

Systematics and phylogenetic analysis of *Thymbreus* Stål (Heteroptera: Reduviidae: Peiratinae)

M. del C. Coscarón

Coscarón, M. del. C. Systematics and phylogenetic analysis of *Thymbreus* Stål (Heteroptera: Reduviidae: Peiratinae).

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María del Carmen Coscarón. Departamento Científico de Entomología, Facultad de Ciencias Naturales y Museo, Paseo del Bosque, 1900 La Plata, Argentina.

Key words: Heteroptera; Reduviidae; Neotropical; *Thymbreus*.

Thymbreus, an exclusively Neotropical genus, is revised and a diagnosis is given. The following species are included: *T. crocinopterus* Stål, *T. ocellatus* (Signoret) and *T. pyrrhopterus* (Stål). A key is presented and the main taxonomic characters (head, legs, male and female genitalia) are illustrated. A table with measurements and ratios are included. A phylogenetic analysis and a map of the geographical distribution of the species are presented.

Introduction

The genus *Thymbreus* was described by Stål (1859; type species: *Opinus pyrrhopterus* Stål, 1860). It has been treated successively as a valid genus (Maldonado-Capriles, 1990; Wygodzinsky, 1949). *Thymbreus* has Neotropical distribution, up to southern Mexico.

Up to date, a total of three species have been assigned to the genus *Thymbreus*: *T. crocinopterus* Stål, 1862, *T. ocellatus* (Signoret, 1863) and *T. pyrrhopterus* (Stål, 1858).

The present revision was prompted by the lack of a complete taxonomic treatment. It is an attempt to delimit the species by the use of new characters and besides, to undertake a cladistic analysis of the genus.

Material and methods

This study has been based on material provided by the following institutions of which abbreviations are used through the text: American Museum of Natural History (AMNH), New York, USA; British Museum (Natural History) (BMNH), London, England; Museo del Instituto de Zoología Agrícola (IZAV), Universidad Central de Venezuela, Maracay, Venezuela; Museu de Zoologia (MZSP), São Paulo, Brazil; Nationaal Natuurhistorisch Museum (RMNH), Leiden, The Netherlands; Zoological Museum (ZMH), University of Helsinki, Helsinki, Finland, and Zoologisches Museum (Humboldt-Universität) (ZMB), Berlin, Germany.

For the terminology used for the external morphology, see Coscarón (1983), Lent & Jurberg (1966) and Lent & Wygodzinsky (1979). The measurements and ratios given in table 1, were taken according to Coscarón (1989). For this revision a total of four measurements and 11 ratios were selected. Extraction, dissection, inflation, and drawings of the male and female genitalia were performed according to Coscarón (1983). The terminology employed for the characters of the female genitalia is detailed in Coscarón (1994).

Cladistic analysis

The three species assigned to *Thymbreus* are considered as terminal taxa; for the cladistic analysis the following 14 characters were analyzed:

1. Body shape dorsoventrally flattened. [0] absent; [1] present
2. Antennae with abundant long hairs. [0] absent; [1] present
3. Pronotum with lateral internal, medial and external sulci. [0] present; [1] absent
4. Pronotum rugosities. [0] absent; [1] present
5. Suture of the metapleura. [0] curved; [1] straight
6. Legs with one colour. [0] present; [1] absent
7. Legs with abundant long hairs. [0] absent; [1] present
8. Hemelytra corion. [0] light; [1] dark
9. Hemelytra clavo with at least one region not black. [0] present; [1] absent
10. Conexivum. [0] dorsally visible; [1] dorsally not visible
11. Colour of conexivum. [0] with one pattern; [1] with more than one pattern
12. Medial process of the pygophore inferior edge. [0] straight; [1] sinuose
13. Parameres with an evagination. [0] absent; [1] present
14. Shape of tergites IX and X. [0] subtriangular; [1] subquadrangular

The data matrix (table 2) was analyzed with Hennig86 version 1.5 (Farris, 1988), applying the implicit enumeration option for calculating trees. The cladogram was rooted with the genus *Peirates* Serville. Consistency (Kluge & Farris, 1969) and the retention indices (Farris, 1989) were calculated.

