Phytoseiid mites (Acari: Phytoseiidae) in the northern coastal region of the Rio Grande do Sul State, Brazil

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(Received 26 February 2015; accepted 10 May 2015)

This work aims to evaluate the phytoseiid fauna in natural environments of the coastal plain of the northern coast of the Rio Grande do Sul State, Brazil. The plants were sampled from locations within the counties of Tramandaí and Osório during the last month of each season. Three locations were chosen in the Tramandaí area: (A1) – sand dunes; (A2) – mangrove and (A3) – forest plantation; and one in Osório: (A4) – hill with dense rainforest. A total of 561 specimens belonging to 29 species were collected. The preserved areas presented higher richness, given that the A4 area stood out as the richest, with 18 species, and A1 presented the lowest richness, with four species. The most abundant genus was *Amblyseius*, with five species, followed by *Neoseiulus* and *Iphiseiodes*, with three species. A redescription of *Typhlodromus* (Anthoseius) ornatus and a key for the species in this paper are provided.

**Keywords:** dichotomous key; *Iphiseiodes saopaulus*; natural environment; *Psidium guajava*; rainforest

Introduction

The northern coast of Rio Grande do Sul is a very important environmental area, with highly diverse fauna and flora and a landscape derived from a combination of ecological factors and gradients from the coastal plain to the eastern border of the Serra Geral where the vegetation is described as rainforest.[1] The vegetation is predominantly pioneering, notwithstanding native arborous species occurring in isolation or in forest fragments, forming sandbank forests.[2] The east portion is a flat region, sometimes broken by soft ripples covered by underbrush, interspersed with swamped or dry fields.

This environment has suffered impacts caused by the drastic reduction of its area, due to a fragmentation process for the implementation of economic activities and urban sprawl.[2] It houses rare ecosystems and presents high environmental vulnerability. It also presents different landscapes, especially throughout the extension of its sandy beaches and lagoons. In the surrounding areas, however, there is a great diversity of topographic features with continental and marine influence, in different stages of succession, which explain the variety of habitats and consequently of flora and fauna. However, they are threatened by the increase in anthropogenic activity during the last century.[3]

Phytoseiidae Berlese, 1913 is a large group of about 2300 species [4] placed in 82 genera.[5] Many species are predators and some species, in particular pertaining to the genera *Neoseiulus*, *Euseius*, *Phytoseiulus*, *Typhlodromus*, *Typhlodromips* and *Typhlodromalus*, have been successfully used to control populations of phytophagous mites and maintain them below economic injury levels without adversely affecting the environment.[6,7]

About 160 phytoseiid species have been reported in Brazil,[8] including about 50 within the Rio Grande do Sul State (southern Brazil), both on cultivated plants and natural vegetation. So far, no data had been generated on phytoseiid mites in that region. This article reports taxonomic information on the phytoseiid mites based on specimens collected from the northern coastal region of the Rio Grande do Sul State, Brazil, in the municipalities of Tramandaí and Osorio and provides a key for the identification of phytoseiids from this area.

Material and methods

This study was carried out in the Tramandaí and Osório municipalities between August 2011 and May 2012, with one data collection per season (Figure 1).

Three areas were chosen in the Tramandaí municipality: sand dunes (A1), containing the natural features of most sandy beaches, with continuous input of sands carried by prevailing winds; mangrove or swamp area (A2); northern coast forest plantation area (A3), which contains
a protected area for the preservation of regional ecosystems. In the Osório municipality, the chosen area was the Morro da Borrúsia (A4), an Atlantic Forest Domain, representing the rainforest ecosystem.

The survey was conducted seasonally and the 10 most common plant species, based on previous phytosociologic analysis were randomly sampled in each one of the areas, employing an effort of one hour for the counting and collection of mites for each plant species. Slides were kept in a kiln for five days at 50–60°C to fix, extend and brighten up the specimens and to dry the medium.

The notations of dorsal and ventral setae concur with Rowell et al. [9] and Chant & Yoshida-Shaul, [10] respectively. All measurements are given in micrometers (μm), presenting the mean for all measured individuals first, followed (in parentheses) by their respective range, if the measurement was variable. The distribution records of the species are in accordance with Demite et al. [8].

Voucher specimens of each collected species were deposited in the reference collection of mites of the Museu de Ciências Naturais of Centro Universitário UNIVATES (ZAUMCN), Lajeado, Rio Grande do Sul State, Brazil.

Results
Species richness
A total of 561 mites of 29 species belonging to 18 genera of the subfamilies Amblyseinae (20 species), Typhlodrominae (7 species) and Phytoseiinae (2 species) were identified on the plants. The most abundant genus

Figure 1. Map locating the municipalities of Osório and Tramandaí in the Rio Grande do Sul State, Brazil.
was *Amblyseius*, with five species, followed by *Neoseius* and *Iphiseiodes*, with three species. However, *Iphiseiodes saopaulus* Denmark & Muma (17.16%), *Euseius alatus* De Leon (9.38%) and *Typhlodromalus aripo* De Leon (9.02%) were the most abundant, whereas *Amblyseius operculatus* De Leon and *T. aripo* were more frequent.

Morro da Borrúdia (A4) was the area where phyto-seeid mites showed their highest diversity and highest richness, with 18 species. Their lowest richness, presenting 4 species, was observed in the sand dunes (A1).

**Subfamily Amblyseinae Muma**

**Tribe Amblyseini Muma**

Genus *Amblyseius* Berlese

*Amblyseius aerialis* (Muma)[11]

FEMALE (5 specimens measured). Dorsal shield 365 (327–383) long and 260 (254–267) wide; j1 35, j3 50 (45–55), j4 5 (3–7), j5 5, j6 6, j2 8 (5–10), j5 7 (5–9), z2 10 (8–12), z4 9 (7–13), z5 6, Z1 10 (7–12), Z4 129 (119–138), Z5 278 (266–290), s4 100 (92–107), S2 14 (10–17), S4 12 (10–15), S5 10 (8–13), r3 10, R1 13 (8–15); distances between st1-st3 67 (64–73), st2-st2 80 (75–86) and st5-st5 84 (77–89); ventrianal shield 132 (122–139) long, 78 (75–84) wide at level of ZV2 and 76 (73–78) wide at level of anus; movable cheliceral digit 39 (37–42) long, with 3 teeth; fixed cheliceral digit 35 (33–36) long, with 10 teeth; calyx of spermatheca 18 (15–21) long; Sge I 40 (38–45), Sge II 40 (38–42), Sge III 54 (50–58), Sti III 39 (35–42), Sge IV 131 (115–140), Sti IV 90 (84–95), St IV 75 (69–78).

**Specimens examined:** Brasil, Rio Grande do Sul, A3; *Citrus* sp. XI-2011 (13); A4: *Piper xylostoeides* (Kunth) Steud.VIII-2011 (1).

**Remarks:** Species reported from North America (Mexico and USA), Central America (Cuba, Honduras, Jamaica, Martinique), South America (Argentina, Brazil, Colombia, Guyana, Venezuela), Africa (Algeria) and Asia (India).

