

## A new species of *Neoseiulus* (Acari: Mesostigmata: Phytoseiidae) with a key for the Brazilian species of the genus

Matheus dos Santos Rocha<sup>1,4</sup>, Guilherme Liberato da Silva<sup>2</sup> & Noeli Juarez Ferla<sup>3</sup>

<sup>1</sup>Laboratório de Diversidade e Sistemática de Arachnida, Programa de Pós-Graduação em Biologia, Universidade do Vale dos Sinos. 93022-000 São Leopoldo, RS, Brasil.

<sup>2</sup>Departamento de Microbiologia, Imunologia e Parasitologia, Universidade Federal do Rio Grande do Sul. 90050-170 Porto Alegre, RS, Brazil

<sup>3</sup>Laboratório de Acarologia, Museu de Ciências Naturais, UNIVATES – Centro Universitário. 95900-000 Lajeado, RS, Brazil.

<sup>4</sup>Corresponding author. E-mail: mrocha0602@gmail.com

**ABSTRACT.** *Neoseiulus* HUGHES, 1948 is currently one of the largest genus of Phytoseiidae Berlese. *Neoseiulus demitei* **sp. nov.**, a new species of phytoseiid mite from Rio Grande do Sul State, Brazil, is illustrated and described based on specimens collected on *Tibouchina* sp. (Melastomataceae) plants. This new species differs from others by having most of propodosomal setae reaching the base of nearby setae and a constriction of ventrianal shield at level of preanal pores. Nevertheless, this new species is the first of the species subgroup *kennetti* described from Brazil. A key of *Neoseiulus* species reported in Brazil is also included.

**KEY WORDS.** Amblyseiinae; native environment; Neoseiulini; predator; Rio Grande do Sul.

Phytoseiidae (Acari: Mesostigmata) is a large family of predatory mites. They are fast-moving, active predators, feeding mostly on mites but also on small insects, nematodes and fungi, and may feed on plants, including pollen and extrafloral exudates. Owing to their success in spider control, Phytoseiids are the best known and most studied group of predatory mites (GERSON *et al.* 2003). The Amblyseiinae is the largest subfamily, with approximately 1,500 nominal species (CHANT & McMURTRY 2007). Species of *Neoseiulus* HUGHES, 1948 have been commercially reared to be used as biological control agents of several species of thrips and other small pest insects and mites in Europe and North America over the past 20 years (BEARD 2001).

*Neoseiulus* includes 389 described species (DEMITE *et al.* 2014) found in all zoogeographic regions, except Antarctica, in a wide variety habitats (CHANT & McMURTRY 2003). Twenty species of *Neoseiulus* have been reported from Brazil. Of these, eight had already been found to occur in the state of Rio Grande do Sul (DEMITE *et al.* 2014).

In this article, a new species of *barkeri* species group, *Neoseiulus demitei* **sp. nov.**, is described and illustrated from specimens collected in the State of Rio Grande do Sul, Brazil. A key to Brazilian *Neoseiulus* species is also included.

### MATERIAL AND METHODS

The mites were collected from leaves of *Tibouchina* sp. (Melastomataceae), observed under a binocular microscope, mounted on glass slides in Hoyer's medium and observed un-

der a phase contrast microscope Leica® DM 750. Drawings were made using a camera Lucida apparatus and the lines were highlighted using Corel Draw X5®.

