

A REDESCRIPTION OF THE CHIGGER MITE *SCHOENGASTIA PROPRIA* (ACARIFORMES: TROMBICULIDAE) AND ITS FIRST RECORD FROM IRAN

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ABSTRACT: A chigger mite species *Schoengastia propria* Audy and Womersley, 1957, described from a snake in India, is re-described based on new materials collected from an alcohol-fixed museum specimen of a lizard from Iran, as well as from a rat in Thailand.

KEY WORDS: chiggers, taxonomy, Asia, parasites of reptiles

DOI: 10.21684/0132-8077-2026-34-1-89-95

INTRODUCTION

Chigger mites of Iran have been studied since the 1970s, with major contributions by Vercammen-Grandjean *et al.* (1970) and Kudryashova *et al.* (1978). A recent checklist included 85 species of trombiculids from Iran (Stekolnikov *et al.* 2019b). Shortly thereafter, this number was increased to 104 as a result of new species descriptions and new country records (Shamsi *et al.* 2020). The majority of the Iranian chigger species known at that time were parasites of mammals. Vercammen-Grandjean *et al.* (1970) also recorded 12 species from birds and one species from a lizard. One species has been described from a scorpion (Stekolnikov *et al.* 2019a), while a few new species were collected without host association—from plants (Goff and Saboori 1998) and soil (Wen *et al.* 2012). Thus, until recently, only a single case of a chigger mite associated with a reptile host has been reported from Iran—the parasitizing of *Pentidionis agamae* (André, 1929) on *Agama* sp. (Squamata: Agamidae) in Kazerun (Vercammen-Grandjean *et al.* 1970).

A recent examination of a museum lizard specimen from Iran has yielded one chigger species tentatively identified as *Schoengastia* sp. (Orlova *et al.* 2023). Hereby, we provide the results of its identification. In view of some differences between our material and the previously published

morphological data on this species (*Schoengastia propria* Audy and Womersley, 1957), we provide its full redescription based on the Iranian sample, as well as on two specimens from Thailand. We also provide data on this species' individual variation.

MATERIALS AND METHODS

Chigger mites were collected from an alcohol-fixed lizard specimen, deposited at the Zoological Institute of the Russian Academy of Sciences (St. Petersburg, Russia; the collection acronym for the lizard specimens is ZISP, and for the chigger specimens—ZIN). Chiggers attached to the host's skin were extracted using tweezers and mounted on microscope slides using Berlese fluid.

The microscope examination and, partly, the drawing (of the idiosoma and legs) were performed using a Leica DM2500 microscope supplied with a drawing tube and a differential interference contrast device. The drawings of the scutum and the gnathosoma, as well as the accompanying measurements were taken using a MBI-3 microscope, supplied with phase contrast optics, a drawing tube and an ocular micrometre. The terminology and abbreviations used in the present work follow Goff *et al.* (1982), with a few additions (Stekolnikov *et al.* 2025).

RESULTS

***Schoengastia propria*
Audy and Womersley, 1957**

(Figs. 1–3)

Schoengastia propria Audy and Womersley, 1957: 367, fig. 8; Nadchatram *et al.* 1980: 269, 280; Fernandes and Kulkarni 2003: 324, fig. 106; Chaisiri *et al.* 2016: 332.

Schoengastia sp.: Orlova *et al.* 2023: 116, fig. 4.

Diagnosis. SIF = 7BS-N-3-(4-5)111.(0-1)000; fPp = B/N/NNB; fD = 2H-10(11)-(6-8)-6-4-2(4)-0(2), DS = 31–36, V = 28–41, NDV = 62–73; Ip = 869–898; scutum pentagonal, with posterior margin

slightly concave in center; sensillary bases at level of PLs; AL > PL >> AM; clavate sensilla partially covered with small setules; cheliceral blade with tricuspid cap and dorsal row of 4–6 teeth; tibialae II terminal; mastitarsala nude or ciliated. The measurements are provided in Table 1.

Redescription of larva. *Idiosoma* (Fig. 1). Eyes 2 + 2, on ocular plate; 31–36 barbed dorsal idiosomal setae; distribution by rows usually 2H-10-8-6-4-2(4), with little variation; two sternal setae between coxae I–II and two between coxae III; 28–41 ventral setae; NDV = 62–73.