*Amblyseius herbicola* (Chant)

*Typhlodromus* (*Amblyseius*) *herbicola* Chant.[12]

FEMALE (5 specimens measured). Dorsal shield 365 (335–387) long and 254 (250–262) wide; j1 35, j3 39 (37–45), j4 5, j5 5, j6 6, j2 8, j5 5, z2 10, z4 10, z5 6, Z1 6, Z4 98 (92–102), Z5 249 (237–262), s4 92 (90–97), S2 14 (10–17), S4 12 (10–15), S5 10 (8–13), r3 10, R1 13 (8–15); distances between st1-st3 65 (62–70), st2-st2 70 (67–75) and st5-st5 66 (65–70); ventrianal shield 114 (107–120) long, 54 (50–60) wide at level of ZV2 and 66 (60–72) wide at level of anus; movable cheliceral digit 32 long, with 4 teeth; fixed cheliceral digit 35 long, with 12 teeth; calyx of spermatheca 27 (25–30) long; Sge I 43 (40–45), Sge II 36, Sge III 47 (42–50), Sti III 38 (35–40), Sge IV 115 (108–125), Sti IV 87 (80–95), St IV 71 (65–75).

**Specimens examined:** Brasil, Rio Grande do Sul, A3: *Solanum concinnum* Schott ex Sendtn. VIII-2011 (1), *Senecio crassiflorus* (Poir.) DC. VIII-2011 (1); *Citrus* sp. XI-2011 (1), *Handroanthus pulcherrimus* (Sandwith) Mattos XI-2011 (4); *Eugenia uniflora* L. II-2012 (2).

**Remarks:** Species reported from North America (Hawaii), Central America (Costa Rica, El Salvador, Guadaloupe, Guatemala, Honduras, Martinique, Puerto Rico), South America (Argentina, Brazil, Colombia, Venezuela), Europe (Canary Islands), Africa (Angola, Kenya, South Africa), Asia (China, India, Iran, Malaysia, Philippines, Singapore, Taiwan), Oceania (Australia, New Caledonia, Papua New Guinea).

*Amblyseius impressus* Denmark & Muma

*Amblyseius impressus* Denmark & Muma.[13]

FEMALE (5 specimens measured). Dorsal shield 450 (440–467) long and 264 (250–272) wide; j1 40 (33–45), j3 50 (43–55), j4 5, j5 5, j6 6, j2 8, j5 10, z2 11 (8–13), z4 10 (9–11), z5 9 (7–10), Z1 6, Z4 146 (133–157), Z5 290 (277–300), s4 92 (90–97), S2 10 (8–13), S4 12 (10–15), S5 10 (9–12), r3 15 (13–17), R1 15 (12–17); distances between st1-st3 65 (62–70), st2-st2 75 (70–79) and st5-st5 79 (78–80); ventrianal shield 114 (107–120) long, 54 (50–60) wide at level of ZV2 and 66 (60–72) wide at level of anus; movable cheliceral digit 32 long, with 4 teeth; fixed cheliceral digit 35 long, with 12 teeth; calyx of spermatheca 14 (10–15) long; Sge I 43 (40–45), Sge II 46 (43–49), Sge III 47 (42–50), Sti III 38 (35–40), Sge IV 125 (120–134), Sti IV 87 (80–95), St IV 71 (65–75).

**Specimens examined:** Brasil, Rio Grande do Sul, A4: *Psidium guajava* LII-2012 (9), *Casearia sylvestris* Sw. V-2012 (2), *Sorocea bonplandii* (Baill.) W.C. Burger et al. V-2012 (1).

**Remarks:** This species is previously known from state of São Paulo, Brazil.

*Amblyseius opercularis* De Leon

*Amblyseius opercularis* De Leon.[14]

FEMALE (5 specimens measured). Dorsal shield 421 (390–450) long and 293 (275–320) wide; j1 36 (32–40), j3 46 (42–50), j4 7, j5 7, j6 10, J2 12, j5 10, z2 14 (12–15), z4 7 (5–10), z5 7, Z1 10, Z4 138 (130–145), Z5 305 (285–320), s4 113 (105–125), S2 10, S4 9 (7–10), S5 10, r3 15, R1 8 (7–9); distances between st1-st3 75 (72–77), st2-st2 84 (80–90) and st5-st5 82 (79–85); ventrianal shield 138 (135–145) long, 93 (85–100) wide at level of ZV2 and 91 (87–95) wide at level of anus; movable cheliceral digit 40 long, with 3 teeth; fixed cheliceral digit 43 long, with 12 teeth; calyx of spermatheca 10 (9–12) long; Sge I 42 (37–50), Sge II 39 (35–45), Sge III 56 (50–62), Sti III 50 (40–60), Sge IV 132 (115–150), Sti IV 93 (82–110), St IV 82 (75–90).
Specimens examined: Brasil, Rio Grande do Sul, A1: Plantago sp. VIII-2011 (5); A2: Psidium guajava L. VIII-2011 (6), Pterocaulon sp. XI-2011 (2), Zingiber cf. officinale V-2012 (2); A3: Solanum concinnum Schott ex Sendtn. VIII-2011 (1), Ficus cestrifolia Schott ex Spreng. VIII-2011 (1); A4: Schinus terebinthifolius Raddi XI-2011 (2), Myr BB 2012 (1).

Remarks: Species reported from Central America (Costa Rica) and South America (Brazil).

Amblyseius vitis Ferla & Silva
Amblyseius vitis Ferla & Silva.[15]

FEMALE (2 specimens measured). Dorsal shield 400 (385–415) long and 293 (280–305) wide; j1 36 (32–40), j3 34 (30–38), j4 7, j5 5, j6 7, j2 8, j5 10, z2 6 (5–8), z4 8, z5 7, Z1 10, Z4 200 (190–210), Z5 427 (415–440), s4 190 (175–205), s2 10, s4 9, s5 10, r3 15, R1 8 (7–9); distances between st1-st3 75 (72–77), st2-st2 84 (80–90) and st5-st5 88; ventrianal shield 138 (135–145) long, 93 (85–100) wide at level of ZV2 and 91 (87–95) wide at level of anus; movable cheliceral digit 38 long, with 3 teeth; fixed cheliceral digit 41 long, with 10 teeth; calyx of spermatheca 20 long; Sge I 65 (60–70), Sge II 48 (45–50), Sge III 93 (90–95), Sti III 70, Sge IV 208 (200–215), Sti IV 170, St IV 130 (125–135).

Specimens examined: Brasil, Rio Grande do Sul, A1: Plantago sp. VIII-2011 (3).

Remarks: Species only reported from state of Rio Grande do Sul, Brazil [11] (2009).

Genus Iphiseiodes De Leon

Iphiseiodes moraei Ferla & Silva
Iphiseiodes moraei Ferla & Silva.[16]

FEMALE (5 specimens measured). Dorsal shield 449 (448–450) long and 338 (325–350) wide; j1 24 (21–24), j3 26 (25–26), j4 4, j5 4, j6 5, J2 5, J5 8, z2 6, z4 4, z5 4, Z1 5, Z4 170 (168–172), Z5 240 (236–242), s4 150 (145–153), S2 4, S4 5, S5 7, r3 5, R1 5; distances between st1-st3 61 (60–63), st2-st2 83 (80–85) and st5-st5 100 (100–103); ventrianal shield 154 (150–157) long, 200 (197–202) wide at level of ZV2 and 167 (158–170) wide at level of anus; movable cheliceral digit 30 long, with 1 tooth; fixed cheliceral digit 39 long, with 8 teeth; calyx of spermatheca 15 long; Sge I 74 (73–75), Sge II 50, Sge III 80, Sti III 43 (38–47), Sge IV 155 (140–168), Sti IV 83 (80–85), St IV 67 (55–73).