Systematics

Thymbreus Stål, 1859

Thymbreus Stål, 1859: 185 (species typica: *Opinus pyrrhopterus* Stål, 1860); Stål, 1866: 254 (= *Pachynomus* Signoret); Maldonado-Capriles, 1990: 375.

Pachynomus Signoret, 1863: 583 (species typica: *Pachynomus ocellatus* Signoret, 1863).

Redescription.— Head metallic; without pilosity around antenna and between eyes. Postocular region rounded. In lateral view, eyes surpassing neither superior nor inferior edge of head. Ocelli not on a tubercle.

Lateral margin of pronotum carinated along its entire length. Anterior lobe with reduced pilosity, hairs and no granulations. Sulci not distinct, neither pilosity and hairs reduced. Medial and transverse sulci distinct. Posterior lobe with rugosities. Scutellum with reduced hairs, pilosity and granulations, and with rugosities. Suture of metapleura straight. Posterior process of the scutellum not acuminate. Fore and hind tibia angularly dilated beneath, spongy fossa (fig. 13) preceded by a small prominence, occupying distal third of tibia. Macropterous forms known.

Distribution.— Neotropical Region (fig. 30).

Notes.— Biology unknown.

Key to species of the genus *Thymbreus*

1. Predominating colour of hemelytra (fig. 11) black (in some specimens it may have a whitish dot); basal zone of mid and hind femur (fig. 4) yellowish *T. ocellatus* (Signoret)
- Predominating colour of hemelytra not black; legs entirely brown 2
2. Corion (fig. 1) orange and yellowish, clavo (fig. 1) yellowish; inferior edge of medial process of pygophore (fig. 2) sinuose, and IX and X tergites (fig. 10) subtriangular *T. crocinopterus* Stål
- Corion (fig. 19) red, clavo (fig. 19) red and black; inferior edge of medial process of pygophore (fig. 20) with an evagination, and IX and X tergites (fig. 29) subquadrangular *T. pyrrhopterus* (Stål)

Thymbreus crocinopterus Stål, 1862
(figs. 1-10, 30)

Thymbreus crocinopterus Stål, 1862: 457; Maldonado-Capriles, 1990: 375.

Pirates semirufus Walker, 1873a: 99; Distant, 1902: 99 (= *Thymbreus crocinopterus* Stål).

Opinus crocinopterus Walker, 1873a: 1.

Pachynomus crocinopterus Walker, 1873b: 132.

Pirates semirufus Lethierry & Severin, 1896: 130.

Material.— **Mexico:** holotype ♀ (NRS), Salle, *crocinopterus*; allotype ♂ (NRS), Salle; 2 ♀♀ (BMNH), Jalapa, Hoega. B.C.A. Rhyn II. *Thymbreus crocinopterus* Stål; 1 ♂ (BMNH) 1981-411, Campeche, Escarcega Forestry Research Station "El Tormento", 17-21.vi.1981, W.R. Dolling, tropical rainforest at light; 1 ♀ (AMNH), Yucatán, Colonia Yucatán, viii.21.1952, J. and D. Pallister; C.R. Vose Fund Explorers Club A.M.N.H. Exped.; 1 ♂ (AMNH), San Blas Nay., iii.22.1962, F.D. Parker Collector. **Venezuela:** 1 ♀ (IZAV), Aragua, El Limón, 450 m, 9.x.1976, F. Fernandez Y. col.

Redescription.— General aspect of ♂ as in fig. 1. Head brown. Anterior lobe of pronotum brown with metallic brown tonalities. Legs completely dark brown. Hemelytra black except part of clavo and upper zone of membrane yellowish, orange between the Cu and Sc of clavo. Conexivum dorsally visible. Predominating colour of pattern of conexivum light yellow except a little darker on the edges. Urosternites not homogeneously coloured, all tergites dark brown.

