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Complementary description of *Lasioseius thermophilus* Willmann, 1942 (Acari: Blattisociidae) based on the material collected from Iran

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Abstract

Lasioseius thermophilus Willmann, (Acari: Blattisociidae) was first described by Willmann in 1942 and then by Westeborer in 1963 based on one female specimen from Poland. Both descriptions are only based on female specimens and are not complete since they lack complete measurements of the setae, details of ventral shields, leg chaetotaxy and spermathecal apparatus. Therefore, the male specimen of this species is described and its female specimen is redescribed based on the materials collected from Guilan province, Iran.

Keywords: Gamasida, Phytoseioidea, predatory mites, redescription

1. Introduction

The family Blattisociidae generally comprises predators and fungivores mites. Most species of this family have been reported from litter, while some species have been found on rodents and in bird nests as well as from aerial plant parts (Lindquist et al., 2009). *Lasioseius* Berlese, 1916 is the most diverse and abundant genus in the family Blattisociidae. The genus contains about 210 species that have been reported feeding on phytopha-gous mites, small arthropods and nematodes, some species feed on fungi (Christian & Karg 2006; Moraes et al., 2015; Abo-Shnaf et al., 2016; Moraza & Lindquist, 2018; Argolo et al., 2018; Mašán, 2023; Mašán & Halliday, 2023; Santos et al., 2024). Until now, 19 species from the genus *Lasioseius* have been reported in Iran (Kamali et al., 2001; Kazemi & Rajaei, 2013; Nemati et al., 2018; Mohammadi & Hajizadeh, 2022; Hajizadeh et al., 2023).

Lasioseius thermophilus Willmann, 1942 (Blattisociidae) was first described by Willmann in 1942 and then by Westeborer, 1963 based on one female specimen from Poland. Both Willmann (1942) and Westeborer (1963) used the same type material in their descriptions. Although the original description (Willmann, 1942) and second description (Westeborer 1963) are quite detailed, they do not include several important morphological characters regarding the setal measurements, details of ventral shields, leg chaetotaxy and spermathecal apparatus of female. Therefore, in this paper male specimen of *L. thermophilus* is described for first time and its female specimen redescribed based on the materials collected from Guilan Province, Iran. This species was previously recorded from Golestan Province (Gorgan), in Iran (Malek-Shahkouyi et al., 2011; Hajizadeh et al., 2023).

2. Materials and methods

In this study, mites were collected from rotten tree trunks samples in Guilan province, Northern Iran. Mites were extracted from samples using Berlese funnels. Specimens were sorted and preserved in 70% ethanol, cleared in Nesbitt's fluid and mounted on microscope slides using Hoyer's medium. All measurements are given in micrometres (μm). The lengths and widths of the idiosoma were taken from the anterior to posterior margins along the midline, and lengths of shields were measured along their midlines and widths at their widest point. The length of the legs was taken from the base of the coxa to the apex of the tarsus, without the pretarsus. Setae were measured from the base of their insertions to their tips. The mean of the measurements is given followed by the range in parentheses. Notations of body structures and idiosomal chaetotaxy follow Lindquist and Evans (1965). Leg setal notation and chaetotactic formulae are based on Evans (1963). Terminology for the other anatomical structures follows Evans and Till (1979) and Evans (1964). For precise inspection of morphological characters of prepared specimens, a compound Olympus microscope (Olympus Optical Co., Ltd, Tokyo, Japan) equipped with differential interference contrast and phase contrast optical system and Canon camera (EOS Kiss X5; Japan) were used. The voucher specimens of the species were preserved as slide-mounted specimens in the Acarology Laboratory, Department of Plant Protection, Faculty of Agricultural Sciences at the University of Guilan, Rasht, Iran.

3. Results

Phytoseioidea

Blattisociidae Garman, 1948

***Lasioseius* Berlese, 1916**

***Lasioseius thermophilus* Willmann, 1942**

Lasioseius (*Zercoseius*) *thermophilus* Willmann, 1942: 242.

Lasioseius (*Lasioseius*) *thermophilus* Westerboer, 1963: 245

Description

Female (Five specimens measured).

