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## A new species and redescription of two species of *Euseius* Wainstein (Acari: Phytoseiidae) from Cerrado biome areas in Brazil

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### ABSTRACT

A new species *Euseius uai* sp. n. Demite & Lofego is described from the Minas Gerais State, Brazil. *Euseius errabundus* De Leon is recorded for the first time in Brazil and *E. unisetus* Moraes & McMurtry is rediscovered. Both were collected in Goiás State, Brazil. A dichotomous key for the Brazilian *Euseius* species is presented.

### ARTICLE HISTORY

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### KEYWORDS

Amblyseiinae; Euseiini;  
natural vegetation;  
redescription; rediscovery

### Introduction

Phytoseiidae (Acari: Mesostigmata) include several species recognized as potential natural enemies of some agricultural insect and mite pests (Gerson et al. 2003; McMurtry et al. 2013, 2015), with about 2730 species described (Demite et al. 2014, 2016).

*Euseius* Wainstein is one of the largest genera within the Phytoseiidae, with about 190 valid species (Demite et al. 2014, 2016). Ten species were recorded from Brazil: *Euseius alatus* De Leon, *E. citrifolius* Denmark & Muma, *E. concordis* (Chant), *E. mesembrinus* (Dean), *E. inouei* (Ehara & Moraes), *E. plaudus* Denmark & Muma, *E. sakagamii* (Ehara), *E. sibelius* (De Leon), *E. unisetus* Moraes & McMurtry and *E. vivax* (Chant & Baker). Recently, Lopes et al. (2015) considered *E. brazilli* and *E. ho* as junior synonyms of *E. mesembrinus*, and *E. vivax* was not considered a junior synonym of *E. fructicolus* (Gonzalez & Schuster).

The Cerrado is the second largest Brazilian biome, exceeded only by the Amazon rainforest (Ribeiro and Walter 1998). It covers an area of approximately 2 million km<sup>2</sup>, representing nearly 22% of the Brazilian territory (Oliveira-Filho and Ratter 2002). This biome has a great concentration of endemic species subjected to strong human pressure, which has led to its classification as a “hotspot”, i.e., a world priority conservation area (Myers et al. 2000). Despite its importance and great extension, few studies were conducted (most made in the last 15 years) on the mite fauna of this biome, and most of them in São Paulo State (Flechtmann 1967; Aranda 1974; Lofego et al. 2004, 2005, 2007; Oliveira et al. 2005; Lofego and de Moraes 2006), only a small and peripheral portion of the Cerrado. The greatest portions are concentrated in central regions of Brazil, mainly in Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais and Tocantins states, where few studies have been conducted and that too recently (Demite et al. 2009; Rezende and Lofego 2011; Rezende et al. 2014).

This paper describes and illustrates a new species of the genus *Euseius*, record for the first time *E. errabundus* in Brazil. *E. unisetus* is rediscovered and the male is described for the first time.

### Materials and methods

Mites were mounted on slides with Hoyer’s medium and examined under a phase-contrast microscope. Illustrations were made using a drawing tube attached to the microscope. Dorsal and ventral setal nomenclature is that of Rowell et al. (1978) and Chant and Yoshida-

Shaul (1991), respectively. All measurements are given in micrometers (µm), mean for all individuals measured, and (in parentheses) by the respective range (when variable). Measurements for the holotype are shown in bold type, before the mean. Measurements of types of *Euseius unisetus* Moraes & McMurtry are provided [in brackets], those of holotype shown in bold type.

The voucher specimens of *Euseius errabundus* De Leon and *E. unisetus* are deposited in the collection of Acari of Departamento de Zoologia e Botânica, UNESP – Universidade Estadual Paulista, São José do Rio Preto, SP, Brazil.

### Results and Discussion

#### *Euseius uai* sp. n. Demite & Lofego (Figures 1–7)

#### Diagnosis

Females with dorsal shield reticulate; r3 on dorsal shield; all setae smooth, except Z5 serrate; peritreme extending between the levels of j3 and z2; ventrianal shield subpentagonal, without waist; JV1 transversally aligned with JV2; calyx of spermatheca tubular, annulated, and atrium inconspicuous; macrosetae of leg IV spatulate.