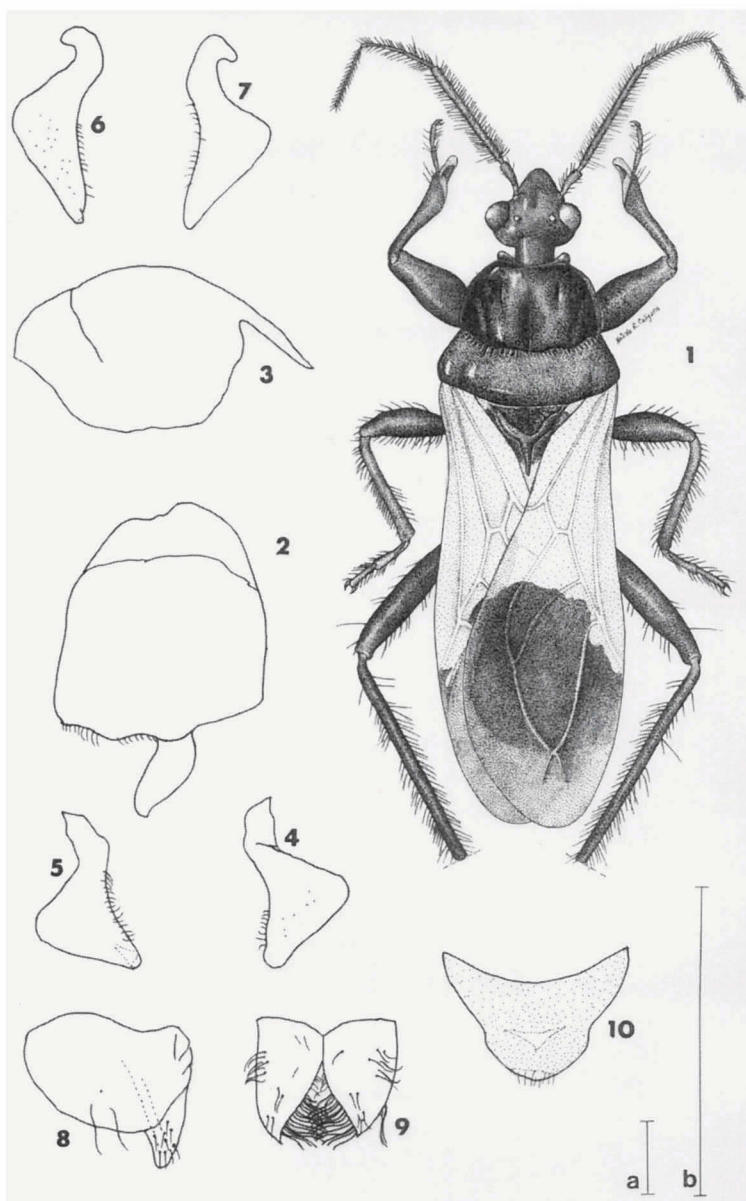
Male genitalia (figs. 2-7).— Inferior edge of medial process of pygophore (fig. 2) sinuose. Parameres according to figs. 4-7.

Female genitalia (figs. 8-10).— Gonocoxite VIII and gonapophysis, gonocoxite IX and IX and X tergites as seen in figs. 8, 9 and 10, respectively. IX and X tergites (fig. 10) subtriangular.

Measurements, see table 1.

Distribution.— Mexico, Guatemala, Panama and Venezuela (fig. 30).

Notes.— This species is recognized by the yellowish colouration of the hemelytra, the completely dark brown appendages and the shape of the male and female genitalia (figs. 2-10). The nearest species is *T. pyrrhopterus*. New record for Venezuela.



Figs. 1-10. *Thymbreus crocinopterus* Stål. 1. General aspect of ♂, dorsal view. 2. Pygophore, ventral view. 3. Pygophore, lateral view. 4. Left paramere, external view. 5. Left paramere, internal view. 6. Right paramere, external view. 7. Right paramere, internal view. 8. Gonocoxite and gonapophysis VIII. 9. Gonocoxites IX. 10. IX and X tergites. Scale figures (a) 1 and (b) 2-10. Scale line 2.0 mm.

Thymbreus ocellatus (Signoret, 1863)
(figs. 11-18, 30)

Pachynomus ocellatus Signoret, 1863: 583.

Thymbreus ocellatus Stål, 1866: 254; Maldonado-Capriles, 1990: 375.