Dorsal idiosoma (Figs. 1, 5): Dorsal shield oval, 460 (450-480) long and 270 (260-280) wide in *j6* level, reticulated entirely; with 36 pairs of dorsal setae, podonotal part with 21 pairs of setae (*j1- j6*, *z1-z6*, *s1-s6*, *r2-r4*) and opisthonotal part with 15 pairs of setae (*J1-J5*, *Z1-Z5*, *S1*-S5); most of dorsal shield setae tricarinate except for *z1*, *s2*, *r2*, *r4*, *R1- R8* short, smooth and aciculate; setae *S4*, *S5*, *Z3*, *Z4* and *Z5* distally serrate; lengths: *j1* 28 (25-30), *j2* 23 (18-25), *j3* 29 (28-33), *j4* 27 (23-30), *j5* 26 (23-30), *j6* 29 (25-33), *J1* 28 (25-30), *J2* 30 (28-33), *J3* 30 (28-32), *J4* 30 (25-33), *J5* 14 (12-15), *z1* 14 (13-15), *z2* 24 (23-25), *z3* 31 (30-33), *z4* 31 (30-33), *z5* 26 (23-28), *z6* 28 (25-30), *Z1* 29 (28-30), *Z2* 31 (30-32), *Z3* 35 (33-38), *Z4* 44 (40-48), *Z5* 51 (48-53), *s1* 21 (18-25), *s2* 10 (9-12), *s3* 31 (30-33), *s4* 29 (28-30), *s5* 31 (28-33), *s6* 34 (33-35), *S1* 32 (30-33), *S2* 34 (31-35), *S3* 36 (35-38), *S4* 39 (38-40), *S5* 44 (40-48), *r2* 13 (12-14), *r3* 44 (43-50), *r4* 15 (13-18), *r5* 24 (23-28), *R1* 19 (18-20), *R2* 20 (18-22), *R3* 18 (16-20), *R4* 19 (18-20), *R5* 17 (15-18), *R6* 18 (15-19), *R7*19 (18-20), *R8* 24 (20-28), setae *r5* and *R1–R8* on lateral integument; dorsal shield with 7 pairs of solenostomes (*gd1*, *gd2*, *gd4*, *gd5*, *gd6*, *gd8*, *gd9*) and 10 pairs small poroids.

Peritreme and peritrematal shield – Peritrematal shield fused anteriorly with dorsal shield and extending posteriorly behind coxa IV; peritreme extending forward to level of setae *j1*.

Ventral idiosoma (Fig. 6): Ventral setae aciculate and smooth, except *JV5*, which is thicker and serrate distally. Tritosternum 96 (86-106) long, base 41(38-45) long, laciniae 55 (48-63) long. Presternal region transversely striate. Sternal shield punctate, retracted in coxae II region, posterior margin slightly concave, 115 (105-125) long and 82 (80-83) wide at level of setae *St2*, bearing three pairs of setae (*st1–st3*) and two pairs of lyrifissures (*iv1*, *iv2*), *St1* 32 (28-35), *St2* 29 (28-30), *St3* 25 (23-28), *St1* situated on the anterior margin of sternal shield. Metasternal plate rounded, bearing the fourth pair of sternal setae *St4* 24 (20-25) and a pair of lyrifissures (*iv3*). Endopodal strips situated between coxae III-IV and anterior part of genital shield. Genital shield punctate, rectangular, somewhat retracted above *St5*, 87 (83-93) long and 63 (60-77) wide at post corners, *St5* 22 (20-25). Two pairs of metapodal shields, primary 19 (18-20) long and 7 (6-10) wide, accessory 14 (10-15) long and 4 (3-5) wide. With a fine structural line between genital and ventrianal shields. Ventrianal shield is almost triangular with rounded corners, slightly tucked in at side of anus, with transverse striae and finely

punctate, broader than long, length 143 (138-157), width at level of setae *Zv2* (widest point) 170 (165-180); with four pairs of preanal setae, *Jv1* 18 (15-23), *Jv2* 24 (21-25), *Jv3* 22 (20-23), *Zv2* 21 (15-23); five pairs of setae surrounding ventrianal shield on integument all simple except *Jv5* tricarinate, *Jv4* 17 (15-18), *Jv5* 38 (35-40), *Zv1* 17 (15-20), *Zv3* 14 (13-15), *Zv4* 11 (10-13), five pairs of pores surrounding ventrianal shield; paranal setae 20 (18-23) and postanal seta 28 (24-30).

