



## New records of Gerromorpha (Insecta, Hemiptera, Heteroptera) from Piauí state, northeastern Brazil

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### Abstract

Based on material recently collected in Piauí state, northeastern Brazil, we present new records for seven species of Gerromorpha (Insecta, Hemiptera, Heteroptera). *Rheumatobates crassifemur schroederi* Hungerford, 1954 (Gerridae); *Mesovelia mulsanti* White, 1879 (Mesoveliidae); and *Paravelia polhemusi* Rodrigues, Moreira, Nieser, Chen & Melo, 2014 (Veliidae) are reported from the state for the first time.

### Keywords

Aquatic insects, biodiversity, Caatinga biome, faunistics, semiaquatic bugs

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## Introduction

Piauí state, in northeastern Brazil, has a highly diversified flora, composed of a large ecotonal zone that includes Cerrado, Caatinga, and pre-Amazonian elements. The Parnaíba river basin occupies almost the entire territory of the state, has an extensive fluvial network, and has been impacted mainly by inadequate soil management practices and irregular disposal of pollutants and pesticides in the water (Castro 2000; Brasil 2006).

Among the more than 2,100 described species of semiaquatic bugs (Insecta, Hemiptera, Heteroptera, Gerromorpha), 239 species and subspecies occur in Brazil. The diversity of Gerromorpha in the Northeast Region of the country is still poorly known, especially that from

semiarid environments such as the Cerrado and Caatinga, with some states with very few species reported (Polhemus and Polhemus 2008; Moreira et al. 2011b; Moreira 2020a, 2020b, 2020c, 2020d, 2020e).

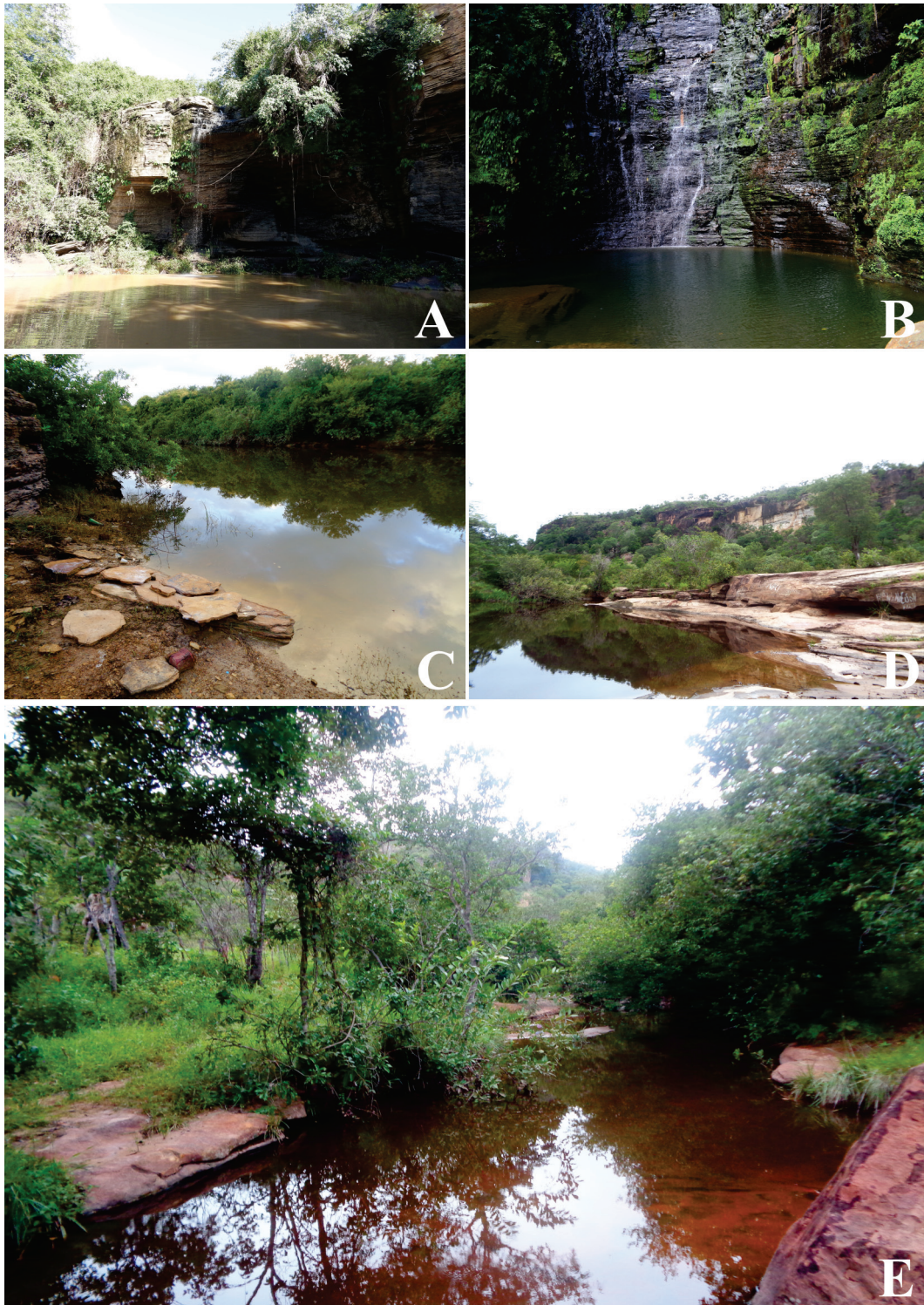
Currently, the state of Piauí has records of eight species of Gerromorpha: *Brachymetra furva* Drake, 1957; *Halobates micans* Eschscholtz, 1822; *Halobatopsis plattensis* (Berg, 1879); *Neogerris lubricus* (White, 1879); *Tachygerris adamsoni* (Drake, 1942) (Gerridae); *Microvelia ayacuchana* Drake & Maldonado-Capriles, 1952; *M. pulchella* Westwood, 1834; and *Platyvelia brachialis* (Stål, 1860) (Veliidae) (Ikawa et al. 2012; Rodrigues et al. 2012; Cordeiro and Moreira 2015). Aiming to improve

the knowledge about the diversity of Gerromorpha from Piauí, we present new records for seven species, three of which are reported from the state for the first time.