Gnathosoma (Fig. 2). Cheliceral blade with tricuspid cap and dorsal row of 4–6 teeth, two distal teeth largest; cheliceral base with dense

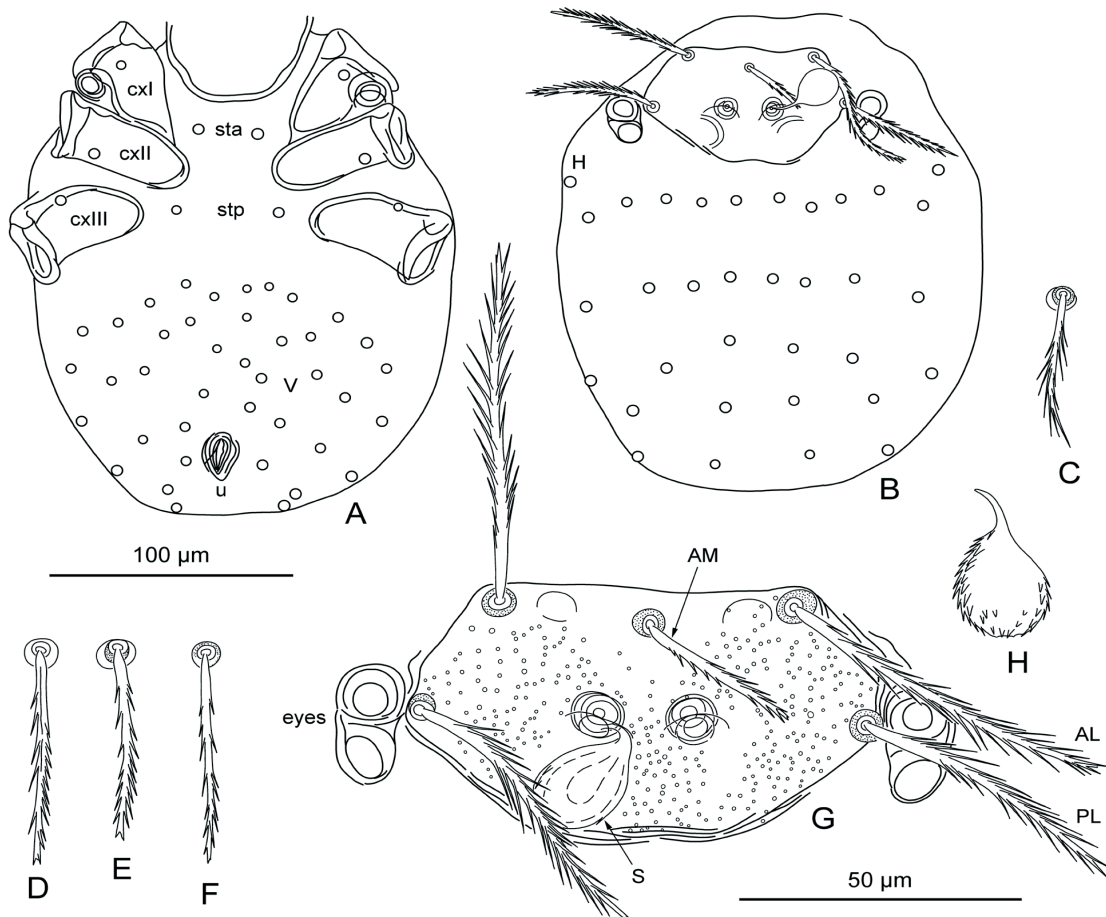


Fig. 1. *Schoengastia propria* Audy and Womersley, 1957, specimens from Iran. A—ventral aspect of idiosoma; B—dorsal aspect of idiosoma; C—preanal seta; D—humeral seta; E—dorsal idiosomal seta (central); F—dorsal idiosomal seta (marginal); G—scutum and eyes; H—sensillum.