Sperm induction structures. Spermathecal apparatus (Fig. 8) well developed and pear-shaped, total length 32 (25-45), with a well-sclerotised neck 18 (13-25) and spherical vesicle or saccule 14 (13–15) in diameter.

Gnathosoma (Fig. 2): Corniculi hornlike, internal malae lanceolate and densely bearded with apices reaching the same level as the tip of corniculi; fixed cheliceral digit 47 (45-50) long with 13-14 teeth and apical hook, pilus dentilis short; movable digit tridentate, 45 (40-50) long (Fig. 4). Deutosternum with eight transverse rows, the most distal one smooth, the other seven with connected rows of denticles, the two basal rows slightly wider, with 8 and 16 denticles respectively (Fig. 3); anterior margin of epistome triramous, median ramus thorn-like, lateral rami divided into 3-4 prongs (Fig. 7). Hypostomal setae smooth and needlelike, *h1* 28 (25-30), *h2* 15 (13-18), *h3* 28 (25-30), *pc* 28 (23-30) (Fig. 3). Palp 148 (145-150) long with normal chaetotaxy (Fig. 2).

Legs (Fig. 1): Legs I–IV with paired claws and rounded pulvilli, lengths of legs: leg I 440 (420-460), leg II 348 (330-360), leg III 330 (310-340), leg IV 452 (420-470), leg III shorter than other legs; all setae aciculate, leg chaetotaxy for coxa I-IV: 2; 2; 2; 1; for trochanter I-IV: 6; 5; 5; 5; for femora I-IV: 12 (2, 3/1, 2/2, 2); 11 (2, 2/1, 3/2, 1); 6 (1, 2/1, 1/0, 1); 6 (1, 2/1, 1/0, 1); for genua I-IV: 13 (2, 3/2, 3/1, 2); 11 (2, 3/1, 2/1, 2; 9 (2, 2/1, 2/1, 1); 9 (2, 2/1, 3/0, 1) and for tibiae I-IV: 13 (2, 3/2, 3/1, 2); 10 (2, 2/1, 2/1, 2); 8 (2, 1/1, 2/1, 1); 10 (2, 1/1, 3/1, 2).

Male (Five specimens measured).

Diagnosis: Dorsal shield with 36 pairs of setae; setae *z1*, *s2*, *r2*, *r4*, *R1- R8* short, smooth and aciculate; sternogenital shield punctate over most of surface with a few lateral striae, with five pairs of setae and three pairs of lyrifissures; ventrianal shield with transverse striae and finely punctate, with six pairs of preanal setae; setae *Zv5* on lateral integument; fixed cheliceral digit with 10 teeth; movable digit with a single tooth; spermatodactyl long, ending in knob-like process.

Dorsal idiosoma (Fig. 9): Dorsal shield oval, 326 (310-340) long and 192 (180-200) wide in *j6* level, reticulated entirely; with 36 pairs of dorsal setae, podonotal part with 21 pairs of

setae (*j1- j6*, *z1-z6*, *s1-s6*, *r2-r4*) and opisthonotal part with 15 pairs of setae (*J1-J5*, *Z1-Z5*, *S1-S5*); most of dorsal shield setae tricarinate except for *z1*, *s2*, *r2*, *r4*, *R1- R8* short, smooth and aciculate; setae *S4*, *S5*, *Z3*, *Z4* and *Z5* distally serrate; lengths: *j1* 21 (20-23), *j2* 21 (20-22), *j3* 25, *j4* 22 (20-24), *j5* 20, *j6* 22 (20-23), *J1* 21 (20-22), *J2* 24 (23-25), *J3* 22 (20-25), *J4* 23 (20-25), *J5* 9 (8-10), *z1* 12 (10-13), *z2* 22 (20-23), *z3* 26 (25-28), *z4* 25, *z5* 21 (20-25), *z6* 24 (23-25), *Z1* 25, *Z2* 26 (25-27), *Z3* 29 (28-30), *Z4* 35 (30-38), *Z5* 37 (35-40), *s1* 14 (12-15), *s2* 11 (10-12), *s3* 25 (23-26), *s4* 26 (25-27), *s5* 26 (25-27), *s6* 25, *S1* 23 (20-25), *S2* 23 (22-25), *S3* 24 (23-25), *S4* 27 (25-28), *S5* 25 (23-28), *r2* 13, *r3* 34 (33-37), *r4* 12 (10-13), *r5* 17 (15-20), *R1* 14 (12-15), *R2* 13, *R3* 13, *R4* 12 (10-13), *R5* 11 (10-12), *R6* 12 (10-13), *R7* 12 (10-13), *R8* 13 (10-18), setae *r5* and *R1–R8* on lateral integument; adenotaxy of dorsal shield as in female.