## Methods

We performed collections on the lower Parnaíba River region, Piauí state, northeastern Brazil (Fig. 1). Specimens were collected by active search with the aid of

aquatic nets, then fixed and preserved in 80% ethanol. Material is deposited in the Coleção Entomológica Heróis do Jenipapo, Universidade Estadual do Piauí, Campo Maior, Brazil (CEHJ). Photographs of the specimens were obtained using a Leica M205 C stereomicroscope coupled with a digital camera and captured using the Leica LAS imaging system. The distribution presented for each species is according to Moreira (2020a, 2020d, 2020e) and abbreviations of Brazilian states are



**Figure 1.** Collecting localities on Centro-Norte Piauiense mesoregion, Piauí state. **A.** Cachoeira das Arraias. **B.** Cachoeira do Urubu-Rei. **C.** Rio Surubim. **D.** Serra de Santo Antônio, Riacho Pé da Serra, P1. **E.** Serra de Santo Antônio, P2.

according to the official standard (IBGE 2020). First records from Piauí state are marked by an asterisk. Maps were produced using QGIS v. 3.10.7 (QGIS Development Team 2020). Localities that are too imprecise (e.g., only the country or state is known) are displayed on the maps as question marks.

**Results**

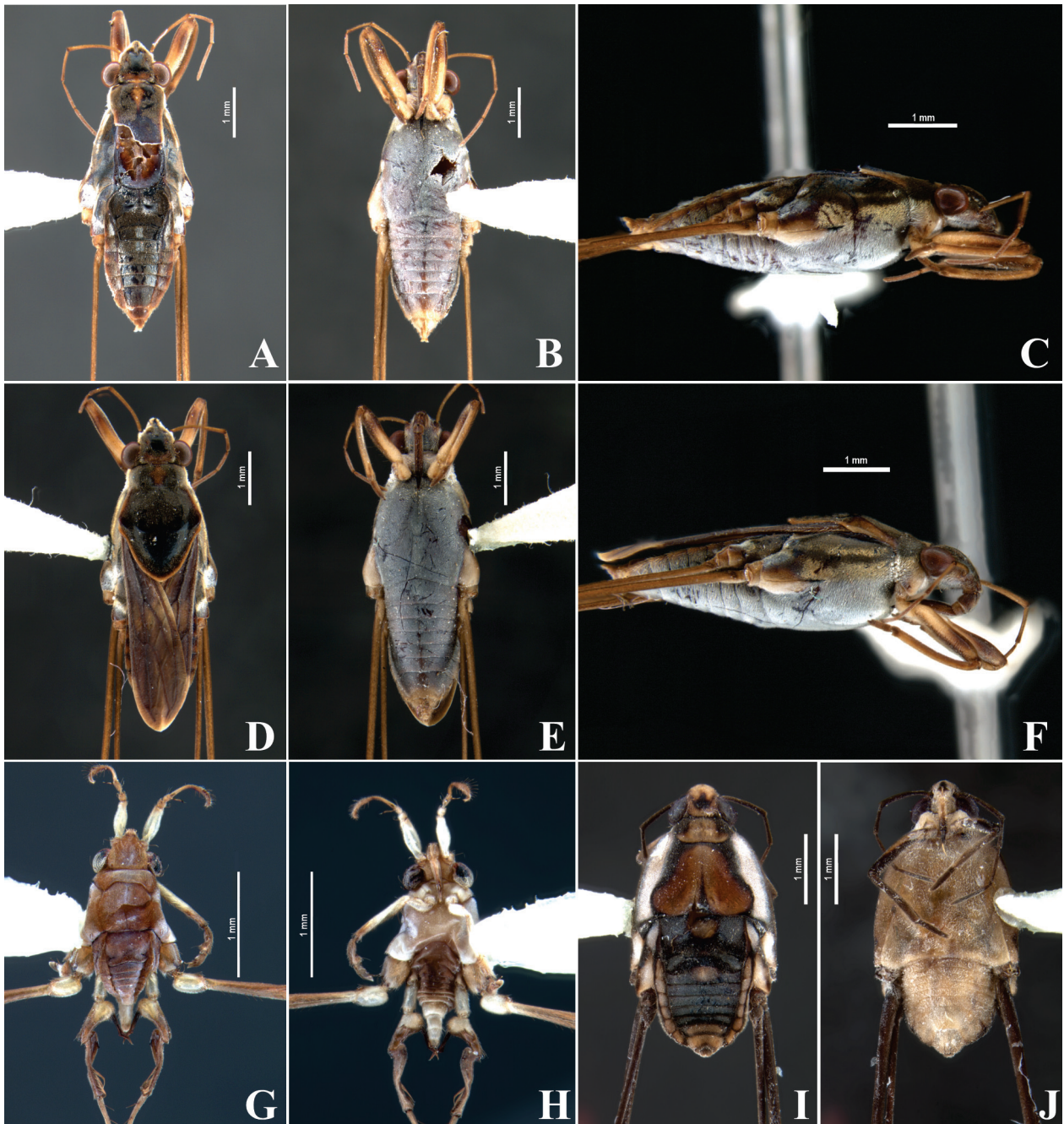
Family Gerridae  
 Subfamily Gerrinae

***Neogerris lubricus* (White, 1879)**

Figures 2A–F, 6

**New record.** BRAZIL • 2 ♀; Piauí, Campo Maior, Serra de Santo Antônio, Riacho Pé da Serra, P1; 04°57'15"S, 042° 11'28"W; 21 Mar. 2015; L.R.C. Lima, I.A. Rodrigues leg.; CEHJ 133.

**Identification.** We identified our specimens based on the body length between 4.50 and 5.00 mm and by the pronotum of the apterous form long, reaching the metanotum (pronotum is broken in our apterous specimen) (Fig. 2A). *Neogerris celeris* (Drake & Harris, 1934) has a similar



**Figure 2.** A–F. *Neogerris lubricus*: (A) apterous female, dorsal view; (B) apterous female, ventral view; (C) apterous female, lateral view; (D) macropterous female, dorsal view; (E) macropterous female, ventral view; (F) macropterous female, lateral view. G, H. *Rheumatobates crassifemur schroederi*: (G) apterous male, dorsal view; (H) apterous male, ventral view. I, J. *Halobatopsis platensis*: (I) apterous female, dorsal view; (J) apterous female, ventral view.

condition of the pronotum, but the body length is between 5.00 and 5.70 mm, and the only confirmed record is from Paraguay (Drake and Harris 1934; Nieser 1994).

**General distribution.** Costa Rica, Panamá, Trinidad and Tobago, Colombia, Guyana, Suriname, French Guiana, Brazil, Ecuador, Peru, Bolivia, Paraguay, Argentina.

**Distribution in Brazil.** AP, AM, PA, RO, PI, BA, MT, MS, MG, SP, RJ.

Subfamily Rhagadotarsinae

***Rheumatobates crassifemur schroederi* Hungerford, 1954**

Figures 2G, H, 7

**New record.** BRAZIL • 4 ♂; Piauí, Campo Maior, Rio Surubim, P2; 04°49'32"S, 042°11'08"W; 4 May 2015; L.R.C. Lima, I.A. Rodrigues leg.; CEHJ 103.