Abbreviations: AL—anterolateral seta; AM—anteromedian seta; cxI—leg I coxa; cxII—leg II coxa; cxIII—leg III coxa; H—humeral seta; PL—posterolateral seta; S—sensillum; sta—anterior sternal setae; stp—posterior sternal setae; u—uropore (anus); V—ventral setae. Scale bars: 100 µm (A–B), 50 µm (C–H).

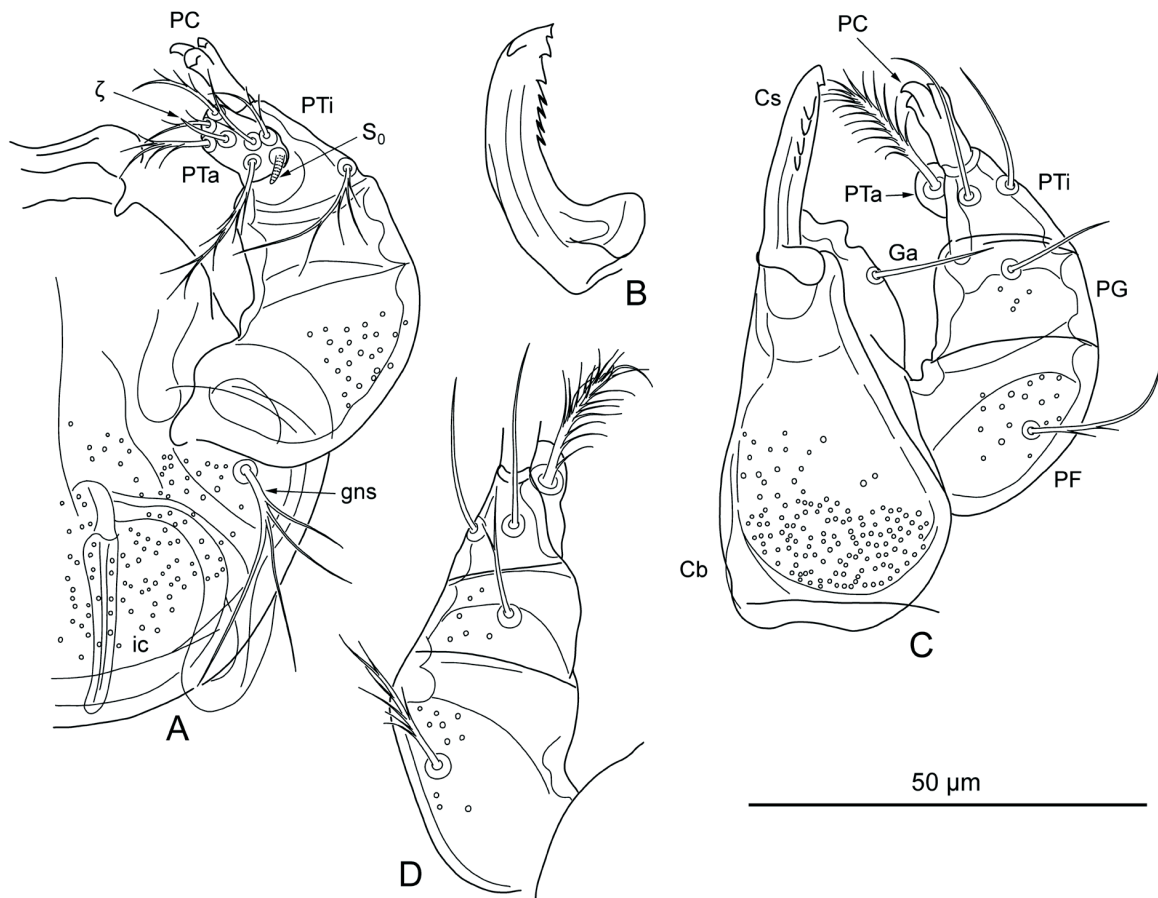


Fig. 2. *Schoengastia propria* Audy and Womersley, 1957, specimens from Iran (A–C) and Thailand (D). A—ventral aspect of gnathosoma; B—cheliceral blade, lateral view; C—dorsal aspect of gnathosoma; D—palp (specimen with branched genual seta).

