectangular; clypeus slightly surpassing mandibular plates; compound eyes small, width of each less than half of interocular distance; ocelli globose, lying behind an imaginary line through posterior margins of compound eyes, more than one-third of width of a compound eye; antennal tubercle not visible from above. Pronotum hexagonal, uniformly punctured except on cicatrices; anterior margin concave; anterolateral margins slightly sinuous, crenulate on anterior half; humeral angles triangular, slightly produced; posterior angles triangular; posterior margin rectilinear. Scutellum reaching an imaginary line connecting middle of fifth connexival segments, with 1+1 yellowish spots on anterior angles near foveae, and one central smaller spot between them; posterior angle yellowish preceded by a brownish V-shaped macula; frenal margins longer than postfrenal margins. Coria longer than scutellum, uniformly punctured, each attaining middle of connexival segment VI; hemelytral membranes surpassing apex of abdomen, each with a central brownish spot. Mesopleural evaporatoria extending onto posterior and lateral margins, and posterior angles; metapleural evaporatoria surrounding ostiolar peritremes; each ostiolar peritreme relatively short, reaching about half of metapleural width. Abdomen slightly punctate; basal tubercle extending beyond metacoxae but not quite to mesocoxae; posterolateral angles of connexival segments projected as small spines. Female genital plates (Fig. 1E): valvifers VIII subtriangular, juxtaposed, posterior margins sinuous, disc tumescent; laterotergites VIII triangular; valvifers IX rectangular; laterotergites IX rounded, not surpassing mediotergite VIII; sternite X quadrate.

Remarks: THOMAS (1992: 126) synonymized this species with *Tyrannocoris jole* (STÅL, 1862), indicating that he studied DISTANT's (1889) type specimen, upon which he based his description of *Podisus gaumeri*. However, we have studied type material of both *T. jole* and *P. gaumeri*, and we have determined that they are not conspecific; furthermore, this species does not belong to *Tyrannocoris* because it has the anterolateral margins of the pronotum sinuous (while they are nearly rectilinear and smooth in *Tyrannocoris*),