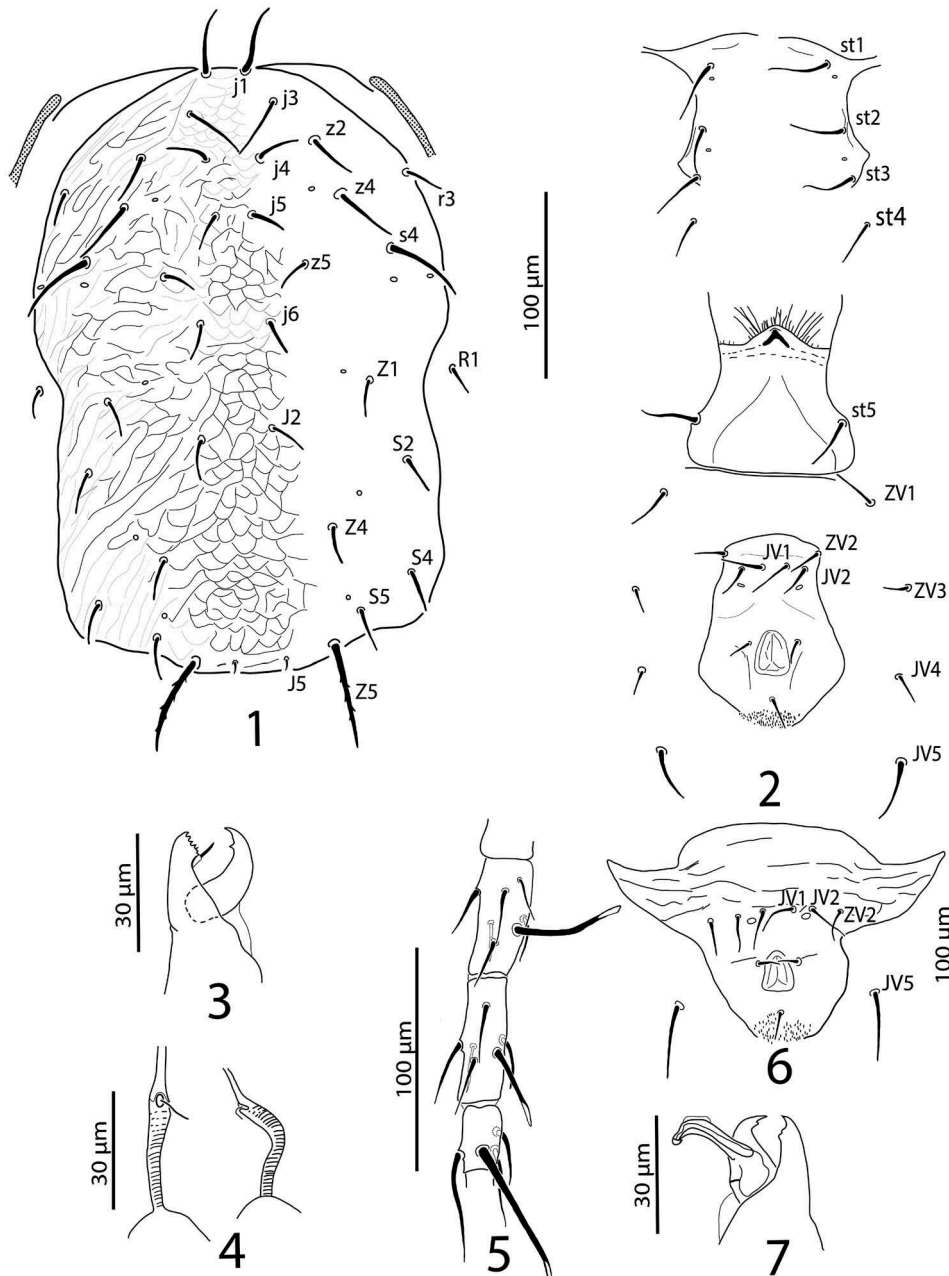
#### Type material (10♀ and 2♂)

Holotype female, allotype male, seven paratype female and one paratype male: Comendador Gomes (19°40'16"S, 48°59'15"W), Minas Gerais State, Brazil, *Pouteria ramiflora* (Mart.) Radlk. (Sapotaceae), 26 May 2015, P.R. Demite and A.C.C. Cavalcante collectors, deposited at Departamento de Zoologia e Botânica, UNESP – Universidade Estadual Paulista, São José do Rio Preto, SP, Brazil; three paratype females, same locality, host, data and collectors as holotype, deposited at Departamento de Entomologia e Acarologia, Universidade de São Paulo, Escola Superior de Agricultura “Luiz de Queiroz” (ESALQ/USP), Piracicaba, SP, Brazil.