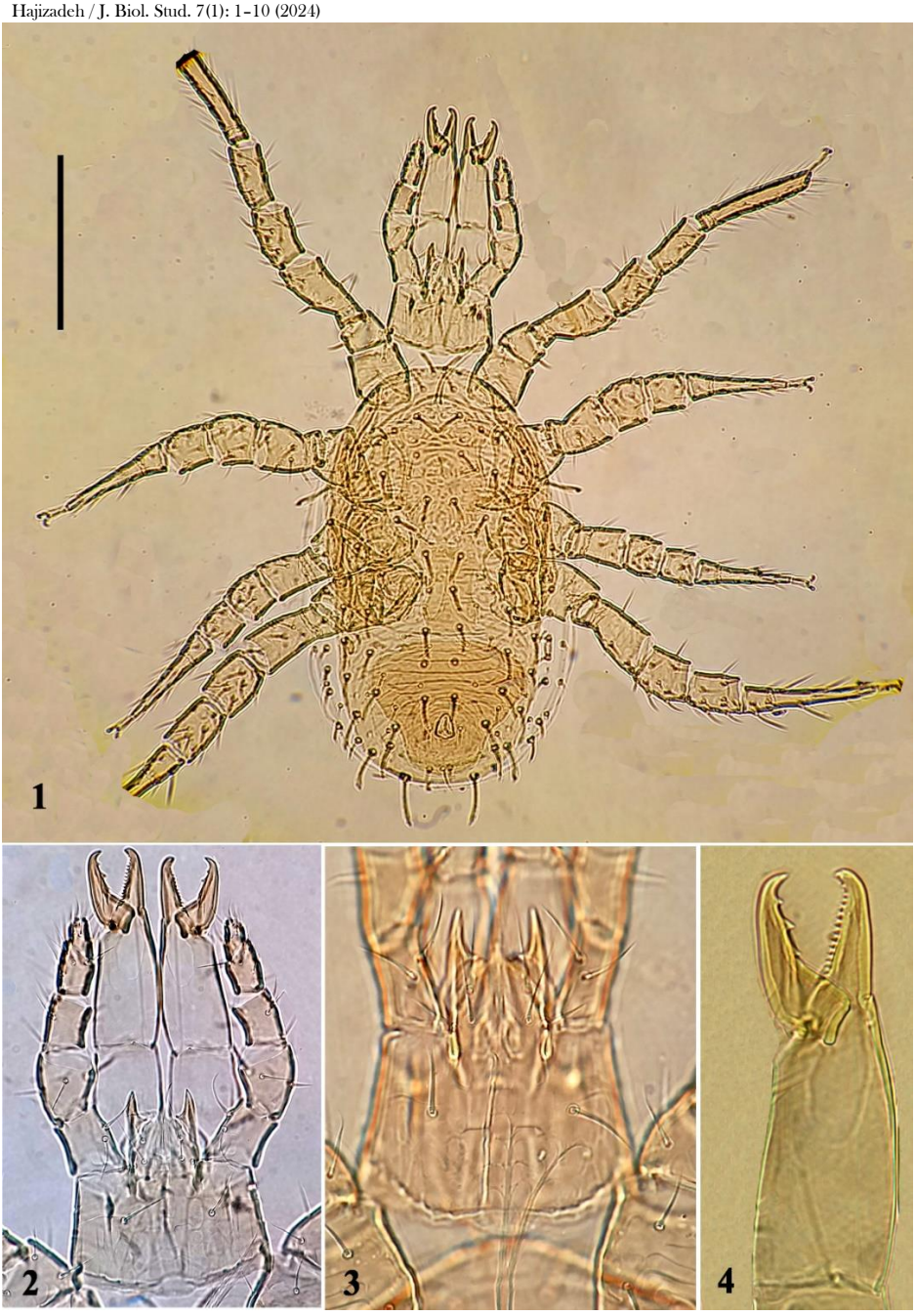
Peritreme and peritrematal shield – As in female.

