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Article

Modification in the generic diagnosis of *Bursaustium* (Acari: Erythraeidae) with description of a new species from southeast of Iran

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ABSTRACT
The generic diagnosis of *Bursaustium* Haitlinger, 2000 is modified and *Bursaustium zabolensis* Noei **sp. nov.** (Acari: Trombidiformes: Erythraeidae) collected from soil samples (off host) under tamarisk trees in Zabol city, Sistan and Baluchestan province, Iran, is described. It is the third known species of the genus and second species of this genus from Iran. A key to species of *Bursaustium* (larva) is also provided.

KEY WORDS: Balaustiinae; *Bursaustium gaspari*; *B. norbakhshi*; larva; *Tamarix*; Trombidiformes.

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INTRODUCTION

The subfamily Balaustiinae Grandjean (Acari: Erythraeidae) comprises 14 genera with 10 genera based on larvae, or adults and larvae. A key to the genera (larva) of the subfamily Balaustiinae was published by Noei *et al.* (2017). The genus *Bursaustium* includes two species based on larvae only, *B. gaspari* Haitlinger, 2000 recorded from forest in Turkey and from herbaceous plants in Greece (off host), and *B. norbakhshi* Saboori, 2002 described as free-living on wheat from Iran (Haitlinger 2000, 2006; Saboori 2002). As a result of the new morphological data observed, presence of crista metopica and scutalae on scutum, the diagnosis for *Bursaustium* of Haitlinger (2000) is amended.

In this paper, we describe a new species of larval *Bursaustium* from Iran.

MATERIAL AND METHODS

Five specimens were extracted from soil 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 Mąkol (2007) and Saboori *et al.* (2009) except for the following characters: IL — idiosoma length, IW — idiosoma width, W — scutum width and *cs* — adoral seta.

Genus *Bursaustium* Haitlinger, 2000

Type species: *Bursaustium gaspari* Haitlinger, 2000

Diagnosis

Idiosoma with dorsal scutum bearing two pairs of sensilla and three pairs of scutalae; crista on dorsal scutum present; the anterior sensilla longer than the posterior ones; each coxa with one barbed seta; each genu with one solenidion; fn Tr 1-1-1, fn BFe 3-3-3; fn TFe 5-5-5; all idiosomal setae short with long setules; palp tibial claw simple.

Remarks

Haitlinger (2000) established the genus *Bursaustium*. In the description of the type species, *B. gaspari*, the absence of a crista metopica was mentioned; a character which was also included into the definition of the genus when Haitlinger (2000) clearly stated "crista on dorsal scutum absent". However, the author provided no arguments why the new genus was placed in Balaustiinae although Southcott (1961) named "presence of a crista metopica" as the only character separating Balaustiinae larvae from other Erythraeidae larvae. Saboori (2002) in his description of *B. norbakhshi* clearly stated "crista metopica distinctly visible" without commenting on its relationship within the genus *Bursaustium*.

Recent re-examination of the holotype of *B. gaspari* by Prof. Haitlinger upon request showed that a crista metopica is clearly present (Fig. 17). Further corrections of data given in the original description concern: fn TFe is 5-5-5 instead of 4-4-5 that the determination of the number of setae on the other part of legs is difficult because of the bad condition of the type specimen. Thus, based on the re-examination *B. gaspari*, we conclude that crista metopica is present and all scutalae (AL, ML and PL) are on the scutum.

Bursaustium zabolensis Noei sp. nov. (Figs. 1–16)

Diagnosis

ASens 53–55, Ti III 70–77, IP 867–969.

