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First record of *Stereotydeus areolatus* Womersley 1935 (Trombidiformes: Penthalodidae) from soils in Argentina, with comments of *Stereotydeus* species

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Abstract — *Stereotydeus areolatus* Womersley 1935 (Acari: Penthalodidae) is recorded for the first time from forest soils of Buenos Aires, Argentina. Additional characteristics, SEM images, and the first description of the male of this species are provided. A list of *Stereotydeus* species and known distributions are also provided.

Key words — *Stereotydeus*, new record, Argentina, SEM images, *Celtis tala* forest

Introduction

Prostigmata is a diverse group of mites that includes 40 superfamilies and more than 17000 species with a variety of trophic niches and reproductive strategies (Kethley 1990). Knowledge of Prostigmata from Argentina is very fragmentary, with only a few species recorded. Bedano (2004) provided a checklist of prostigmatid mites collected from cultivated and natural soils at Cordoba province, Argentina. Species listed there are mainly Heterostigmata and Eupodina. Salazar Martínez et al. (2004) listed three families of Prostigmata deposited in the Natural Museum of La Plata: Ereynetidae, 1 species, parasite of *Bufo* sp.; Trombiculidae, 2 species, parasite of Anura; and Unionicolidae, 1 species, parasite of Mollusca.

Penthalodidae Thor 1932 is mainly composed of plant-feeding mites. It comprises about 35 species arranged in 6 genera (Zhang et al. 2011): *Penthalodes* Murray 1877, *Stereotydeus* Berlese 1901, *Hawaiieupodes* Strandmann & Goff 1978, *Protopenthalodes* Jesionowska 1989, *Callipenthalodes* Qin 1998 and *Turanopentalodes* Barilo 1988. *Turanopentalodes* is considered to belong to Penthaleidae (Khaustov 2014).

Stereotydeus was proposed by Berlese & Leonardi (1901) with *S. notophalloides* Leonardi 1901 as type species. It is composed of 25 species that have been reported from Australia (Wormersley 1935, Qin 1994, 1998), New Zealand (Strandtmann 1964, Spain and Luxton 1971), Antarctica (Berlese 1917, Womersley & Strandtmann 1963, Strandtmann 1967, 1970, Gless 1968, Pugh 1993), South Africa (Olivier 2006), North America (Baker 1946) and South America (Berlese & Leonardi 1901).

Very little is known of this genus. Womersley & Strandtmann (1963) pointed out that some species are plant feeders. Qin (1994), on the basis of his exhaustive collection in pastures and other native forest, argued that while *Stereotydeus* are phytophagous, they have no economic importance. Herein we record *Stereotydeus areolatus* for the first time from forest soil of Argentina and describe the male for the first time.

Materials and methods

Samples were collect from soil of a *Celtis tala* Gillies ex Planch. forest in "Nahuel Ruca" farm, Mar Chiquita District, Buenos Aires, Argentina (37°37′10.35″S, 57°25′18.34″W) during the period 2008–2009. Samples were processed in Berlese funnels for 12 days; prostigmatic mites were sorted with a stereomicroscope, mounted in open slides and identified with Olympus CX31 research microscope. Male sketches were made with Olympus CX31 drawing tube and they were performed with the software Gimp 2.8 (www.gimp.org.es/). Four specimens were prepared for scanning electron microscope (SEM) study. They were mounted on a stub, sputter-coated with gold (100 Å thick) and studied with a JEOL JSM-6460 electron microscope.

Taxonomy

Stereotydeus Berlese in Berlese & Leonardi 1901

Stereotydeus Berlese in Berlese & Leonardi 1901, p. 14; Trägårdh 1907a, p. 18; Womersley 1941, p. 292; Womersley & Strandtmann 1963, p. 453; Qin 1994, p. 1306.

Tectopenthalodes Trägårdh 1907a, pp. 18–19, fig. 9; Womersley 1935, p. 82.