Ventral idiosoma (Fig. 10) – Tritosternum 65 (60-70) long, base 21 (18-25) long, laciniae 43 (38-45) long. Presternal region transversely striate. Sternogenital shield punctate over most of surface with a few lateral striae, 159 (140-168) long and 70 (65-75) and at level of setae *St2*, with five pairs of setae and three pairs of lyrifissures, *St1* 25, *St2* 21 (20-23), *St3* 22 (20-23), *St4* 17 (15-18), *St5* 15; ventrianal shield with transverse striae and finely punctate, length 115 (110-120), width at level of setae *Zv2* (widest point) 150 (133-170), and width at level of paranal setae 106 (100-113); with six pairs of preanal setae [*Jv1* 17 (15-18), *Jv2* 20, *Jv4* 18 (17-20), *Jv5* 21 (20-23), *Zv1* 14, *Zv2* 18 (15-20)]; one pair of setae surrounding ventrianal shield on integument all simple [*Zv5* 15 (10- 21)]; paranal setae 15 and postanal seta 22 (19-23).

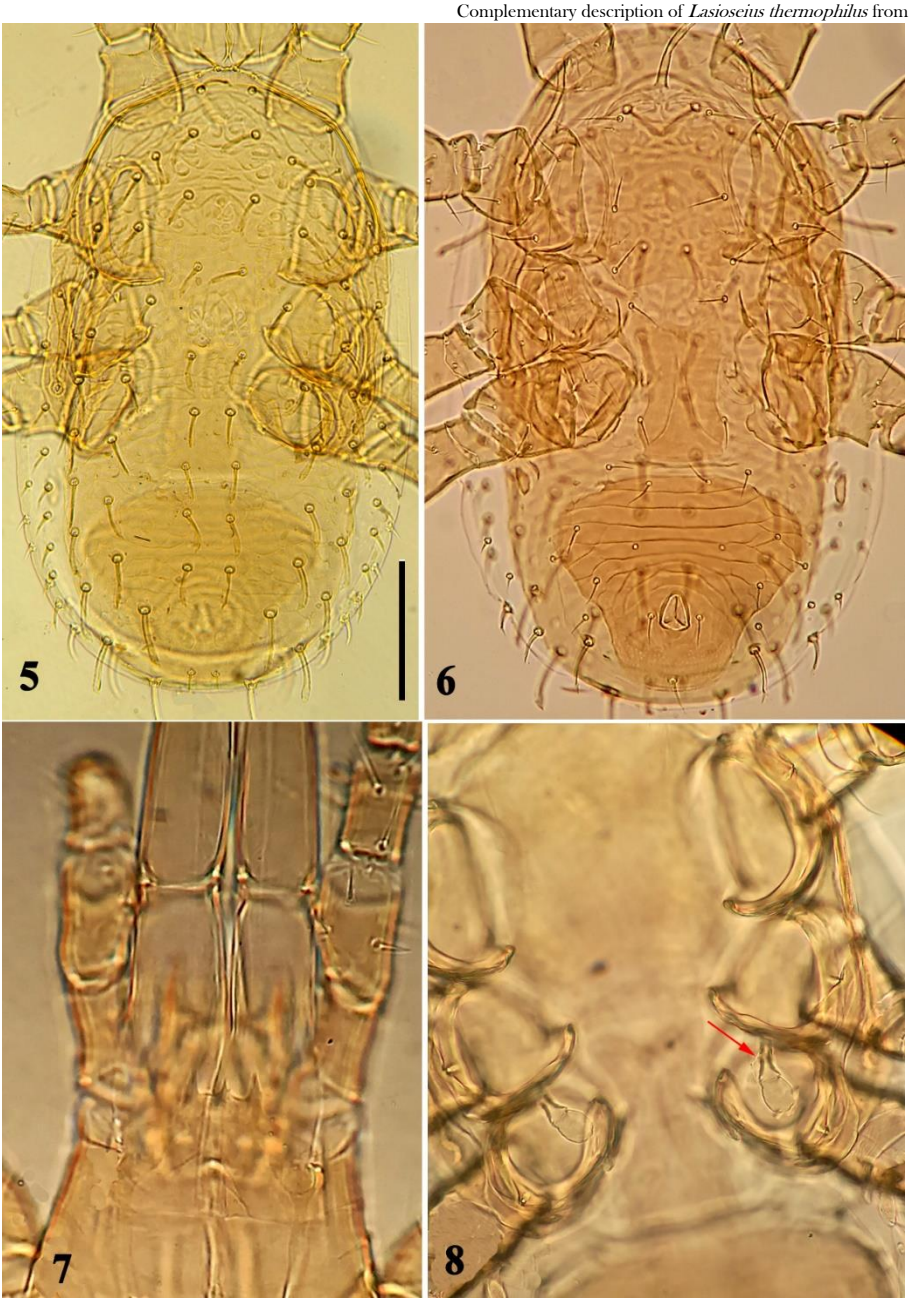
Gnathosoma (Figs. 11-13): Corniculi and internal malae as in female; fixed cheliceral digit 26 (25-28) long with 10 teeth and apical hook and a short pilus dentilis; movable digit 28 long with a single tooth (Figs. 11-13); Spermatodactyl 29 (25-33) long, ending in knob-like process (Figs. 12, 13). Deutosternum structures as in female; subcapitular setae *h1* 19 (18-21), *h2* 12, *h3* 19 (17-23) and pc 22 (20-23); palp 122 (120-125) long; epistome as in female.