Material.— **Brazil**: 1 ♂ (MZSP), Taracuá, Rio Uaupés, AM, viii.1964, Perura and Machado; 1 ♀ (BMNH), Teffé (Ega), Amazonas, M. de Mathan 2^e Trimestre 1879, Distant Coll., 1911-383; 1 ♀ (AMNH), Rondonia, Villa Velha, x.1973, Alvarenga Col. **Bolivia**: 1 ♀ (RMNH), Coroico.

Redescription.— General aspect of ♀ as in fig. 11. Head (fig. 12) dark brown. Anterior lobe of pronotum dark brown, almost black with metallic blue tonalities. Legs (fig. 13) completely dark brown except yellowish base of mid and hind femur. Hemelytra black except an irregular whitish spot in the inferior part. Conexivum dorsally visible. Pattern of the conexivum as seen in figs. 14 and 15. Urosternites homogeneously coloured, all tergites dark brown, almost black.

Female genitalia (figs. 16-18).— Gonocoxite VIII and gonapophysis, gonocoxite IX and IX and X tergites as seen in figs. 16, 17 and 18, respectively. IX and X tergites (fig. 18) subtriangular.

Measurements, see table 1.

Distribution.— Bolivia, Brazil (Amazonas and Rondônia) and Peru (fig. 30).

Notes.— This species is very distincted by its black colouration, the completely dark brown appendages (except the yellowish base of mid and hind femur), and the structure of the female genitalia (figs. 16-18). New record for Brazil.

Thymbreus pyrrhopterus (Stål, 1858)
(figs. 19-29, 30)

Opinus pyrrhopterus Stål, 1858: 72.

Thymbreus pyrrhopterus Stål, 1866: 254; Maldonado-Capriles, 1990: 375.

Pachynomus pyrrhopterus Walker, 1873b: 132.

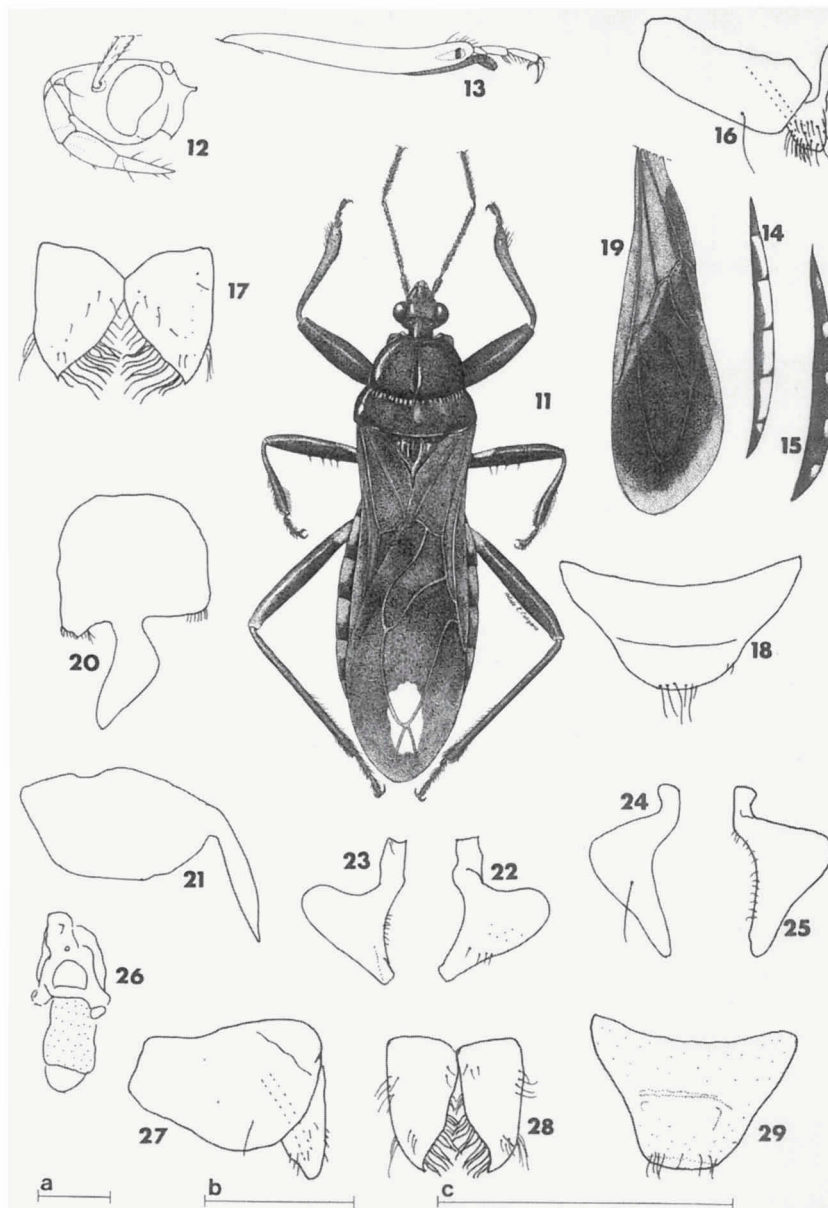
Material.— **Brazil**: holotype ♀ (NRS), Schlö, *pyrrhopterus*; 1 ♀ (ZMH n° 362), Guanabara, Rio de Janeiro, F. Sahlberg; 1 without abdomen (BMNH), Theresopolis, 88-137; 1 ♀ (RMNH), São Paulo; 1 ♂ (ZMB n° 8190), not localised, Coll. Girmar; 1 ♀ (ZMB n° 8190), not localised; 1 ♂ (RMNH), R. Grande do Sul; 1 ♀ (ZMB n° 3077), not localised.

