

DESCRIPTION OF *PARASECIA FERNANDAE* SP.N. (TROMBIDIFORMES: TROMBICULIDAE) AND NEW RECORDS OF CHIGGERS FROM RODENTS IN RIO DE JANEIRO STATE, BRAZIL

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ABSTRACT: In this article, we describe a new species of chiggers, *Parasecia fernandae* sp.n., and report the presence of *Ariso-cerus hertigi* (Brennan et Jones, 1964), *Eutrombicula goeldii* (Oudemans, 1910), *Microtrombicula brachytrichia* Brennan, 1971, *Parasecia manueli* (Brennan et Jones, 1960), *Quadraseta brasiliensis* Goff et Gettinger, 1989 and *Serratacarus dietzi* Goff et Whitaker, 1984, for the first time in Rio de Janeiro State. *P. manueli* is a new record for Brazil. All of these species of chiggers were found parasitizing *Nectomys squamipes* (Brants, 1827). Besides that, *A. hertigi* was found on *Oxymycterus* sp., and *S. dietzi*—on *Cerradomys subflavus* (Wagner, 1842).

KEY WORDS: Chigger mites, ectoparasites, Cricetidae, Rio de Janeiro State, Brazil.

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INTRODUCTION

Chiggers—the larval stage of Trombiculidae—are ectoparasites of vertebrates. During the feeding process, these mites inject digestive enzymes into the skin of the hosts, which can cause severe skin reactions, commonly known as trombiculiasis. Some species of chiggers can also transmit pathogens (Ewing 1944). Jacinavicius *et al.* (2018b) reported 63 chigger species parasitizing vertebrates, including rodents in Brazil. In the state of Rio de Janeiro, seven chigger species have been recorded. Six of them—from birds, reptiles, primates and bats, as follows: *Blankaertia sinnamaryi* Floch et Fauran, 1956; *Eutrombicula batatas* (Linnaeus, 1758); *Fonsecia travassosi* (Fonseca, 1936); *Microtrombicula brennani* Goff, Whitaker et Dietz, 1986; *Perissopalla ipeani* Brennan, 1969; and *Speleocola tamarina* Goff, Whitaker et Dietz, 1987 (Fonseca 1936; Confalonieri and Benez 1976; Goff *et al.* 1986, 1987; Almeida *et al.* 2011; Bassini-Silva *et al.* 2017). The only chigger associated with rodents was *Caamembecaia graciosus* Gazêta, Amorim, Bossi, Linhares et Serra-Freire, 2006. It was found in the Itatiaia National Park, on *Trinomys graciosus* (Moojen, 1948) (Gazeta *et al.* 2006). Currently, the genus *Parasecia* Loomis, 1966 comprises 18 species that parasitize reptiles, birds and mammals in the Neotropical and the Nearctic regions (Goff 1992; Goff and Gettinger 1995; Stekolnikov and González-

Acuña 2015). Here, we describe a new species of this genus, and report new records of six chigger species, collected from cricetid rodents in the Parque Nacional Restinga de Jurubatiba, Macaé Municipality, Rio de Janeiro State, Brazil.

MATERIAL AND METHODS

The mites were slide-mounted in Hoyer's medium (Walter and Krantz 2009); they are housed at the Collection of Apterous Arthropod Vectors of Importance for Public Health (Coleção de Artrópodes Vetores Ápteros de Importância em Saúde das Comunidades), Oswaldo Cruz Institute, Rio de Janeiro, Brazil (CAVAISC—Fiocruz). The species were identified to genus using the key by Brennan and Goff (1977) and to species using the original descriptions of species in the genus. Morphological illustrations were made using Olympus BX 40 with a camera lucida. Extended focal range images were created using Leica Application Suite v. 2.5.0. The images were prepared using Adobe Photoshop v. 13.0, and Inkscape v. 2. The terminology used in this description was adapted from Goff *et al.* (1982), Stekolnikov (2008) and Stekolnikov and Daniel (2012). We also used the nomenclature proposed by Kethley (1990), Wohltmann *et al.* (2006, 2007) and Bassini-Silva *et al.* (2017) for the specialized leg setae, dorsal opisthosomal setae and setae on the prodorsal sclerite.