#### Description

##### Female

*Dorsum* (Figure 1). Idiosomal setael pattern: 10A:9B/JV-3:ZV. Dorsal shield reticulate, in some areas reticulation weak, almost



**Figures 1–7.** *Euseius uai* sp. n. Female: 1. Dorsal shield; 2. Ventral idiosoma; 3. Chelicera; 4. Spermatheca; 5. Genu, tibia and basitarsus of leg IV. Male: 6. Ventrianal shield; 7. Spermatodactyl.

imperceptible, **327** 325 (315–338) long, **220** 222 (210–236) wide at level of *s4*; setae: *j1* **35** 34 (31–36), *j3* **34** 35 (33–39), *j4* **20** 20 (19–22), *j5* **19** 20 (19–22), *j6* **21** 21 (19–22), *J2* **20** 21 (19–23), *J5* **8** 8 (7–9), *z2* **32** 30 (27–32), *z4* **33** 33 (30–36), *z5* **20** 19 (18–20), *Z1* **20** 20 (19–22), *Z4* **22** 22 (21–25), *Z5* **55** 56 (46–61), *s4* **45** 44 (40–47), *S2* **24** 24 (22–26), *S4* **25** 24 (22–27), *S5* **27** 26 (25–27), *r3* **21** 22 (21–23) on dorsal shield, *R1* **16** 16 (15–16). All setae smooth, except *Z5* serrate.

**Venter** (Figure 2). Sternal shield with three pairs of setae and two pairs of lyrifissures; distances between *st1* and *st3* **62** 62 (60–66), *st2*–*st2* **73** 72 (70–74); posterior margin of sternal shield and metasternal plate not visible; *st4* on unsclerotised cuticle; genital shield smooth; distance between *st5* and *st5* **83** 79 (73–85). Ventrianal shield subpentagonal, without waist; *JV1* transversally aligned with *JV2*; with few striae; **103** 105 (102–111) long, **55** 56 (50–62) wide at level of *ZV2* and **74** 75 (72–77) wide at level of anus, with three pairs of pre-anal setae (*JV1*, *JV2* and *ZV2*) and a pair of pores posterior to *JV2*. Four pairs of opisthogastric setae on unsclerotised cuticle (*JV4*, *JV5*, *ZV1* and *ZV3*); *JV5* **37** 36 (34–39). All ventral setae smooth.

*Peritreme*. Extending between the levels of *j3* and *z2*.

**Chelicera** (Figure 3). Movable digit **23** 23 (22–25) long, with one tooth in addition to apical tooth; fixed digit **26** (25–27), with **5** 5–7 teeth in addition to apical tooth and *pilus dentilis*.

**Spermatheca** (Figure 4). Calyx tubular, annulated, **25** 24 (22–27) long, atrium inconspicuous.

**Legs** (Figure 5). Macrosetae: *Sgell* **26** 27 (26–28), *SgeIII* **33** 32 (30–33), *StIII* **32** 31 (30–32), *SgeIV* **50** 53 (50–56), *StIV* **40** 41 (38–44), *StIV* **67** 66 (64–69). Macrosetae of leg IV spatulate. Chaetotatic formula of genu II: 2-2/0-2/0-1 and of genu III: 1-2/1-2/0-1.

#### Male

**Dorsum**. Dorsal shield reticulate, 250–262 long and 200–226 wide; *j1* 28–29, *j3* 29–30, *j4* 18–20, *j5* 17–18, *j6* 18–21, *J2* 17–20, *J5* 7, *z2* 23–28, *z4* 29–31, *z5* 17–18, *Z1* 17–19, *Z4* 18–21, *Z5* 34–49, *s4* 36, *S2* 20–22, *S4* 20–23, *S5* 20–24, *r3* 18–20, *R1* 17–19. All setae smooth, except *Z5* serrate.

*Peritreme*. Extending beyond level z4.

*Venter* (Figure 6). Sternogenital shield smooth; ventrianal shield subtriangular, with transversal striae; 102 long and 140 wide at anterior corners, with three pairs of pre-anal setae, one pair of pores postero-mesad to JV2; JV5 33–34.