Specimens examined: Brasil, Rio Grande do Sul, A3: Citrus sp. V-2012 (6), Eugenia uniflora L. V-2012 (3).

Remarks: Species only reported from state of Rio Grande do Sul, Brazil Ferla & Silva (2011).

Iphiseiodes saopaulus (Denmark and Muma)
Amblyseius saopaulus Denmark & Muma.[13]

FEMALE (5 specimens measured). Dorsal shield 431 (412–450) long and 335 wide; j1 25, j3 31 (30–32), j4 4, j5 5, j6 5, J2 5, J5 7, z2 6, z4 4, z5 4, Z1 5, Z4 137, Z5 202 (192–212), s4 132 (130–135), S2 4, S4 5, S5 5, r3 12, R1 10; distances between st1-st3 62, st2-st2 79 (77–82) and st5-st5 103 (100–105); ventrianal shield 140 (137–142) long, 156 (150–162) wide at level of ZV2 and 107 (90–120) wide at level of anus; movable cheliceral digit 30 long, with 4 teeth; fixed cheliceral digit 33 long, with 12 teeth; calyx of spermatheca 13 long; Sge I 67 (64–70), Sge II 45, Sge III 65 (62–67), Sti III 37, Sge IV 115, St IV 79, St IV 51.

Specimens examined: Brasil, Rio Grande do Sul, A3: Cecropia pachystachya Trécul VIII-2011 (1), II-2012 (1), Psidium cattleianum Sabine VIII-2011(6), XI-2011 (4), Ficus cestrifolia Schott ex Spreng. VIII-2011 (2), XI-2011 (11), Eugenia uniflora L.VIII-2011 (2), II-2012 (1) Citrus sp. XI-2011 (3), Handroanthus pulcherri mus XI-2011 (1), Inga vera Willd.II-2012 (5), V-2012 (20), Psidium guajava L.II-2012 (1), V-2012 (9), Murtaghias indica (L.) Kunzle II-2012 (9), Ficus cestrifolia Schott ex Spreng. V-2012 (12), Handroanthus pulcherri mus (Sandwith) Mattos V-2012 (1), Cecropia pachystachya Trécul V-2012 (1); A4: Schinus terebinthifolius Raddi II-2012 (1).

Remarks: It has been reported on yerba mate by Ferla et al. (2005) from Rio Grande do Sul, Brazil.

Iphiseiodes zuluagai Denmark & Muma
Iphiseiodes zuluagai Denmark & Muma.[13]

FEMALE (5 specimens measured). Dorsal shield 338 (320–370) long and 351 (338–365) wide; j1 26 (25–28), j3 32 (28–37), j4 5, j5 4, j6 4, J2 5, J5 5, z2 5 (4–6), z4 5 (4–6), z5 4, Z1 5, Z4 5 (3–7), Z5 120 (119–125), s4 107 (103–110), S2 4, S4 6, S5 5, r3 7 (5–8), R1 7; distances between st1-st3 52, st2-st2 82 (77–85) and st5-st5 122 (120–125); ventrianal shield 110 (105–115) long, 122 (120–125) wide at level of ZV2 and 135 wide at level of anus; movable cheliceral digit 37 (35–40) long, with 4 teeth; fixed cheliceral digit 43 long, with 9 teeth; calyx of spermatheca 10 (8–12) long; Sge I 52 (50–55), Sge II 35 (32–37), Sge III 50, Sti III 25, Sge IV 83, Sti IV 52 (50–55), St IV 35.

Specimens examined: A2: Zingiber cf. officinale VIII-2011 (3), Psidium guajava L.VIII-2011 (2), Fabaceae Lindl. VIII-2011 (1).

Remarks: Species reported from Central America (Cuba, Guadeloupe, Marie Galante, Martinique, Panama, Puerto Rico) and South America (Brazil, Colombia, Venezuela).

Genus Proprioseiopsis Muma

Proprioseiopsis neotropicus (Ehara)
Amblyseius neotropicus Ehara (1966).[17]
Genus *Amblydromalus* Chant & McMurtry

*Amblydromalus manihoti* (Moraes)

*Amblyseius manihoti* Moraes et al. [19]  
FEMALE (5 specimens measured). Dorsal shield 347 (345–350) long and 208 (208–210) wide; j1 33 (30–37), j3 17, j4 10, j5 10, j6 10, j2 12, j5 8, z2 13 (12–15), z4 15, z5 10, Z1 10, Z4 12, Z5 53 (52–55), s4 18 (17–20), S2 15, S4 19 (18–20), S5 18, r3 10, R1 12; distances between st1-st3 62, st2-st2 73 and st5-st5 80; ventrianal shield 110 (108–112) long, 58 (55–60) wide at level of ZV2 and 65 (62–70) wide at level of anus; movable cheliceral digit 25 (24–26) long, with 1 tooth; fixed cheliceral digit 26 (25–27) long, with 2 teeth; calyx of spermatheca 23 long; Sge II 23 (21–25), Sge III 27, Sge IV 39 (38–40), Sti IV 25, St IV 47 (43–50).

Specimens examined: Brasil, Rio Grande do Sul, A4: *Eugenia cumini* (L.) Drue II-2012 (4), *Cabrerae canjerana* (Vell.) Mart. II-2012 (1), *Verbenoxylum reitzii* (Moldenke) Tronc. V-2012 (7), *Miconia hyemalis* A.St-Hil. & Naudin V-2012 (1).

Remarks: Species reported from Central America (Cuba, Guatemala, Nicaragua, Trinidad) and South America (Bolivia, Brazil, Colombia, Ecuador, Paraguay, Peru, Surinam, Venezuela).

Genus *Euseius* Wainstein

*Euseius alatus* De Leon

*Euseius alatus* De Leon.[20]  
FEMALE (5 specimens measured). Dorsal shield 347 (345–350) long and 208 (208–210) wide; j1 33 (30–37), j3 17, j4 10, j5 10, j6 10, j2 12, j5 8, z2 13 (12–15), z4 15, z5 10, Z1 10, Z4 12, Z5 53 (52–55), s4 18 (17–20), S2 15, S4 19 (18–20), S5 18, r3 10, R1 12; distances between st1-st3 62, st2-st2 73 and st5-st5 80; ventrianal shield 110 (108–112) long, 58 (55–60) wide at level of ZV2 and 65 (62–70) wide at level of anus; movable cheliceral digit 25 (24–26) long, with 1 tooth; fixed cheliceral digit 26 (25–27) long, with 2 teeth; calyx of spermatheca 23 long; Sge II 23 (21–25), Sge III 27, Sge IV 39 (38–40), Sti IV 25, St IV 47 (43–50).

Specimens examined: Brasil, Rio Grande do Sul, A1: *Chenopodium ambrosioides* L. II-2012 (2); A2: *Psidium guajava* L.VIII-2011(2), XI-2011 (31), *Cozya bonariensis* II-2012 (2), *Zingiber cf. officinale* II-2012 (2), *Varroния curassavica* Jacq. II-2012 (1); A3: *Psidium cattleianum* Sabine VIII-2011 (2), II-2012 (4), V-2012 (2), *Psidium guajava* L.V-2012 (3).

