Acarologia is proudly non-profit, with no page charges and free open access

Please help us maintain this system by encouraging your institutes to subscribe to the print version of the journal and by sending us your high quality research on the Acari.

Subscriptions: Year 2023 (Volume 63): 450 €
http://www1.montpellier.inra.fr/CBGP/acarologia/subscribe.php

Previous volumes (2010-2021): 250 € / year (4 issues)
Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France
ISSN 0044-586X (print), ISSN 2107-7207 (electronic)

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d’avenir » programme (Labex Agro: ANR-10-LABX-0001-01)

Acarologia is under free license and distributed under the terms of the Creative Commons-BY
A new record of an *Arrenoseius* Wainstein species and a new species of *Chelaseius* Muma & Denmark (Mesostigmata: Phytoseiidae) from Brazil

Vinicius Borges, Gilberto J. de Moraes, Raphael de Campos Castilho

*Escola Superior de Agricultura Luiz de Queiroz (ESALQ), Universidade de São Paulo (USP), 13418-900 Piracicaba, São Paulo, Brazil.*

Original research

**ABSTRACT**

In an effort to understand the fauna of Gamasina (Mesostigmata) edaphic mites from Brazil, *Arrenoseius robertogonzalezi* Trincado & Martin, 2018, known only from the original description from Chile, was found. Complementary morphological information is provided for this species. Likewise, a new species, *Chelaseius pluridentatus* n. sp. was found and is here described; it is distinguished from other *Chelaseius* Muma & Denmark species mainly by having more teeth on the fixed cheliceral digit, seven instead of 2–5. A key to the world species of *Chelaseius* is also provided.

**Keywords** biological control; predatory mite; soil mite; taxonomy

**Zoobank** http://zoobank.org/98875A01-4AF8-4708-A915-4D7902C65313

**Introduction**

Phytoseiidae (Mesostigmata: Gamasina) is the most extensively studied family of predatory mites (McMurtry et al. 2015). These are mostly found on plants, although some species are less commonly found in the soil. Some species of this family are broadly used for the biological control of pests, especially mites and small insects (McMurtry et al. 2015; Knapp et al. 2018). About 2,560 valid species are presently placed in this family, divided into three subfamilies, namely Amblyseiinae, Phytoseiinae and Typhlodrominae (Moraes et al. 2004; Demite et al. 2023).

The phytoseiids reported from the litter/soil include species of the genera *Arrenoseius* Wainstein and *Chelaseius* Muma & Denmark; these genera presently comprise respectively 25 and 11 valid species (Moraes et al. 2004; Demite et al. 2023). *Arrenoseius* has been mostly reported from the Americas, from Canada to Argentina, occasionally from litter. Five species of this genus have been reported from Brazil, namely *A. gauchero* Ferla, Silva & Moraes, 2010, *A. gloreus* (El-Banhawy, 1978), *A. lofegoi* Barbosa & Demite, 2023, *A. morgani* (Chant, 1957) and *A. urquharti* (Yoshida-Shaul & Chant, 1988), none from the edaphic environment (Demite et al. 2023; Barbosa and Demite, 2023). *Chelaseius* has also been mostly reported from the Americas, from Canada to Argentina, by far mostly from litter. Three species have so far been reported from Brazil, namely *C. braziliensis* Denmark & Kolodochka, 1990, *C. caudatus* Karg, 1983 and *C. lativentris* Karg, 1983, collected in hay, humus and bird nests, respectively (Moraes et al. 2004; Demite et al. 2023).
In an effort to understand the fauna of Gamasina edaphic mites from Brazil, the aim of the study is to provide a new record of *Arrenoseius* and to describe a new species of *Chelaseius*, providing a key to world species of the latter genus.

**Material and methods**

Samples of litter/soil were collected in areas of the Brazilian states of Rio Grande do Sul (Pampa biome) and São Paulo (Atlantic Forest biome). In the laboratory, mites were extracted from the samples in a modified Berlese-Tullgren apparatus (Oliveira *et al.* 2001). All mites were mounted in Hoyer’s medium for later examination under phase contrast (Leica, DMLB) and differential interference contrast (Nikon, Eclipse 80i) microscopes. The Mesostigmata were separated into families, based on Lindquist *et al.* (2009), and the Phytoseiidae were separated into genera, based on Chant and McMurtry (2007). The *Arrenoseius* and the *Chelaseius* specimens were compared with the original descriptions and redescriptions of the species presently affiliated to these genera.

Complementary information on the morphology of the *Arrenoseius* species collected is provided, based on the collected voucher specimens. The *Chelaseius* species was found to belong to a new species, herein described. Measurements were taken with a graded ocular attached to the phase contrast microscope. For each character, the average measurement is given first, followed (in parentheses) by the respective range, all in micrometers. Shield lengths were taken along the midline from the anterior to the posterior margins, and the width, at the widest level, except where otherwise specified.