*Spermatodactyl* (Figure 7). Shaft 19–20 long.

*Legs*. Macrosetae smooth and spatulate; Sgell 23–24, Sgell 27, StilIII 28, SgeIV 38–39, StilIV 33–36, StIV 57–58. Chaetotactic formula of genu II and III as in females.

### Etymology

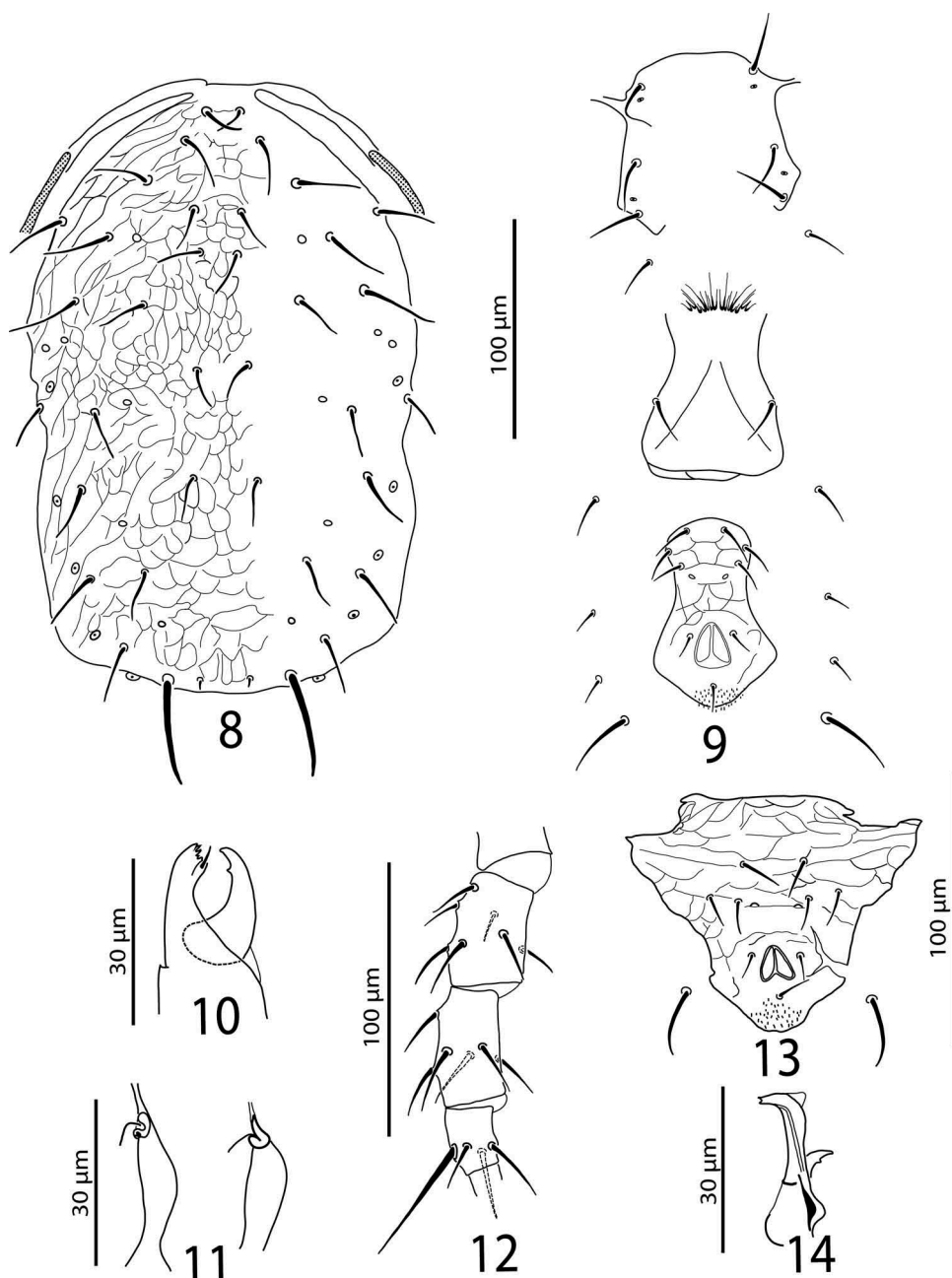
“uai” is a expression much used by the people who live in Minas Gerais, state of type locality of this species.