Redescription.— Head dark brown, almost black. Anterior lobe of pronotum brown with metallic brown tonalities. Legs completely dark brown. Hemelytra (fig. 19) black except complete corion and part of clavo red. Conexivum not dorsally visible. Predominating colour of pattern of conexivum yellow except a little darker on the edges. Urosternites homogeneously coloured, all tergites dark brown, almost black.

Male genitalia (figs. 20-26).— Inferior edge of medial process of pygophore (fig. 20) with an evagination. Parameres as depicted in figs. 20-25, and aedeagus as in fig. 26.

Female genitalia (figs. 27-29).— Gonocoxite VIII and gonapophysis, gonocoxite IX and IX and X tergites as depicted in figs. 27, 28 and 29, respectively. IX and X tergites (fig. 29) subquadangular.

Measurements, see table 1.



Figs. 11-18. *Thymbreus ocellatus* (Signoret). 11. General aspect of ♀, dorsal view. 12. Head, lateral view. 13. Fore leg. 14-15. Conexivum. 16. Gonocoxite and gonapophysis VIII. 17. Gonocoxites IX. 18. IX and X tergites. Figs. 19-29. *Thymbreus pyrrhopterus* (Stål). 19. Hemelytra. 20. Pygophore, ventral view. 21. Pygophore, lateral view. 22. Left paramere, external view. 23. Left paramere, internal view. 24. Right paramere, external view. 25. Right paramere, internal view. 26. Aedeagus. 27. Gonocoxite and gonapophysis VIII. 28. Gonocoxites IX. 29. IX and X tergites. Scale figures (a) 11-13, (b) 14, 15, 19 and (c) 16-18, 20-29. Scale line 2.0 mm.



Fig. 30. Distribution map of *Thymbreus crocinopterus* Stål, *Thymbreus ocellatus* (Signoret) and *Thymbreus pyrrhopterus* (Stål).

Distribution.— Brazil (Rio de Janeiro, São Paulo and Rio Grande do Sul) and Argentina (Misiones) (fig. 30).

Notes.— This species is recognized by the reddish colouration of the hemelytra, the completely dark brown appendages and the shape of the male and female genitalia (figs. 20-29). The nearest species is *T. crocinopterus*.

Table 1. Selected measurements (ranges expressed in mm) and ratios for species of the genus *Thymbreus*. Abbreviations: Tl = total length; Wp = width pronotum; Wa = width abdomen; Hdl = head length; Hdh = head height; Aocl = length anteocular region; Pocl = length postocular region; Eyl = eye length; Eyw = eye width; Eyh = eye height; Eyio = length eye interocular region; oce = ocellar diameter; ant1-4 = antennal segments 1-4 length; rosI-III = rostral segments I-III length; Pronl = pronotal anterior lobule length; PrPol = pronotal posterior lobule length; M = male; F = female.

