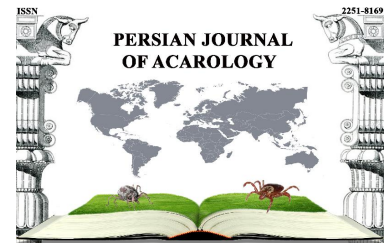




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Article

A new larval species of *Nothrotrombidium* (Acari: Trombellidae) from Iran, with a key to world species

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ABSTRACT

Nothrotrombidium birjandensis **sp. nov.** (Acari: Trombiciformes: Trombellidae) collected from forest soils (off host) in Hotel Kouhestan region, Birjand city, Khorasan Jonoobi province (South Khorasan province), Iran, is described and illustrated. This is the third larval species of *Nothrotrombidium* which is described in the world. A key to world larval species of *Nothrotrombidium* is provided.

KEY WORDS: Acrididae; Birjand; ectoparasite; Noctuidae; terrestrial Parasitengona.

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INTRODUCTION

The family Trombellidae of the superfamily Trombiculoidea is widely distributed and consists of five subfamilies: Moyanellinae Robaux, Notothrombiinae Oudemans, Sibumbellinae Haitlinger, Spelaeothrombiinae Feider and Trombellinae Thor (Walter *et al.* 2009). Among them, the Trombellinae comprises nine genera, including *Durenia* Vercammen-Grandjean, *Gryllotrombella* Saboori, Nemati & Mossadegh, *Maiputrombella* Southcott, *Neonothrotrombium* Robaux, *Nothrotrombidium* Womersley, *Parathrombella* Andre, *Taraxithrombium* Robaux, *Trombella* Berlese and *Womersleyia* Radford. The genus *Nothrotrombidium* includes eight species of which larvae are known for two species only; namely *N. otiorum* (Berlese, 1902) [from both larval and post-larval forms] from Italy, Austria, France, Norway, Romania, Sardinia and Spain and *N. treati* Southcott, 1987 [from only larval form] from *Spaelotis clandestina* (Harris) (Lepidoptera: Noctuidae) from USA (Southcott 1987; Mağol and Wohltmann 2012, 2013). Deutonymphs and adults are large, often colorful mites found in forest litter habitats (Walter *et al.* 2009). *Nothrotrombidium* larvae have been reported as parasite of Lepidoptera and of short-horned grasshoppers of the family Acrididae (Southcott 1987; Ahmadi *et al.* 2011).

In this paper, a new larval species of the genus *Nothrotrombidium* is described from forest soils (off host) from Iran.

MATERIAL AND METHODS

Three specimens were extracted from forest soils (off host), near a seasonal river by a Berlese funnel, cleared in Nesbitt's fluid and mounted on glass microscope slides using Hoyer's medium (Walter and

Krantz 2009). Figures were drawn and measurements (given in micrometers, μm) were made using a BX51 phase contrast Olympus microscope equipped with a drawing tube. The terminology and abbreviations follow Mağol (2007) except for the following characters: IL — idiosoma length, IW — idiosoma width, W — scutum width, LN — distance from anterior tip of scutum to level of the AM seate and *cs* — adoral seta.

Genus *Nothrotrombidium* Womersley, 1954

Nothrotrombidium birjandensis sp. nov. (Figs. 1–16)

Diagnosis of larva – SD 85–90, Ta I 122–132, Ta II 100–107, Ta III 122–127, Ti III 110–122, Fe II 82–87, Fe III 100–107.

Description of larva ($n = 3$)

Dorsum (Figs. 1, 2) – Idiosoma 235–275 long and 127–162 wide. Dorsum of idiosoma with 32 dorsal barbed setae, arranged in 5 oblique rows: 6-6-6-6-8, fD = 32. Scutum almost ovoid in shape and flattened between levels of AL and PL setae, punctate from posterior margin to level of AM bases, bearing 3 pairs of normal setae (AM, AL and PL) and 1 pair of sensilla (S). Setae AM and PL subequal in length and slightly longer than AL setae, there is a slight concavity anterior to each AM seta, all scutalae barbed. Sensilla flagelliform, slender and entirely nude. Posterolaterally on each side of scutum 2 eyes situated on common ocular plate (23–26 long, 15–17 wide), anterior lens (diameter 12–13) slightly larger than posterior one (diameter 8–10).