Stereotydeus areolatus Wormersley 1935
(Figs. 1–2)

Material studied. Nahuel Rucá farm, Mar Chiquita, Buenos Aires, Argentina – 3 males and 4 females collected

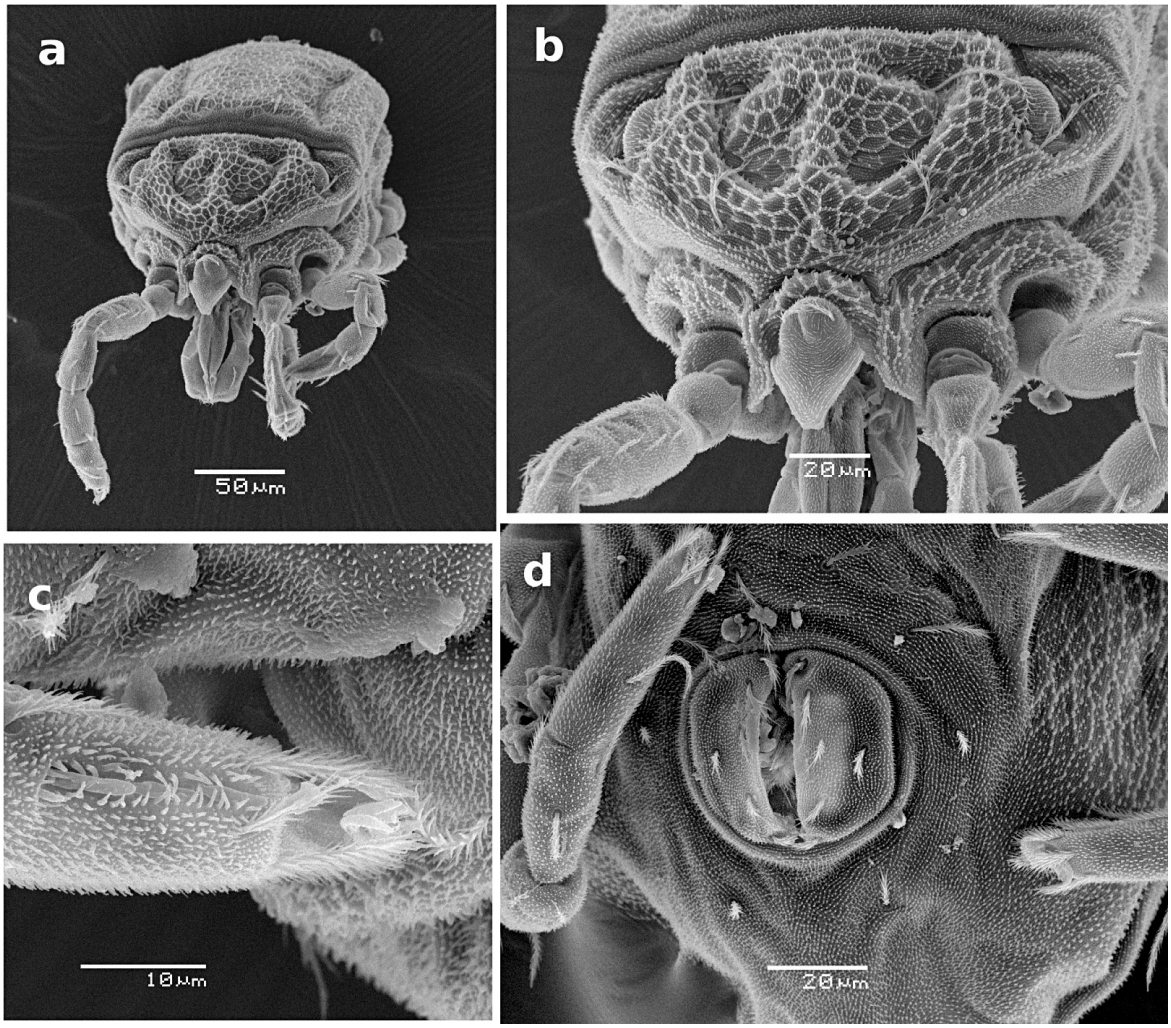

Fig. 1. Adults of *Stereotydeus areolatus*. a, frontal view; b, detail of prodorsum and epirostrum ornamentation; c, rhagidial organ of leg II; d, detail of genital region.

in 1st October of 2008; 3 females collected in 1st July of 2009. Soil under *Celtis tala* forest.