**Identification.** Our males were identified based on the uniform dorsolateral row of setae on antennomere IV; the incrassate hind trochanter, connected beyond the base of the hind femur, without a long spur or a fringe of long setae ventrally on the basal lobe; and the hind femur bare at base, without an anteriorly directed dense tuft of bristles in this area (Fig. 2G, H) (Hungerford 1954).

**General distribution.** Subspecies endemic from Brazil.

**Distribution in Brazil.** AM, PA, PI\*, CE, RN, PE, MT, GO.

Subfamily Trepobatinae

***Halobatopsis platensis* (Berg, 1879)**

Figures 2I, J, 8

**New record.** BRAZIL • 2 ♀; Piauí, Pedro II, Cachoeira do Urubu-Rei; 04°19'34"S, 041°27'46"W; 15 May 2015; L.R.C. Lima, I.A. Rodrigues leg.; CEHJ 414.

**Identification.** Our females were identified based on the apterous mesonotum with longitudinal black marks and the abdominal laterotergites slightly elevated, not reflected over the mediotergites (Fig. 2I) (Nieser and Melo 1999).

**General distribution.** Brazil, Peru, Argentina, Uruguay.

**Distribution in Brazil.** PI, BA, MT, GO, DF, MS, MG, ES, SP, RJ, PR, RS.

Family Mesoveliidae

Subfamily Mesoveliinae

***Mesovelia mulsanti* White, 1879**

Figures 3A–F, 9

**New records.** BRAZIL • 1 ♂, 5 ♀; Piauí, Campo Maior, Rio Surubim, P2; 04°49'32"S, 042°11'08"W; 17 Apr. 2015; L.R.C. Lima, I.A. Rodrigues leg.; CEHJ 130 • 1 ♂, 1 nymph; Piauí, Campo Maior, Açude Grande; 04°50'13"S, 042°10'37"W; 9 Jan. 2015; L.R.C. Lima, I.A. Rodrigues leg.; CEHJ 64 • 1 ♂, 1 ♀; Piauí, Castelo do Piauí, Cachoeira das Arraias; 05°11'29"S, 041°42'03"W; 12 Mar 2016; L.R.C. Lima, I.A. Rodrigues leg.; CEHJ 402.

**Identification.** Our material was identified based on the males, which have body length between 3.00 and 4.00 mm, a row of black spinules on the middle femur and a pair of tightly packed clusters of black spinules ventrally on abdominal segment VIII (Fig. 3D). Females from the same localities were associated with the males based on the size, color and presence of black spinules on the middle femur (Spangler 1990; Moreira et al. 2008).

**General distribution.** Canada, United States of America, Mexico, Belize, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Cuba, Jamaica, Dominican Republic, Puerto Rico, US Virgin Islands, St Martin, St Kitts and Nevis, Antigua and Barbuda, Guadeloupe, Dominica, St Lucia, St Vincent and the Grenadines, Barbados, Grenada, Aruba, Curaçao, Klein Curaçao, Bonaire, Trinidad and Tobago, Colombia, Venezuela, Guyana, French Guiana, Brazil, Peru, Bolivia, Paraguay, Argentina, Hawaiian Islands (introduced).

**Distribution in Brazil.** AP, AM, PA, RO, PI\*, CE, PE, BA, MT, GO, MS, MG, ES, SP, RJ, PR, SC, RS.

Family Veliidae

Subfamily Microveliinae

***Microvelia ayacuchana* Drake & Maldonado-Capriles, 1952**

Figures 4A–C, 10

**New record.** BRAZIL • 1 ♂; Piauí, Campo Maior, Serra de Santo Antônio, P2; 04°57'00"S, 042°11'40"W; 19 Apr. 2015; L.R.C. Lima, I.A. Rodrigues leg.; CEHJ 86.

**Identification.** The single male of this species was identified based on the abdominal sternum VII longer than the preceding two together, with large central U-shaped notch at the posterior margin, and the venter of abdominal segment VIII centrally depressed, with a long posterior projection (Fig. 4C) (Moreira 2012).

**General distribution.** Venezuela, Guyana, Suriname, Brazil.

**Distribution in Brazil.** PA, PI, ES.

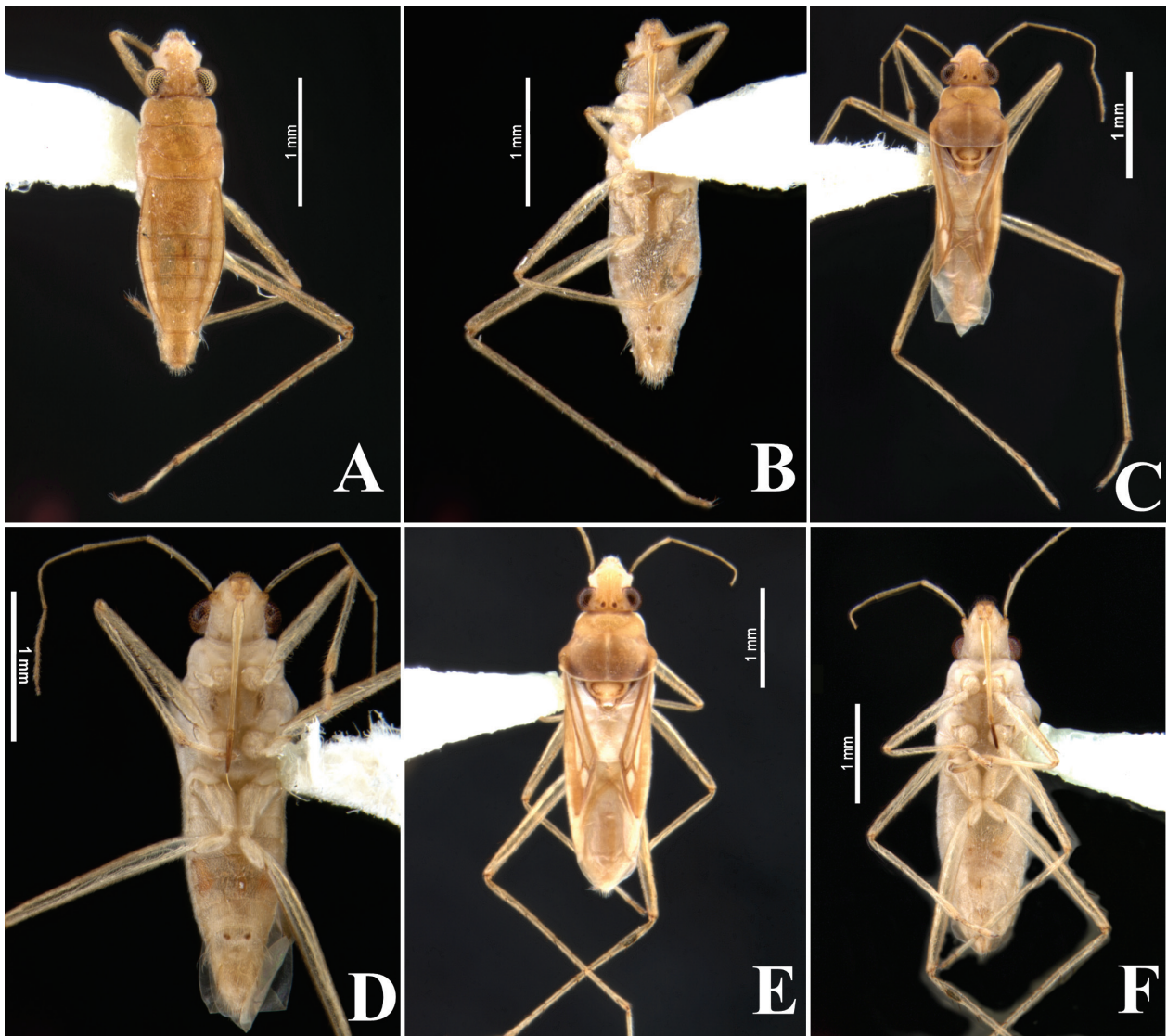
***Microvelia pulchella* Westwood, 1834**