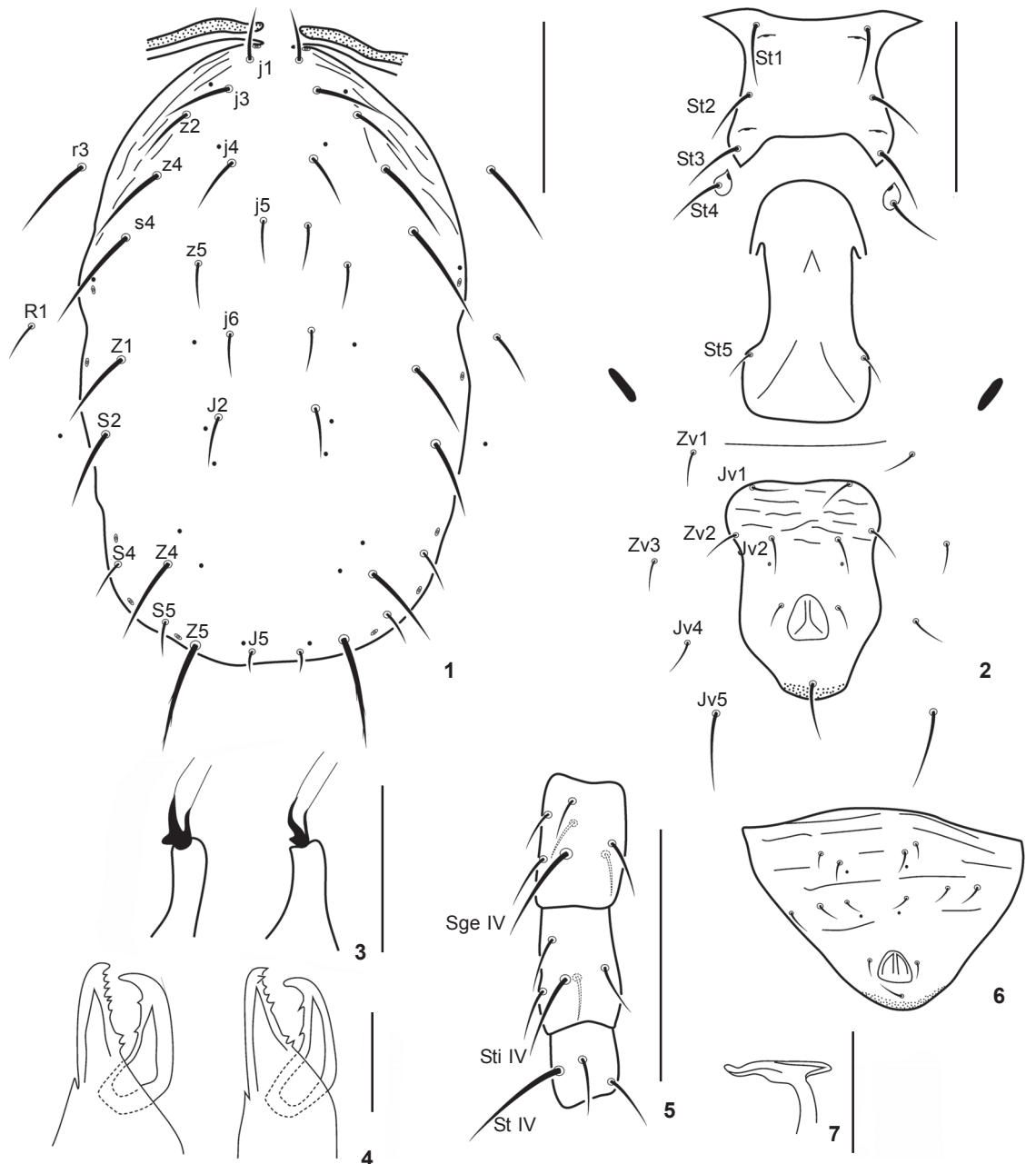
The classification system used is that of CHANT & McMURTRY (2007). The setal nomenclature is that of ROWELL *et al.* (1978) and CHANT & YOSHIDA-SHAUL (1992) for the dorsal and ventral surfaces of the idiosoma, respectively. Measurements are given in micrometers (µm), holotype measurements are shown in bold type followed by their mean and range within parentheses.