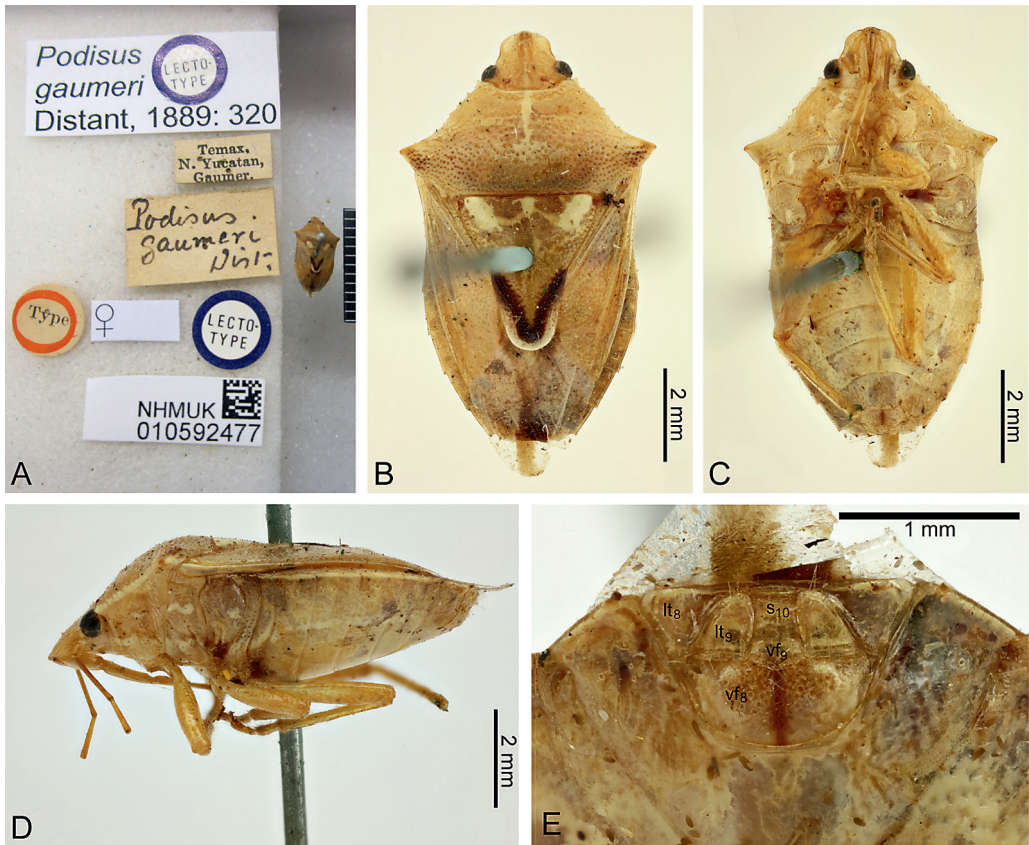


Fig. 1: *Tylospilus gaumeri*. Lectotype female of *Podisus gaumeri* deposited at NHMUK: (A) labels; (B) dorsal; (C) ventral; (D) lateral; (E) genital plates of female, ventro-posterior view. Photographed by Talita Roell (© 2017 The Natural History Museum, London). Abbreviations: lt₈, laterotergites VIII; lt₉, laterotergites IX; st₁₀, sternite X; vf₈, valvifers VIII; vf₉, valvifers IX.

and the ostiolar peritremes are relatively short, less than half of the metapleural width (reaching two-thirds of metapleural width in *Tyrannocoris*). The lectotype specimen for *P. gaumeri* that we examined matches very closely the original description given by Distant, especially in the details of the scutellum (“with a pale levigate spot near each basal angle, and a smaller spot at the centre of the basal margin, a V-shaped black fascia at the apex, the apical margin pale luteous.”) and the abdomen (“Ventral spine strong, robust, extending a little in front of the posterior coxae”) (DISTANT 1889). Additionally, the labels “Temax. N. Yucatan, Gaumer.” and “*Podisus gaumeri* Dist.” confirm that this is a specimen from Distant’s type series, and was examined by Thomas, who inadvertently designated it as the lectotype by referring to it as “the type” (ICZN 1999: Art. 74.6).

In the key for the identification of Asopinae genera provided by THOMAS (1992), this specimen will key to the genus *Tylospilus*; it also possesses the general main characteristics of the genus, such as the dorsum of the head lacking dark punctures, the base of

the abdomen with a relatively long spine, and the posterior tibiae cylindrical in shape (THOMAS 1992).