Remarks: Species reported from Central America (Martinique) and South America (Brazil, Colombia, Peru and Venezuela).
Species reported from North America (Mexico), Central America (Jamaica, Puerto Rico) and South America (Argentina, Brazil, Colombia, Ecuador, Peru)

Genus Typhlodromalus Muma

Typhlodromalus aripo DeLeon

*Typhlodromalus aripo* DeLeon, [14]

FEMALE (5 specimens measured). Dorsal shield 344 (320–362) long and 199 (192–212) wide; j1 28 (25–30), j3 36 (35–37), j4 11 (10–12), j5 11 (10–12), j6 15 (12–17), J2 16 (15–17), J5 11 (10–12), z2 20 (17–22), z4 32 (30–37), z5 11 (10–12), Z1 23 (20–27), Z4 42 (37–45), Z5 60 (57–62), s4 43 (37–47), S2 25 (22–27), S4 21 (20–23), S5 10, r3 19, R1 17; distances between st1-st3 62 (59–67), st2-st2 60 and st5-st5 69 (65–72); ventrianal shield 119 (112–125) long, 67 (60–75) wide at level of ZV2 and 67 wide at level of anus; movable cheliceral digit 30 long, with 3 teeth; fixed cheliceral digit 35 long, with 9 teeth; calyx of spermatheca 17 long; Sge III 26 (23–32), J2 17, J5 10, z2 17, z4 16 (15–17), Z5 14 (12–15), Z1 15 (12–17), Z4 37 (35–40), Z5 54 (52–55), S2 48 (46–50), S4 20, S2 26 (25–27), S4 26 (25–27), S5 22 (20–25), r3 17 (15–20), R1 17; distances between st1-st3 62 (60–65), st2-st2 56 (55–57) and st5-st5 60, ventrianal shield 102 long, 81 (75–87) wide at level of ZV2 and 67 (60–75) wide at level of anus; movable queliceral digit 26 (25–27) long, with three teeth, fixed queliceral digit 23 (22–25) long, with four teeth; calyx of spermatheca 15 (12–17) long. St IV 46 (45–47).

Specimens examined: Brasil, Rio Grande do Sul, A1: Chenopodium ambrosioides L. VIII-2011 (12), XI-2011 (1), I-2012 (4), V-2012 (8), Plantago L. VIII-2011 (1), Glandularia selloi (Spr.) Tronc. XI-2011 (1), Salpichroa origanifolia (Lam.) Thell II-2012 (7), V-2012 (1), Noticastrum sp. V-2012 (5); A2: Ageratum conyzoides L. VIII-2011 (2), Baccharis spicata (Lam.) Baill.XI-2011 (4), Pterocaulon sp. II-2012 (2); A3: Eupatorium sp. VIII-2011 (1).

Remarks: Species reported from Central America (Costa Rica, El Salvador, Guatemala, Jamaica) and South America (Argentina, Brazil, Colombia, Guyana, Paraguay).

Typhlodromalus marmoreus (El-Banhawy)

*Ambylusius marmoreus* El-Banhawy, [22]

FEMALE (4 specimens measured). Dorsal shield 333 (328–338) long and 191 (180–200) wide; j1 26 (25–28), j3 32 (29–35), j4 12 (11–14), j5 11 (10–13), j6 15 (14–15), J2 20 (15–25), J5 9 (8–10), z2 33 (32–35), z4 45 (40–48), z5 12 (12–13), Z1 40 (36–46), Z4 57 (53–62), Z5 81 (78–85), S4 52 (49–55), S2 48 (46–50), S4 15 (14–16), S5 13 (11–15), r3 32 (30–35), R1 15 (14–18); distances between st1-st3 59 (52–62), st2-st2 61 (60–62) and st5-st5 59 (52–68); ventrianal shield 105 (102–110) long, 60 (58–64) wide at level of ZV2 and 65 (62–66) wide at level of anus; movable cheliceral digit 27 long, with 3 teeth; fixed cheliceral digit 31 long, with 11 teeth; calyx of spermatheca 18 (17–20) long; Sge IV 31 (30–34), Sg IV 42 (41–44), St IV 45 (43–48).

Specimens examined: Brasil, Rio Grande do Sul, A4: Boehmeria caudata Sw. XI-2011 (9).

Remarks: Species reported only from South America (Brazil).

Tribe Neoseiulini Chant & McMurtry

Genus Neoseiulus Hughes

*Neoseiulus californicus* (McGregor)

*Typhlodromus californicus* McGregor, [23]

FEMALE (2 specimens measured). Dorsal shield 340 (337–342) long and 196 (192–200) wide; j1 13 (12–15), j3 13 (12–15), j4 11 (10–12), j5 12, j6 13 (12–15), J2 17, J5 10, z2 17, z4 16 (15–17), Z5 14 (12–15), Z1 15 (12–17), Z4 37 (35–40), Z5 54 (52–55), S2 40, S2 26 (25–27), S4 26 (25–27), S5 22 (20–25), r3 17 (15–20), R1 17; distances between st1-st3 62 (60–65), st2-st2 56 (55–57) and st5-st5 60, ventrianal shield 102 long, 81 (75–87) wide at level of ZV2 and 67 (60–75) wide at level of anus; movable queliceral digit 26 (25–27) long, with three teeth, fixed queliceral digit 23 (22–25) long, with four teeth; calyx of spermatheca 15 (12–17) long. St IV 46 (45–47).

Specimens examined: Brasil, Rio Grande do Sul, A2: Xanthium strumarium L II-2012 (2), Conyza bonariensis II-2012 (1), Varronia curassavica Jacq.V-2012 (1), Solidago chilensis Meyen V-2012 (1); A4: Myrsine parvifolia A.DC V-2012 (1).

Remarks: Species reported from North America (Mexico, USA), Central America (Cuba, Guatemala), South America (Argentina, Brazil, Chile, Colombia, Peru, Uruguay, Venezuela), Europe (France, Italy) and Asia (Japan, Taiwan).

*Neoseiulus tunus* (De Leon)

*Typhlodromips tunus* De Leon, [14]

FEMALE (5 specimens measured). Dorsal shield 310 (277–320) long and 168 (162–180) wide; j1 22 (20–25), j3 29 (27–32), j4 13, j5 13 (10–17), j6 17, J2 20, J5 11, z2 25, z4 33 (32–37), z5 12, (10–17), Z1 27, Z4 46 (40–52), Z5 75 (65–80), S4 39 (35–42), S2 37 (35–40), S4 25, S5 15, r3 29 (27–32), R1 20 (17–25); distances between st1-st3 62 (59–67), st2-st2 65 (63–67) and st5-st5 61 (54–67); ventrianal shield 108 (102–112) long, 76...
(72–80) wide at level of ZV2 and 62 wide at level of anus; movable cheliceral digit 29 (28–30) long, with 3 teeth; fixed cheliceral digit 32 (30–35) long, with 6 teeth; calyx of spermatheca 6 long; Sge IV 17, St IV 25.

**Specimens examined**: Brasil, Rio Grande do Sul, A2: Fabaceae Lindl. VIII-2011 (3); A4: Inga vera Willd.VIII (2), Schinus terebinthifolius Raddi II-2012 (4).