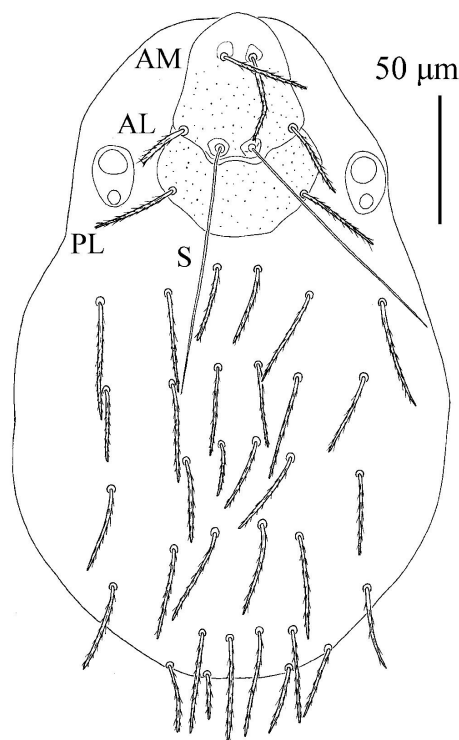
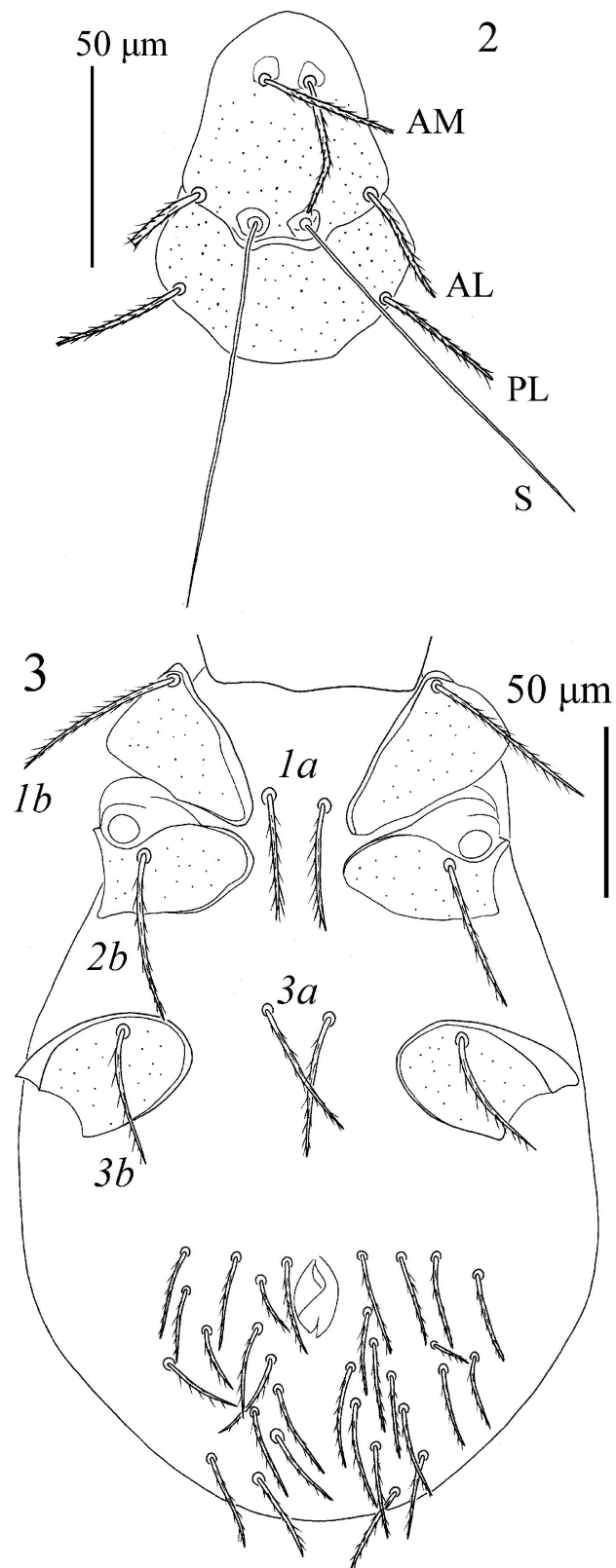