### Remarks

This new species resembles *Euseius dossei* (Pritchard and Baker 1962) and *Euseius victoriensis* (Womersley 1954) due to similar shape and setal positions on the ventrianal shield (females), and by having macrosetae spatulate on the legs. But differs from both in having the dorso-central setae approximately twice longer and dorsal shield completely reticulated, while *E. dossei* and *E. victoriensis* have reticulation only on lateral margins.

### *Euseius errabundus* De Leon (Figures 8–14)

*Euseius errabundus* De Leon 1967: 19; de Moraes et al., 1986: 41, 2004: 66; McMurtry & de Moraes 1989: 186; Aponte & McMurtry, 1993: 151; Chant & McMurtry 2005: 215, 2007: 120; Guanilo et al., 2008: 21; Demite et al., 2016.



Figures 8–14. *Euseius errabundus* De Leon. Female: 8. Dorsal shield; 9. Ventral idiosoma; 10. Chelicera; 11. Spermatheca; 12. Genu, tibia and basitarsus of leg IV. Male: 13. Ventrianal shield; 14. Spermatodactyl.

**Material examined (n = 10♀ and 4♂)**

Four females, 18 February 2015, Urutaí (17°28'12"S, 48°12'20"W), Goiás State, Brazil, on *Cariocar brasiliense* Camb., Caryocaraceae; 1 female and 1 male, 20 April 2015, Caldas Novas (17°39'40"S, 48°44'27"W), Goiás State, Brazil, same host; 2 females and 1 male, 28 March 2015, Pires do Rio (17°25'14"S, 48°23'22"W), Goiás State, Brazil, same host; 3 females and 2 males, 4 July 2015, Orizona (16°59'38"S, 48°19'57"W), Goiás State, Brazil.

**Female**

**Dorsum** (Figure 8). Idiosomal setal pattern: 10A:9B/JV-3:ZV. Dorsal shield reticulate, 268 (265–275) long, 172 (167–180) wide at level of s4; setae: j1 24 (21–26), j3 27 (26–32), j4 22 (18–23), j5 22 (20–24), j6 21 (19–24), J2 22 (20–25), J5 6 (5–6), z2 30 (28–32), z4 31 (26–35), z5 22 (19–25), Z1 25 (20–29), Z4 25 (21–29), Z5 50 (45–54), s4 36 (33–40), S2 29 (26–32), S4 27 (22–30), S5 29 (25–31), r3 30 (25–31), R1 21 (20–23). All setae smooth.

**Venter** (Figure 9). Sternal shield with three pairs of setae and two pairs of lyrifissures; distances between st1 and st3 56 (54–59), st2–st2 63 (61–65); posterior margin of sternal shield and metasternal plate not visible; st4 on unsclerotised cuticle; genital shield smooth; distance between st5 and st5 56 (51–64). Ventrianal shield constricted between JV2 and anus level; reticulate; 85 (80–93) long, 38 (36–42) wide at level of ZV2 and 57 (52–60) wide at level of anus; with three pairs of pre-anal setae (JV1, JV2 and ZV2) and a pair of pores postero-mesad to JV2. Four pairs of opisthogastric setae on unsclerotised cuticle (JV4, JV5, ZV1 and ZV3); JV5 31 (27–33). All ventral setae smooth.

**Peritreme**. Extending to level of z2.

**Chelicera** (Figure 10). Movable digit 20 (19–22) long, with one tooth in addition to apical tooth; fixed digit 22 (21–23), with 4–5 teeth in addition to apical tooth and *pilus dentilis*.

**Spermatheca** (Figure 11). Calyx tubular, inflated in the middle, 23 (20–24) long, atrium nodular.

**Legs** (Figure 12). Macroseta: StIV 44 (37–48), pointed. Chaetotactic formula of genu II: 2-2/0-2/0-1 and of genu III: 1-2/1-2/0-1.