Figures 4D–J, 11

**New records.** BRAZIL • 2 ♂, 1 nymph; Piauí, Castelo do Piauí, Cachoeira das Arraias; 05°11'29"S, 041°42'03"W; 12 Mar. 2016; L.R.C. Lima, I.A. Rodrigues leg.; CEHJ 403 • 2 ♂, 1 ♀; same collection data as for preceding; 13 Mar. 2016; CEHJ 406.

**Identification.** Our material of this species was identified based on the males, which have the body elongated, subcylindrical; the apterous mesonotum exposed, not covered by the pronotum (Fig. 4D); the hind tibia bent (Fig. 4E, H); the terminalia aligned with the longitudinal axis of the body; and the abdominal segment VIII ventrally without depressions, projections or notches (Moreira 2012).

**General distribution.** Canada, United States of America, Mexico, Guatemala, Costa Rica, Panama, Bahamas,



**Figure 3.** *Mesovelia mulsanti*. **A.** Apterous male, dorsal view. **B.** Apterous male, ventral view. **C.** Macropterous male, dorsal view. **D.** Macropterous male, ventral view. **E.** Macropterous female, dorsal view. **F.** Macropterous female, ventral view.

Cuba, Cayman Islands, Jamaica, Dominican Republic, Puerto Rico, US Virgin Islands, Anguilla, St. Martin, Saba, St Kitts and Nevis, Guadeloupe, Martinique, St Vincent and the Grenadines, Barbados, Grenada, Aruba, Curaçao, Klein Curaçao, Bonaire, Klein Bonaire, Trinidad and Tobago, Colombia, Venezuela, French Guiana, Brazil, Ecuador, Peru, Argentina.

**Distribution in Brazil.** AM, PA, MA, PI, PE, BA, AL, MS, MG, ES, SP, RJ, SC.

Subfamily Veliinae

***Paravelia polhemusi* Rodrigues, Moreira, Nieser, Chen & Melo, 2014**

Figures 5A–D, 12

**New record.** BRAZIL • 1 ♂, 3 ♀; Piauí, Pedro II, Cachoeira do Urubu-Rei; 04°19'34"S, 041°27'46"W; 15 May 2015; L.R.C. Lima, I.A. Rodrigues leg.; CEHJ 144.

**Identification.** Our material was identified based on the forewings with a basal pair of wide yellow maculae that slightly surpass the apex of the pronotum and a posterior

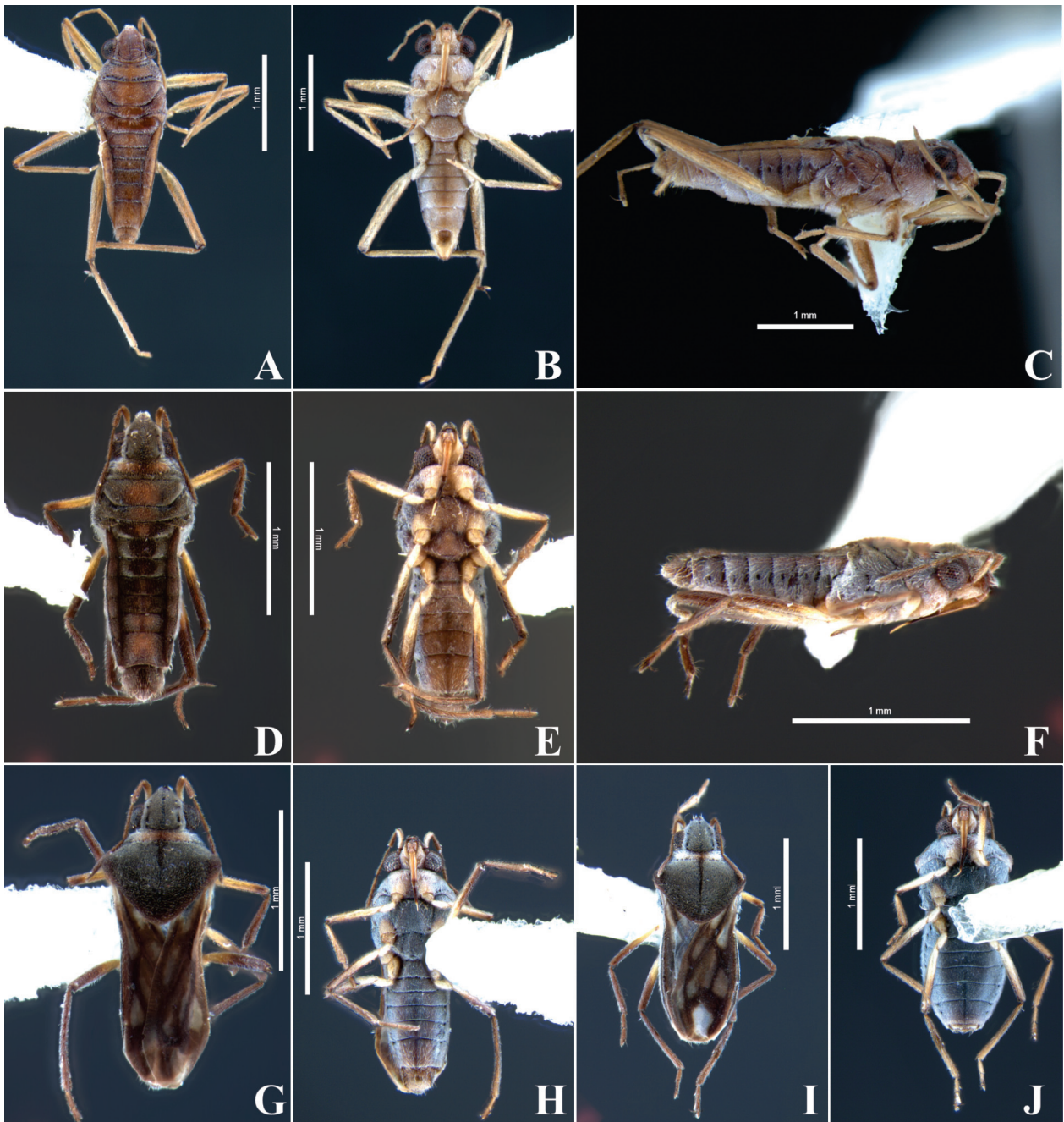
rounded white macula (Fig. 5A, C). The male has a pair of projections on abdominal sternum VII (Fig. 5B) and a keel on the posterior half of the proctiger (Rodrigues et al. 2014; Rodrigues and Álvarez-Arango 2019).