Figure 1. *Nothrotrombidium birjandensis* sp. nov. (larva) – Dorsal view of idiosoma.

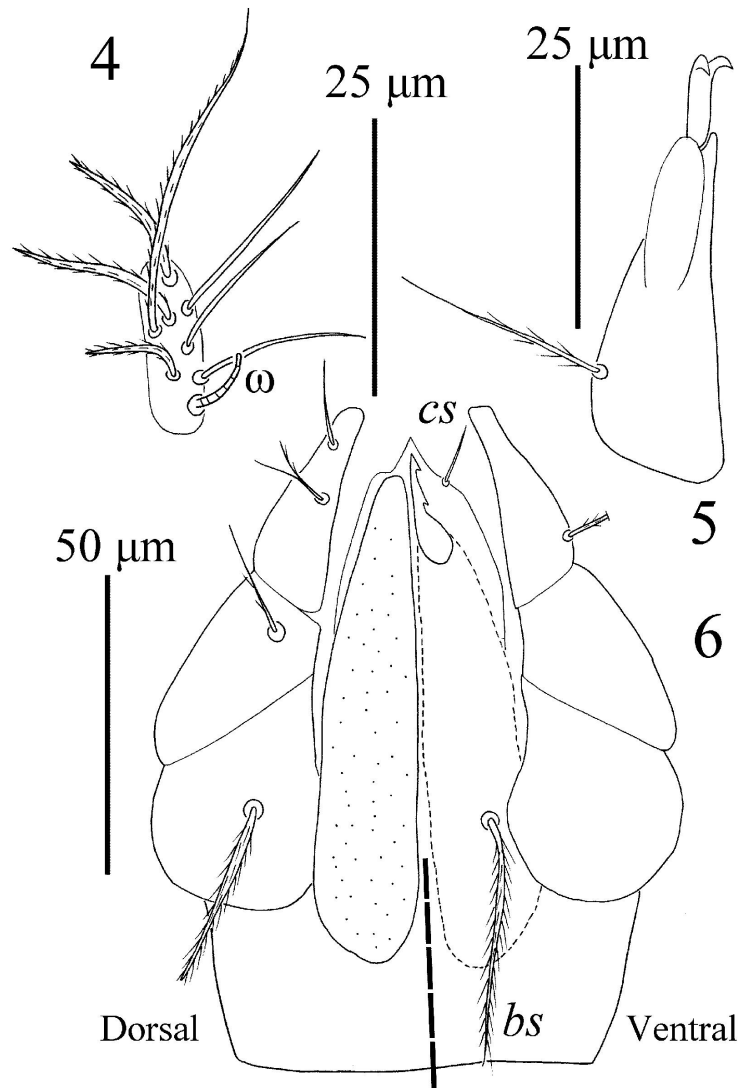
Venter (Fig. 3) – Idiosoma ventrally with 2 pairs of barbed sternal setae (*1a* and *3a*) and 15 pairs of barbed ventral setae (fV = 30) behind coxa III, and a uropore. Coxa I with distal antero-lateral seta *1b*, supracoxal seta absent; coxa II with approximately anteromedial seta *2b*; coxa III with seta *3b*

approximately antero-medially; all coxalae barbed; coxae I–III each punctate. Claparède's organs between coxae I and II, circular. NDV = $32 + 30 = 62$ (in all specimens).