Abbreviations: Cb—cheliceral base; Cs—cheliceral blade; Ga—galeal (deutorostral) seta; gns—gnathocoxal (tritorostral) seta; ic—infracapitulum (gnathobase, gnathocoxa); PC—palpal claw (odontus); PF—palpal femur; PG—palpal genu; PTa—palpal tarsus; PTi—palpal tibia; S_0 —palpal tarsala (ω); ζ —palpal subterminala (ζ).

puncta in proximal part and sparse puncta in medial part; gnathobase (infracapitulum) with sparse puncta, without transverse cuticular striations, bears one pair of branched tritorostral setae; galeal (deutorostral) seta nude; palpal claw (odontus) with three large, subequal, curved prongs; palpal femur and genu with puncta; palpal femoral seta branched; palpal genual seta nude; palpal tibia with nude dorsal and lateral setae and branched ventral seta; palpal tarsus with seven branched setae, nude subterminala (ζ) and basal tarsala (ω).

Scutum (Fig. 1G, H). Nearly pentagonal, with small puncta; posterior scutal margin greatly projected, arcuate, slightly concave in center, superimposed by cuticular striations; AM slightly posterior to level of ALs; sensillary bases at level of PLs (PSB – P-PL = –1–2, mean 1); clavate sensilla (trichobothria) partially covered with small

setules; AL > PL >> AM; ALs and PLs larger and covered with much longer barbs than dorsal idiosomal setae; scutal corners rounded, not projected.

Legs (Fig. 3). All seven-segmented (with divided femur), with one pair of claws and claw-like empodium. Sensory setae: Leg I: 4–5 genualae (σ), microgenuala (κ), 2 tibialae (φ) and microtibiala (κ) in distal part of segment, tarsala I (ω), famulus (ϵ) distal to tarsala, subterminala (ζ), nude parasubterminala (z), pretarsala (ζ). Leg II: genuala (σ), 2 tibialae (φ) in terminal position, close to each other, tarsala (ω), famulus (ϵ) proximal to tarsala, pretarsala (ζ). Leg III: genuala (σ), tibiala (φ), mastitarsala ciliated at different extent. Unspecialized setae (leg I, II, III): coxa 1, 1, 1; trochanter 1, 1, 1; basifemur 1, 2, 2; telofemur 5, 4, 3; genu 4, 3, 3; tibia 8, 6, 6; tarsus 22, 16, 15 (including mastitarsala).