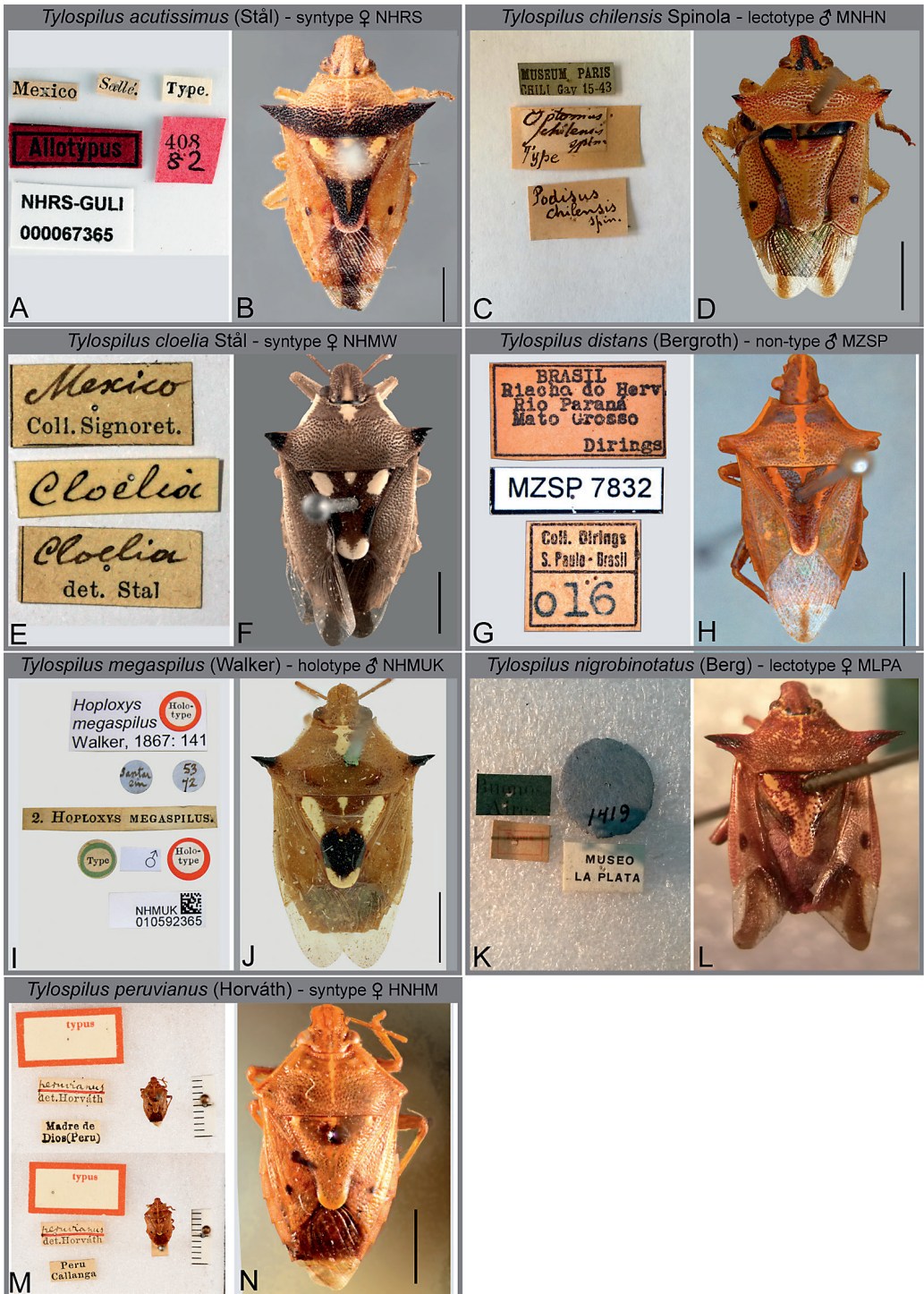
Photographs of the type specimens for most of the other eight species of *Tylospilus* were examined (Fig. 2) (see also BRUGNERA et al. 2020), and the original descriptions were checked (SPINOLA 1852, STÅL 1862, WALKER 1867a, STÅL 1870, BERG 1879, BERGROTH 1891, HORVÁTH 1911, BRUGNERA et al. 2020). We have determined that *Tylospilus gaumeri* is not conspecific with any other *Tylospilus* species, and it can be distinguished from the other species by the humeral angles only slightly produced (strongly produced and acute in *T. acutissimus*, *T. armatusimilis*, *T. chilensis*, *T. cloelia*, *T. distans*, *T. megaspilus*, and *T. nigrobinotatus*), and the anterolateral margins of the pronotum slightly sinuous and crenulate (strongly sinuous in most species of *Tylospilus*, except *T. peruvianus*). *Tylospilus peruvianus* has the humeral angles not produced, the anterolateral margins of the pronotum nearly rectilinear, and it lacks the spots on the scutellum (Fig. 2M, N), thus differentiating it from *T. gaumeri*. Similar spots on the scutellum occur in *T. gaumeri*, *T. acutissimus*, *T. cloelia*, *T. distans*, and *T. megaspilus*.