SYSTEMATICS

A total of 24 chiggers were examined and six species were identified: *Arisocerus hertigi* (Brennan et Jones, 1964); *Eutrombicula goeldii* (Oudemans, 1910); *Microtrombicula brachytrichia* Brennan, 1971; *Parasecia manuely* (Brennan and Jones, 1960); *Quadrasetta brasiliensis* Goff et Gettinger, 1989; and *Serratacarus dietzi* Goff et Whitaker, 1984. We have also recorded a new species of *Parasecia* parasitizing *Nectomys squamipes* (Brants, 1827) in Parque Nacional Restinga de Jurubatiba, Macaé Municipality, Brazil. In two cases, different species of chiggers co-parasitized the same host. One case involved *P. manuely* and the new species. The other case involved *P. manuely* and *M. brachytrichia*. In both cases, the chiggers parasitized *N. squamipes*.

Family Trombiculidae Ewing, 1944

Genus *Parasecia* Loomis, 1966

Diagnosis. *Larva.* Seven branched setae on palptarsus, with ζ ; odontus trifurcate; cheliceral blade with tricuspid cap; galealae branched or nude; scutum rectangular, with or without sinuous anterior and posterior margins, *se* (=PL) on the prodorsal sclerite; femora of legs I–III each divided into a basifemur and telofemur; coxae unisetose; empodium present and onychodrites absent; Leg I and II with subterminal eupathid; tarsus of the leg I with dorsal eupathid and ζ ; mastiseta on tarsus of the leg III present or absent.

Parasecia fernandae

Jacinavicius et Bassini-Silva sp.n.

Fig. 1 A–J, Tables 1–2

Diagnosis. *Larva.* Palptibia with nude dorsal and lateral setae, and a branched ventral seta, palptarsus with seven branched setae, ω and ζ , galeal setae nude, odontus trifurcate; idiosoma hypertrichous with more than 100 setae; genu of legs I each with three σ , tarsus of the legs I and II each with the famulus (ϵ) positioned distal to ω , tarsus of the legs III with one mastiseta.

Description. *Larva.* *Gnathosoma*—palp setal formula B/B/NNB/7B ζ ω ; supracoxal setae branched, odontus trifurcate, cheliceral blade with tricuspid cap; galeal setae nude (Fig. 1A–B).

Idiosoma—eyes 2/2 set in an ocular plate, anterior eye larger; prodorsal sclerite with 1 pair of flagelliform internal scapular (*si*) setae (trichobothria), 1 pair of *vi* (=AM), 1 pair of *ve* (=AL) seta and one pair of *se* on the prodorsal sclerite;

se>*si*>*vi*>*ve*; the anterior and posterior margin of the prodorsal sclerite straight, lateral margins slightly concave (Fig. 1C). The idiosoma in all specimens are damaged, ca. 85 idiosomal setae, dorsal opisthosoma with 6 pairs of setae in the C row, with the c6 pair of seta in an anterior position (=humeral setae), D row with 5 pairs of setae, E row with 4 pairs of setae, plus ca. 23 setae, totaling ca. 53 dorsal opisthosomal setae; 2 pairs of sternal setae (1a, 3a), ca. 28 ventral setae. (Fig. 1G–J).

Legs—femur legs I–III each divided into a basifemur and telofemur, each leg terminated with a pair of claws and a claw-like empodium, without onychotriches, coxal fields not striate. *Leg I*—coxal field with 1 branched seta 1b (1B); trochanter 1B; basifemur 1B; telofemur 5B; genu 4B, 3 σ and κ ; tibia 8B, 2 ϕ and κ ; tarsus 22B, ω , ϵ , dorsal eupathid (ζ) with a companion seta (*z*) and terminating with a subterminal eupathid (ζ), famulus (ϵ) distal to ω (Fig. 1D). *Leg II*—coxal field seta 2b (1B); trochanter 1B; basifemur 2B; telofemur 4B; genu 3B, σ ; tibia 6B, 2 ϕ ; tarsus 15B, ω , ϵ and a subterminal eupathid (ζ), base of ϵ distal to ω (Fig. 1E). *Leg III*—coxal field seta 3b (1B), trochanter 1B; basifemur 2B; telofemur 3B; genu 3B, σ ; tibia 6B, ϕ ; tarsus 14B with one mastiseta (Fig. 1F).

Type material. Holotype: larva (ACA-2625), ex. *N. squamipes*, Parque Nacional Restinga de Jurubatiba, Macaé municipality, Rio de Janeiro State, Brazil, 15.V.2001, leg. F.M. Hatano. Paratypes: 2 larvae (ACA-2625), same data; 4 larvae (ACA-2623), same host, locality and collector, 19.V.2001; 1 larva (ACA-2618b), same host, locality and collector, 17.III.2002.