**Remarks**: Species reported from Central America (Guadeloupe, Jamaica, Marie Galante, Martinique) and South America (Argentina, Brazil, Peru).

**Neoseiulus sp.**

FEMALE (1 specimen measured). Dorsal shield 330 sp.

**Remarks**: Species reported from North America.

**Specimens examined**: Brasil, Rio Grande do Sul, A2: Fabaceae Lindl. VIII-2011 (5), Quillaja brasiliensis (A.St.-Hil. & Tul.) Mart.XI-2011 (2), Myr- sine hermogenessii (Jung-Mend. & Bernacci) M.F.Freitas & Kin.-Gouv. II-2012 (1), V-2012 (1), Sebastiana brasiliensis Spreng.II-2012 (5), Eugenia cuminii (L.) Druce II-2012 (5), Verbenoxylum reitzii (Moldenke) Tronc. V-2012 (8), Alsophila cf. setosa Kauf.V-2012 (4).

**Remarks**: Species only reported from state of São Paulo, Brazil.

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**Typhlodromips japi Lofego, Demite & Ferè**

**Typhlodromips japi** Lofego, Demite & Ferè.[25]

FEMALE (2 specimens measured). Dorsal shield 326 (322–330) long, 202 wide; j1 23 (22-25), j3 18 (15-22), j4 11 (10-12), j5 12 (10-15), j6 14 (12-17), J2 14 (12-17), J5 10, z2 13 (12-15), z4 12, z5 11 (10-12), Z1 17, Z4 23 (22-25), Z5 57 (52-62), s4 17 (15-20), s2 18 (17-20), S4 18 (17-20), S5 13 (12-15), r3 15, R1 16 (15-17); distances between st1-st3 60, st2-st2 61 (57-65) and st5-st5 61 (60-62), ventrianal shield 104 (97-112) long, 103 (100-107) wide at level of ZV2 and 97 (95-100) wide at level of anus; movable cheliceral digit 25 long, with three teeth, fixed queliceral digit 21 (20-22) long, with seven teeth; calyx of spermatheca 22 long; Sge IV 22 (20-25), St IV 17, St IV 35 (30-40).

**Specimens examined**: Brasil, Rio Grande do Sul, A4: Thelypteris cf. hispidula C.F.Reed XI-2011 (5), Quillaja brasiliensis (A.St.-Hil. & Tul.) Mart.XI-2011 (2), Myr- sine hermogenessii (Jung-Mend. & Bernacci) M.F.Freitas & Kin.-Gouv. II-2012 (1), V-2012 (1), Sebastiana brasiliensis Spreng.II-2012 (5), Eugenia cuminii (L.) Druce II-2012 (5), Verbenoxylum reitzii (Moldenke) Tronc. V-2012 (8), Alsophila cf. setosa Kauf.V-2012 (4).

**Remarks**: Species only reported from state of São Paulo, Brazil.

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**Typhlodromips mangleae De Leon**

**Typhlodromips mangleae** De Leon.[14]

FEMALE (5 specimens measured). Dorsal shield 310 (277–320) long and 168 (162–180) wide; j1 22 (20-25), j3 29 (27–32), j4 13, j5 13 (10–17), j6 17, J2 20, J5 11, z2 25, z4 33 (32-37), z5 12, (10–17), Z1 27, Z4 46 (40–52), Z5 73 (65–80), s4 39 (35–42), S2 37 (35–40), S4 25, S5 15, r3 29 (27–32), R1 20 (17–25); distances between st1-st3 62 (59–67), st2-st2 65 (63–67) and st5-st5 61 (54–67); ventrianal shield 108 (102–112) long, 76 (72–80) wide at level of ZV2 and 62 wide at level of anus; movable cheliceral digit 29 (28–30) long, with 3 teeth; fixed cheliceral digit 32 (30–35) long, with 6 teeth; calyx of spermatheca 6 long; Sge IV 17, St IV 25.

**Specimens examined**: Brasil, Rio Grande do Sul, A2: Psidium guajava L. V-2012 (1); A4: Soroea bonplandii (Baill.) W.C. Burger et al. VIII-2011 (1), Cestrum bracteatum Link & Otto VIII-2011 (2), Cabralea canjer-ana (Vell.) Mart.XIII-2011 (1), Nectandra megapotamica XI-2011 (1).

**Remarks**: Species reported from Central America (Puerto Rico) and South America (Brazil, Colombia).

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**Subfamily Phytoseiinae Berlese**

**Tribe Phytoseiini Berlese**

**Genus Phytoseius Ribaga**

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**Tribe Typhlodromipsini Chant & McMurtry**

**Genus Typhlodromips De Leon**

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**Tribe Typhlodromipsini Chant & McMurtry**

**Genus Typhlodromips De Leon**
Phytoseius litoralis Silva, Rocha & Ferla
Phytoseius litoralis Silva, Rocha & Ferla.[26]
FEMALE (6 specimens measured). Dorsal shield 280 (275–285) long and 155 (150–158) wide; j1 30 (28–33), j3 34 (30–38), j4 4 (3–5), j5 4 (3–5), j6 4 (3–5), j5 7 (5–8), z2 15, z3 30 (28–33), z4 14 (13–15), z5 5 (3–5), Z4 89 (83–100), Z5 74 (65–80), s4 123 (120–133), s6 79 (75–88), r3 45 (43–48); distances between st1-st3 58 (55–63), st2-st2 61 (58–65) and st5-st5 60 (58–63); ventri- 
tanal shield 91 (85–100) long, 43 (40–48) wide at level of ZV2 and 48 (45–50) wide at level of anus; movable quelicular digit 21 (20–23) long, with 1 tooth; fixed quelicular digit 23 (21–23) long, with 4 teeth; calyx of sper- matheca 6 (5–8) long; Sge IV 12 (10–13), Sti IV 50 (48–50), St IV 26 (25–28).

Specimens examined: Brasil, Rio Grande do Sul, A3: Cayponia sp. VIII-2011 (1), Handroanthus pulcherrimus (Sandwith) Mattos V-2012 (2), XI-2011 (1), Cecropia pachystachya Trécul XI-2011 (1), Psidium guajava L.II-2012 (3), V-2012 (4).

Remarks: This species was described by Silva et al. [6] on north coastal region found on native plants in “Morro do Borrúcia”, state of Rio Grande do Sul, Brazil.

Phytoseius guianensis De Leon
Phytoseius guianensis De Leon.[21]
FEMALE (4 specimens measured) Dorsal shield 282 (272–287) long and 143 (142–145) wide; j1 17 (15–20), j3 19 (16–21), j4 13 (13–14), j5 15, j6 19, J2 19 (18–20), J5 8, Z2 16, Z3 23 (22–24), z4 20, Z5 17, Z4 24 (23–25), Z5 37 (35–38), s4 29 (27–30), s6 31 (30–33), r3 27, R1 16 (15–18); distances between st1-st3 57 (55–58), st2-st2 63 and st5-st5 48 (47–50); ventri- 
tanal shield 93 (90–95) long, 43 (40–45) wide at level of ZV2 and 48 (45–50) wide at level of anus; movable quelicular digit 25 long, with 2 teeth; fixed quelicular digit 25 long, with 4 teeth; calyx of spermatheca 8 (7–10) long; St IV 25 (23–28).