Tylospilus gaumeri is most similar to *T. acutissimus*, both sharing small compound eyes and large ocelli (Fig. 3A, B), narrow ostiolar peritremes, and similar spots on the evaporatoria (Fig. 3C, D), but they can be differentiated by the humeral angles being acute, produced and anteriorly directed in *T. acutissimus* (Fig. 3A), while they are only slightly produced and laterally directed in *T. gaumeri* (Fig. 3B), abdominal spots present in *T. acutissimus* (Fig. 3E) and absent in *T. gaumeri* (Fig. 3F), and valvifers VIII more tumescent in *T. gaumeri* (Fig. 3H, J) than in *T. acutissimus* (Fig. 3 G, I). Despite the asopines can greatly vary in the general morphology (e.g. ZHAO et al. 2013, ROELL et al. 2019) the lack of material hinder us to explore the morphology of the internal genitalia for both *T. gaumeri* and *T. acutissimus*, then we are not able to fully investigate the relationships between these two species and a possible synonymy between them for now.

Key to the species of *Tylospilus*

(modified from THOMAS (1992) and BRUGNERA et al. (2020))

- 1 Anterolateral margins of pronotum rectilinear (Fig. 2N). *T. peruvianus*
- Anterolateral margins of pronotum sinuous. 2
- 2 Clypeus contrastingly darker than mandibular plates, ocelli surrounded by dark maculae, these combined in a λ-like dark spot on the head. Scutellum slightly spotted. Each humeral angle contrastingly darker than the pronotal disc (Fig. 2D).
..... *T. chilensis*
- Different from the combined characteristics above. 3
- 3 Each humeral angle with a post-apical tooth or tubercle on posterior edge. 4
- Each humeral angle simple, without a post-apical tooth. 7
- 4 Pronotum about twice as wide as long; humeral angles weakly produced. 5
- Pronotum about three times as wide as long, humeral angles strongly produced. 6
- 5 Anterior half of anterolateral pronotal margins smooth, pale, calloused; scutellum with 1+1 black bands on anterior three-fourth of postfrenal portion (Fig. 2F).
..... *T. cloelia*



- Anterior half of anterolateral pronotal margins slightly crenulate; scutellum with an entire black macula on anterior three-fourth of postfrenal portion (Fig. 2J). *T. megaspilus*
- 6 Humeral angles developed laterally; black spot on apex of radial vein smaller than diameter of a compound eye; metapleuron right posterior ostiolar peritreme without a pale calloused spot; abdominal sternite VII with a mesial black spot. *T. armatusimilis*
- Humeral angles strongly developed with apices directed upwardly; black spot on apex of radial vein equal to diameter of a compound eye; metapleuron right posterior peritreme with a pale calloused spot; a mesial row of black spots on abdominal sternites IV–VII (Fig. 2L). *T. nigrobinotatus*
- 7 Anterior half of anterolateral pronotal margins smooth, calloused (Fig. 2H). ... *T. distans*
- Anterior half of anterolateral pronotal margins crenulate or slightly rough. 8
- 8 Humeral angles acute, produced, directed anteriorly; abdominal spots present (Figs. 2B, 3A). *T. acutissimus*
- Humeral angles slightly produced, directed laterally; abdominal spots absent (Figs. 1, 3B). *T. gaumeri*

***Tyrannocoris jole* (STÅL, 1862) (Figs. 4, 5)**

Telepta jole STÅL, 1862: 92 syntype male at NHMW (Mexico, Vera Cruz) (Fig. 4).

Arma iole: WALKER 1867a: 135.

Rhaphigaster aggressor WALKER, 1867b: 359 holotype female at NHMUK (Mexico, Santo Domingo) (Fig. 5).

Podisus (Podisus) iole: STÅL 1870: 52.

Apateticus (Eupodisus) jole: SCHOUTEDEN 1907: 71.

Apateticus (Podisus) jole: KIRKALDY 1909: 19.

Podisus jole: BARBER & BRUNER 1946: 53.

Tyrannocoris jole: ORTEGA-LEÓN 1997: 74, 89; ARISMENDI & THOMAS 2003: 225; PEREZ-GELABERT & THOMAS 2005: 325, 348; GRAZIA et al. 2015: 688; LUPOLI 2019: 76, 83, 86, 87.