Type deposition. Holotype and five paratypes are deposited in CAVAISC-Fiocruz, Rio de Janeiro, Brazil; two paratypes are deposited in Acari Collection of Butantan Institute (IBSP), São Paulo, Brazil.

Etymology. The specific name *fernandae* is in the honor of the collector, Fernanda Martins Hatano, a professor of the Federal Rural University of Amazônia and a specialist in the ecology of rodent mites.

Differential diagnosis. *Parasecia fernandae* sp.n. is similar to *P. argentinensis* Goff et Gettinger, 1995, *P. soucouyanti* (Brennan et Yunker, 1966) and *P. valida* Brennan, 1969, in having mastiseta on tarsus of legs III and three σ on the genu of legs I. However, the new species differs from the above three in having a hypertrichous idiosoma (ca. 115 vs. 52–54, 48–56 and 42, respectively) and ϵ distal to ω (proximal in the other three species).

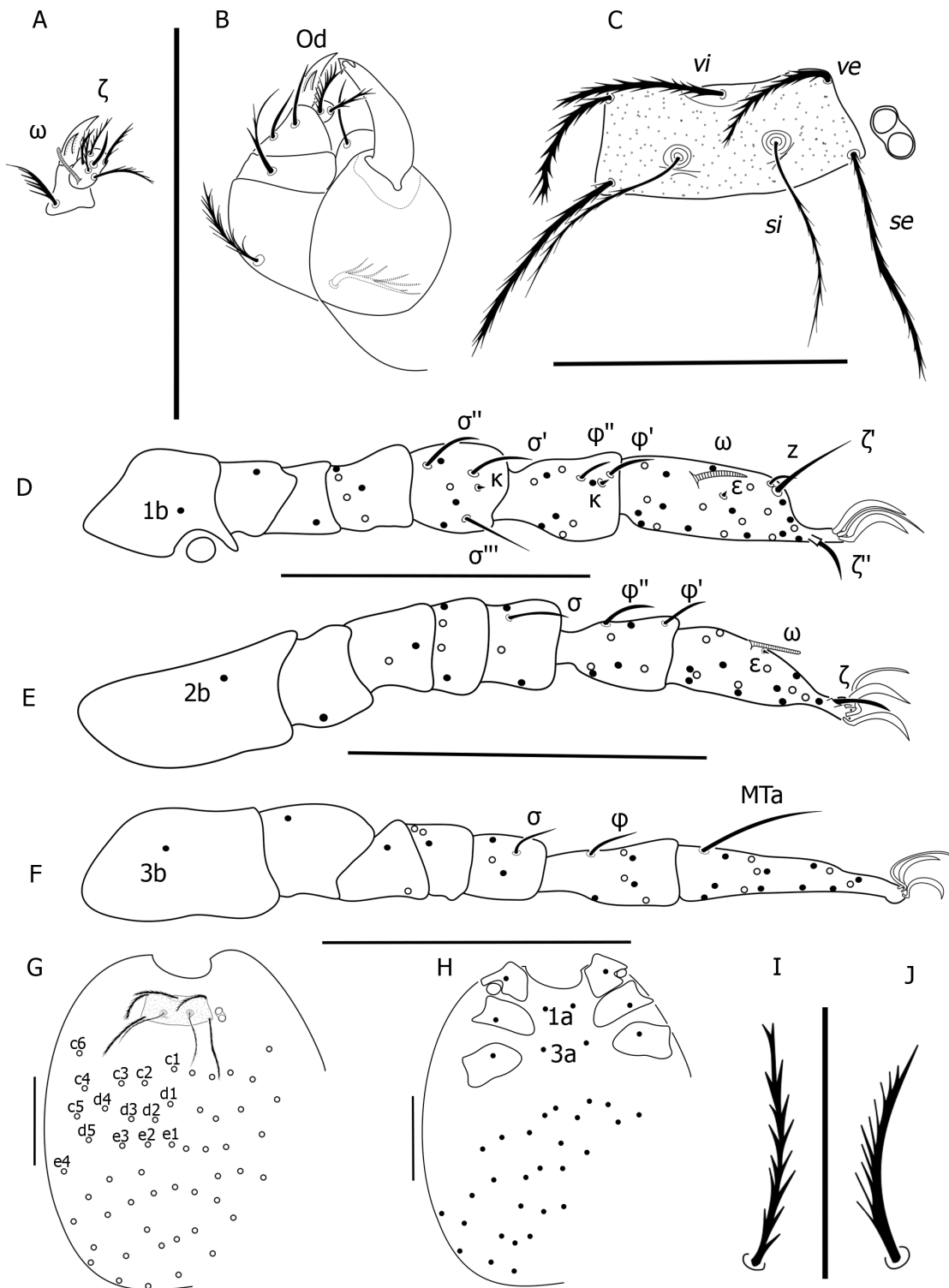


Fig. 1. Morphological details of *Parasecia fernandae* sp.n. A—ventral view of palptarsus; B—dorsal view of gnathosoma; C—prodorsal sclerite; D—Leg I; E—Leg II; F—Leg III; G—dorsal view of idiosoma; H—ventral view of idiosoma; I—dorsal opisthosomal setae; J—ventral opisthosomal setae. Black spots—ventral setae of the idiosoma or legs; white spots—dorsal setae of the idiosoma or legs. Symbols: ζ—eupathidium of palptarsus and tarsus of legs I and II; ω—solenidion of palptarsus and tarsus of legs I and II; Od—odontus; ve—anterolateral setae; se—posterolateral setae; vi—anteromedial seta; si—trichobothria; σ—solenidia on the genu of legs I, II and III; κ—microsetae on genu and tibia of the leg I; φ—solenidia on the tibia of the legs I, II and III; ε—famulus on the tarsus of legs I and II; z—companion seta on tarsus of the leg I; MTa—mastisetae on tarsus of the leg III; 1a—anterior sternal setae; 3a—posterior sternal setae; 1b—seta of the coxal field of the leg I; 2b—seta of the coxal field of the leg II; 3b—seta of the coxal field of the leg III. Scale bars=100 μm (A–H), 50 μm (I–J).