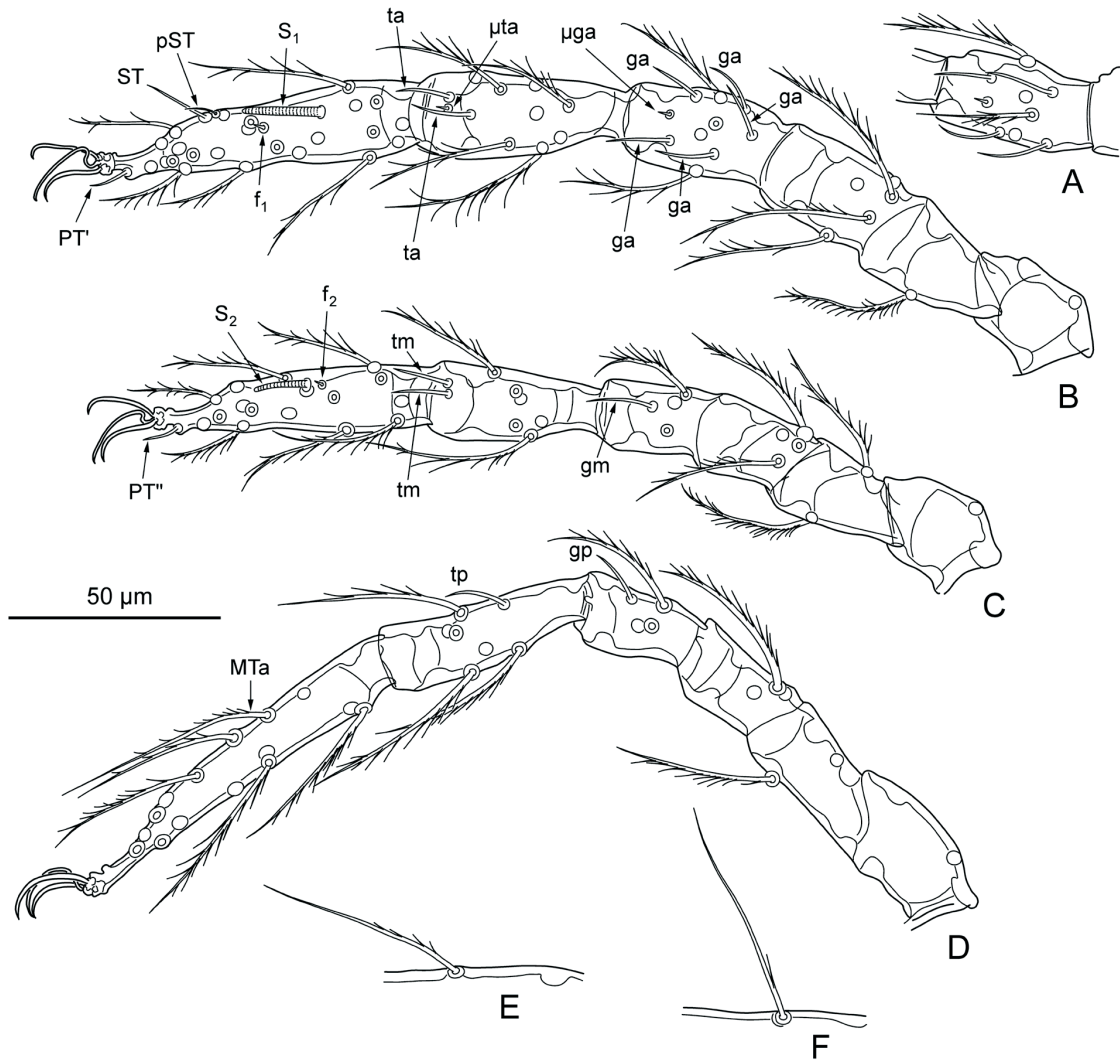


Fig. 3. *Schoengastia propria* Audy and Womersley, 1957, specimens from Iran. A—genu of leg I with four genualae; B—leg I, trochanter–tarsus, genu with five genualae; C—leg II, trochanter–tarsus; D—leg III, trochanter–tarsus; E, F—mastitarsala, variants of ciliation.

Abbreviations: f_1 —famulus I (ϵ); f_2 —famulus II (ϵ); ga—genuala I (σ); gm—genuala II (σ); gp—genuala III (σ); MTa—mastitarsala; pST—paraterminala (z); PT'—pretarsala I (ζ); PT''—pretarsala II (ζ); S_1 —leg I tarsala (ω); S_2 —leg II tarsala (ω); ST—subterminala (ζ); ta—tibiala I (φ); tm—tibiala II (φ); tp—tibiala III (φ); μ ga—microgenuala (κ); μ ta—microtibiala (κ).

Distribution and hosts. This species was described from Bombay (currently Mumbai), India, from the Asiatic water snake *Fowlea piscator* (Schneider, 1799) (as *Natrix piscator*) (Squamata: Colubridae). Later, it was recorded from Thailand, the Kanchanaburi Province, from the black rat *Rattus rattus* (L., 1758) (Rodentia: Muridae) (Nadchatram *et al.* 1980), as well as from the Tak Province, from the rats *Bandicota indica* (Bechstein, 1800) and *R. rattus* (Chaisiri *et al.* 2016). Herein, *S. propria* is reported from both Iran and the lizard *Lacerta strigata* Eichwald, 1831 (Squamata: Lacertidae) for the first time.

Type deposition. Holotype (larva), CORU 43862, ex *Natrix piscator*, Bombay, India, 4 May 1956, coll. Haffkine Institute, was deposited in the collection of the Zoological Survey of India (Kolkata, India). One paratype each was deposited in the Natural History Museum (NHM, London, UK), the United States National Museum of Natural History (USNM, Washington DC) and the personal collection of J.R. Audy (Audy and Womersley 1957). However, the senior author (AAS) did not find any material on *S. propria* during his revision of the NHM collection in 2017 and 2019. This species was also absent from the catalogue of the

USNM collection (Bassini-Silva *et al.* 2021). The place of the deposition of the personal collection of J.R. Audy is unknown. Fernandes and Kulkarni (2003) have examined a paratype with the number CORU 43061, loaned by M. Nadchatram. The place of its current deposition is also unknown.