**Male**

**Dorsum**. Dorsal shield reticulate, 216 (208–225) long and 154 (150–158) wide; j1 21 (20–22), j3 23 (22–24), j4 19 (17–20), j5 19 (17–21), j6 19 (18–20), J2 18 (16–20), J5 5 (5–6), z2 26 (24–27), z4 26 (24–29), z5 21 (19–24), Z1 21 (20–22), Z4 20 (18–22), Z5 35 (34–36), s4 31 (28–34), S2 23 (19–25), S4 20 (18–21), S5 23 (20–25), r3 25 (23–27), R1 19 (18–20). All setae smooth.

**Peritreme**. Extending to level of z4.

**Venter** (Figure 13). Sternogenital shield slightly reticulate; ventrianal shield subtriangular, reticulate; 89 (88–93) long and 118 (107–125) wide at anterior corners, with three pairs of pre-anal setae, one pair of pores mediad to bases of JV2; JV5 23 (22–26).

**Spermatodactyl** (Figure 14). Shaft 19 (18–20) long.

**Legs**. Macroseta: StIV 33 (31–35), blunt. Chaetotactic formula of genu II and III as in females.

**Remarks**

This is first record of this species for Brazil. The measurements of females collected in Goiás State are close of measurements of original description (De Leon 1967), except for the z2 longer (28–30) in comparison with the holotype (23).

**Previous records**

Peru, Trinidad and Venezuela (Demite et al. 2016).

***Euseius unisetus* Moraes & McMurtry (Figures 15–21)**

*Euseius unisetus* de Moraes & McMurtry, 1983: 140; de Moraes et al., 1986: 56, 2004: 85; Chant & McMurtry, 2005: 216; 2007: 123; Demite et al., 2016.

**Material examined (n = 3♀ and 2♂ + holotype + paratype♀)**

Two females and one male, 27 October 2015, Ipameri (17°43'05"S 48°08'31"W), Goiás State, Brazil, on unknown plant; one female and one male, 10 November 2015, same locality, on *Psidium guajava* L. (Myrtaceae). Holotype: one female, 25 April 1980, Ouricuri, Pernambuco State; Paratype female: same date and locality as holotype. Holotype and paratype deposited at Departamento de Entomologia e Acarologia, Universidade de São Paulo, Escola Superior de Agricultura "Luiz de Queiroz" (ESALQ/USP), Piracicaba, SP, Brazil.

**Female**

**Dorsum** (Figure 15). Idiosomal setal pattern: 10A:9B/JV-3:ZV. Dorsal shield reticulate, [268 270] 265 (260–270) long, [172 173] 164 (155–172) wide at level of s4; with four pairs of lyrifissures and six pairs of pores; setae: j1 [17 17] 18 (17–19), j3 [18 20] 19 (19–20), j4 [14 15], 15 (15–16), j5 [16 17] 18, j6 [18 19] 21 (21–22), J2 [18 20] 21 (21–22), J5 [7 6] 7 (6–7), z2 [21 22] 22 (21–23), z4 [25 26] 25 (25–26), z5 [19 19] 19 (18–20), Z1 [20 22] 21 (19–23), Z4 [18 22] 20 (19–22), Z5 [52 50] 49 (47–50), s4 [27 28] 29 (29–30), S2 [23 22] 24 (22–26), S4 [20 20] 21 (20–21), S5 [20 22] 23 (21–25), r3 [27 26] 27 (25–30), R1 [17 17] 18 (17–18). All setae smooth, except Z5 serrate.

**Venter** (Figure 16). Sternal shield with three pairs of setae and two pairs of lyrifissures; distances between st1 and st3 [53 53] 55 (54–55), st2–st2 [63 62] 61 (57–64); anterior margins and posterior of sternal shield and the metasternal plate not visible; st4 on unsclerotised cuticle; genital shield smooth; distance between st5 and st5 [55 54] 58 (54–61). Ventrianal shield constricted at level of JV2; smooth; [82 83] 84 (81–86) long, [45 45] 45 (40–50) wide at level of ZV2 and [54 49] 64 (57–71) wide at level of anus; with three pairs of pre-anal setae (JV1, JV2 and ZV2) and a pair of pores postero-mesad of JV2. Four pairs of opisthogastric setae on unsclerotized cuticle (JV4, JV5, ZV1 and ZV3); JV5 [24 23] 24 (22–27). All ventral setae smooth. One metapodal plate visible.