***Arisocerus hertigi* (Brennan et Jones, 1964)**

This species was described based on specimens obtained from *Dasyprocta* sp. in Paraguay (Brennan and Jones 1964). In addition to this record, the species *A. hertigi* was reported in Brazil parasitizing *Didelphis albiventris* Lund, 1840 in the Federal District and *Cavia intermedia* Cherem, Olimpio and Ximenez, 1999 in Santa Catarina State (Goff et Gettinger 1989; Regolin *et al.* 2015). In this study, we reported the first record of *A. hertigi* parasitizing *N. squamipes* and *Oxymycterus* sp. and the first record to Rio de Janeiro State.

Material examined. 3 larvae (ACA-2613), ex. *N. squamipes*, Parque Nacional Restinga de Jurubatiba, Macaé municipality, Rio de Janeiro State, Brazil, 15.III.2001, leg. F.M. Hatano. 1 larva (ACA-2620), same host, locality and collector, 15.V.2001. 1 larva (ACA-2622), same host, locality and collector, 16.III.2002. 1 larva (ACA-2627), ex. *Oxymycterus* sp., same locality and collector, 24.VIII.2002. 1 larva (ACA-2628), same host, locality and collector, 31.XI.2002. 1 larva (ACA-2629) same host, locality and collector, 03.VI.2002. 1 larva (ACA-2630), same host, locality and collector, 31.XI.2002. 1 larva (ACA-2631), same host, locality and collector, 24.VIII.2002.

***Eutrombicula goeldii* (Oudemans 1910)**

This species was found parasitizing several birds, reptiles and mammals in the following countries: Bolivia, Brazil, Colombia, Costa Rica, Dominica, Panama, Surinam, Trinidad, and Venezuela (Oudemans 1910; Boshell and Kerr 1942; Brennan and Jones 1960; Brennan and Yunker 1966; Brennan 1967; Brennan 1968; Arnold 1970; Brennan 1970a; 1970b; Brennan and Lukoschus 1971; Brennan and Reed 1974; Brennan and Bronswijk 1975). Brennan and Jones (1960) and Brennan and Reed (1974) recorded this chigger parasitizing a rodent misidentified as *N. squamipes* in Trinidad and Venezuela, respectively. Probably, the authors referred to the species *Nectomys palmipes* (Allen et Chapman, 1893), since, according Musser and Carleton (2005), this is the only species in the genus *Nectomys* that occurs in Trinidad and Venezuela. In Brazil, the only record of this species was from *Dasyprocta leporine* Linnaeus 1758 (= *Dasyprocta aguti* Linnaeus, 1766) with no detailed locality information. Here we are reporting the first record of *E. goeldii* parasitizing *N. squamipes* and the first record from Rio de Janeiro State.

