A new genus and species of Tarsonemidae (Acari: Heterostigmata) from the Atlantic Forest, Brazil

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Abstract

Kaliszewskia ochoai gen. nov., sp. nov. (Tarsonemidae: Tarsoneminae: Tarsonemini) is described from adult females, collected on Blepharocalix salicifolius (Kunth) O.Berg and Plinia sp. (Myrtaceae), from the Atlantic Forest in Brazil.

Key words: Tarsonemoidea, taxonomy, neotropics, biodiversity

Introduction

The Atlantic Forest biome is almost totally restricted to Brazil. At the time of the Brazilian colonization by the Portuguese, in the XVIth century, it occupied most of the extensive Brazilian coast, reaching in some places deep inland to reach northeastern Argentina and eastern Paraguay, extending from Rio Grande do Norte to Rio Grande do Sul states, over an area of approximately 1,100,100 km² in Brazil. It covered a wide range of climatic zones and vegetation types. Due to urbanization and agricultural occupation, only an estimated 7–8 % of that area remains occupied by native vegetation at different stages of degradation (Galindo-Leal & Câmara 2005). This biome has a great concentration of endemic species subjected to strong anthropic pressure, which has led to its classification as a "hotspot", i.e., a world priority conservation area (Myers et al. 2000).

An effort has been made to determine the mite fauna on the main plant groups of the Atlantic Forest. Several papers have dealt with different mite groups of the Atlantic Forest, some of the most recent ones being those published by Buosi et al. (2006), Castro & Moraes (2007, 2010) and Demite et al. (2013). Myrtaceae is one of the most diverse and widespread plant families of the Atlantic Forest (eg. Mori et al. 1983; Tabarelli & Mantovani 1999). About 1,000 species of 23 myrtaceous genera were reported from Brazil by Landrum & Kawasaki (1997). The present paper deals with a new species of mites of the family Tarsonemidae from myrtaceous plants found in the Atlantic Forest.

About 35 tarsonemid species have been reported from Brazil (Ochoa & Connor 1996; Binotti et al. 2001; Gondim Jr. & Oliveira 2001; Lin & Zhang 2002; Moraes et al. 2002; Lofego & Feres 2006; Lofego & Gondim Jr. 2006; Lofego et al. 2005, 2007; Sousa et al. 2014; Demite et al. 2012; Rezende et al. 2015), including 21 species from the Atlantic Forest (Feres et al. 2005, 2007; Buosi et al. 2006; Lofego & Feres 2006; Demite et al. 2012; Sousa et al. 2014). It has been predicted that many tarsonemid species remain to be discovered in tropical regions, including the Atlantic Forest, given that the number of described species is considerably smaller than in temperate regions (Lin & Zhang 2002).
Material and methods

Leaf samples of myrtacean species were collected at Serra do Conduru, a State Park at Uruçuca (14°04'S; 39°11'W), Bahia State and Ilha do Cardoso, a State Park at Cananéia (25°04'S; 47°55W), on the coast of São Paulo State. The climate of both areas is the Af Köppen type, characterized by a hot and humid tropical climate with rainfall in all months of the year and without a well defined dry season (Climate-Data.org, 2014). The samples were examined under a stereomicroscope and the mites collected were mounted in Hoyer’s medium and later examined under a phase contrast microscope. After detecting that the specimens belonged to a new genus and species, they were illustrated with the help of a drawing tube attached to the microscope, and structures were measured using a graded eyepiece.

In the subsequent description, setal nomenclature follows Lindquist (1986), except for the gnathosomal setae dgs and vgs (Magowski et al. 1998). All measurements are given in micrometers. For each structure, the mean is given followed by the respective range (in parentheses). Unless otherwise specified, measurements given refer to the length of the structures.

Kaliszewskaia gen. nov.

Diagnosis. This new genus fits the characterization of Tarsonemini, Tarsoneminae, as described by Lindquist (1986). However, it can be distinguished from all genera of this tribe by a combination of the following female characteristics: a) setae sc2, c1, c2 and d thickened but flexible (tip bent to different directions in mounted specimens), barbed and distally knobbed; b) seta v1 stout, strongly serrated and inserted at the tip of a long flat tubercle; c) seta ps minute; d) femur I with a postero-ventral cone-shaped projection that bears v''; e) anterior ambulacral claw of legs II and III distinctly shorter than posterior claw; f) seta 3a inserted distinctly medial end of apodeme 3. The first three characteristics are autapomorphies for the one known species of this new genus (Cetaratotarsonemus De Leon species have c1, c2 and d similar to those of the new genus here described, but without distal knobs). The other characteristics are shared with three other genera: a projection on femur I bearing seta v'' is also found in Rhynoctarsonemus Beer; some Fungitarsonemus Cromroy species have asymmetrical ambulacral claws; and Ceratotarsonemus and Fungitarsonemus have seta 3a inserted anteriad of the medial end of apodeme 3.