**Peritreme**. Extending beyond level j3.

**Chelicera** (Figure 17). Movable digit [20] 20 long, with one tooth in addition to apical tooth; fixed digit [23] 22 (21–22), with [3] 3–4 teeth in addition to apical tooth and *pilus dentilis*.

**Spermatheca** (Figure 18). Calyx uniformly tubular [23 20] 23 (20–25) long, atrium nodular.

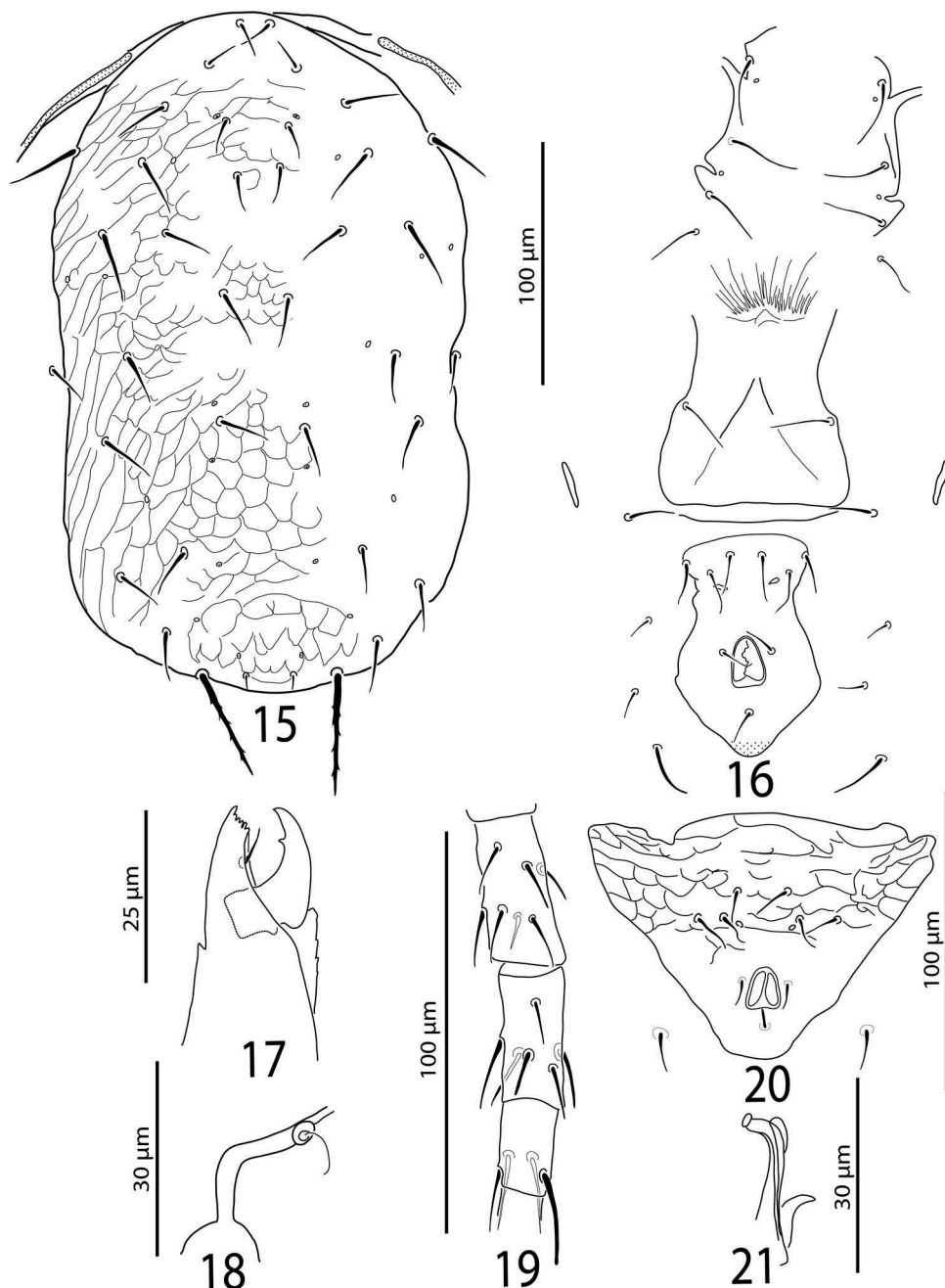
**Legs** (Figure 19). Macroseta: StIV: [20 20] 20, knobbed. Chaetotactic formula of genu II: 2-2/0-2/0-1 and of genu III: 1-2/1-2/0-1.