**General distribution.** Endemic from Brazil.

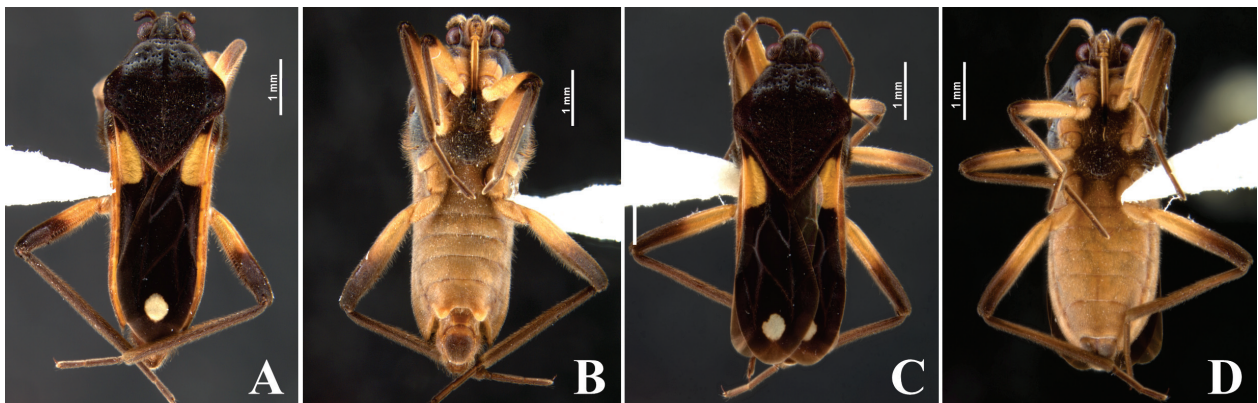
**Distribution in Brazil.** PA, PI\*, MT.

## Discussion

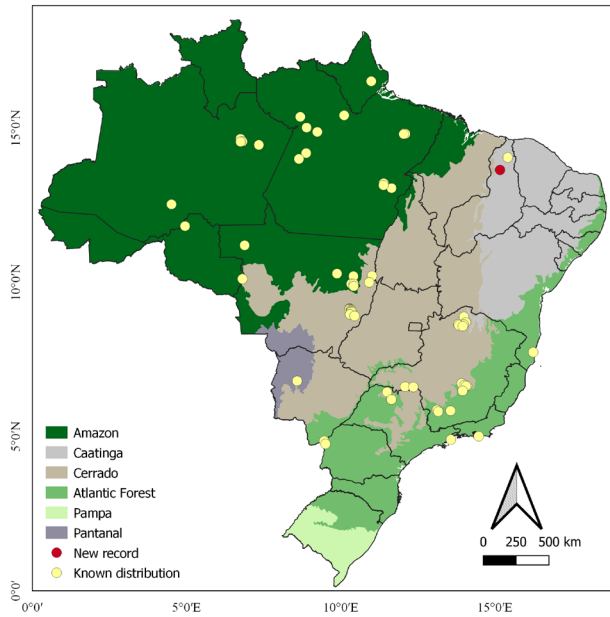
Northeastern Brazil is historically the poorest explored region of the country in terms of aquatic and semi-aquatic bugs (Moreira et al. 2011b). As a consequence, the Caatinga biome, which is situated almost entirely within this region, has much fewer records of Gerromorpha when compared with the neighboring Cerrado and Atlantic Forest biomes (Moreira 2020a, 2020b, 2020c, 2020d, 2020e). The records herein presented are part of an ongoing effort to fill these gaps, within a framework of research projects, such as “Diversity and distribution of aquatic bugs (Insecta: Heteroptera: Gerromorpha &



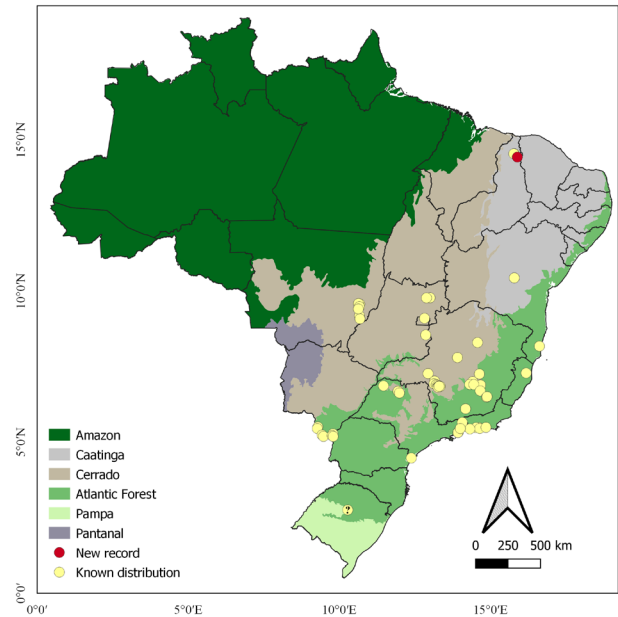
**Figure 4.** A–C. *Microvelia ayacuchana*: (A) apterous male, dorsal view; (B) apterous male, ventral view; (C) apterous male, lateral view. D–J. *Microvelia pulchella*: (D) apterous male, dorsal view; (E) apterous male, ventral view; (F) apterous male, lateral view; (G) macropterous male, dorsal view; (H) macropterous male, ventral view; (I) macropterous female, dorsal view; (J) macropterous female, ventral view.