Redescription: Body oval, yellowish-brown. Head subrectangular; clypeus slightly surpassing mandibular plates; each compound eye width about half interocular distance; ocelli globose, lying posterior to imaginary line through posterior margins of compound eyes, less than 1/3 width of compound eyes, antennal tubercles partially visible from above. Pronotum hexagonal, uniformly punctured except on cicatrices; anterior margin concave; anterolateral margins straight, smooth; humeral angles triangular, slightly produced,

◀ Fig. 2: *Tylospilus* species, labels and dorsal views: (A, B) Syntype of *Podisus (Tylospilus) acutissimus* deposited at NHRS. (C, D) Lectotype of *Oplomus chilensis* deposited at MNHN. (E, F) Syntype of *Telepta cloelia* deposited at NHMW. (G, H) Non-type specimen of *Podisus distans* deposited at MZSP. (I, J) Holotype of *Hoploxys megaspilus* deposited at NHMUK. (K, L) Lectotype of *Mormidea nigrobinotata* deposited at MLPA. (M, N) Syntype of *Podisus (Tylospilus) peruvianus* deposited at HNHM. Photographed by (A, B) Gunvi Lindberg (© 2019 Naturhistoriska Riksmuseet); (C, D) Talita Roell (© 2017 Muséum National d'Histoire Naturelle); (E, F) Harald Bruckner (© 2019 Natural History Museum Vienna); (I, J) Talita Roell (© 2017 The Natural History Museum, London); (K, L) Talita Roell (© 2016 Museo de La Plata); (M, N) Péter Kóbor (© 2019 Hungarian Natural History Museum); original photos cropped, light levels and contrast adjusted. Scale bars = 2 mm.