Material examined. Thirty-three larvae (ZIN 18819–18851) ex *Lacerta strigata*, collection lot number ZISP 22069, Iran, Mazandaran Province, near Babolsar, 36°41' N, 52°41' E, 5 July 1942, the Soviet Epidemiological and Parasitological Expedition; mites collected by Igor V. Doronin. Two larvae (ZIN 9837 and 9838) ex *Bandicota indica* No. R7127, Thailand, Tak Province, Mae Sot District, coconut and banana plantation, 16.481683° N, 98.440465° E, 5 December 2013, coll. Kittipong Chaisiri (Chaisiri *et al.* 2016).

DISCUSSION

Schoengastia Oudemans, 1910 currently includes 94 species distributed in Africa, Asia (except Northern), Australia and Oceania (Nielsen *et al.* 2021). The genus exhibits broad host diversity, parasitizing reptiles, small mammals and occasionally birds. Some of its species were reported attacking humans (Stekolnikov 2021). Vercammen-Grandjean (1958) revised African *Schoengastia* while Nadchatram *et al.* (1980) revised *Schoengastia* of the Asiatic-Pacific region. However, many species of this genus remain incompletely described due to their types being hard to access or lost (Stekolnikov 2024).

Schoengastia propria is the second chigger species found on a reptile host in Iran and the second species of *Schoengastia* recorded from this country. Previously, Wen *et al.* (2012) described *Schoengastia (Priomesochela) persica* Wen, Saboori and Akrami, 2012 based on one specimen extracted from soil using a Berlese's funnel. Fernandes and Kulkarni (2003), who examined one paratype of *S. propria*, have corrected and updated its description. All type specimens of *S. propria* lack the AM scutal seta; thus, here, we provide data on this seta for the first time, filling a longstanding gap in the morphological characterization of this species.

Our material differs from the type series by the presence of eight (seven in one specimen) vs. six setae in the 2nd posthumeral row (more specifically, fD = 2H-10(11)-8(7)-6-4-2(4)-0(2) vs. 2H-10-6-6-4-2-2). Since neither the original description (Audy and Womersley 1957), nor the redescription (Fer-

nandes and Kulkarni 2003) included a drawing of the idiosoma, we cannot establish whether this difference reflects a real intraspecific variation or a different interpretation of the setal pattern. The metric and meristic characters of the samples from Iran, Thailand and India do not exhibit any differences of taxonomic significance (Table 1). Audy and Womersley (1957) described the mastitarsala of *S. propria* as nude or bearing one cilium (“short barbule”) in the proximal third. In our material, there is a variation from a typical upstanding mastitarsala bearing one cilium to a heavily ciliated seta almost indistinguishable from other unspecialized leg setae (Fig. 3D–F). This variation suggests that the mastitarsala morphology should be treated as a variable rather than a diagnostic character of this species.

The presence of 4–5 genualae I in *S. propria* is a rare trait: this species shares it only with *S. yunnanensis* Liu, Hsu and Wen, 1965, whereas other *Schoengastia* possess 3 or 2 genualae I (Vercammen-Grandjean 1958; Nadchatram *et al.* 1980). The four genualae are arranged in two lateral pairs, with the fifth seta occupying a dorsal and proximal (Fig. 3B), or sometimes lateral, distal position. This unpaired seta or one of the distal genualae may occasionally be absent (Fig. 3A).

Schoengastia yunnanensis was described from two specimens (holotype and paratype) collected from a rat in the Yunnan Province, China (Li *et al.* 1965). This species is very close to *S. propria*, but differs from it in the presence of heavily branched palpal genual seta (vs. seta bearing at most one cilium). According to the original description, *S. yunnanensis* also possess eight branched setae on the palpal tarsus and two morphologically distinct microgenualae I. All other chigger mites, on the other hand, have at most seven unspecialized setae on the palpal tarsus and one microgenuala I. It is not clear if these unique traits are in fact the stable characters of the species or rare morphological abnormalities; they could also be a result of examination errors. We consider it plausible that *S. yunnanensis* is conspecific with *S. propria*. To resolve this question, we recommend a re-examination of the type materials of both species in the future.