Character	Sex	<i>T. crocinopterus</i>	<i>T. ocellatus</i>	<i>T. pyrrhopterus</i>
Tl	M	10.54 - 12.24	14.45 - 16.66	12.07 - 12.41
	F	11.39 - 12.58	-	14.28 - 14.45
Wp	M	2.89 - 3.06	3.40 - 4.08	3.40
	F	3.06 - 3.40	-	3.74
Wa	M	3.06 - 3.40	4.08 - 4.76	3.40 - 3.74
	F	3.74 - 3.91	-	4.25 - 4.59
Hdl/Hdh	M	1.37 - 1.46	1.38 - 1.54	1.53 - 1.54
	F	1.40 - 1.57	-	1.43 - 1.45
Aocl/Pocl	M	2.40 - 2.70	3.20 - 4.00	3.20 - 4.00
	F	2.60 - 3.40	-	3.40 - 3.50
Eyl/Eyw	M	1.22 - 1.44	1.20 - 1.35	1.27 - 1.50
	F	1.09 - 1.52	-	1.42
Eyh/Hdh	M	0.87 - 0.88	0.88 - 0.89	0.82 - 0.83
	F	0.75 - 0.88	-	0.71 - 0.72
Eyio/oce	M	1.11 - 1.12	1.07 - 1.21	1.23 - 1.26
	F	1.14 - 1.25	-	1.18 - 1.22
ant1/ant2	M	0.25	0.31 - 0.33	0.23 - 0.30
	F	0.27 - 0.30	-	0.34
ant1/ant3	M	-	0.43	-
	F	0.40 - 0.42	-	-
ant1/ant4	M	-	-	-
	F	0.34 - 0.56	-	-
rosI/rosII	M	0.76 - 0.80	0.88 - 1.05	0.63 - 0.75
	F	0.71	-	0.66 - 0.77
rosI/rosIII	M	0.89 - 1.10	1.00 - 1.10	0.85
	F	1.00 - 1.10	-	0.85 - 0.87
Pronl	M	2.63 - 2.76	2.89 - 3.14	2.89 - 3.14
	F	2.63 - 2.68	-	2.89 - 3.12
PrAnl/PrPol	M	1.45 - 1.68	1.60 - 1.79	1.41 - 1.60
	F	1.26 - 1.46	-	1.29 - 1.47

Table 2. Data matrix for the species of *Thymbreus* Stål. 0= plesiomorphic state; 1= apomorphic state; ?= missing data.

<i>Peirates</i>	00000	00000	0000
<i>T. crocinopterus</i>	11111	01000	0110
<i>T. ocellatus</i>	10111	10111	1??0
<i>T. pyrrhopterus</i>	11111	01000	0011

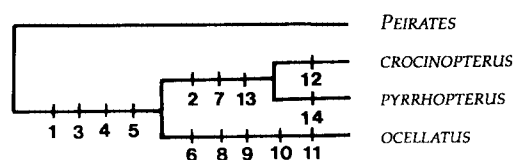


Fig. 31. Cladogram of species of the genus *Thymbreus* Stål.

Cladistics and geographical distribution

The analysis using equal weights yielded only one equally parsimonious cladogram, with 14 steps, a consistency and retention indices of 1.00 (fig. 31). The genus *Thymbreus* is considered a monophyletic group because of four synapomorphies (table 2).

Thymbreus occurs in North (most southern part), Central and South America (fig. 31), specially in forested areas. The species included in *Thymbreus* are allopatric. They are mainly associated with the rainforest realms of Central and South America. The superimposition of the distribution map of the species of *Thymbreus* and the biogeographic realms of Central and South America (Cabrera & Willink, 1973) shows that *T. crocinopterus* is related to rainforest and quasi-rainforest, and *T. ocellatus* and *T. pyrrhopterus* exclusively to rainforest. According to Cabrera & Willink (1973), the species belong to the Amazonic realm. *T. crocinopterus* occurs in the Pacific and Venezuelan Provinces. The first one is one of the most humid regions of the world. The vegetation is typical for rainforest, and it is very similar to the Amazonic Province. Instead, the latter an intermediate vegetation between forest and rainforest. *T. ocellatus* appears in the Amazonic Province. The vegetation consists of rainforest, it is an undulated landscape with many rivers which during the rainy season flood the selvatic areas. Finally, *T. pyrrhopterus* occurs in the Paranense and Atlantic Provinces where the vegetation also consists of rainforest.