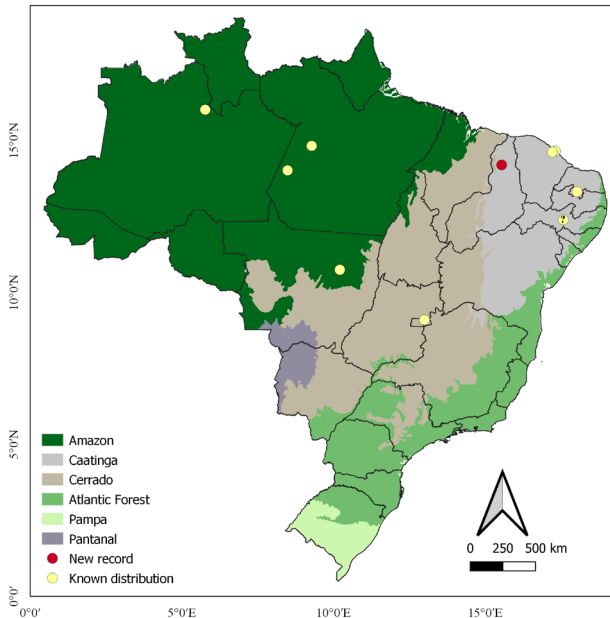
**Figure 5.** *Paravelia polhemusi*. A. Macropterous male, dorsal view. B. Macropterous male, ventral view. C. Macropterous female, dorsal view. D. Macropterous female, ventral view.



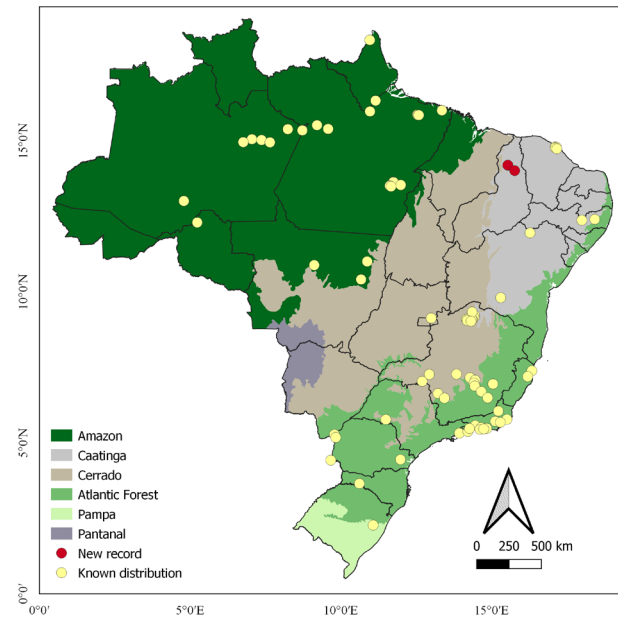
**Figure 6.** Geographic distribution of *Neogerris lubricicus* in Brazil.



**Figure 8.** Geographic distribution of *Halobatopsis platensis* in Brazil. Question mark indicates an imprecise record.



**Figure 7.** Geographic distribution of *Rheumatobates crassifemur schroederi* in Brazil. Question mark indicates an imprecise record.

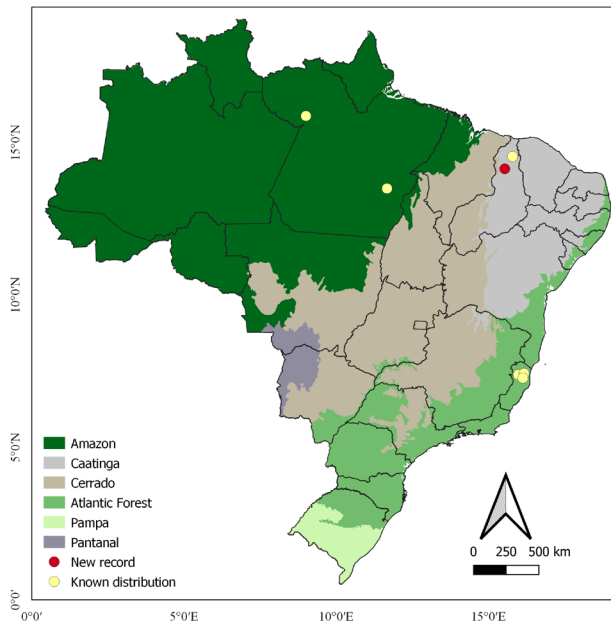


**Figure 9.** Geographic distribution of *Mesovelvia mulsanti* in Brazil.

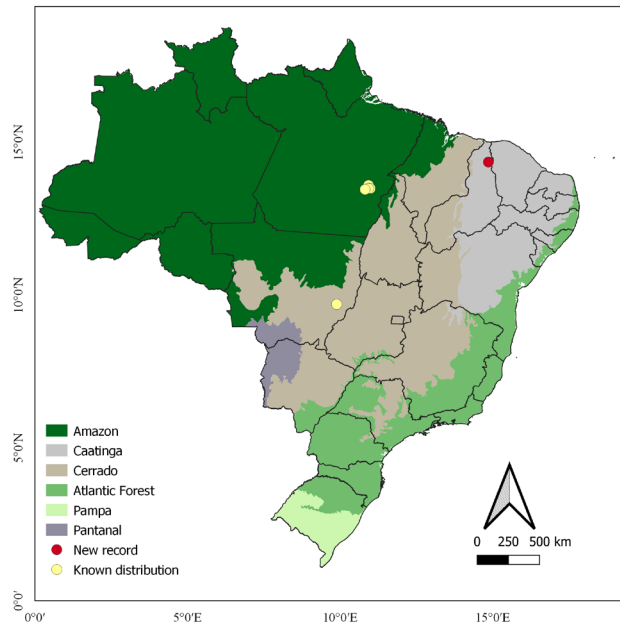
Nepomorpha) from Alagoas and Sergipe, northeastern Brazil” (National Council for Scientific and Technological Development [CNPq] #429936/2016-8; Rodrigues et al. in press) and “Diversity and conservation of Hemiptera (Insecta) from the Caatinga” (CNPq #421413/2017-4).