### TAXONOMY

#### *Neoseiulus demitei* **sp. nov.**

Figs 1-7

Adult female (n = 8). Idiosomal setal pattern (CHANT & YOSHIDA-SHAUL 1992): 10A:9B/JV-3:ZV. **Dorsum** (Fig. 1): dorsal shield smooth, with a few striae anterolaterally; 6 pairs of lyrifissures and 9 pairs of pores, **367** 363 (355-370) long and **227** 224 (215-230) wide. Setae j1 **29** 29 (28-32), j3 **44** 41 (38-44), j4 **43** 39 (35-43), j5 **27** 26 (24-27), j6 **38** 34 (32-38), J2 **32** 30 (28-32), J5 **12** 11 (10-12), z2 **34** 34 (33-35), z4 **57** 54 (50-59), z5 **33** 31 (28-35), Z1 **44** 42 (39-45), Z4 **55** 51 (47-55), Z5 **67** 62 (57-67), s4 **66** 63 (60-66), S2 **47** 46 (43-50), S4 **23** 23 (19-26), S5 **23** 21 (18-24), r3 **50** 48 (45-50), R1 **31** 30 (29-31). All setae smooth and sharp-tipped, except Z5 slightly serrate. **Venter** (Fig. 2): sternal shield smooth, with three pairs of setae and two pairs of lyrifissures, seta St4 set on distinct metasternal shields; distances between St1-St3 **67** 64 (61-67), St2-St2 **67** 66 (65-67). Genital



Figures 1-7. *Neoseiulus demitei* sp. nov. (1-5) Female: (1) dorsal shield; (2) ventral surface; (3) spermatheca; (4) chelicera; (5) leg IV: genu, tibia and basitarsus. (6-7) Male: (6) ventri-anal shield; (7) spermatodactyl. (j-) Dorso-central setae, (JV) medial ventral setae, (r-R) marginal setae, (Sge, Sti, St) setaceous macrosetae, (s-S) lateral setae, (ST) sternal setae, (ZV) mediolateral ventral setae, (z-Z) mediolateral setae. Scale bars: 1, 2, 5, 6 = 100  $\mu$ m, 3, 4, 7 = 20  $\mu$ m.

shield smooth, distance between St5-St5 63-60 (56-63). Ventri-anal shield pentagonal, with light striations, 125-126 (120-130) long, 90-86 (80-91) wide at level of JV2 and 79-79 (75-82) wide at level of anus, with three pairs of preanal setae (JV1, JV2,

and ZV2) and pre-anal pores posterolateral of JV2. Four pairs of opisthogastric setae on unsclerotized cuticle (JV4, JV5, ZV1 and ZV3). Ventral setae smooth. With one pair of metapodal plates. Peritreme almost reaching level of j1. **Spermatheca** (Fig. 3): ca-

lyx saccular, 16 15 (14-17) long, atrium narrower than base of calyx and bifurcate (invaginated) at junction with major duct. **Chelicera** (Fig. 4): Movable cheliceral digit 30 29 (27-31) long, with 2 teeth; fixed cheliceral digit 28 29 (28-30) long, with 6-8 teeth. *Pilus dentilis* not visible. **Legs** (Fig. 5): only the leg IV with setaceous macrosetae, with the following lengths: Sge IV 45 41 (38-45), Sti IV 32 31 (30-33), St IV 47 47 (43-50).

Adult male (n = 3). **Dorsum**: Dorsal shield pattern similar to female, 280 292 (280-300) long and 155 163 (155-170) wide. Setae j1 20 21 (20-22), j3 30 30, j4 22 22, j5 20 21 (20-22), j6 22 23 (22-25), J2 22 23 (22-24), J5 10 11 (10-13), z2 25 25 (25-26), z4 37 36 (35-37), z5 25 25, Z1 35 35 (35-36), Z4 37 36 (35-37), Z5 40 41 (40-42), s4 50 49 (48-50), S2 32 31 (30-32), S4 20 19 (17-22), S5 15 15 (15-16), r3 32 32 (30-33), R1 25 26 (25-27). **Venter** (Fig. 6): sternogenital shield smooth. Ventrianal shield triangular, with a few striae, 120 123 (120-125) long and 160 163 (160-163) wide at anterior corners, with five pairs of preanal setae, two pairs of small, rounded pores. Seta JV5 smooth. Peritreme almost reaching level of j1. **Chelicera** (Fig. 7): fixed digit 22 23 (20-25) long and movable digit 23 22 (21-24) long, spermatodactyl T-shaped, with shaft 25 23 (22-25) long. **Legs**: only leg IV with setaceous macrosetae, follows lengths: Sge IV 39 35 (30-39), Sti IV 24 25 (24-26) and St IV 37 37.