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References

- Cabrera, A.L. & A. Willink, 1973. Biogeografía de América Latina.— The General Secretariat of the Organization of American States, Monograph 13: 1-120.
- Coscarón, M.C., 1983. Revisión del género *Rasahus* (Insecta, Heteroptera, Reduviidae).— Revta. Mus. La Plata (N.S.) 13: 75-138.
- Coscarón, M.C., 1989. A phenetic study of the genus *Rasahus* Amyot and Serville (Heteroptera, Reduviidae).— Ent. fenn. 1: 131-144.

- Coscarón, M.C., 1994 (in press). The female terminalia in the genus *Rasahus* (Amyot and Serville) (Heteroptera, Reduviidae, Peiratinae).— *Revta. bras. Ent.* 38 (1): 63-77.
- Farris, J.S., 1988. Hennig86 reference. Version 1.5.— Published by the author, Port Jefferson, New York.
- Farris, J.S., 1989. The retention index and the rescaled consistency index.— *Cladistics* 5: 417-419.
- Kluge, A.G. & J.S. Farris, 1969. Quantitative phyletics and the evolution of anurans.— *Syst. Zool.* 18: 1-32.
- Lent, H. & J. Jurberg, 1966. Revisão dos Piratinae Americanos. II. O gênero *Phorastes* Kirkaldy 1900, com um estudo sobre a genitália das espécies (Hemiptera, Reduviidae).— *Revta. bras. Biol.* 26: 297-314.
- Lent, H. & P. Wygodzinsky, 1979. Revision of the Triatominae (Hemiptera, Reduviidae) and their significance as vectors of Chagas's Disease.— *Bull. Am. Mus. Nat. Hist.* 163: 125-516.
- Lethierry, L.F. & G. Severin, 1896. Catalogue Général des Hémiptères. Vol. III. Hétéroptères.— *Mus. R. Hist. Nat. Belg.* 3: 1-275.
- Maldonado-Capriles, J., 1990. Systematic catalogue of the Reduviidae of the World. Spec. Edn. In: Caribbean Journal of Sciences, Book Systematic catalogue of the Reduviidae of the World: 1-694.— Mayaguez.
- Signoret, A.V., 1862. Description d'hémiptères nouveaux de Jurimaguas et Moyabamba (Pérou).— *Ann. Soc. Ent. Fr.* (4)2: 579-588.
- Signoret, A.V., 1863. Révision des Hémiptères du Chili.— *Ann. Soc. Ent. Fr.* 4: 541-588.
- Stål, C., 1858. Bidrag till Rio Janeiro-Traktens Hemipter-fauna.— *K. Vet. Ak. Handl.* 2: 1-87.
- Stål, C., 1859. Till Kannedomen om Reduviini.— *Oef. Vet. Ak. Foerh.* 16: 175-204.
- Stål, C., 1860. Bidrag till Rio de Janeiro - traktens Hemipter - fauna.— *Ofv. Sv. kongl. Vet. Akad. Handl.* 2: 45-59.
- Stål, C., 1862. Hemiptera mexicana enumeravit speciesque novas descripsit.— *Stettin. ent. Ztg.* 23: 437-462.
- Stål, C., 1863. Formae speciesque novae Reduviidum.— *Ann. Soc. Ent. Fr.* 4: 25-58.
- Stål, C., 1866. Bidrag till Reduviidernas kännedom.— *Oef. k. Vet. Ak. Foerh.* 23: 235-302.
- Walker, F., 1873a. Catalogue of the specimens of Hemiptera Heteroptera in the collection of the British Museum. Part 7: 1-123.— London.
- Walker, F., 1873b. Catalogue of the specimens of Hemiptera Heteroptera in the collection of the British Museum. Part 8: 1-220.— London.
- Wygodzinsky, P., 1949. Elenco sistemático de los Reduviiformes americanos.— *An. Inst. Med. Reg. Tucumán Monografía* 1: 1-102.

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