The most relevant taxonomic structures of the new species were photographed using a digital camera connected to the differential interference contrast microscope. Illustrations were made using Adobe Illustrator®. Dorsal setal nomenclature is based on Lindquist and Evans (1965), as adapted by Rowell *et al.* (1978); ventral nomenclature is based on Chant and Yoshida-Shaul (1991); idiosomal setal pattern, on Chant and Yoshida-Shaul (1992); and notation of pore-like structures, on Athias-Henriot (1971, 1975).

The key provided for the separation of the *Chelaseius* species was prepared based on the original descriptions and available redescriptions. The species included were those whose adult females have been described and that were reported in Demite *et al.* (2023). In the key, only the country of original description is mentioned.

**Taxonomy**

**Family Phytoseiidae Berlese**

**Genus *Arrenoseius* Wainstein**


*Arrenoseius robertogonzalezi* Trincado & Martin, 2018


**Adult female**

(n = 8)

**Idiosomal setal pattern** — 10A:9B/JV-3:ZV.

**Dorsal idiosoma** — Dorsal shield 355 (350–360) long and 280 (275–293) wide. Measurements of setae: j1 13 (11–14); j3 19 (18–21); j4 8 (7–9); j5 8 (7–9); j6 7 (6–8); J2 8 (7–9); J5 9 (8–10); z2 17 (16–19); z4 19 (18–20); z5 8; Z1 9 (8–10); Z4 63 (61–64); Z5 85 (84–88); s4
Ventral idiosoma — Sternal shield 55 (52–58) long and 75 (73–77) wide at level of st2; distances between st1–st3 60 (59–61) and st2–st2 65 (64–66). Genital shield 110 (108–112) long (including hyaline flap) and 125 (124–129) wide at level of posterior margin; distance between st5–st5 85 (84–86). Ventrianal shield 125 (121–131) long, 165 (162–166) wide at level of ZV2 and 130 (129–133) wide at anus level. Measurements of setae: st1 25 (23–26), st2 28 (27–30), st3 28 (26–29), st4 28 (27–29), st5 30 (29–31), JV1 23 (22–25), JV2 25 (23–26), JV4 13 (12–14), JV5 50 (47–51), ZV1 30 (29–32), ZV2 25 (23–26), ZV3 10 (9–11); all aciculate and smooth.

Peritreme — Extending forward to level of j1.

Chelicera — Fixed cheliceral digit 35 (34–36) long, with eight teeth; movable cheliceral digit 33 (32–34) long, with two teeth.

Spermatheca — Calyx saccular, 18 (17–19) long.

Leg macroseta — Present only on tarsus IV, 60 (59–61) long.

Specimens examined

Eight adult females collected from litter/soil of a soybean plantation [Glycine max (L.) Merrill] at Aceguá (31°45′11″S, 54°3′22″W; 204 m above sea level), Rio Grande do Sul state, Brazil, in October 2021. All voucher specimens were collected by A.F. Duarte and deposited in the Mite Reference Collection of Departamento de Entomologia e Acarologia, Escola Superior de Agricultura “Luiz de Queiroz” (ESALQ), Universidade de São Paulo (USP), Piracicaba, São Paulo state, Brazil.

Remarks

This is the first record of this species in Brazil. It was recently described from Chile, based on the holotype and five paratype females collected on Festuca sp. [Poaceae], Viburnum tinus L. [Adoxaceae] and Passiflora incarnata L [Passifloraceae]. Despite the extensive effort dedicated to the edaphic fauna of Mesostigmata in representative sites of all Brazilian ecosystems, this species was only found in the southernmost region of the Brazilian territory, at the border with Uruguay. This is compatible with the relatively high latitude of the type localities of this species, in Chile (Santiago and O’Higgins Regions). According to the original description, the types of A. robertogonzalezi are slightly larger than the specimens collected in this study (dorsal shield length and maximum width respectively 389 (360–407) and 320 (300–330)), and consequently some of their setae are slightly longer: j3 25 (24–26), z4 24 (23–25) and s4 54 (50–57). These differences are here considered to be intraspecific variations.

Chelaseius Muma & Denmark

Chelaseius, Denmark & Kolodochka 1990: 219; Moraes et al. 2004: 56.

Chelaseius pluridentatus n. sp.

Zoobank: 1E6A830-1630-4063-A05B-A8AE0781936

Diagnosis

Setae J5, Z4 and Z5 smooth; seta s4 about 20 times as long as z4; seta Z4 about 12 times as long as S4; ventrianal shield smooth, with a lateral constriction at level of ZV2; fixed cheliceral digit with seven teeth; spermatheca trumpet-shaped, calyx about 45 long.