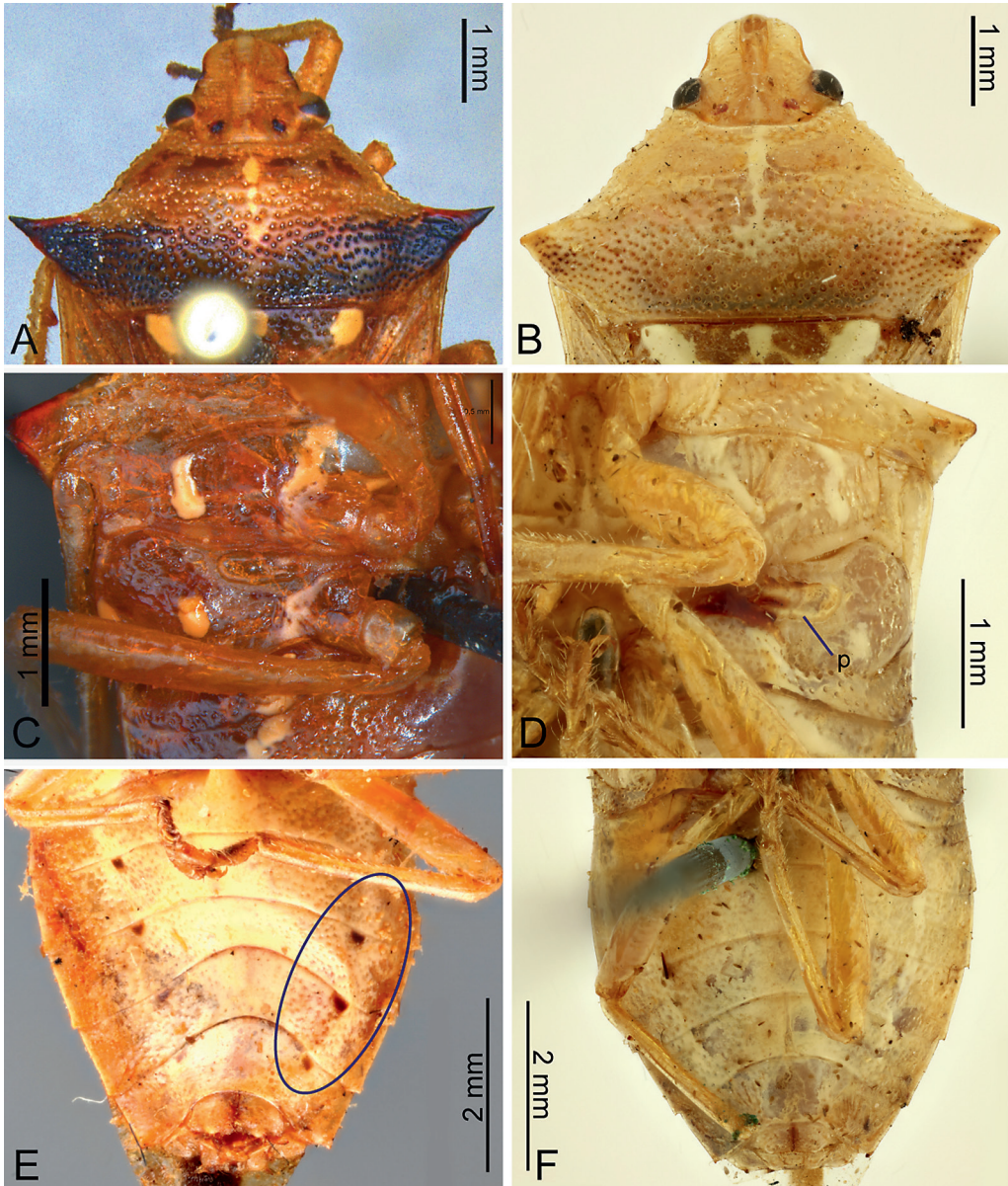


Fig. 3: Comparison between *Tylospilus acutissimus* [first column] and *Tylospilus gaumeri* [second column]: (A, B) head and pronotum; (C, D) external scent efferent system of metathoracic glands; (E, F) abdomen, ventral.

darker than disc of pronotum; posterior angles triangular; posterior margin rectilinear. Scutellum reaching an imaginary line connecting middle of each connexival segment V, with posterior angle pale. Coria longer than scutellum, uniformly punctured, attaining middle of connexival segments VI; hemelytral membranes surpassing apex of abdomen. Mesopleural evaporatoria extending onto posterior and lateral margins, and posterior