ACKNOWLEDGEMENTS

This study was supported by the cooperative agreements No. 125013001089-0 (to Alexandr A. Stekolnikov) and No. 125012800908-0 (to Igor V.

Doronin) from the Ministry of Science and Higher Education of the Russian Federation. The Thai chigger specimens were obtained through the CERoPath project (ANR 07 BDIV 012) and the BioDivHealthSEA project (ANR 11 CPEL 002), both funded by the French National Research Agency.

REFERENCES

- Audy, J.R. and Womersley, H. 1957. Malaysian Parasites—XXIX. New species of Oriental and Australian Trombiculidae (Acarina). *Studies from the Institute for Medical Research, Federation of Malaya*, 28: 359–382.
- Bassini-Silva, R., Jacinavicius, F.C., Welbourn, C., Barros-Battesti, D.M. and Ochoa, R. 2021. *Complete type catalog of Trombiculidae sensu lato (Acari: Trombidiformes) of the U.S. National Entomology Collection, Smithsonian Institution*. Smithsonian Contributions to Zoology, 652. Smithsonian Scholarly Press, Washington, D.C., 141 pp.
- Chaisiri, K., Stekolnikov, A.A., Makepeace, B.L. and Morand, S. 2016. A revised checklist of chigger mites (Acari: Trombiculidae) from Thailand, with the description of three new species. *Journal of Medical Entomology*, 53: 321–342. <https://doi.org/10.1093/jme/tjv244>
- Fernandes, S.J., S. and Kulkarni, S.M. 2003. Studies on the trombiculid mite fauna of India. *Records of the Zoological Survey of India, Occasional Paper*, 212: 1–539.
- Goff, M.L., Loomis, R.B., Welbourn, W.C. and Wrenn, W.J. 1982. A glossary of chigger terminology (Acari: Trombiculidae). *Journal of Medical Entomology*, 19: 221–238. <https://doi.org/10.1093/jmedent/19.3.221>
- Goff, M.L. and Saboori, A. 1998. Two new species of chiggers (Acari: Trombiculidae and Leeuwenhoekiiidae) from Iran. *Journal of Medical Entomology*, 35: 857–860. <https://doi.org/10.1093/jmedent/35.5.857>
- Kudryashova, N.I., Neronov, V.M. and Farang-Azad, A. 1978. Mites of the family Trombiculidae (Acariformes) from small mammals from Iran. *Sbornik Trudov Zoologicheskogo Muzeya MGU*, 16: 92–180. [In Russian]
- Nadchatram, M., Goff, M.L. and Thanalukshumi, P. 1980. The genus *Schoengastia* (Acari: Trombiculidae) in the Asiatic-Pacific region. *Journal of Medical Entomology*, 17: 268–281. <https://doi.org/10.1093/jmedent/17.3.268>
- Nielsen, D.H., Robbins, R.G. and Rueda, L.M. 2021. Annotated world checklist of the Trombiculidae and Leeuwenhoekiiidae (1758–2021) (Acari: Trombiculoidea), with notes on nomenclature, taxonomy, and distribution. *Zootaxa*, 4967: 1–243. <https://doi.org/10.11646/zootaxa.4967.1.1>
- Orlova, M.V., Doronin, I.V., Doronina, M.A., Anisimov, N.V. and Dolgova, I.G. 2023. A review of chigger mites (Trombiculidae) associated with *Lacerta* spp. (Reptilia: Lacertidae) from Caucasus and adjacent territory. *Russian Journal of Herpetology*, 30: 112–117. <https://doi.org/10.30906/1026-2296-2023-30-2-112-117>
- Shamsi, M., Stekolnikov, A.A., Saboori, A., Hakimitabar, M. and Golpayegani, A.Z. 2020. Contributions to the fauna of chigger mites (Acariformes: Trombiculidae) of Iran. *Zootaxa*, 4834: 301–355. <https://doi.org/10.11646/zootaxa.4834.3.1>
- Stekolnikov, A.A. 2021. A checklist of chigger mites (Acariformes: Trombiculidae) of Southeast Asia. *Zootaxa*, 4913: 1–163. <https://doi.org/10.11646/zootaxa.4913.1.1>
- Stekolnikov, A.A. 2024. Revision of South African chiggers (Acariformes: Trombiculidae) originated from the collection of R.F. Lawrence, with redescription of nine species. *Zootaxa*, 5493: 1–35. <https://doi.org/10.11646/zootaxa.5493.1.1>
- Stekolnikov, A.A., Halajian, A. and Mathee, S. 2025. Revision of the African chigger mite genus *Hyracarus* (Acariformes: Trombiculidae: Leeuwenhoekiiinae). *Persian Journal of Acarology*, 14: 41–86. <https://doi.org/10.22073/pja.v14i1.86155>
- Stekolnikov, A.A., Mohammadi Bavani, M., Rafinejad, J. and Saboori, A. 2019a. A new species of chigger mite (Acariformes: Trombiculidae: Leeuwenhoekiiinae) collected from a scorpion in Iran. *International Journal of Acarology*, 45: 341–346. <https://doi.org/10.1080/01647954.2019.1649306>
- Stekolnikov, A.A., Saboori, A., Shamsi, M. and Hakimitabar, M. 2019b. Chigger mites (Acariformes: Trombiculidae) of Iran. *Zootaxa*, 4549: 1–66. <https://doi.org/10.11646/zootaxa.4549.1.1>
- Vercammen-Grandjean, P.H. 1958. Revue des *Schoengastia* centrafricains et remaniements divers de cet important genre (Acarina–Trombiculidae). *Annales de Parasitologie Humaine et Comparée*, 33: 619–670.
- Vercammen-Grandjean, P.H., Rohde, C.J. and Mesghali, H. 1970. Twenty larval Trombiculidae (Acarina) from Iran. *Journal of Parasitology*, 56: 773–806. <https://doi.org/10.2307/3277727>
- Wen, T.H., Saboori, A. and Akrami, M.A. 2012. A new sand mite of *Schoengastia* (Acari: Trombiculidae) from the soil under camel's thorn in Iran. *Persian Journal of Acarology*, 1: 1–10.