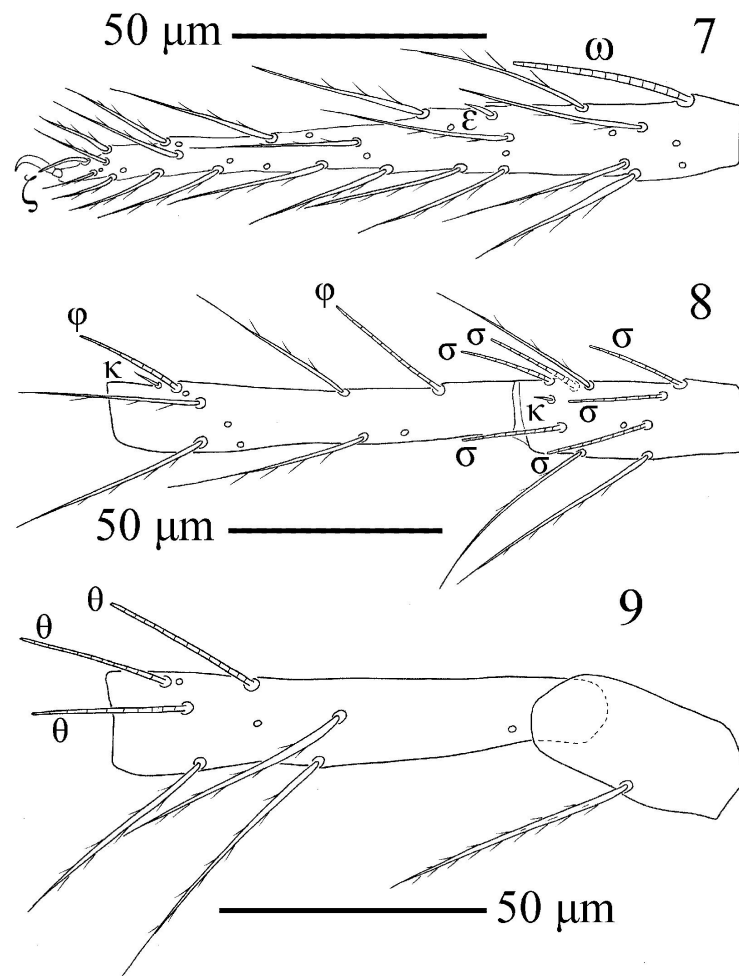
Figures 2–3. *Nothrotrombidium birjandensis* sp. nov. (larva) – 2. Dorsal scutum; 3. Ventral view of idiosoma.

Gnathosoma (Figs. 4–6) – Cheliceral bases punctate on dorsal surface, cheliceral base 83–85 long; cheliceral blade slightly curved, 20–21 long, with a median and subterminal teeth. Adoral seta *cs* 10–11 long and nude, one pair of barbed subcapitular setae (*bs*), 25–40 long; palpfemur 35–42 and palpgenu 35–42 long, each with one barbed dorsal seta. Palptibia 26–35 with two barbed and one nude seta; palpal tibial claw slender, bifurcate, 6–9 long; palptarsus 9–12 with 4 barbed and 3 nude setae (one barbed setae longer than the others), and a solenidium; fPp = 0-B-B-BBN₂-4B3N ω . Palpal supracoxal setae absent.



Figures 4–6. *Nothrotrombidium birjandensis* sp. nov. (larva) – 4. Palpal tarsus in holotype; 5. Ventral view of palpal tibial claw in one paratype excluding setae on palpal tarsus; 6. Dorsal (left) and ventral (right) view of gnathosoma.