Comments. Color pale yellow. Female: body length including epirostrum 300–310 m; width 120–160 m (n = 3); male: length including epirostrum 290–310 m; width 150–160 m (n = 3).

The specimens studied resembles those of the description from Womersley (1935), as reviewed by Qin (1994), in all the aspects analyzed, including the dorsal idiosomal hexagonal ornamentation (Fig. 1a). Images from SEM provided additional information about the tridimentional aspect of prodorsal ornamentation. The striations of the epivertex are delicate lines. On lateral view, as well as the entire prodorsum and the podosomatic area, the delicate striation are enclosed inside of the reticular ornamentation composed of tiny spicules. (Fig. 1b). The polygonal ornamentation of the venter, as pointed out by Qin (1994) in his redescription of *S. areolatus*, is very obvious and it is clearly different from the surrounding area of the genital shield (Figs. 1d, 2b). Rhagidial organs of tarsi I and II, located in a single pit, were observed in all specimens studied; the pit is cover with transverse spicules (Fig. 1c).

Males resemble females in body general appearance, including prodorsal reticulation (Fig. 2a) and ventral polygonal ornamentation (Fig. 1b), and in the position and shape of the setae. Genital setae are located as it shown in Fig. 2b; the genital aperture is about 30% smaller than in female. In pre-genital position the sperm sac can observed (Fig. 2b, black arrow).

Material deposition. All specimens were kept in alcohol; 5 Individuals: 2 males and 3 females (MACN-Ar 31306) will be deposited in the Museo Argentino de Ciencias Naturales (MACN), Buenos Aires, Argentina; 2 individuals will be kept in the personal collection of the author.

Differential diagnosis. Two other species of *Stereotydeus, S. notophalloides* Leonardi 1901 and *S. gamasoides* Leonardi 1901 from Chile (Berlese & Leonardi 1901), are the only species of the genus known from the South America. Descriptions of Chilean species are very

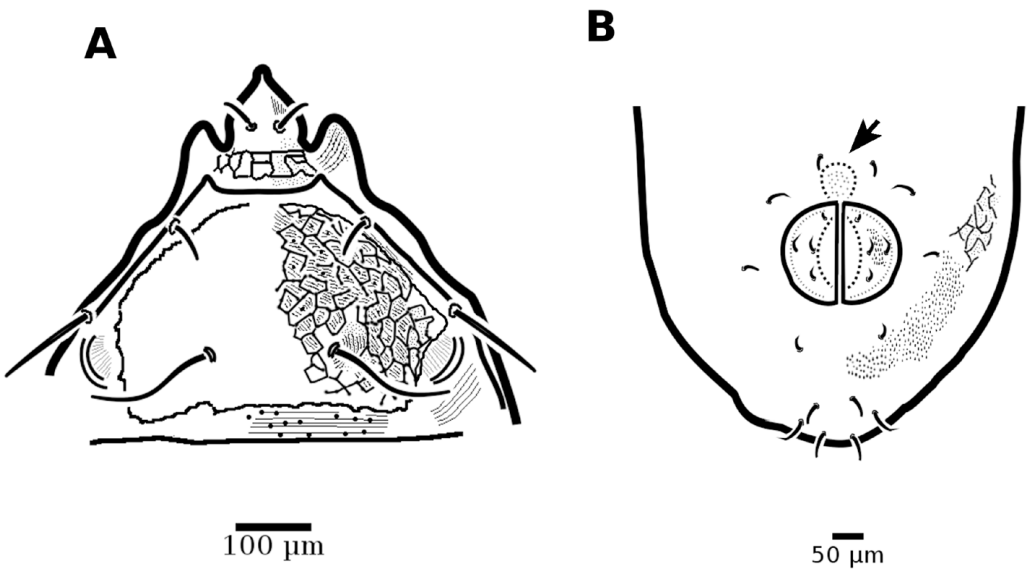

Fig. 2. Adult male of *Stereotydeus areolatus*. a, prodorsum in dorsal view; b, detail of genital region (arrow shows the sperm sac).

brief and without illustration, and neither have been redescribed. Therefore, comparison among Neotropical species could not be made.