Description. Adult female. Gnathosoma. Capsule slightly wider than long, sub-triangular, not beaklike anteriorly; palpcoxal setae not observed. Dorsal gnathosomal setae smooth, sharp-tipped. Palpi directed anteriorly, slightly convergent distally, short and robust, each with short seta and short cone-shaped structure. Cheliceral stylets of moderate length, with basal levers hardly distinguishable. Largest diameter of pharynx about one sixth width of gnathosomal capsule, with discrete muscular layer and thinly sclerotized walls; without conspicuous paired gland-like structures posteriorly.

Idiosoma. Most setae barbed; setae v1 inserted on tubercles. Some setae (sc2, c1, c2 and d) moderately elongate, stout, and knobbed. Prodorsal shield extending over base of gnathosoma. Stigmata laterad of base of tubercle bearing v1, on discrete marginal projection of prodorsal shield; main tracheal trunks with unsclerotized atria, and without sclerotized or divided postatrial structures. Vestigial v2 mediad insertion of sc2, latter setae more widely spaced from each other than v1, and inserted near mid-length of prodorsal shield; seta sc2 inserted anterolaterad of sc1. Posterior margins of tergites not conspicuously concave or emarginate. Setae c1 and c2 obliquely aligned; setae e and f nearly transversely aligned and each pair closer together than setae d. Venter with apodemes 1 fused to each other and to prosternal apodeme to form Y-shaped structure. Apodeme 2 not fused with prosternal apodeme. Prosternal apodeme well sclerotized up to level slightly posterior to medial ends of apodeme 2, then widening and fading to reach sejugal apodeme, which is continuous, but weakened medially. Apodeme 3 slightly arched and transverse, extending from anterior end of trochanters III to level mediad insertion of 3a. Apodeme 4 extending convergently from insertion of 3b to central region of poststernal apodeme. Poststernal apodeme distinct, not bifurcate anteriorly. Anterior margin of coxisternal plates III straight. Setae 3c and 4a absent. Bases of legs IV moderately spaced, separated by interval about 1.5 times width of trochanter IV; tegula moderately long, about as long as basal width, rounded apically. Aggenital plate without setae. Pseudanal setae vestigial.
Legs: Ambulacrum of leg I with a single, uncinate claw. Ambulacra of legs II and III with empodia and asymmetrically paired claws, anterior claw much smaller than posterior. Femora I and II without flanges or ridges, but femora I with postero-ventral cone-shaped projection bearing v''. Legs I and II of moderate length, no segment distinctly elongate; combined length of genu and tibia of leg II subequal with length of tarsus, and femorogenu about 1.5 longer than tibiotarsus. Trochanter III elongate, subelliptical, plate-like, longer than femorogenu III. Leg IV elongate, cylindrical, with femorogenu about 1.5 longer than tibiotarsus. Number of tactile setae (solenidia in parentheses): femur, genu and tibia+tarsus of leg I, 4-4-6+8(1); femur, genu, tibia and tarsus of leg II, 3-3-4-5(1); femorogenu, tibia and tarsus of leg III, 1+3-4-4; femorogenu and tibiotarsus of leg IV, 1+1-1+1. Legs I-III with femoral and genual setation complete, with conspicuously barbed and thickened setae on femur I (d, l' and l''). Tibial sensory cluster of leg I incomplete, without solenidion φ1 and φ2. Tarsus I with seta pl'' present and pl'' absent. Tarsus II without spine-like pl''. Subunguinal seta (s) of tibiotarsus I and unguinal seta u' of tarsi II and III thorn-like.

Remarks. In addition to the features mentioned in the diagnosis, the new genus shares the following features with Fungitarsonemus: palpi short and robust, almost totally fused to gnathosomal capsule; seta sc2 inserted anteriad of sc1; seta d of femur I stoutened; solenidia of tibia I and pl'' of tarsus II absent (present in some Fungitarsonemus). The new genus also shares the following features with Ceratotarsonemus, Daidalotarsonemus and Excelsotarsonemus: modified dorsal idiosomal setae and seta l' of femur I stoutened and barbed. An examination of the male and immature will be required to determine the phylogenetic positioning of this new genus in relation to these and other genera.

Etymology. This genus is named in memoriam of Marek Kaliszewski, eminent Polish acarologist.

Type species. Kaliszewskaia ochoai sp. nov.

(Figs. 1–6)

Diagnosis. Adult females of this species can be distinguished from those of other tarsonemid species by the combination of characters given in the diagnosis of the genus.

Female (three specimens measured). Gnathosoma: (Fig. 1a and 2) sub-triangular, length 30 (29–31), maximum width 38 (36–40); dorsal apodeme indistinguishable. Setae dgs 11 (10–12) and vgs 9, smooth; seta pp absent or indistinguishable. Palpi short and robust, each with one subterminal seta and a small cone-shaped structure. Cheliceral styles 10 (9–10). Pharynx fusiform 16 (15–18) long and 7 (6–7) wide at widest region, with discrete muscular layer and thinly sclerotized walls.