Specimens examined: Brasil, Rio Grande do Sul, A2: Varronia curassavica Jacq. II-2012 (2), V-2012 (1); A4: Symlocos trachycarpus Brand II-2012 (2).

Remarks: Species reported from South America (Argentina, Brazil, Venezuela).

Subfamily Typhlodrominae Wainstein

Tribe Typhloseiopsini Chant & McMurtry

Genus Leonseius Chant & McMurtry

Leonseius regularis (De Leon)

Typhloseiops regularis De Leon.[21]
FEMALE (2 specimen measured). Dorsal shield 358 (347-370) long and 256 (255-257) wide; j1 26 (25-27), j3 45 (40-50), j4 25, j5 25, j6 25, J2 5, J5 8 (7-10), Z2 3, z4 7 (5-10), Z5 3, Z1 8 (5-12), Z4 108 (107-110), Z5 325 (320-330), s4 101 (95-107), S5 25, r3 10, R1 8; distances between st1-st3 62, st2-st2 72 and st5-st5 65, ventri- 
tanal shield 122 (120-125) long, 55 wide at level of ZV2 and 55 wide at level of anus; movable quelicular digit 27 long, with three teeth, fixed quelicular digit 30 long, with seven teeth. Sge I 50, Sge II 50, Sge III 37, Sge IV (75-102) Sti IV 65 (55-75), St IV 50.

Specimens examined: Brasil, Rio Grande do Sul, A3: Psidium cattleianum Sabine XI-2011 (1), Ficus cest- trifolia Schott ex Spreng. XI-2011 (2), Citrus sp. XI-2011 (1), Eugenia uniflora L. II-2012 (1); A4: Psidium guajava L. II-2012 (2), Eugenia cunini (L.) Druce II-2012 (1).

Remarks: Species reported from Central America (Costa Rica, Guadeloupe, Puerto Rico, Trinidad) and South America (Brazil, Colombia, Guyana).

Genus Typhloseiopsis DeLeon

Typhloseiopsis dorsorecticulatus Lofego, Demite & Feres

Typhloseiopsis dorsorecticulatus Lofego, Demite & Feres.[27]
FEMALE (5 specimens measured). Dorsal shield 334 (332–337) long and 208 (200–215) wide; j1 14 (12–17), j3 15, j4 11 (10–12), j5 12, j6 13 (12–15), J2 18 (17–20), J5 12, z2 15, z3 13 (12–15), z4 16 (15–20), z5 12, Z4 23 (22–25), Z5 58 (55–62), s4 18, s6 18 (17–20), S5 15, r3 17, R1 18 (15–20); distances between st1-st3 55, st2-st2 54 (52–67) and st5-st5 59 (55–62); ventri- 
tanal shield 115 long, 107 (100–112) wide at level of ZV2 and 102 wide at level of anus; movable quelicular digit 22 long, with 1 tooth; fixed quelicular digit 24 long, with 2 teeth; calyx of spermatheca 23 long; Sg III 12, Sg IV 15 (12–20), Sti IV 14 (12–17), St IV 22.

Specimens examined: Brasil, Rio Grande do Sul, A2: Schinus terebinthifolius Raddi VIII-2011 (2), Psidium guajava L. VIII-2011 (2), XI-2011 (1), V-2012 (1), Baccharis spicata (Lam.) Baill. XI-2011 (5), Rumohra adi- 
tiformis (G.Forst.) Ching XI-2011 (5), Schinus terebinthifolius Raddi V-2012 (1); A4: Trema micranta XI-2011 (2), Myrsine parvifolia A.DC V-2012 (1).

Remarks: Species reported only from South America (Brazil).
50, S2 50, S4 50, S5 50, r3 45, ventrianal shield 80 long, 72 wide at level of ZV2 and 55 wide at level of anus; movable queliceral digit 17 long, with two teeth, fixed cheliceral digit 17 long.

**Specimens examined:** Brasil, Rio Grande do Sul, A4: *Boehmeria caudata* Sw. XI-2011 (4).

**Remarks:** Species reported from North America (Canada, Mexico, USA), Central America (Costa Rica, Cuba, El Salvador, Honduras, Jamaica, Puerto Rico) and South America (Argentina, Brazil, Colombia, Venezuela).

**Genus Typhlodromina**

**Typhlodromina tropica** (Chant)

*Typhlodromina tropica* Muma & Denmark.[29]

**FEMALE** (2 specimens measured). Dorsal shield 331 (325-337) long and 214 (212-217) wide; j1 13 (12-15), j3 27 (25-30), j4 32 (30-35), j5 33 (32-35), j6 41 (40-42), j2 50, j5 10 (7-12), z2 25 (20-30), z4 42 (40-45), Z5 38 (35-42), Z1 62 (50-75), Z4 68 (62-75), Z5 50, S2 52 (50-55), S5 38 (37-40), r3 31 (30-32), R1 22 (20-25), St IV 36 (35-37); distances between st1-st3 55 (50-60), st2-st2 63 (57-70) and st5-st5 75, ventrianal shield 123 (120-127) long, 85 (77-92) wide at level of ZV2 and 68 (62-95) wide at level of anus; movable queliceral digit 25 long, fixed queliceral digit 22 long; calyx of spermatheca 26 (25-27) long.

**Specimens examined:** Brasil, Rio Grande do Sul, A2: *Eupatorium laevigatum* L. V-2012 (1); A3: *Psidium guajava* L. II-2012 (1). A4: *Boehmeria caudata* Sw. XI-2011 (1), *Quillaja brasiliensis* (A.St.-Hil. & Tul.) Mart. XI-2011 (1), *Eugenia cumini* (L.) Druce II-2012 (4), *Adesmia latifolia* (Spreng.) Vogel V-2012 (1).

**Remarks:** Species reported from North America (Mexico), Central America (Costa Rica, Honduras, Nicaragua), South America (Brazil, Colombia, Peru, Venezuela), Africa (Egito) and Oceania (New Zealand).

**Genus Metaseiulina**

**Metaseiulina eiko** (El-Banhawy)

*Metaseiulina eiko* El-Banhawy.[30]

**FEMALE** (2 specimens measured). Dorsal shield 282 (280) long and 155 (152) wide; j1 16 (18), j3 17, j4 13 (15), j5 12, j6 15, j2 19 (18), j5 12 (11), z2 16 (17), z3 18 (19), z4 19, z5 13 (15), Z4 30 (31), Z5 39 (40), s4 20 (21), s6 22 (23), r3 20 (23); distances between st1-st3 51, st2-st2 46 and st5-st5 45 (47); ventri-anal shield 90 (91) long, 48 (54) wide at level of ZV2 and 52 (61) wide at level of anus; movable cheliceral digit 30 (32) long, with 1 tooth; fixed cheliceral digit 26 long, with 2 teeth; calyx of spermatheca 20 long.

**Specimens examined:** Brasil, Rio Grande do Sul, A2: *Psidium guajava* L. XI-2011 (1), *Xanthium strumarium* L. II-2012 (1).