Two other species are known from North America: *S. mexicanus* Baker 1946 and *S. lattimorei* Baker 1946. The former was collected in several cities of Mexico, while the latter was found at Brownsville, Texas. *Stereotydeus areolatus* and *S. mexicanus* are quite similar in appearance and both have rhagidial organs of tarsi I locate in a single pit, but can be distinguished by the presence of ventral polygonal reticulation in postero-lateral region in *S. areolatus*, (Figs. 1d, 2b). *S. areolatus* can be distinguished from *S. lattimorei* by the more robust body appearance (Baker 1946, fig. 3) and the absence of idiosomal reticulation in the last species.

Remarks. Images from SEM provided a very detailed aspect of the ornamentation in the idiosoma, venter and podosomatic area, and specially they allow to interpreting the prodorsal furrows described by Qin (1994). Moreover, and considering that shape and characteristic of the body ornamentation are frequently used to compared and distinguished *Stereotydeus* species (see *Stereotydeus* key from Qin 1994), I believe that in order to achieve a more accurate characterization of this structure, SEM images should be taken into account to describe it.

List of species of *Stereotydeus*

A list of the known species of *Stereotydeus* and their geographic distribution is provided below.

Stereotydeus areolatus Womersley 1935

Distribution: Australia, Argentina.

Comments: Cited in Womersley (1941, p. 294) and Qin (1998). Redescription in Qin (1994). First report of males.

Stereotydeus australicus Thor 1934

Distribution: Antarctica, Australia.

Comments: Cited in Womersley (1941, p. 294). Redescription and assignation of neotype in Qin (1994). Males known.

Stereotydeus belli (Trouessart 1902)

Penthaleus belli Trouessart 1902, p. 225; Gressitt & Weber 1959, p. 444.

Chromotydaeus belli: Berlese 1917, p. 8; Thor & Willmann 1941 (not directly referred, according to Womersley & Strandtmann 1963, p. 458).

Stereotydeus belli: Womersley & Strandtmann 1963, p. 458.

Distribution: Antarctica.

Comments: Cited in Gressitt & Shoup (1967), Strandtmann (1967), Gless (1968), Wallwork (1973) and Pugh (1993). Redescription Womersley & Strandtmann (1963). Males and nymphs known.

Stereotydeus brevipalpus Qin 1994

Stereotydeus occidentalis Womersley 1935 (in part, see Qin 1994).

Distribution: Australia.

Comments: Males known.

Stereotydeus capensis Womersley 1935

Distribution: South Africa.

Comments: Males and immature states unknown.

Stereotydeus delicatus Strandtmann 1967

Distribution: Antarctica.

Comments: Cited in Gless (1968), Wallwork (1973), Tenorio (1976) and Pugh (1993). Males and nymphs known.

Stereotydeus gamasoides Leonardi in Berlese & Leonardi

1901

Distribution: Chile.

Comments: Cited in Berlese & Leonardi (1903) and Berlese (1917). Males and immature states unknown.

Stereotydeus intermedius (Trouessart 1907)

Penthalodes intermedius Trouessart 1907; Berlese 1917, p. 8.

Stereotydeus intermedius: Strandtmann 1967, p. 79 (see comments).

Distribution: Antarctica.

Comments: Cited in Strandmann (1967), Wallwork (1973) and Pugh (1993). Berlese (1917, p. 8) provided a confused point of view about the species described by Trouessart from Antarctic: ..."*Penthaleus belli*, du cap Adare (Terra Victoria); le *P. villosus*, et le *Penthalodes intermedius* de l'Ile Lauria. On doit considérer le premier comme un vrai *Penthaleus*, mais le second ne me semble pas certainement un vrai *Tectopenthalodes*. Le *P. belli* est pourtant probablement un *Chromotydaeus*", but in the next paragraph he proposed *Stereotydeus* (*Tectopenthalodes*) *villosus* as a new combination. Strandtmann (1967) cited the species *Chromotydaeus intermedius* as a junior synonym of *Stereotydeus intermedius*. *S. intermedius* is probably a senior synonym of *S. longipes* (Strandtmann 1970, p. 98).

Stereotydeus lattimorei Baker 1946

Distribution: United Stated.

Comments: Males and immature states unknown.

Stereotydeus longipes Strandtmann 1970

Distribution: Antarctica.