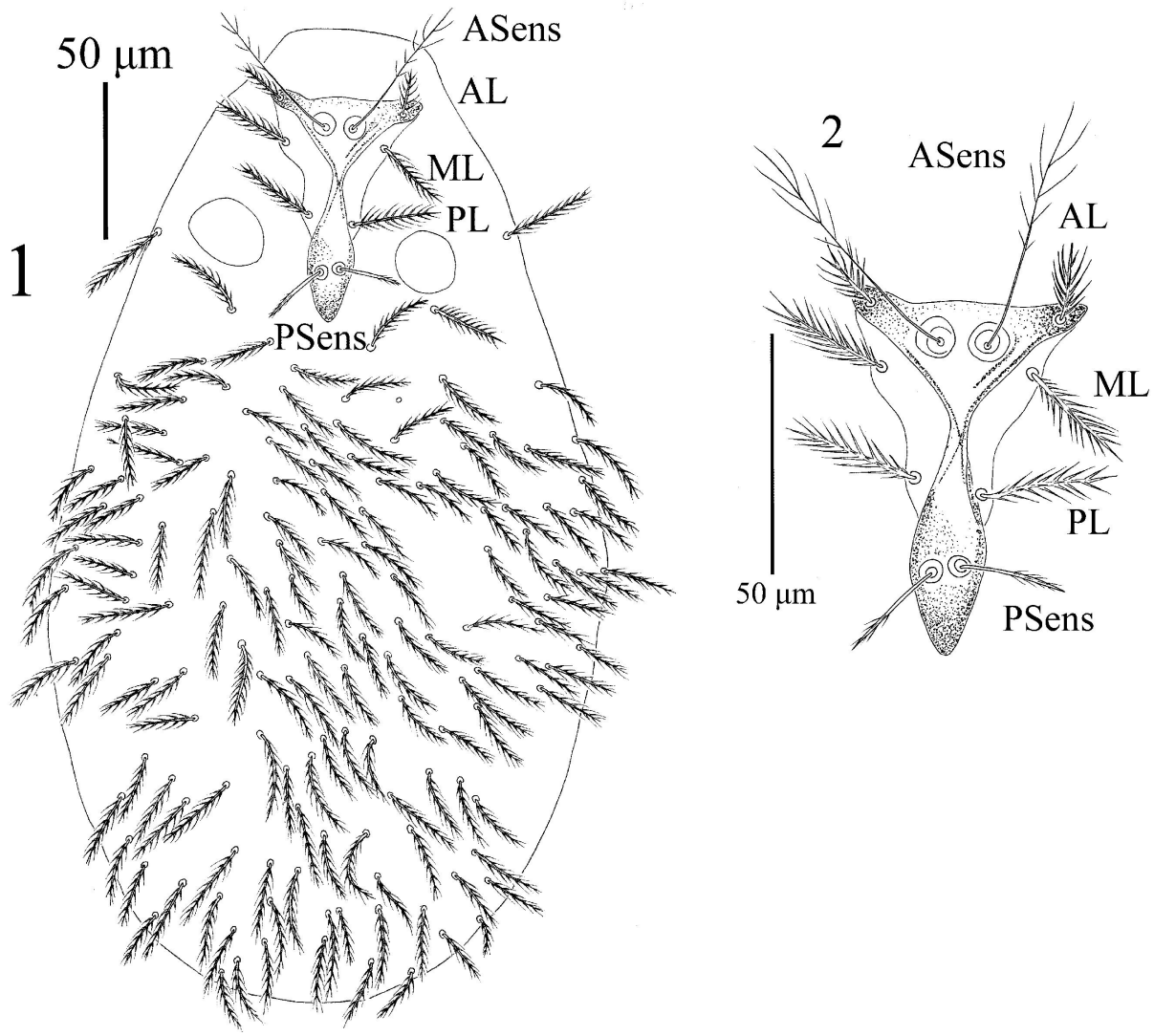
Description (larva, n = 5)

Dorsum (Figs. 1–2, 12, 13–16) – Dorsum of idiosoma with ~120–146 barbed setae with long setules (Fig. 1 and Table 1). Scutum with a distinct crista metopica between triangular anterior sensillary area and fusiform posterior sensillary area (Figs. 2, 13–16). The triangular anterior sensillary area bearing AL scutalae anterolaterally on scutum and one pair of anterior sensilla (ASens). The fusiform posterior sensillary area bearing one pair of posterior sensilla (PSens). ASens longer than PSens and with long barbs in distal half. PSens filiform and barbed. The edge of the dorsal scutum is very lightly chitinized and is separable from the dorsal idiosomal skin only by the absence of striations. ML and PL scutalae present upon the lightly chitinized area, at the edge of scutum (Figs. 2, 13–16). Posterolaterally on each side of scutum one eye (diameter 20–22). AL shorter than ML and PL, all barbed with long setules.

Venter – Idiosoma ventrally with one pair of sternal setae (*1a*) and four pairs setae (three pairs in one paratype, ARS-20181127-2e) between coxae I and II; between coxae II and III ~50–77 setae (excluding sternal setae *3a*); and ~50–59 ventral setae behind coxae III. Each leg coxa with one seta. A peg-like supracoxal seta present on coxa I, 5 long (Fig. 3). NDV = ~220–280 (Table 1). All ventral setae barbed with long setules.