Legs (Figs. 7–16) – Leg segmentation formula 6-6-6. Leg setal formula. Leg I: Ta – 1 ω , 1 ϵ , 1 ζ , 31n (32n in holotype on the right side); Ti – 2 ϕ , 1 κ , 8n; Ge – 6 σ , 1 κ , 4n; Fe – 3 θ (4 θ in paratypes), 6n; Tr – 1n (Figs. 7–9). Leg II: Ta – 1 ω , 1 ϵ , 1 ζ , 26n; Ti – 2 ϕ , 7n; Ge – 4 σ (5 σ in holotype on the right side), 1 κ , 4n; Fe – 3 θ (4 θ in one paratype on the right side), 7n; Tr – 1 n (Figs. 10–12). Leg III: Ta – 24n; Ti – 1 ϕ , 7n; Ge – 6 σ (5 σ in paratypes), 4n; Fe – 5 θ (6 θ in holotype on the right side), 6n; Tr – 1n (Figs. 13–16). Leg tarsi each with a falciform terminal claw.



Figures 7–9. *Nothrotrombidium birjandensis* **sp. nov.** (larva) – 7. Tarsus I; 8. Genu-tibia I; 9. Trochanter-femur I.

IP = 1283–1379. Metric data are given in Table 1.

Type materials

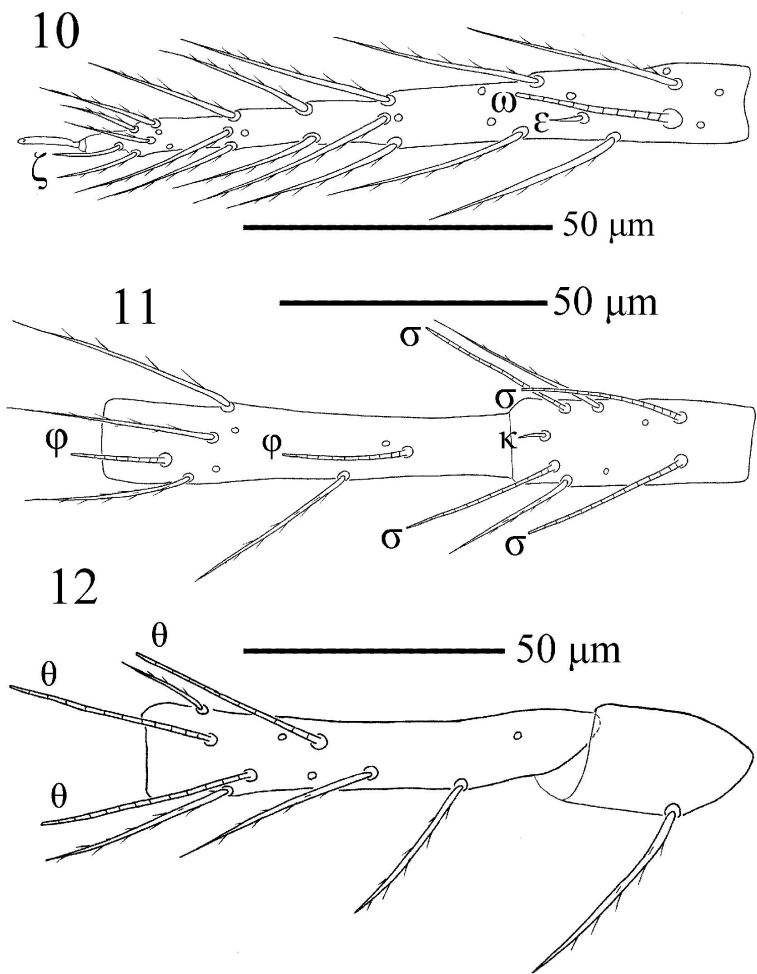
The Holotype (ARS-20170305-1a) and 1 paratype (ARS-20170305-1b) larvae were collected from forest soils (off host), near a seasonal river, Iran: Khorasan Jonoobi province (South Khorasan province, Eastern Iran), Birjand city, Hotel Kouhestan region, 32° 49.40' N, 59° 10.48' E, 79 m a.s.l., 21 June 2016, coll. J. Noei; 1 paratype larva (ARS-20170305-1c), same data except, 23 May 2017.