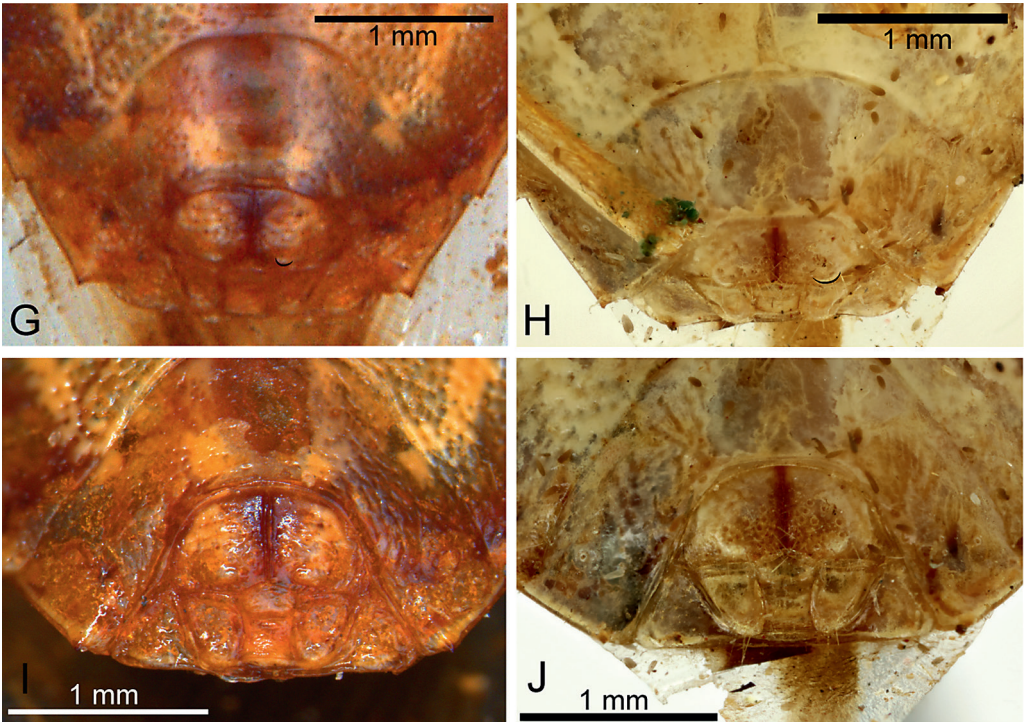


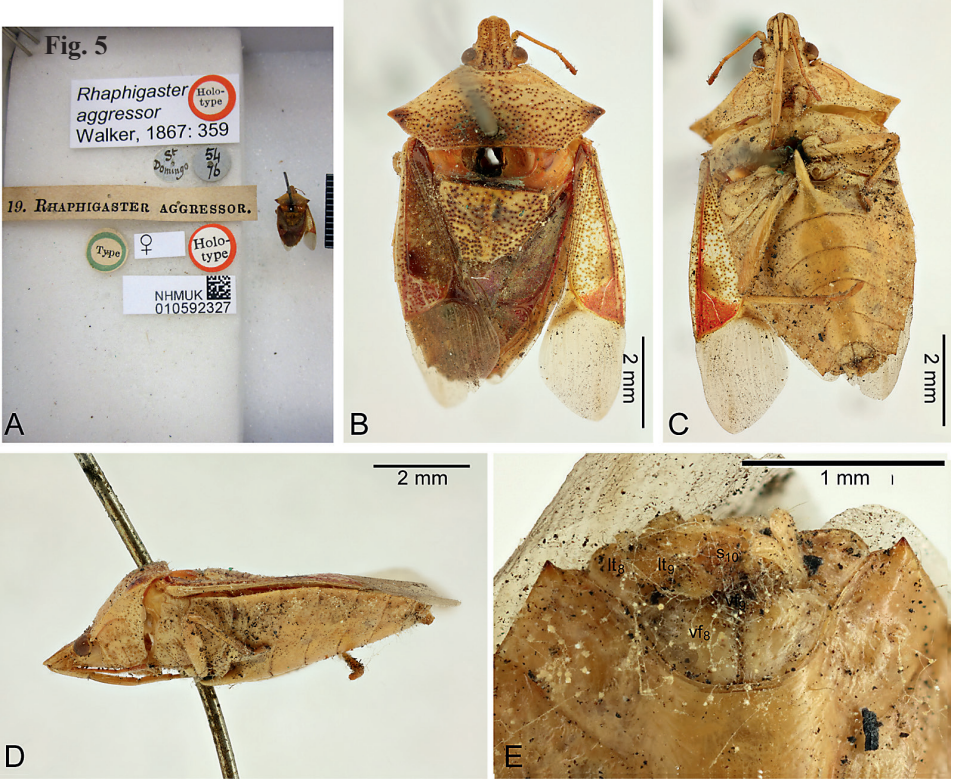
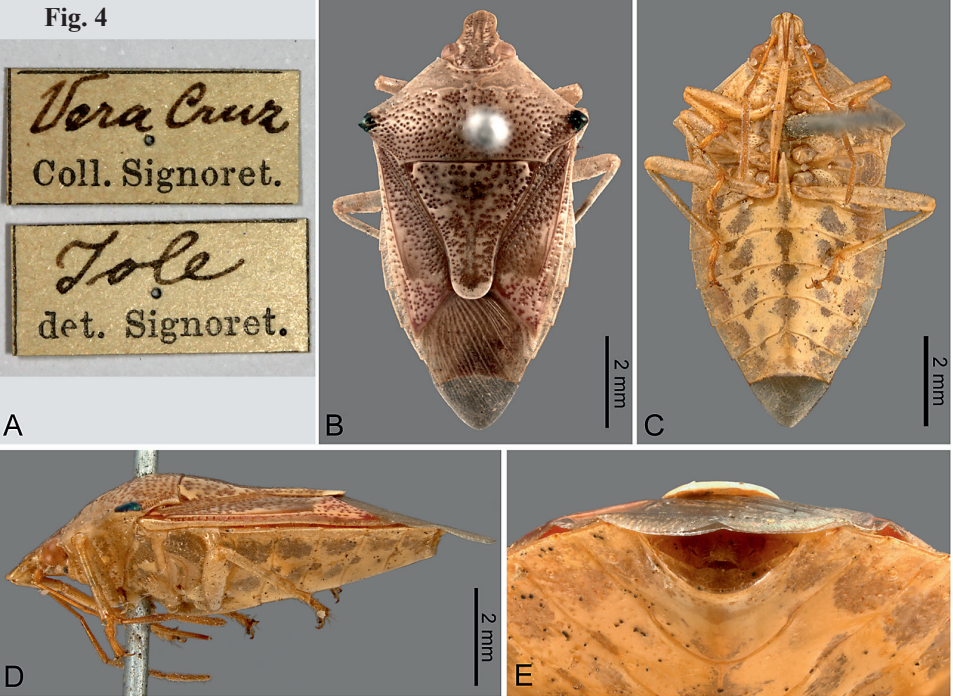
Fig. 3 (continued): Comparison between *Tylospilus acutissimus* [first column] and *Tylospilus gaumeri* [second column]: (G–J) genital plates of female. Abbreviation: p, peritreme.