Material examined. 1 larva (ACA-2626), ex. *N. squamipes*, Parque Nacional Restinga de Jurubatiba, Macaé municipality, Rio de Janeiro State, Brasil, 14.II.2002, leg. F.M. Hatano.

***Microtrombicula brachytrichia*
Brennan, 1971**

The only record of this species is the type data: collected in Belém, Pará State, Brazil on *Proechimys guyannensis* (Geoffroy, 1803) (Brennan 1971). In this study, we are providing a new record of locality and host for this species.

Material examined. 1 larva (ACA-2633), ex. *N. squamipes*, Parque Nacional Restinga de Jurubatiba, Macaé municipality, Rio de Janeiro State, Brazil, 30.VIII.2001, leg. F.M. Hatano. 2 larvae (ACA-2634), same data. 1 larva (ACA-2624b), same host, locality and collector, 16.II.2002.

***Parasecia manueli*
(Brennan et Jones, 1960)**

Parasecia manueli has been collected parasitizing some species of birds, reptiles, marsupials and rodents, in several countries of the Neotropical region: Colombia, Cuba, Panama, Peru, Surinam, Trinidad and Venezuela (Brennan and Jones 1960; 1961; Brennan and Yunker 1966; Brennan 1968; Brennan and Lukoschus 1971; Brennan and Bronswijk 1975; Brennan and Reed 1975; Daniel and Stekolnikov 2003). Brennan and Jones (1960) recorded this chigger parasitizing a rodent wrongly identified as *N. squamipes* in Trinidad, as well as *E. goeldii*. Probably the authors referred to the species *N. palmipes*. It is important to note that *P. manueli* was recorded in Brazil for the first time in the present study, as well as, the first record of this mite parasitizing the rodent *N. squamipes*.

Material examined. 3 larvae (ACA-2616), ex. *N. squamipes*, Parque Nacional Restinga de Jurubatiba, Macaé municipality, Rio de Janeiro State, Brazil, 17.III.2002, leg. F.M. Hatano. 1 larva (ACA-2618a), same data. 1 larva (ACA-2619), same host, locality and collector, 15.V.2001. 1 larva (ACA-2632), same host, locality and collector, II.2001. 2 larvae (ACA-2624a), same host, locality and collector, 16.III.2002.

***Quadrasetta brasiliensis*
Goff et Gettinger, 1989**

The distribution of this species is restricted to the Brazilian territory, federal district and São Paulo and Paraná States (Goff and Gettinger 1989;

Jacinavicius *et al.* 2018a). This species was found parasitizing several marsupials and rodents. However, it is the first time that it was found parasitizing *N. squamipes*, and it is the first record for Rio de Janeiro State.

Material examined. 1 larva (ACA-2614), ex. *N. squamipes*, Parque Nacional Restinga de Jurubatiba, Macaé municipality, Rio de Janeiro State, Brazil, 14.V.2001, leg. F.M. Hatano. 2 larvae (ACA-2621), same host, locality and collector, 16.III.2002.

***Serratacarus dietzi* Goff et Whitaker, 1984**

The only record of this species was the type data, Serra da Canastra National Park, Minas Gerais State, Brazil, parasitizing *Necromys lasiurus* (Lund, 1840) (Goff and Whitaker 1984). Here we are recording for the first time, these species parasitizing *N. squamipes* and *Cerradomys subflavus* (Wagner, 1842) in Rio de Janeiro State.

Material examined. 1 larva (ACA-2615), ex. *N. squamipes*, Parque Nacional Restinga de Jurubatiba, Macaé municipality, Rio de Janeiro State, Brasil, 02.VI.2002, leg. F.M. Hatano. 1 larva (ACA-2617), ex. *C. subflavus*, same locality and collector, 25.VIII.2002.