Three out of the seven species mentioned above are recorded for the first time from Piauí state: *Rheumatobates crassifemur schroederi*, *Mesovelvia mulsanti*, and *Paravelia polhemusi*. *Rheumatobates crassifemur* is distributed from Panama and Trinidad and Tobago south to Argentina, and has three subspecies: *R. c. crassifemur*, *R. c. esakii*, and *R. c. schroederi* (Hungerford 1954). The first is the most widely distributed, with records spreading throughout most of the range of the species, and the

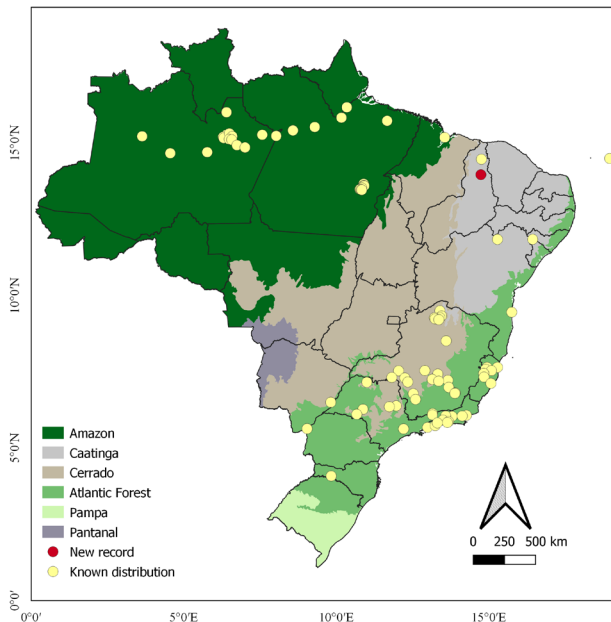
only one found in Panama (Drake and Hottes 1951; Hungerford 1954; Mazzucconi and Bachmann 1993, 1995; Aristizábal-García 2002; Moreira et al. 2011c). The second is the only subspecies recorded from Trinidad and Tobago, also occurring in northern and western South America (Hungerford 1954; Nieser 1970; Nieser and Alkins-Koo 1991; Aristizábal-García 2002; Moreira et al. 2011a; Peralta-Argomeda 2011; Motta et al. 2018). The last one is endemic from Brazil, covering areas of Amazon, Cerrado and Caatinga (Hungerford 1954; Nieser 1970). Our material of *R. c. schroederi* is the first recorded from the Parnaíba hydrographic region, the largest basin contained entirely within northeastern Brazil, and the closest occurrence is located about 400 km to



**Figure 10.** Geographic distribution of *Microvelia ayacuchana* in Brazil.



**Figure 12.** Geographic distribution of *Paravelia polhemusi* in Brazil.



**Figure 11.** Geographic distribution of *Microvelia pulchella* in Brazil.

the northeast in Ceará state (Hungerford 1954).

*Mesovelia mulsanti* is the most widely distributed species of the genus in the Americas, and was also introduced to the Hawaiian Islands (Damgaard et al. 2012). It has a few previous reports from northeastern Brazil (Neering 1954; Moreira et al. 2008; Moreira and Campos 2012), but none from Piauí state or from the Parnaíba hydrographic region. The published record closest to ours is from around 360 km to the northeast in Ceará state (Moreira and Campos 2012). *Paravelia polhemusi* was described less than a decade ago and heretofore recorded only from Pará and Mato Grosso states (Rodrigues et al. 2014; Rodrigues and Álvarez-Arango 2019). Our material is the first reported from the Caatinga biome and the Parnaíba hydrographic region, extending the distribution

of the species northeastward by more than 1,000 km.

The remaining four species found in our sampling localities, namely *Neogerris lubricus*, *Halobatopsis platenensis*, *Microvelia ayacuchana*, and *M. pulchella*, are not rare and have all been previously recorded from Piracuruca municipality, within or adjacent to Sete Cidades National Park (Rodrigues et al. 2012; Cordeiro and Moreira 2015). These records are located about 60 km to the north of our northernmost collecting station.

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## Authors’ Contributions

CLF sorted and identified specimens, produced the maps, and revised the manuscript; LRCL collected the specimens and revised the manuscript; JMSR identified and photographed specimens, and revised the manuscript; CASA revised the manuscript and supervised CLF; FFFM revised identifications and wrote the manuscript.

## References

Aristizábal-García H (2002) Los hemipteros de la película superficial del agua en Colombia. Parte 1. Familia Gerridae. Academia Co-