Type deposition

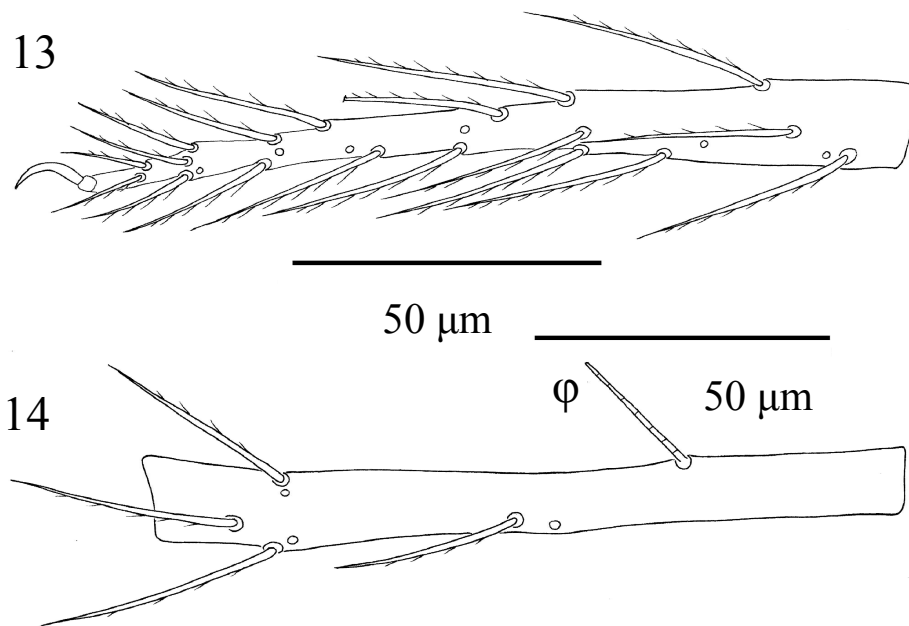
The holotype and paratype larvae are deposited in the Acarological Collection, Jalal Afshar Zoological Museum (JAZM), Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran.

Etymology

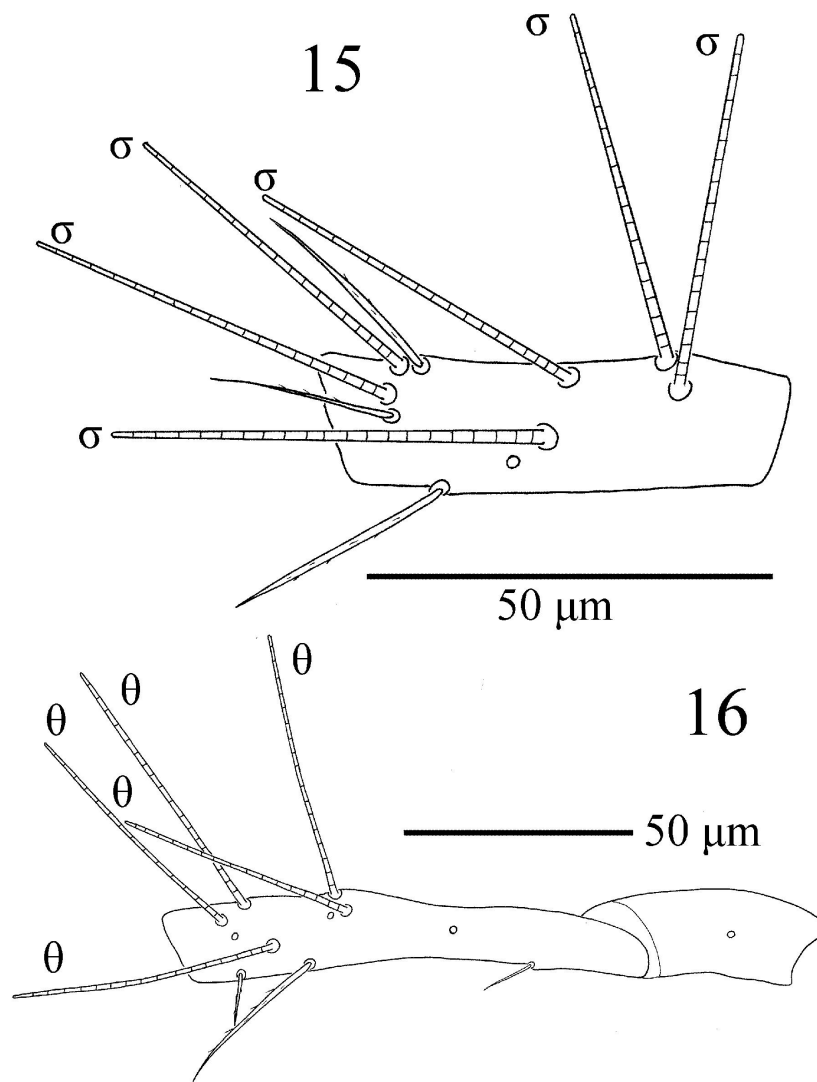
The specific epithet is derived from the type locality, Birjand city.