**Remarks:** Species previously reported from South America (Brazil).

**Tribe Typhlodromini**

**Genus Typhlodromus** Scheinstein

**Typhlodromus (Antheseius) ornatus** (Denmark and Muma)

**(Figure 2 A-G)**

*Amblydromella ornata* Denmark & Muma.[13]

**FEMALE** (6 specimens measured). Dorsum (Figure 2A) - Dorsal shield reticulated, two pairs of lyrissures and four pairs of pores, 353 (352-360) long and 177 (162-190) wide. Setae j1 21 (20-22), j3 14 (13-16), j4 11, j5 11, j6 13, j2 15 (14-16), j5 11 (11-12), z2 11 (11-12), z5 13 (12-15), z4 14 (13-15), z5 11 (10-12), Z4 20 (19-22), Z5 35 (34-37), s4 16 (15-18), s6 18 (18-19), S2 19 (19-20), S4 21 (20-22), S5 21 (20-23), r3 17 (15-18), R1 17. Setae smooth and sharp-tipped, except j1, j3, s4, s6, r3, Z1, R1, S2, S4, S5. Z4 serrated and Z5 serrated blunt.

Venter (Figure 2B) - Ventrianal shield smooth, with two pairs of setae and two pairs of lyrissures, with median posterior projection. St3 and St4 on metasternal shields, distances between St1-St3 70 (67-75), St2-St2 63 (60-65). Genital shield smooth, distance between St5-St5 59 (54-64). Ventrianal shield pentagonal, smooth, 126 (120-132) long, 89 (87-90) wide at level of ZV2 and 79 (72-83) wide at level of anus, with four pairs of preanal setae (JV1, JV2, JV3 and ZV2) and pre-anal pores posterolateral of JV2. Four pairs of opisthogastric setae on un sclerotized cuticle (JV4, JV5, ZV1 and ZV3). Ventral setae smooth except seta JV5 serrate blunt. With two pairs of metapodal plates.

Peritreme - Almost reaching level of j1.

Spermatheca (Figure 2C) - Calyx tubular, 23 (22-24) long; atrium c-shaped.

Chelicera (Figure 2D) - Movable cheliceral digit 30 long, with 2 teeth; fixed cheliceral digit 27 long, with 4 teeth. *Pilus dentilis* not visible.

Legs (Figure 2E) - Only basitarsus IV with macrosetae, St IV 26 (25-27), but with knobbed tips setae in the tibia IV (ad1), and basitarsus IV (ad3).

MALE - (1 specimens measured).

Dorsum - Dorsal shield pattern similar to female, 245 long and 143 wide. Setae j1 13, j3 13, j4 14, j5 13, j6 15, J2 17, j5 10, z2 13, z3 13, z4 17, z5 14, Z4 20, Z5 25, s4 15, s6 16, S2 18, r3 18. Only setae Z4 and Z5 serrated.

Venter (Figure 2F) - Sternomental shield smooth. Ventrianal shield subtriangular, a few reticulate, 85 long and 120 wide at anterior corners, with 4 pairs of preanal setae (JV1, JV2, ZV2 and ZV3), one pair of small, rounded pores. Seta JV5 smooth, short.

Peritreme – Between j1 and j3.

Chelicera (Figure 2G) - Spermatodactyl L-shaped, with shaft 13 long.

Leg macrosetae - Without macrosetae. Chaetotaxy of genua II and III as in female.
Specimens examined: Brasil, Rio Grande do Sul, A: Pterocaulon sp. II-2012 (4), Schinus terebinthifolius Raddi V-2012 (1). Remarks: Species reported from South America (Brazil). In this paper, the specimens are redescribed and illustrated.

Discussion

Plant-mites interaction

Mites were found on 62 plant species belonging to 35 families. I. saopaulus was present on 14 plant species, the highest number of hosts, followed by E. ho (12) and T. aripo (9).

The highest richness was observed on P. guajava (Myrtaceae) with 11 mite species and on Eugenia cumini (Myrtaceae), with four species. Both plant host species are not native from Brazil. At the same time, they are largely adaptable to natural ecosystems and are greatly used as ornamental plants. In regards to these results, we emphasize the importance of maintaining these species as possible reservoirs for predators. We also observed a high abundance on P. guajava, totaling 82 specimens. E. alatus, with 36 specimens has presented the highest abundance. This was already reported by Ferla and Moraes [31] about this plant in the Rio Grande do Sul State.

In previous studies carried out in the Brazilian Cerrado ecosystem, 208 individuals were found, belonging to nine...
species, where *E. citrifolius* was classified as more dominant, in addition to being the most frequent and abundant.[32, 33] These studies also concluded the importance of maintaining populations of phytoseiid on *P. guajava*.

**Biocology of native predator**

*T. japi* were present only in Morro da Borrúsia (A4) throughout the study. Lofego et al. [25] described this species in an Atlantic Forest ecological reserve, in preserved environments. *P. litoralis* only appeared at one location in the forest plantation (A3) and also seems to prefer preserved environments. *I. saopaulus* was the most abundant species in A3, apparently adapted to preserved environments. *I. saopaulus* was cited by Ferla et al. [34] on yerba mate leaves and Ferla et al. [35] on leaves of *Vitis labrusca*. Castro & Moraes [36] reported *I. zuluagai* as the most abundant species collected on plants in the Atlantic Forest of the São Paulo State, showing that the genus *Iphiseiodes* has a high abundance among their host plants in this native forest.

*T. aripo* has been considered an important predator of *Mononychellus tanajoa* (Bondar) on cassava (*Manihot esculenta* Crantz).[37, 38] This species was introduced in Africa, where both became established and now provide effective biological control of the mealybug.[37] In spite of its high preference to feeding on *M. tanajoa*, this species was mainly distributed in the sand dunes (A1) and mangrove (A2) areas, which shows that it can also be associated to unstable environments and/or with extreme abiotic action (ex: winds over dunes). This conclusion is supported by their absence from Morro da Borrúsia (A4), which is a place of extreme environmental preservation. This species has been associated to strawberry fruits, peach trees, blackberries, grapevines and weeds.[39–43]

*E. ho* and *E. alatus* were the most abundant in the spring sample, possibly due to the feeding habitat, as noted by McMurtry & Croft,[6] who classify these species as polyphagous (pollen feeders). *E. ho* only appeared at the forest plantation (A3) and Morro da Borrúsia (A4), where their food is possibly more available. This species is widely distributed in the agroecosystem of the Rio Grande do Sul State, such as on citrus, yerba mate, peach trees and grapevines.[34, 40–42, 44] Although they are pollen feeders, they are also able to feed on other mites, especially the Eriophyidae, Tarsonemidae, Tenuipalpidae and Tetranychidae families McMurtry & Croft.[6] Some studies have shown that certain species of *Euseius* can develop and reproduce preying only on eriophids.[45, 46]

*A. operculatus* was the only species that occurred in all locations. It was already mentioned as occurring in the Rio Grande do Sul State on strawberries and grapevines.[35, 39]

Based on the high species richness found in preserved environments, we conclude that both anthropic activity and the extreme influence of abiotic factors may influence mite distribution and species richness, demonstrating the need to preserve native areas which support a rich biodiversity of mites.