Legs –Lengths of legs: leg I 340 (320-360), leg II 252 (230-270), leg III 238 (220-270), leg IV 350 (340-370), setation and form of setae on legs I–IV as in female.

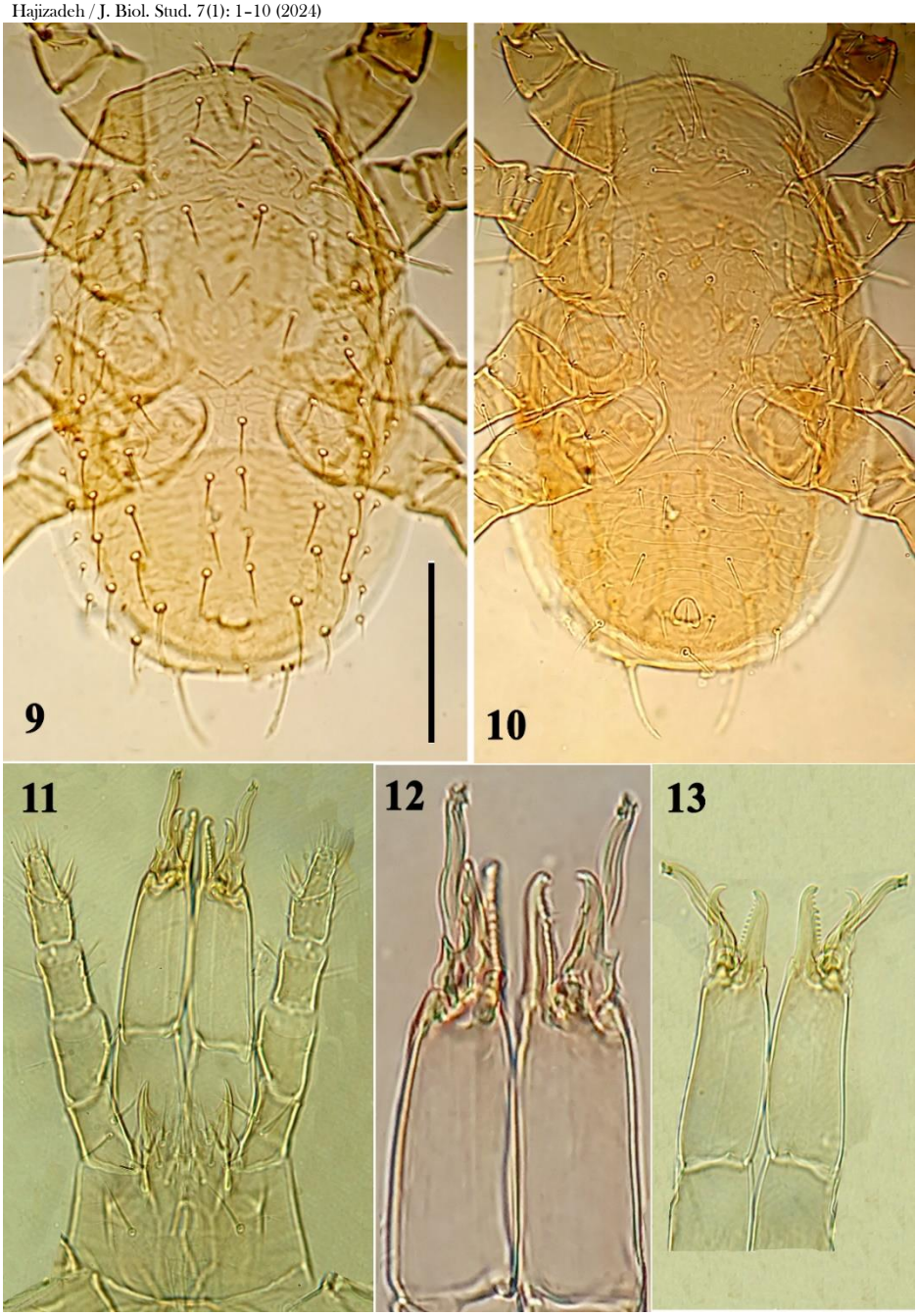
Material examined: Forty Females and 10 males, during August to October 2023, rotten tree trunks, Rasht county, campus of University of Guilan, (37°11'44.5"N 49°38'30.7"E, 28m), collector Jalil Hajizadeh.