Figures 10–12. *Nothrotrombidium birjandensis* sp. nov. (larva) – 10. Tarsus II; 11. Genu-tibia II; 12. Trochanter-femur II.



Figures 13–14. *Nothrotrombidium birjandensis* sp. nov. (larva) – 13. Tarsus III; 14. Tibia III.



Figures 15–16. *Nothrotrombidium birjandensis* **sp. nov.** (larva) – 15. Genu III; 16. Trochanter–femur III.

Remarks

The new species belongs to the genus *Nothrotrombidium* in having sensillary setae arising behind middle of scutum, a little behind level of AL setae; coxal setae formula 1-1-1; pedotarsal claws 1-1-1 and cheliceral bases long and slender.

Nothrotrombidium birjandensis **sp. nov.** differs from *N. otiorum* in shorter SD (85–90 vs. 90–109), Ta I (L) (122–132 vs. 160), Ti I (72–93 vs. 122), Fe I (92–95 vs. 116), Ta II (100–107 vs. 136), Ti II (60–75 vs. 100), Fe II (82–87 vs. 122), Ta III (122–127 vs. 160), Ti III (110–122 vs. 188), Fe III (100–107 vs. 145) and differs from *N. treati* in the low number of ventral setae, fV (30 vs. 38), in shorter PW (45–51 vs. 62), ASB (50–52 vs. 78), PSB (35–37 vs. 44), SD (85–90 vs. 122), W (55–67 vs. 76), AP (25–27 vs. 35), Ta I (L) (122–132 vs. 151), Ta II (L) (100–107 vs. 125), Fe II (82–87 vs. 100), Ta III (L) (122–127 vs. 146), Ti III (110–122 vs. 145), Fe III (100–107 vs. 118) and IP (1283–1379 vs. 1550) (Table 1).

Leg setal formula has not been reported for *N. otiorum* and *N. treati* in detail and thus no comparison with the new species is possible.

Table 1. Comparison of larval measurements in species of the genus *Nothrotrombidium*: *N. birjandensis* **sp. nov.** (present study, H (1a), holotype and P (1b and 1c), paratypes), *N. treati* and *N. otiorum* (Feider 1958; Southcott 1987).