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Table 1
Standard measurements of *Parasecia fernandae* sp.n. (n=8)

| | AW | PW | SB | ASB | PSB | SD | P-PL | AP | vi | ve | se | si | H | 1a | 3a | DMIN | DMAX | VMIN | VMAX |
|----------|----|----|----|-----|-----|----|------|----|----|----|----|----|----|----|----|------|------|------|------|
| Holotype | 76 | 86 | 36 | 23 | 16 | 39 | 9 | 28 | 58 | 46 | 82 | 71 | 65 | 46 | 40 | 48 | 60 | 31 | 40 |
| Minimum | 74 | 85 | 33 | 21 | 15 | 39 | 8 | 26 | 55 | 45 | 79 | 67 | 62 | 41 | 37 | 45 | 54 | 31 | 35 |
| Maximum | 76 | 86 | 37 | 24 | 20 | 42 | 12 | 32 | 60 | 49 | 85 | 72 | 65 | 47 | 40 | 50 | 64 | 33 | 41 |
| Mean | 75 | 86 | 35 | 23 | 18 | 41 | 10 | 29 | 58 | 47 | 82 | 70 | 64 | 44 | 39 | 48 | 59 | 32 | 38 |

AW—distance between the bases of the *ve* setae; PW—distance between the bases of the *se* setae; SB—distance between sensillary bases; ASB—distance from sensillary bases to extreme anterior margin of the prodorsal sclerite; PSB—distance from sensillary bases to extreme posterior margin of the prodorsal sclerite; SD—ASB+PSB; P-PL—distance from *se* setal base to extreme posterior margin; AP—distance between the bases of *ve* and *se*; *vi*—anteromedial seta; *ve*—anterolateral setae; *se*—posterolateral setae; *si*—trichobothria; H—humeral setae; 1a—anterior sternal setae; 3a—posterior sternal setae; DMIN—minimum length of dorsal opisthosomal setae; DMAX—maximum length of dorsal opisthosomal setae; VMIN—minimum length of ventral idiosomal setae; VMAX—maximum length of ventral idiosomal setae.

Table 2
Standard measurements of *Parasecia fernandae* sp.n. (n=8)

| | I | II | III | Ip | σ' I | σ'' I | σ''' I | κ I | φ' I | φ'' I | κ I | ω I | ε I | z | ζ' I | ζ'' I | σ II | φ' II | φ'' II | ω II | ε II | ζ II | σ III | φ III | MTa |
|----------|-----|-----|-----|-----|------|-------|--------|-----|------|-------|-----|-----|-----|---|------|-------|------|-------|--------|------|------|------|-------|-------|-----|
| Holotype | 235 | 222 | 288 | 744 | 18 | 18 | 23 | 1 | 14 | 11 | 2 | 16 | 1 | 8 | 28 | 13 | 17 | 14 | 17 | 13 | 1 | 16 | 16 | 17 | 39 |
| Minimum | 212 | 219 | 278 | 698 | 17 | 17 | 21 | 1 | 13 | 11 | 2 | 16 | 1 | 8 | 26 | 13 | 17 | 14 | 15 | 13 | 1 | 15 | 16 | 17 | 39 |
| Maximum | 247 | 234 | 290 | 774 | 18 | 18 | 23 | 1 | 14 | 12 | 2 | 19 | 1 | 8 | 28 | 14 | 18 | 15 | 17 | 15 | 1 | 16 | 17 | 19 | 41 |
| Mean | 230 | 227 | 284 | 736 | 18 | 18 | 22 | 1 | 14 | 12 | 2 | 18 | 1 | 8 | 27 | 14 | 18 | 15 | 16 | 14 | 1 | 16 | 17 | 18 | 40 |

I—length of leg I; II—length of leg II; III—length of leg III; Ip—sum of leg lengths (coxal field to tarsus); σ' I—length of solenidia (σ') on genu of the leg I; σ'' I—length of solenidia (σ'') on genu of the leg I; σ''' I—length of solenidia (σ''') on genu of the leg I; κ I—length of microseta on genu of the leg I; φ' I—length of solenidia (φ') on tibia of the leg I; φ'' I—length of solenidia (φ'') on tibia of the leg I; κ I—length of microseta on tibia of the leg I; ω I—length of solenidium on tarsus of the leg I; ε I—length of famulus on tarsus of the leg I; z—length of the companion seta on tarsus of the leg I; ζ' I—length of dorsal eupathidium on tarsus of the leg I; ζ'' I—length of subterminal eupathidium on tarsus of the leg I; σ II—length of solenidium on genu of the leg II; φ' II—length of solenidia (φ') on tibia of the leg II; φ'' II—length of solenidia (φ'') on tibia of the leg II; ω II—length of solenidium on tarsus of the leg II; ε II—length of famulus on tarsus of the leg II; ζ II—length of subterminal eupathidium on tarsus of the leg II; σ III—length of solenidium on genu of the leg III; φ III—length of solenidium on tibia of the leg III; MTa—length of mastisetae on tarsus of the leg III.