**Male**

**Dorsum**. Dorsal shield reticulate, 210 long and 140–150 wide; j1 15, j3 17, j4 12–13, j5 13, j6 15–16, J2 15–17, J5 5, z2 15–16, z4 20–21, z5 16, Z1 16, Z4 15–17, Z5 30–32, s4 21–22, S2 19–20, S4 16–17, S5 15–17, r3 20–21, R1 13–14. All setae smooth, except Z5 serrate.

**Peritreme**. Extending beyond level z4.

**Venter** (Figure 20). Sternogenital shield smooth; ventrianal shield reticulated, subtriangular; 77–78 long and 92–103 wide at



**Figures 15–21.** *Euseius unisetus* Moraes & McMurtry. Female: 15. Dorsal shield; 16. Ventral idiosoma; 17. Chelicera; 18. Spermatheca; 19. Genu, tibia and basitarsus of leg IV. Male: 20. Ventrianal shield; 21. Spermatodactyl.

anterior corners, with three pairs of pre-anal setae (JV1, JV2 and ZV2), one pair of pores postero-mesad to bases of JV2; JV5 18–20.

*Spermatodactyl* (Figure 21). Shaft 12–15 long.

*Legs.* Macroseta: StIV 19–20, knobbed. Chaetotactic formula of genu II and III as in females.

**Remarks**

This species is found for the first time since its description. The male is described for the first time. The measurements of females collected in Ipameri, Goiás State are close to measurements of original description (de Moraes and McMurtry 1983).

**Previous records**

Brazil.

**Key to the Brazilian species of genus *Euseius* (females)\***

- 1 Dorsal shield smooth ..... 2
- 1'. Dorsal shield reticulate ..... 3
- 2 (1). Length of seta z4 as or longer than the distance between their bases and bases z2 ..... *E. concordis* (Chant)
- 2' Length of setae z4 corresponding to approximately half the distance between their bases and the bases of z2 ..... *E. mesembrinus* (Dean)
- 3 (1). Macroseta only on basitarsus of leg IV ..... 4
- 3'. Macrosetae on genu, tibia and basitarsus of leg IV ..... 5
- 4 (3). Setae j3 and z4 reaching bases of setae z2 and s4, respectively; R1 inserted on dorsal shield; ventrianal shield reticulate; calyx of spermatheca tubular, inflated in the middle ..... *E. errabundus* De Leon
- 4'. Setae j3 and z4 not reaching bases of setae z2 and s4, respectively; R1 inserted on unsclerotised cuticle; ventrianal

- shield smooth; calyx of spermatheca uniformly tubular .....  
 ..... *E. unisetus* Moraes & McMurtry  
 5 (3'). Seta JV1 next to anterior margin of ventrianal shield .....  
 ..... *E. plaudus* Denmark & Muma  
 5'. Seta JV1 approximately in transverse line with ZV2 and away  
 from anterior margin of ventrianal shield ..... 6  
 6 (5'). Genu III without macroseta ..... *E. sibelius* (De Leon)  
 6'. Genu III with a macroseta ..... 7  
 7 (6'). Setae r3 or R1 inserted on dorsal shield ..... 8  
 7'. Both r3 and R1 inserted on unsclerotised cuticle ..... 9  
 8 (7). Setae r3 inserted on dorsal shield and R1 on unsclerotised  
 cuticle; macrosetae of leg IV spatulated .....  
 ..... *E. uai* sp.n. Demite & Lofego  
 8'. Setae r3 inserted on unsclerotised cuticle and R1 in the dorsal  
 shield; macrosetae of leg IV knobbed ..... *E. alatus* De Leon  
 9 (7'). Macrosetae of leg IV blunt *E. citrifolius* Denmark & Muma  
 9'. Macrosetae of leg IV knobbed ..... *E. inouei* (Ehara & Moraes)

\* *Euseius sakagami* (Ehara) and *E. vivax* (Chant & Baker) were not included in the present key as they were recorded in Brazil only one time each, by Ehara (1966) and Denmark and Muma (1973), respectively. These species were collected in São Paulo State, a region where several surveys of mite fauna have been conducted. However, they were not found again. Thus they are considered as questioned identifications.

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