Comments: Cited in Wallwork (1973), Tenorio (1976) and Pugh (1993). Males and immature states known. Probably a junior synonym of *S. intermedius* (Strandtmann 1970, p. 98).

Stereotydeus meyeri Strandtmann 1967

Distribution: Antarctica.

Comments: Cited in Tenorio (1976), Pugh (1993) and Wallwork (1973). Males known.

Stereotydeus mexicanus Baker 1946

Distribution: Mexico.

Comments: Males known.

Stereotydeus mollis Womersley & Strandtmann 1963

Distribution: Antarctica.

Comments: Cited in Gressitt & Shoup (1967), Strandtmann (1967), Wallwork (1973), Tenorio (1976) and Pugh (1993). Males, nymphs and larvae known.

Stereotydeus notaphalloides Leonardi in Berlese & Leonardi 1901; type species

Distribution: Chile.

Comments: Cited in Berlese & Leonardi (1903). Males and immature states unknown.

Stereotydeus nudisetatus Strandtmann 1964

Stereotydeus nudiseta: Pugh 1993, p. 342 (misspelled).

Distribution: New Zealand, Antarctica.

Comments: Cited in Spain & Luxton (1971) and Qin (1998). Males known.

Stereotydeus occidentalis Womersley 1935

Stereotydeus occidentale Womersley 1935, p. 80; Womersley 1941, p. 294.

Stereotydeus occidentalis: Thor & Willmann 1941 (not directly referred, according to Qin 1994, p. 1315).

Distribution: Australia.

Comments: Cited and redescription in Qin (1998). Males and immature states known.

Stereotydeus pallodus Olivier 2006

Distribution: South Africa.

Comments: Males known.

Stereotydeus pseudopulcher Qin 1994

Distribution: Australia.

Comments: Cited in Qin (1998). Males known.

Stereotydeus punctatus Strandtmann 1967

Stereotydeus puactatus: Pugh 1993, p. 342 (misspelled).

Distribution: Antarctica.

Comments: Cited in Gressitt & Shoup (1967), Gless (1968), Wallwork (1973) and Tenorio (1976). Males known.

Stereotydeus pulcher Strandtmann 1964

Stereotydeus pukher: Pugh 1993, p. 342 (misspelled).

Distribution: Antarctica, New Zealand.

Comments: Cited in Spain and Luxton (1971) and Qin (1998). Males and immature states known.

Stereotydeus reticulatus Strandtmann 1970

Distribution: Antarctica.

Comments: Cited in Wallwork (1973), Tenorio (1976) and Pugh (1993). Males, nymphs and larvae known.

Stereotydeus shoupi Strandtmann 1967

*Stei*otydeus sboupi*: Pugh 1993, p. 342 (typing error and misspelled).

Distribution: Antarctica.

Comments: Cited in Wallwork (1973) and Tenorio (1976). Males, nymphs and larvae known.

Stereotydeus tasmanicus Qin 1994

Distribution: Australia.

Comments: Males and immature states unknown.

Stereotydeus undulatus Strandtmann 1964

Distribution: New Zealand, Antarctica.

Comments: Cited in Spain & Luxton (1971), Pugh (1993) and Qin (1998). Males and immature states unknown.

Stereotydeus vaginatus Olivier 2006

Stereotydeus vaginalis: Olivier 2006, figs. 1–7 (misspelled).

Distribution: South Africa.

Comments: Males known.

Stereotydeus villosus (Trouessart 1902)

Penthaleus villosus Trouessart 1902.

Tectophenthaleus villosus: Trägårdh 1907a, p. 18; Tragardh 1907b, p. 11.

Penthalodes villosus: Trouessart 1912 (not directly referred, according to Womersley & Strandtmann 1963, p. 456).

Stereotydeus (*Tectopenthalodes*) *villosus*: Berlese 1917, p. 8; Gressitt & Weber 1959, p. 445.

Stereotydeus villosus: Womersley & Strandtmann 1963, p. 456.

Distribution: Antarctica.

Comments: Cited in Strandtmann (1967), Tilbrook (1967), Wallwork (1973) and Pugh (1993). Redescription in Womersley & Strandtmann (1963). Males and nymphs known.

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