Figures 1-4: *Lasioseius thermophilus* female. 1. Body; 2. Gnathosoma; 3. Hypostome; 4. Chelicera. Scale bar = 200 µm for 1; 175 µm for 2; 50 µm for 3 and 4.



Figures 5-8: *Lasioseius thermophilus* female. 5. Idiosoma, dorsal view; 6. Idiosoma, ventral view; 7. Epistome; 8. Spermatheca, red arrow indicates it. Scale bar = 100 µm for 5; 90 µm for 6; 30 µm for 7; 50 µm for 8.



Figures 9-13: *Lasioseius thermophilus* male. 9. Idiosoma, dorsal view; 10. Idiosoma, ventral view; 11. Gnathosoma; 12 & 13. Chelicera. Scale bar = 100 µm for 9 and 10; 60 µm for 11; 30 µm for 12; 40 µm for 13.

4. Discussion

Lasioseius thermophilus was first described by Willmann in 1942 and then by Westeborer, 1963 based on one female specimen from Poland (collected from thermal spring in Johannisbad in the Giant Mountains). Although the original description (Willmann, 1942) and second description (Westeborer, 1963) are quite detailed and include most of the diagnostic characters. However, several important morphological characters regarding the setal measurements, details of ventral shields, leg chaetotaxy and spermathecal apparatus of females were not mentioned in the original and second descriptions. Therefore, in this paper male specimen of *L. thermophilus* is described for the first time and its female specimen redescribed based on the materials collected from Guilan province, Iran. This is the first report of the species in Guilan province, Northern Iran.

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Conflict of interests

The authors have no conflict of interest to declare.

References

Abo-Shnaf R.I., Sánchez, L., & Moraes, G.J. de (2016). Plant inhabiting Gamasina mites (Acari: Mesostigmata) from the Dominican Republic, with descriptions of four new species of *Lasioseius* (Blattisociidae) and complementary descriptions of other species. Systematic and Applied Acarology, 21, 607–646. DOI: 10.11158/saa.21.5.5

Argolo, P.S., Santos, J.C., Oliveira, A.R., & Moraes, G.J de (2018). Two new species of *Lasioseius* Berlese (Acari: Blattisociidae) from Brazil, and a key for separation of the Brazilian species of the genus. Systematic and Applied Acarology, 23, 1567–1577. DOI: 10.11158/saa.23.8.7

Berlese, A. (1916). Centuria prima di Acari nuovi. Redia, 12, 19–67.

Christian, A., & Karg, W. (2006). The predatory mite genus *Lasioseius* Berlese, 1916 (Acari, Gamasina). Abhandlungen und Berichte des Naturkundemuseums Görlitz, 77, 99–250.

Evans, G.O. (1963). Observations on the chaetotaxy of the legs in the free-living Gamasina (Acari: Mesostigmata). Bulletin of the British Museum (Natural History) Zoology, 10(5), 277–303.

Evans, G. O. (1964). Some observations on the chaetotaxy of the pedipalps in the Mesostigmata (Acari). Annals and Magazine of Natural History, Series 13 (6), 513–527.