Type material. Holotype female, four paratypes female and paratype male, BRAZIL, *Rio Grande do Sul*: Forquetinha, from *Tibouchina* sp. (Melastomataceae), 06/XI/2012, deposited at the Departamento de Entomologia, Fitopatologia e Zoologia Agrícola (Agricultural Entomology, Phytopathology and Zoology Department), Escola Superior de Agricultura "Luiz de Queiroz" (ESALQ), Universidade de São Paulo (USP), Piracicaba, SP, Brazil. One paratype female, Brazil, Rio Grande do Sul Forquetinha, same collection data as holotype, deposited at Museum of Biological Diversity, the Ohio State University, 1315 Kinnear Road, Columbus, OH 432112, USA. Three paratype females, Brazil, Rio Grande do Sul, Forquetinha, same collection data as holotype, deposited at Museu de Ciências Naturais (ZAUMCN), UNIVATES – Centro Universitário, Lajeado, Rio Grande do Sul, Brazil.

**Etymology**. The new species was named in honor of Dr Peterson Demite, a Brazilian Acarologist.

**Remarks**. The studied specimens belong to *Neoseiulus barkeri* species group and share with the other species in it the spermatheca with atrium forked for at least half of its length until the juncture with major duct; and belongs to the *kennetti* species subgroup by having the atrium without vacuolated area at junction with major duct (CHANT & McMURTRY 2003). The spermatheca of this new species resembles the spermathecae of *Neoseiulus inflatus* (KUZNETSOV, 1984), *Neoseiulus kennetti* (SCHUSTER & PRITCHARD, 1963), *Neoseiulus inornatus* (SCHUSTER & PRITCHARD, 1963), and *Neoseiulus kodryensis* (KOLODOCHKA, 1980). *Neoseiulus inflatus* differs from this new species by having macrosetae only on St IV, Seta Z5 serrated, five teeth on fixed digit and one tooth on movable digit; from *N. kennetti* by having dorsal shield reticulated, macrosetae only on Ge IV and St IV, peritreme extending to level

of seta j3, two teeth on fixed digit and without tooth on movable digit; from *N. inornatus* by having macrosetae only on Ge IV and St IV, setae Z4 and Z5 serrated and longer; *N. kodryensis* by having macrosetae St IV longer, setae Z4 and Z5 serrated and longer, three teeth on fixed digit and one tooth on movable digit. The new species differs from all species of the genus by having most propodosomal setae reaching the base of nearby setae and a constriction of ventrianal shield at level of preanal pores.

### Key for females of *Neoseiulus* species of Brazil (based on CHANT & McMURTRY 2003)

1. Spermatheca with atrium forked for at least half its length at juncture with major duct, or atrium appearing thick-walled, vacuolated ..... *barkeri* species group ..... 2
- 1'. Spermatheca with atrium not deeply forked at juncture with major duct, not appearing thick-walled, vacuolated ..... 6
2. Spermatheca with atrium narrower than base of calyx, calyx never basally constricted or stalked ..... *kennetti* species subgroup ..... 3
- 2'. Spermatheca with atrium as wide as or wider than base of calyx, calyx sometimes basally constricted or stalked .... 4
3. Most anterolateral setae on dorsal shield shorter than the length between their setae nearby; Setae Z5 with 27 µm; ventrianal shield not constricted at level JV2; macrosetae absent on St IV ..... *Neoseiulus gracilis* (Muma, 1962)
- 3'. Most anterolateral setae on dorsal shield longer than the length between their setae nearby; setae Z5 with 55 µm; ventrianal shield constricted at level JV2; macrosetae present on Sge IV, Sti IV and St IV ..... *Neoseiulus demitei* sp. nov.
4. Calyx not markedly constricted or stalked at juncture with atrium; atrium deeply forked at juncture with major duct but without vacuolated area ... *barkeri* species subgroup..5
- 4'. Calyx stalked or narrowly constricted at juncture with atrium; stalk sometimes short and blending into atrium or slender; atrium with vacuolated area ... *womersleyi* species subgroup ..... *Neoseiulus neoaurescens* (Moraes & Mesa, 1988)
5. Setae Z5 serrated; peritreme not extending at level j1; macrosetae St IV (68 µm) *Neoseiulus barkeri* Hughes, 1948
- 5'. Setae Z5 smooth; peritreme extending forward to j1; macrosetae St IV (58 µm) ..... *Neoseiulus transversus* Denmark & Muma, 1973
6. Female ventrianal shield large, square or rectangular, rounded posteriorly (L/W ratio = 1.0-1.3:1.0); dorsal shield with marked shoulder at level of seta r3 ..... *paspalivorus* species group ..... 7
- 6'. Female ventrianal shield pentagonal or with lateral margins slightly rounded; dorsal shield without marked shoulder at level of seta r3 ..... *cucumeris* species group ..... 10
7. Peritreme extending at level j1 ..... 8
- 7'. Peritreme extending at level j3 ..... 9