Character	H (1a)	P (1b)	P (1c)	Range	<i>N. treati</i> * (N = 1)	<i>N. otiorum</i> (N = 1**)
IL	275	235	237	235–275	390	377–380
IW	162	130	127	127–162	255	174–180
LN	16	15	15	15–16	36	-
MA	32	40	32	32–40	-	-
AW	42	35	35	35–42	47	-
PW	51	45	48	45–51	62	-
ASB	52	50	50	50–52	78	-
PSB	35	35	37	35–37	44	-
SD	87	85	90	85–90	122 (L)	90–109
W	67	55	60	55–67	76	61
AP	25	27	27	25–27	35	-
AM	35	30	17	17–35	16	-
S	100	97	102	97–102	98 (SE)	110
AL	30	17	14	14–30	16	-
PL	35	25	26	25–35	29	-
AA	11	12	11	11–12	-	-
SB	12	12	12	12	15	-
DS Min.	25	27	25	25–27	33–62	-
DS Max.	45	45	47	45–47		
PDS	40	37	40	37–40	48–53	-
cs	11	11	10	10–11	11	-
bs	40	27	25	25–40	-	-
PaFed	31	30	25	25–31	15?	-
PaGed	13	12	12	12–13	10	-
1a	37	35	35	35–37	31	-
1b	57	50	52	50–57	47	-
2b	47	40	40	40–47	36	-
3a	45	27	32	27–45	33	-
3b	42	25	22	22–42	32	-
Ta I (L)	132	125	122	122–132	151	160
Ta I (H)	15	12	15	12–15	20	-
Ti I	93	72	72	72–93	93	122
Ge I	50	45	42	42–50	55	58
Fe I	92	95	95	92–95	100	116
Tr I	40	42	40	40–42	50	44
Cx I	52	52	50	50–52	61	-
Leg I	459	431	421	421–459	510	-
Ta II (L)	107	100	100	100–107	125	136
Ta II (H)	12	15	15	12–15	20	-
Ti II	75	63	60	60–75	83	100
Ge II	47	40	40	40–47	52	58
Fe II	86	87	82	82–87	100	122
Tr II	40	41	40	40–41	50	41
Cx II	50	55	50	50–55	35	-

Table 1. Continued.

Character	H (1a)	P (1b)	P (1c)	Range	<i>N. treati</i> * (N = 1)	<i>N. otiorum</i> (N = 1**)
Leg II	405	386	372	372–405	445	-
Ta III (L)	127	122	125	122–127	146	160
Ta III (H)	12	12	12	12	18	-
Ti III	122	112	110	110–122	145	188
Ge III	57	50	50	50–57	62	67
Fe III	107	100	105	100–107	118	145
Tr III	50	52	50	50–52	64	61
Cx III	52	45	50	45–52	60	-
Leg III	515	481	490	481–515	595	-
IP	1379	1298	1283	1283–1379	1550	-

* The length of Leg I–III is including claw.

** Except for IL, IW and SD which were unknown in the text.

Key to larvae of *Nothrotrombidium* of the world [modified from Southcott (1987)]

1. Ti I/Ge I > 2, Ti II 100, Ti III 188 *N. otiorum* (Berlese, 1902)
- Ti I/Ge I < 2, Ti II ≤ 83, Ti III ≤ 145 2
2. SD 85–90, Ti III 110–122, Ta I 122–132, Ta II 100–107, Ta III 122–127
..... *N. birjandensis* **sp. nov.**
- SD 122, Ti III 145, Ta I 151, Ta II 125, Ta III 146 *N. treati* Southcott, 1987

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گونه جدیدی از لارو *Nothrotrombidium* (Acari: Trombellidae) از ایران، همراه با کلید گونه‌های جهان

جواد نوعی

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چکیده

گونه جدید (*Nothrotrombidium birjandensis* sp. nov. (Acari: Trombidiformes: Trombellidae) از خاک‌های جنگلی (بدون میزبان) در استان خراسان جنوبی، شهر بیرجند، منطقه هتل کوهستان ایران جمع‌آوری، توصیف و ترسیم می‌شود. این سومین گونه لاروی از جنس *Nothrotrombidium* است که در جهان توصیف می‌شود. کلید شناسایی گونه‌های لاروی جنس *Nothrotrombidium* دنیا تهیه شده است.

واژگان کلیدی: Acrididae؛ بیرجند؛ انگل بیرونی؛ Noctuidae؛ پارازیت‌گونه‌ای خشکی‌زی.

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