Evans, G.O., & Till, W.M. (1979). Mesostigmatic mites of Britain and Ireland (Chelicerata: Acari-Parasitiformes): An introduction to their external morphology and classification. The Transac-tions of the Zoological Society of London, 35(2), 145–270.

Hajizadeh, J., Javadpour, M., & Mohammadi, L. (2023). Review of the genus *Lasioseius* Berlese (Acari: Blattisociidae) in Iran, and a key for identification of the Iranian species of the genus. Persian Journal of Acarology, 12(4), 463-485.

Kamali, K., Ostovan, H., & Atamehr, A. (2001). A catalog of mites & ticks (Acari) of Iran. Islamic Azad University Scientific Publication Center, 192 pp.

Kazemi, S., & Rajaei, A. (2013). An annotated checklist of Iranian Mesostigmata (Acari), excluding the family Phytoseiidae. Persian Journal of Acarology, 2, 63–158.

Lindquist, E.E., & Evans, G.O. (1965). Taxonomic concept in the Ascidae, with a modified setae nomenclature for the idiosoma of the Gamasina (Acarina: Mesostigmata). Memoirs of the Entomological Society of Canada, 47, 1–64.

Lindquist, E.E., Krantz, G.W., & Walter, D.E. (2009). Order Mesostigmata. In: Krantz, G.W. & Walter, D.E. (Eds.), A manual of acarology. 3rd Edition. Texas Tech University Press, Lubbock, Texas, USA, pp. 124–232.

Malek-Shahkouyi, M., Afshari, A., & Nemati, A. (2011). Report of some edaphic mesostigmatic mites (Acari: Mesostigmata) from Gorgan region, Iran. In: Kazemi, Sh. & Saboori, A. (Eds.) Abstract and Proceeding Book of the First Persian Congress of Acarology, Kerman, Iran, p. 39.

Mašán P. (2023). A new, morphologically and ecologically unusual *Lasioseius* mite (Acari: Blattisociidae) associated with Diaperis boleti (Coleoptera, Tenebrionidae) and wood decomposing fungi in Slovakia. Acarologia, 63(1), 89–105. DOI: 10.24349/ikgu-7ysc

Mašán, P., & Halliday, B. (2023). Two new species of *Lasioseius* (Acari: Mesostigmata: Blattisociidae) with reduced sclerotization of the sternal shield. International Journal of Acarology, 49(1), 24–33.

Mohammadi, L., & Hajizadeh, J. (2022). Introduction of a species from the genus *Lasioseius* (Mesostigmata: Blattisociidae) for the mite fauna of Iran. Abstract book of 24th Iranian Plant Protection Congress, 3–6 September 2022, IRIPP, Tehran, pp. 364–365.

Moraza, M.L., & Lindquist, E.E. (2018). A new species-group with new species of the genus *Lasioseius* (Acari: Mesostigmata: Blattisociidae) associated with Neotropical hispine beetles in furled leaves of Heliconia. Acarologia, 58, 62–98.

Moraes, G.J. de, Venancio, R., Santos, V.L.V., & Paschoal, A.D. (2015). Potential of Ascidae, Blattisociidae and Melicharidae (Acari: Mesostigmata) as biological control agents of pest organisms. In: Carrillo, D., Moraes, G.J. de & Peña, J. (Eds.), Prospects for biological control of plant feeding mites and other harmful organisms. Switzerland: Springer International Publishing, pp. 33–75. DOI: 10.1007/978- 3-319-15042-0_2.

Nemati, A., Riahi, E., Khalili-Moghadam, A., & Gwiazdowicz, D.J. (2018). A catalogue of the Iranian Mesostigmata (Acari): additions and updates of the previous catalogue. Persian Journal of Acarology, 7, 115–191.

Santos, J.C., Demite, P.R., & Moraes, G.J. de (2024). Blattisociidae Database. Available from: http:// www.lea.esalq.usp.br/acari/blattisociidae (Accessed on 01.02.2024).

Westerboer, I. (1963). Die Familie Podocinidae Berlese 1916. Abschnitt IV. In: Stammer, H.J. (Ed.), Beiträge zur Systematik und Ökologie mitteleuropäischer Acarina. Band II. Mesostigmata I. Akademische Verlagsgesellschaft Geest & Portig K.- G., Leipzig, pp. 179–450.

Willmann, C. (1942). Milben aus deutschen Mineralquellen. Zoologischer Anzeiger, 139, 237–247.