8. Setae r3 shorter than R1; Setae Z5 serrated .....  
..... *Neoseiulus baraki* Athias-Henriot, 1966
- 8'. Setae r3 longer than R1; Setae Z5 smooth .....  
..... *Neoseiulus mumai* (Denmark, 1965)
9. Fixed digit with seven teeth; macrosetae on St IV (29); fourth pair of sternal setae free on cuticle .....  
..... *Neoseiulus benjamini* (Schicha, 1981)
- 9'. Fixed digit with six teeth; macrosetae on St IV (15); fourth pair of sternal setae on metasternal plates .....  
..... *Neoseiulus paspalivorus* (De Leon, 1957)
10. Dorsal setae strongly barbed ..... *tunus* species subgroup
- 10'. Dorsal setae not strongly barbed ..... *cucumeris* species subgroup ..... 12
11. Only seta J5 smooth; macrosetae on leg IV setaceous; cervix of spermatheca fundibuliform .....  
..... *Neoseiulus neotunus* (Denmark & Muma, 1973)
- 11'. All j-j series smooth; macrosetae on leg IV are knobbed distally; cervix of spermatheca cup-shaped *Neoseiulus tunus* (De Leon, 1967)
12. Most setae on dorsal shield long (40-60), often much longer than bases of nearby setae ..... 13
- 12'. Most setae on dorsal shield short, not reaching the bases of nearby setae ..... 15
13. Only macrosetae on St IV ..... 14
- 13'. Macrosetae on Sge IV, Sti IV and St IV ..... 19
14. Cervix of spermatheca elongate; peritreme extending at level j1 ..... *Neoseiulus anonymus* (Chant & Baker, 1965)
- 14'. Cervix of spermatheca cup-shaped; peritreme extending at level j3 ..... *Neoseiulus idaeus* Denmark & Muma, 1973
15. Only setae Z5 strongly serrated and stout .....  
..... *Neoseiulus veigai* Gondim Jr. & Moraes, 2001
- 15'. Setae Z5 serrated or smooth, not stout ..... 16
16. Setae Z5 smooth; cervix of spermatheca wider than long...  
..... *Neoseiulus paraibensis* (Moraes & McMurtry, 1983)
- 16'. Setae Z5 serrated; cervix of spermatheca longer than wide ..... 17
17. Only setae Z5 serrated .....  
..... *Neoseiulus californicus* (McGregor, 1954)
- 17'. Setae Z4 and Z5 serrated ..... 18
18. Macrosetae on Sge IV, Sti IV and St IV; ventrianal shield not constriction at level setae JV2 .....  
..... *Neoseiulus recifensis* Gondim Jr & Moraes, 2001
- 18'. Macrosetae only on St IV; ventrianal shield with constriction at level setae JV2 .....  
..... *Neoseiulus melinis* Lofego & Moraes, 2003
19. All dorsal setae serrated except j1 and j5 smooth; J2 relatively longer, reaching the base of Z4 .....  
..... *Neoseiulus pluridentatus* Lofego & Moraes, 2003
- 19'. Only setae Z4 or Z5 serrated; J2 not reaching the base of Z4 ..... 20

20. Only setae Z5 serrated; cervix of spermatheca cup-shaped; macrosetae only on basitarsus IV and not knobbed .....  
..... *Neoseiulus fallacis* (Garman, 1948)
- 20'. Setae Z4 and Z5 serrated; cervix of spermatheca trumpet-shaped; macrosetae present on genu, tibia and basitarsus IV and knobbed distally .... *Neoseiulus barreti* Kreiter, 2005

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