Idiosoma (Figs. 1 and 2): Tergites and ventral plates punctuated; length 208 (193–230), width at level of cI 133 (130–138); prodorsal shield covering gnathosoma entirely. Stigma on discrete marginal projection of prodorsal shield, laterad of base of tubercle (40 long) bearing vI. Seta ψs 11 (10–12) and vgs 9, smooth; seta pp absent or indistinguishable. Palpi short and robust, each with one subterminal seta and a small cone-shaped structure. Cheliceral styles 10 (9–10). Pharynx fusiform 16 (15–18) long and 7 (6–7) wide at widest region, with discrete muscular layer and thinly sclerotized walls.

Coxisternal seta 1a 7 (6–7), inserted near junction of apodeme 1 with prosternal apodeme; coxal pits 1b hardly distinguishable, located anterolateral seta 1a; seta 2a 7 (6–7) inserted on distal end of apodeme 2; coxal pits 2b posterolateral 2a; seta 3a 7 (7–8), inserted midway between sejugal apodeme and apodeme 3; seta 3b 5, inserted on distal end of apodeme IV. Prosternal apodeme fused with apodemes 1, but not with apodeme 2, conspicuous from apodeme I to level of posterior end of apodemes 2, widening and fading posteriorly to reach sejugal apodeme, which is continuous, but faded medially. Apodeme 3 slightly arched, transverse, extending from anterior end of trochanter III to level posterolateral insertion of 3a. Poststernal apodeme distinct, not bifurcate anteriorly, extending from level of apodeme 3 to level of posterior end of trochanter III. Tegula rounded, 11 (10–11) long and 12 (11–12) wide at base. Anterior edge of metadososomal plate nearly straight. Posterolateral extensions of coxisternal plates IV approaching but not overlapping each other medially beneath tegula. Setae ps minute (2).
FIGURES 1a–b. *Kaliszewskia ochoai* sp. nov. (female). 1a, gnathsosoma, dorsal view; 1b, idiosoma, dorsal surface.
FIGURE 2. Kaliszewskaia ochoai sp. nov. (female). Ventral surface.
FIGURES 3–6. Kaliszewskia ochoai sp. nov. (female), 3, leg I; 4, leg II; 5, leg III; 6, leg IV.
Legs (Figs. 3–6): lengths (proximal end of trochanter to distal end of tarsus): leg I 52 (51–52), leg II 53 (52–53), leg III 54 (51–57), leg IV 36 (36–37). Number of setae (solenidia in parentheses) on femur, genu, tibia and tarsus, respectively: leg I: 4–4–6+8+(1ω), leg II: 3–3–4–5+(1ω), leg III: 1+3–4–4. Tarsal solenidion ω of tibiotarsus I 7 (6–7), stout and slightly elongate. Sensory cluster of tibia I incomplete (φ1 and φ2 missing); eupathidion k (5) proximal to d 34 (32–35), serrat. Solenidion ω of tarsus II proximal, 7, stout and slightly elongate; seta pl'' absent. Seta of tibia II 38 (36–40), serrat. Femurogenu IV 25; tibiotarsus IV 15. Lengths of leg IV setae: v`F 7, v`G 8, v`T1 16 (17–18) and tc'' 22 (21–23); setae v`G and v`F slender and smooth, v`T1 lanceolate and smooth; tc''T1 slender and serrat.

**Larva and male:** Unknown.

**Type material.** Holotype ♀ (specimen number 9515): Serra do Conduru, Uruçuca, Bahia State, Brazil, on *Plinia* sp. (Myrtaceae), 16 March 2013, deposited at Departamento de Zoologia e Botânica, Universidade Estadual Paulista (UNESP), São José do Rio Preto, São Paulo State, Brazil. Paratypes: 2♀ (specimen numbers T-MZLQ 3013, T-MZLQ 3014): Ilha do Cardoso, Cananéia (25°04S; 47°55W), São Paulo State, Brazil, on *Blepharocalix salicifolius* (Kunt) O. Berg (Myrtaceae), 16 July 2012, deposited at Departamento de Entomologia e Acarologia, Escola Superior de Agricultura “Luiz de Queiroz”(ESALQ), Universidade de São Paulo (USP), Piracicaba, São Paulo State, Brazil. All specimens collected by P. R. Demite.

**Etymology.** This species is named after the eminent acarologist Ronald Ochoa, USDA, USA.

**Remarks.** Nothing is known about the feeding behavior of this species. Tarsonemini species are known as egg parasitoids, algivores, fungivores or phytophages (Lindquist 1969, 1986; Lofego et al. 2005). The feeding habits of species of the genera morphologically most similar to *Kaliszewskia* are also inadequately known. *Fungitarsonemus* species have been speculated to feed on fungi, which could also be the case of the species here described, given that the habitats where the types were found are humid, allowing easy development of fungi on leaves. Species of *Ceratotarsonemus*, *Daidalotarsonemus* and *Rynchotarsonemus* are also thought to feed on algae, lichens or on plant leaves.

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**References**