- lombiana de Ciencias Exactas, Físicas y Naturales, Bogotá, 239 pp.
- Brasil (2006) Caderno da região hidrográfica do Parnaíba. Ministério do Meio Ambiente, Secretaria de Recursos Hídricos, Brasília, 186 pp.
- Castro AAJF (2000) Cerrado do Brasil e do Nordeste: produção, hoje, deve também incluir manutenção da biodiversidade. In: Benjamin AH, Sicoli JCM (Eds) Agricultura e meio ambiente. Anais do 4º Congresso Internacional de Direito Ambiental, São Paulo (Brasil), de 4 a 7 de Junho de 2000. Imprensa Oficial do Estado, São Paulo, 79–87.
- Cordeiro IRS, Moreira FFF (2015) New distributional data on aquatic and semiaquatic bugs (Hemiptera: Heteroptera: Gerromorpha & Nepomorpha) from South America. *Biodiversity Data Journal* 3: e4913. <https://doi.org/10.3897/BDJ.3.e4913>
- Damgaard J, Moreira FFF, Hayashi M, Weir TA, Zettel H (2012) Molecular phylogeny of the pond treaders (Insecta: Hemiptera: Heteroptera: Mesoveliidae), discussion of the fossil record and a checklist of species assigned to the family. *Insect Systematics & Evolution* 43: 175–212. <https://doi.org/10.1163/1876312X04302004>
- Drake CJ, Harris HM (1934) The Gerrinae of the Western Hemisphere (Hemiptera). *Annals of the Carnegie Museum* 23: 179–241.
- Drake CJ, Hottes FC (1951) Notes on the genus *Rheumatobates* Bergroth (Hemiptera: Heteroptera). *Proceedings of the Biological Society of Washington* 64: 147–158.
- Hungerford HB (1954) The genus *Rheumatobates* Bergroth (Hemiptera-Gerridae). *University of Kansas Science Bulletin* 36 (7): 529–588. <https://doi.org/10.5962/bhl.part.24625>
- IBGE (Instituto Brasileiro de Geografia e Estatística) (2020) Cidades e Estados. <https://www.ibge.gov.br/cidades-e-estados.html?view=municipio>. Accessed on 2020-10-12.
- Ikawa T, Okabe H, Cheng L (2012) Skaters of the seas—comparative ecology of nearshore and pelagic *Halobates* species (Hemiptera: Gerridae), with special reference to Japanese species. *Marine Biology Research* 8 (10): 915–936. <https://doi.org/10.1080/17451000.2012.705848>
- Mazzucconi SA, Bachmann AO (1993) Familia Gerridae (Heteroptera): estudio comparativo de las alas de las especies argentinas, chilenas y uruguayas. *Revista de la Sociedad Entomológica Argentina* 52 (1–4): 87–99.
- Mazzucconi SA, Bachmann AO (1995) Geographic distribution of the Gerridae in Argentina (Insecta, Heteroptera). *Insecta Mundi* 9 (3–4): 363–370.
- Moreira FFF (2012) Sinopse da fauna de Veliidae (Insecta: Heteroptera: Gerromorpha) ocorrente na Região Sudeste do Brasil. PhD thesis, Universidade Federal do Rio de Janeiro, Rio de Janeiro.
- Moreira FFF (2020a) Gerridae in catálogo taxonômico da fauna do Brasil. PNUD. <https://fauna.jbrj.gov.br/fauna/faunadobrasil/2377>. Accessed on 2020-10-12.
- Moreira FFF (2020b) Hebridae in catálogo taxonômico da fauna do Brasil. PNUD. <https://fauna.jbrj.gov.br/fauna/faunadobrasil/1882>. Accessed on 2020-10-12.
- Moreira FFF (2020c) Hydrometridae in catálogo taxonômico da fauna do Brasil. PNUD. <https://fauna.jbrj.gov.br/fauna/faunadobrasil/948>. Accessed on 2020-10-12.
- Moreira FFF (2020d) Mesoveliidae in catálogo taxonômico da fauna do Brasil. PNUD. <https://fauna.jbrj.gov.br/fauna/faunadobrasil/1841>. Accessed on 2020-10-12.
- Moreira FFF (2020e) Veliidae in catálogo taxonômico da fauna do Brasil. PNUD. <https://fauna.jbrj.gov.br/fauna/faunadobrasil/1596>. Accessed on 2020-10-12.
- Moreira FFF, Campos GGF (2012) New distributional data concerning some Gerromorpha (Insecta: Hemiptera: Heteroptera) from Brazil. *Check List* 8 (3): 542–547. <https://doi.org/10.15560/8.3.542>
- Moreira FFF, Ribeiro JRI, Nessimian JL (2008) A synopsis of the species of *Mesovelgia* (Insecta: Heteroptera: Mesoveliidae) occurring in the floodplain of the Amazon River, Brazil, with redescrptions of *Mesovelgia mulsanti* White and *M. zeteki* Harris & Drake. *Acta Amazonia* 38 (3): 539–550. <https://doi.org/10.1590/S0044-59672008000300020>
- Moreira FFF, Alecrim VP, Ribeiro JRI, Nessimian JL (2011a) Identification key to the Gerridae (Insecta: Heteroptera: Gerromorpha) from the Amazon River floodplain, Brazil, with new records for the Brazilian Amazon. *Zoologia* 28 (2): 269–279. <https://doi.org/10.1590/S1984-46702011000200018>
- Moreira FFF, Barbosa JF, Ribeiro JRI, Alecrim VP (2011b) Checklist and distribution of semiaquatic and aquatic Heteroptera (Gerromorpha and Nepomorpha) occurring in Brazil. *Zootaxa* 2958: 1–74. <https://doi.org/10.11646/zootaxa.2958.1.1>
- Moreira FFF, Ribeiro JRI, Nessimian JL, Itoyama MM, Castanhole MMU, Pereira LLV (2011c) New records and distribution expansions for Neotropical water-striders (Insecta: Heteroptera: Gerromorpha). *Check List* 7 (3): 303–309. <https://doi.org/10.15560/7.3.303>
- Motta FS, Moreira FFF, Crumière AJJ, Santos ME, Khila A (2018) A new species of *Rhagovelia* Mayr, 1865 (Hemiptera: Heteroptera: Veliidae) from French Guiana, with new records of Gerromorpha from the country. *Zootaxa* 4433 (3): 520–530. <https://doi.org/10.11646/zootaxa.4433.3.7>
- Neering T (1954) Morphological variations in *Mesovelgia mulsanti* (Hemiptera, Mesoveliidae). *University of Kansas Science Bulletin* 36 (5): 125–148.
- Nieser N (1970) Gerridae of Suriname and the Amazon with additional records of other neotropical species. *Studies on the fauna of Suriname and other Guyanas* 12 (47): 94–138.
- Nieser N (1994) A new species and a new status in *Neogerris* Matsumura (Heteroptera: Gerridae) with a key to American species. *Storkia* 3: 27–37.
- Nieser N, Alkins-Koo M (1991) The water bugs of Trinidad & Tobago. *Occasional Papers of the Zoology Department, University of the West Indies* 9: 1–127.
- Nieser N, Melo AL (1999) A new species of *Halobatopsis* (Heteroptera: Gerridae) from Minas Gerais (Brazil), with a key to the species. *Entomologische Berichten* 59 (7): 97–102.
- Peralta-Argomedo JL (2011) Diversidad de heteropteros acuáticos y semiacuáticos de la Reserva Nacional Tambopata, Madre de Dios, Perú. *Museo de Historia Natural “Javier Prado”, Jesús María, 15 pp.*
- Polhemus JT, Polhemus DA (2008) Global diversity of true bugs (Heteroptera; Insecta) in freshwater. *Hydrobiologia* 595: 379–391. <https://doi.org/10.1007/s10750-007-9033-1>
- QGIS Development Team (2020) QGIS Geographic Information System, Open Source Geospatial Foundation. <https://qgis.osgeo.org/>. Accessed on 2020-10-12.
- Rodrigues HDD, Álvarez-Arango LF (2019) A new species of *Oiovelia* from Colombia, with notes for other three species of South American Veliinae (Heteroptera: Gerromorpha: Veliidae). *Papéis Avulsos de Zoologia* 59: e20195935. <https://doi.org/10.11606/1807-0205/2019.59.35>
- Rodrigues HDD, Melo AL, Ferreira-Kepler RL (2012) New records of Gerromorpha (Insecta: Hemiptera: Heteroptera) from Brazil. *Check List* 8 (5): 908–913. <https://doi.org/10.15560/8.5.908>
- Rodrigues HDD, Moreira FFF, Nieser N, Chen P-P, Melo AL, Dias-Silva K, Giehl NFS (2014) The genus *Paravelia* Breddin, 1898 (Hemiptera: Heteroptera: Veliidae) in Brazil, with descriptions of eight new species. *Zootaxa* 3784 (1): 1–47. <https://doi.org/10.11646/zootaxa.3784.1.1>
- Rodrigues JMS, Nery L, Rodrigues HDD, Moreira FFF (in press) Survey of the semiaquatic bugs (Hemiptera: Heteroptera: Gerromorpha) from Alagoas and Sergipe, northeast Brazil. *Zootaxa*.
- Spangler PJ (1990) A new species of halophilous water-strider, *Mesovelgia polhemusi*, from Belize and a key and checklist of New World species of the genus (Heteroptera: Mesoveliidae). *Proceedings of the Biological Society of Washington* 103 (1): 86–94.