Borges V. et al. (2023), Acarologia 63(2): 411-418. https://doi.org/10.24349/soei-hdfd
Morphological characterization

Adult female

(n = 4) (Figures 1–2).

Idiosomal setal pattern — 10A:9B/JV-3:ZV.

Dorsal idiosoma — (Figure 1A). Dorsal shield smooth; 360 (350–370) long and 273 (265–290) wide; podonotal region with nine pairs of setae (j1, j3–j6, z2, z4, z5 and s4), four pairs of distinguishable lyrifissures and five pairs of distinguishable gland pores; opisthonotal region with eight pairs of setae (J2, J5, Z1, Z4, Z5, S2, S4 and S5), eight pairs of distinguishable lyrifissures and two pairs of distinguishable gland pores. Unsclerotized cuticle along lateral margins of dorsal shield with two pairs of setae (r3 and R1). Measurements of setae: j1 36
Ventral idiosoma — (Figure 1B). Sternal shield smooth; 59 (55–60) long and 89 (88–93) wide at level of st2; with three pairs of setae and two pairs of lyrifissures; distances between st1–st3 58 (57–60) and st2–st2 81 (80–83). Metasternal plates roundish, bearing seta st4 and lyrifissure iv3. Genital shield smooth; 111 (108–113) long (including hyaline flap) and 83 (82–85) wide at level of posterior margin; bearing seta st5; distance between st5–st5 73 (72–75); posterior margin slightly convex. Lyrifissure iv5 posteromesad st5, on the unsclerotized cuticle. Ventrianal shield pentagonal, with a slight constriction posteriad ZV2 and smooth; 112 (110–118) long, 104 (100–105) wide at level of ZV2 and 75 (73–76) wide at anus level; with three pairs of setae (JV1, JV2 and ZV2) in addition to three circumanal setae, and a pair of distinguishable pores; cribrum composed of 2–3 irregular rows of spicules along posterior margin of the shield. Unsclerotized cuticle along margins of ventrianal shield with four pairs of setae (JV4, JV5, ZV1 and ZV3) and four pairs of distinguishable lyrifissures. Two pairs of elliptoidal metapodal plates, the anterior smaller. Measurements of setae: st1 31 (30–33), st2 29 (28–30), st3 29 (28–30), st4 26 (25–28), st5 29 (28–30), JV1 24 (22–26), JV2 24 (23–25), JV4 13 (12–14), JV5 109 (107–110), ZV1 25 (23–27), ZV2 13 (12–15), ZV3 13 (12–15); all aciculate and smooth.

Peritreme — Extending forward to level of j1.

Chelicera — (Figure 2A). Fixed cheliceral digit 64 (63–65) long (from dorsal lyrifissure to tip of the digit), with three relatively large teeth followed proximally by four smaller teeth, in addition to the apical tooth, and a long and setiform plus dentilis set on an ellipsoid tubercle, 22 (21–23) long, at the base; movable cheliceral digit 46 (43–48) long, without teeth; dorsal and antiaxial lyrifissures distinct, dorsal seta indistinct.

Spermatheca — (Figure 2B). Calyx trumpet-shaped, 45 (44–46) long.

Leg macrosetae — (Figure 2C). Sge I 41 (40–43), Sge II 43 (42–45), Sge III 60 (58–62), Sti III 55 (54–56), Sge IV 133 (130–135), Sti IV 101 (100–105), Sti IV’ 78 (75–79); all aciculate and smooth. Chaetotaxy: genu II 1–2/1, 2/0–1, genu III 0–2/1, 2/1–1.

Adult male
Not known.

Etymology
The name pluridentatus refers to the presence of more teeth on the fixed cheliceral digit of this species than in other Chelaseius species.

Specimens examined
Holotype female and one paratype female from litter/soil of a fragment of the Atlantic Forest biome at Embrapa Pecuária Sudeste (22°01′10″S, 47°53′38″W; 860 m above sea level), São Carlos, São Paulo state, Brazil, December 31, 2021 and January 28, 2022, respectively; two paratype females from litter/soil of an Integrated Crop-Livestock-Forestry (ICLF) area at same locality, March 4, 2022 and April 29, 2022. All types collected by V. Borges and deposited in the Mite Reference Collection of Departamento de Entomologia e Acarologia, Escola Superior de Agricultura “Luiz de Queiroz” (ESALQ), Universidade de São Paulo (USP), Piracicaba, São Paulo state, Brazil.