**Key to the phytoseiid species reported in this paper (females)**

1 Podonotal region of dorsal shield (anterior to *R1*) with 5 or 6 pairs of “lateral” setae: *j3*, *z2*, *z4*, and *s4* always present, and *z3* and/or *s6* present ............................................2

2 1° Podonotal region of dorsal shield with 4 pairs of “lateral” setae: *j3*, *z2*, *z4* and *s4*………………………………………………………………….**Amblyseinae** Muma

3 2(1) Posterior “lateral” dorsal shield setae *Z1*, *Z2*, *S4* and *S5* absent; seta *r3* usually inserted on dorsal shield…………….**Phytoseiinae** Berlese……………**Phytoseius** Ribaga

2° At least one of the setae *Z1*, *S2*, *S4*, and *S5* present; seta *r3* usually in soft cuticle next to dorsal shield (rarely on shield)………………………………………**Typhlodrominae** Wainstein

4(3) Sternum with median posterior projection; some forward “migration” of preanal setae *JV2* and *ZV2*; setae *ZV1* inserted after the anterior margin of the ventrianal shield……………………………………...**Euseiini** Chant & McMurtry

5° Sternum shield without posterior projection; without forward “migration” of preanal setae *JV2* and *ZV2*; Setae *ZV1* adjacent to anterior margin of the ventrianal shield………………………………………………..8

4° Chelicera of normal size and shape; with prominent teeth evenly distributed along fixed digit; peritreme usually extending to level of seta *j1*……………………………subtribe *Typhlodromatina* Chant & McMurtry

6 5(4) Ratio seta *s4*: *Z1* > 3.0:1.0……………………………………….**Amblydromalus manihoti** (Moraes)

5° Ratio seta *s4*: *Z1* < 3.0:1.0………………………**Typhlodromalus** Muma

6° Most setae of dorsal shield serrated; setae *j1*, *j3*, *z2*, *z4*, *Z1*, *Z4*, *Z5*, *s4*, *S2* and *r3* considerably thick………………………………………...**T. mammores** (El-Banhawy)

7° Most setae of dorsal shield smooth and thin……………………………………...**T. aripo** De Leon

7(4) Dorsal shield smooth or with few striation on anterolateral region……………………**E. ho** (De Leon)

8° Dorsal shield with striations…………**E. alatus** De Leon

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8(3) Seta S4 absent...........Phytoseiulini Chant & McMurtry........Phytoseius macropilis (Banks)
8' Seta S4 present..............9
9(8) Ratio seta s4:ZI > 3.1:1.0; setae s4, Z5 and usually Z4 markedly longer than other dorsal setae; setae JV2 present...........Amblyseini Muma 10
9' Ratio seta s4:ZI < 3.0:1.0; setae s4, Z5 and usually Z5 not greatly longer than other dorsal setae; setae JV2 always present.......................19
10(9) Sternal shield narrow, L/W ratio usually ca 1.0:1.0; female ventrianal shield usually longer than wide; legs II and III usually and leg I often with macrosetae; leg IV usually with 3 strong macrosetae........subtribe Amblyseini Chant & McMurtry................11
10' Sternal shield broader, L/W ratio usually less than 1.0:1.0; female ventrianal shield usually broader; legs II-IV with/ without macrosetae...........15
11(10) Ventrianal shield vase shaped, with constriction after JV3................................................................................Amblyseius hericolus (Chant)
11' Ventrianal shield never-shaped vase..............12
12(11) Cervix of spermatheca long cylinder-shaped, at least two times longer than wide..................A. aerialis (Muma)
12' Cervix of spermatheca different than described above, usually bell-shaped or short cylinder...........13
13(12) Cervix of spermatheca bell shaped..................A. vitis Ferla & Silva
13' Cervix of spermatheca in form of short cylinder....14
14(13) Cervix of spermatheca wider than long; atrium very distinct, nodular........................A. impressus Denmark & Muma
14' Cervix of spermatheca how long such broad, indistinct atrium..............................................................A. operculatus De Leon
15(10) Seta JV2 absent, seta j3 present........subtribe Propioseiopsina Chant & McMurtry........Proprioseiopsia neotropicus (Ehara)
15' Seta JV2 usually present or, if absent, seta j5 also absent......................subtribe Arrenoseiina Chant & McMurtry 16
16(15) Seta j5 absent..................Phytoseius sexpilis Muma
16' Seta j5 present........................Iphiseiodes De Leon 17
17(16) Four setae on ventrianal shield..........................I. moraesii Ferla & Silva
17' Three setae on ventrianal shield........................18
18(17) Cervix of spermatheca tubular; SgelV 95 mm, StilV 55 mm and StihV 35 mm.......................I. zuluagai Denmark & Muma
18' Cervix of spermatheca fundibular; SgelV 124 mm, StilV 74 mm and StihV 44 mm.....................I. saopaulus (Denmark & Muma)
19(9) GeII without and GeIII rarely with macrosetae..........................Neoseiulini Chant & McMurtry........Typhlodromipsini Chant & McMurty..........................................................Typhlodromus De Leon 22
20(19) Dorsal setae strongly barred......................N. tunus (De Leon)
20' Dorsal setae not strongly barred..............................................T. mangaleae De Leon
21(20) Spermatheca with calyx bell-shaped..............N. californicus (McGregor)
21' Spermatheca with calyx elongate, tubular, flaring distally..........................Neoseiulus sp.
22(19) Spermatheca with calyx shallow dish-shaped..............T. japi Lofego, Demite & Feres
23(2) Setae JV2 and R1 present................plumifer group Chant & Yoshida-Shaul......................P. guianensis De Leon
23' Seta JV2 absent, seta R1 present................horridus group Denmark........................................P. litoralis Silva, Rocha & Ferla
24(2) Setae S4 and JV4 present............................Typhlodromini...........................................Typhlodromus Scheuten...T. ornatus (Denmark & Muma)
24' Setae S4 and JV4 absent...................................25
25(24) Seta z4 inserted mesad of or almost directly posterior to z3; macrosetae present on genu, tibia and tarsus IV..................Typhloseiopsini..................................26
25' Seta z4 inserted approximately in line with bases of z3 and s4; leg IV with 0-3 macrosetae........Metaoseiulini...........................................27
26(25) Chelicerae with more than 10 teeth on fixed digit; setae s4, Z4, and Z5 long, whip-like............Leonoseius regularis (De Leon)
26' Chelicerae with less than 7 teeth; setae s4 short to minute, Z4 short or almost as long as Z5, never whip-like........Typhloseiopsis dorsoreticulatus Lofego, Demite & Feres
27(25) Setae R1 absent and S2 present; macrosetae absent.........................................................Galendromus (Galendromus) annectens (De Leon)
27' Seta R1 present and S2 usually absent; macrosetae present or absent...................................28
28(27) Setae along margins of dorsal shield long; seta R1 much shorter than s6; setae S5 and Z5 approximately equal in length; insertions of JV1, JV3 and ZV2 aligned in nearly vertical rows on ventrianal shield.------------------------ Typhlodromina tropica (Chant)

28' Setae along margins of dorsal shield medium in length; setae R1 and s6 subequal in length; seta S5 usually much shorter than Z5; insertions of JV1, JV3 and ZV2 forming a triangle on ventrianal shield; leg IV with 0 to 3 macrosetae.--------------------------------------Metaseius

(Metaseiulus) eiko (El-Banhawy)

Acknowledgements
The authors would like to thank Univates for financing the Project, as well as the referees of the Neotropical Biodiversity for their valuable and much appreciated suggestions.

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