Redescription of *Schoengastia propria*

Table 1.
Morphometric (AW– S₂, µm) and meristic (DS–NDV) traits of *Schoengastia propria*.

	Iran			Thailand		India*
	Range	Mean	N	ZIN 9837	ZIN9838	
AW	50–59	54	10	46	50	48–51
PW	77–83	80	10	68	72	71–76
SB	15–20	17	10	14	15	15–15
ASB	23–28	26	10	31	23	26–27
PSB	25–29	27	10	24	27	20–22
SD	50–56	53	10	55	50	46–49
P-PL	25–27	26	10	30	27	—
AP	25–29	27	10	24	25	24–26
AM	25–31	28	9	23	23	—
AL	60–67	64	9	61	—	61?– 68
PL	49–58	53	10	56	58	48? –51
S(length)	25–31	28	5	31	31	28–29
S(width)	14–15	14	5	14	14	15– 16
H	40–43	41	10	41	43	39–43
D _{min}	27–32	29	10	31	32	—
D _{max}	38–41	40	10	41	41	36–37
V _{min}	25–31	27	9	27	25	26–28
V _{max}	32–36	34	9	36	34	34– 41
pa	306–313	309	6	324	302	281
pm	266–275	270	6	272	275	248
pp	293–319	306	6	313	319	284
Ip	869–898	885	6	909	896	813
TaIII L	85–92	88	8	95	94	81
TaIII W	13–14	14	8	14	14	16
S ₁	17–20	18	4	16	15	17–19
S ₂	12–15	14	4	16	14	13–14
DS	31–36	33	9	37	32	32
V	28–41	35	9	39	43	32–36
NDV	62–73	68	10	76	75	68–72

Note: *Holotype and two paratypes, after Fernandes and Kulkarni (2003); values outside the intervals for the Iranian sample are in **bold**.