angles; metapleural evaporatoria surrounding ostiolar peritremes; each ostiolar peritreme elongate, reaching more than 2/3 of metapleural width. Abdomen sparsely punctate; basal tubercle acute, attaining mesocoxae; posterolateral angles of connexival segments projected as small spines. Female genital plates (Fig. 5E): valvifers VIII oval, juxtaposed; laterotergites VIII triangular; valvifers IX rectangular; laterotergites IX rounded.

Remarks: *Tyrannocoris jole* (Figs. 4, 5) differs from most species of *Tyrannocoris* (Fig. 6) by the humeral angles being triangular and slightly produced (more obtuse in *T. nigriceps* and *T. rex*). This species, however, is very similar to *T. rideri* (Fig. 6F), differentiated from it only by the humeral angles being contrastingly darker than the disk of the pronotum, as pointed in the identification key of THOMAS (1992: 124). A study of the genital morphology is needed to better elucidate the relationship between these species.

Key to the species of *Tyrannocoris*
(modified from THOMAS 1992: 124)

- 1 Lateral pronotal margins slightly sinuous. Humeral angles well developed beyond the lateral margins of hemelytra by about the same width as the compound eyes. 2
- Lateral pronotal margins rectilinear. Humeral angles slightly surpassing the lateral margins of hemelytra, corresponding to less than half of the width of compound eyes. 3



- 2 Humeral angles contrastingly darker than the pronotal disc (Fig. 4B). *T. jole*
 – Humeral angles not contrastingly darker than the pronotal disc (Fig. 6F). *T. rideri*
 3 Dorsum of the head dark. Connexival segments unicolored. Pronotum with 1+1 large unpunctuated pale spots on anterolateral regions. *T. nigriceps*
 – Dorsum of the head pale. Connexival segments with dark spots on anterior and posterior margins. Pronotum without two distinct spots. *T. rex*



Fig. 6: *Tyranocoris* species, holotypes deposited at AMNH: (A, D) *Tyranocoris nigriceps*; (B, E) *Tyranocoris rex*; (C, F) *Tyranocoris rideri*. Photographed by Steve Thurston (© 2019 American Museum of Natural History).

◀ Fig. 4: *Tyranocoris jole*, syntype of *Telepta jole* deposited at NHMW: (A) labels; (B) dorsal; (C) ventral; (D) lateral; (E) pygophore, posterior view. Photographed by Harald Bruckner (© 2019 Natural History Museum Vienna).

Fig. 5: *Tyranocoris jole*, holotype of *Rhaphigaster aggressor* deposited at NHMUK: (A) labels; (B) dorsal; (C) ventral; (D) lateral; (E) genital plates of female, ventro-posterior view. Photographed by Talita Roell (© 2017 The Natural History Museum, London). Abbreviations: lt₈, laterotergites VIII; lt₉, laterotergites IX; st₁₀, sternite X; vf₈, valvifers VIII; vf₉, valvifers IX.

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