Remarks
Chelaseius pluridentatus n. sp. differs from other known Chelaseius species by having seven teeth (instead of 2–5 in other species, according to Denmark & Kolodochka, 1990; Chant & McMurtry, 2004). It is most similar to C. austrellum (Athias-Henriot, 1967), but females of the
latter have setae $J_5$, $Z_4$ and $Z_5$ barbed, seta $s_4$ about eight times as long as $z_4$; seta $Z_4$ about 12 times as long as $S_4$; and calyx of spermatheca about 20 long. It is similar to *C. braziliensis* Denmark & Kolodochka, concerning the higher number of teeth on the fixed cheliceral digit (five teeth in *C. braziliensis*, lower number in other species) and an ellipsoid tubercle at the base of the pilus dentilis (this feature may not have been given full attention in the description or redescription of some other species), but the latter differs by having spermathecal calyx cup-shaped.

**Key to world species of Chelaseius**

1. Seta $s_4$ shorter than distance $s_4-Z_1$; seta $Z_4$ about as long as distance $Z_4-Z_5$  
   ... .........................................................
   *C. vicinus* (Muma, 1965); USA
   — Seta $s_4$ at least as long as distance $s_4-Z_1$; seta $Z_4$ much longer than distance $Z_4-Z_5$  
   ... 2

2. Spermatheca funnel- or trumpet-shape ...................................................... 3
   — Spermatheca not funnel- or trumpet-shaped ........................................ 5

3. Fixed cheliceral digit with seven teeth; $s_4$ about 20 times as long as $z_4$; calyx of spermatheca about 45 long ...........................................  
   *C. pluridentatus* n. sp.; Brazil
   — Fixed cheliceral digit with 2–3 teeth; $s_4$ at most 10 times as long as $z_4$; calyx of spermatheca about 20 long ........................................... 4

![Figure 2 Chelaseius pluridentatus n. sp. Female. A – Chelicera; B – Spermatheca; C – Genu, tibia and basitarsus of leg IV.](image-url)
4. Fixed cheliceral digit with three teeth; S2 about 2.5 times as long as z5; Z4 about eight times as long as S4. 
   — Fixed cheliceral digit with two teeth; S2 about 1.5 times as long as z5; Z4 about 13 times as long as S4. 
   C. austrellus (Athias-Henriot, 1967); Argentina

5. Calyx of spermatheca at most 1.5 times as long as widest diameter. 
   — Calyx at least about twice as long as widest diameter.

6. Calyx of spermatheca saccular, about 1.5 times as long as widest diameter; Z1 about four times as long as z5. 
   C. lativentris Karg, 1983; Brazil
   — Calyx of spermatheca cup-shaped, at most as long as widest diameter; Z1 at most twice as long as z5.
   C. valliculosus Kolodochka, 1987; Crimea

7. Fixed cheliceral digit with five teeth of about uniform sizes; spermathecal atrium undifferentiated; Z4 about eight times as long as S4. 
   C. bresilensis Denmark & Kolodochka, 1990; Brazil
   — Fixed cheliceral digit with less than five teeth; spermathecal atrium nodular; Z4 at least 20 times as long as S4.

8. Fixed cheliceral digit with two teeth; S2 about 1.4 times as long as z5. 
   — Fixed digit with three distal relatively large teeth and one small proximal tooth; S2 about 2.8 times as long as z5. 
   C. schusterellus (Athias-Henriot, 1967); Argentina

9. Ventrianal shield smooth; seta S4 at least about four times as long as Z1. 
   — Ventrianal shield lightly imbricate; seta S4 at most twice as long as Z1.

10. Seta Z4 at least about five times as long as S4; setae Z4 and Z5 slightly barbed. 
    — Seta Z4 at most about 3.5 times as long as S4; setae Z4 and Z5 smooth. 
    C. floridanus (Muma, 1955); USA
    — Seta Z4 and Z5 respectively about 0.3 and 0.4 as long as dorsal shield; seta Z4 at most six times as long as Z1; calyx of spermatheca elongate bell-shaped, length < 10 long. 
    C. freni Karg, 1976; Chile

11. Setae Z4 and Z5 respectively about 0.3 and 0.4 as long as dorsal shield; seta Z4 at most six times as long as Z1; calyx of spermatheca elongate bell-shaped, length < 10 long. 
    — Setae Z4 and Z5 respectively about 0.4 and 0.7 as long as dorsal shield; seta Z4 at least 10 times as long as Z1; calyx of spermatheca tubular to very slightly flaring next toward vesicle, length > 20 long. 
    C. tundra (Chant & Hansell, 1971); Canada

Acknowledgments
To CNPq Brazil for the scholarship for the first author. This work was supported by the São Paulo Research Foundation (FAPESP) and was part of BOTA-FAPESP program (2017/12004-1). We are grateful to Adriane F. Duarte, for the collection the specimens identified as A. robertogonzalezii.

ORCID
Vinicius Borges https://orcid.org/0000-0003-3986-8504
Gilberto J. de Moraes https://orcid.org/0000-0002-5587-1781
Raphael de Campos Castilho https://orcid.org/0000-0002-1114-8137
References