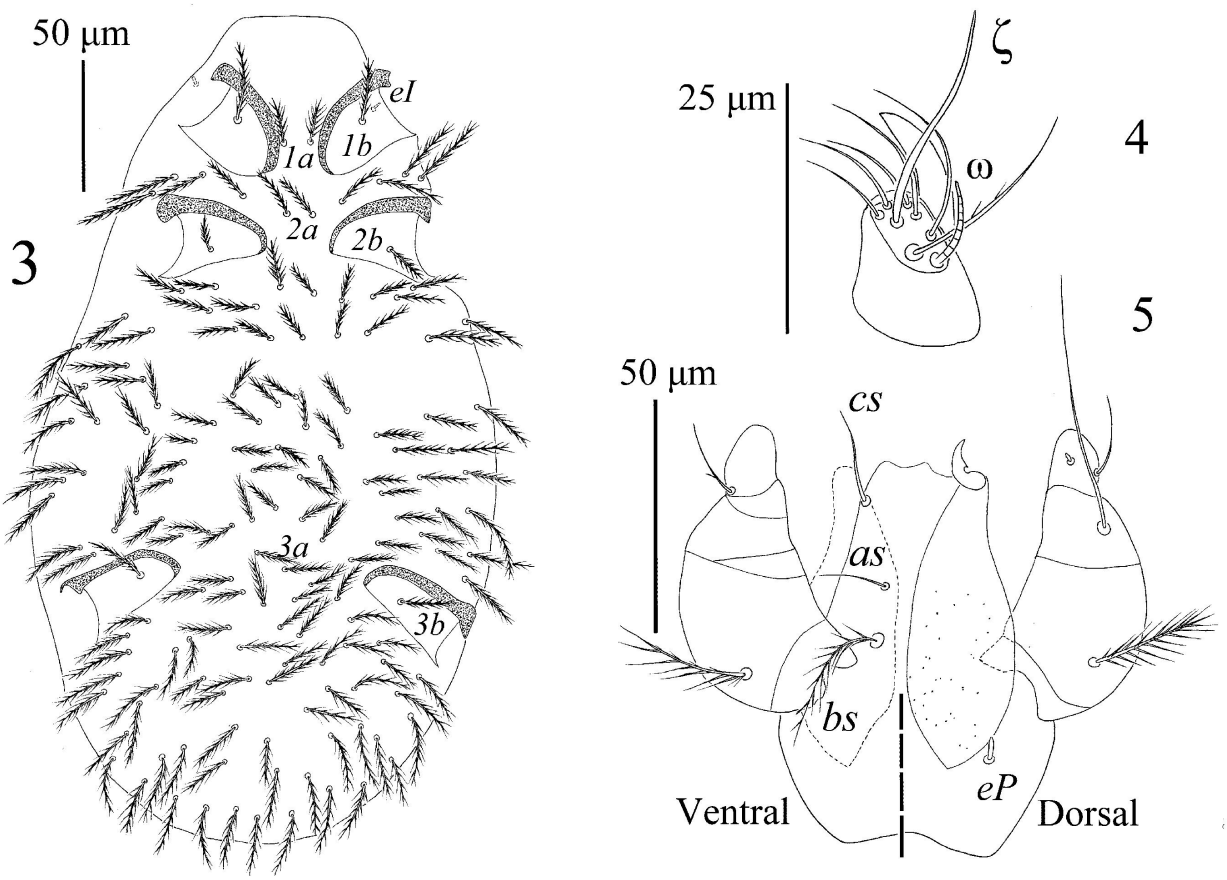
Gnathosoma – Cheliceral bases punctate on dorsal surface, cheliceral base 47–62 long; cheliceral blade slightly curved, 10 long, with one median tooth. Subcapitulum with a nude galealae

(*cs*), 16–20 long and two hypostomalae, anterior (*as*) nude, 10–12 long and posterior (*bs*) barbed with long setules, 27–37 long; palp femur 27–37 long, with one dorsal and one ventral seta, both barbed with long setules and palp genu 13–17 long, with a long, nude dorsal seta. Palp tibia 10–12 long, with three setae (one barbed, one nude and one conical seta); palpal tibial claw 10–17; palp tarsus 5–8 with five setae (one barbed and four nude setae), one solenidion and one eupathidium; fPp = 0-BB-N-BNN-4NBωζ. Palpal supracoxal setae (*eP*) peg-like, 5 long (Figs. 4–5).

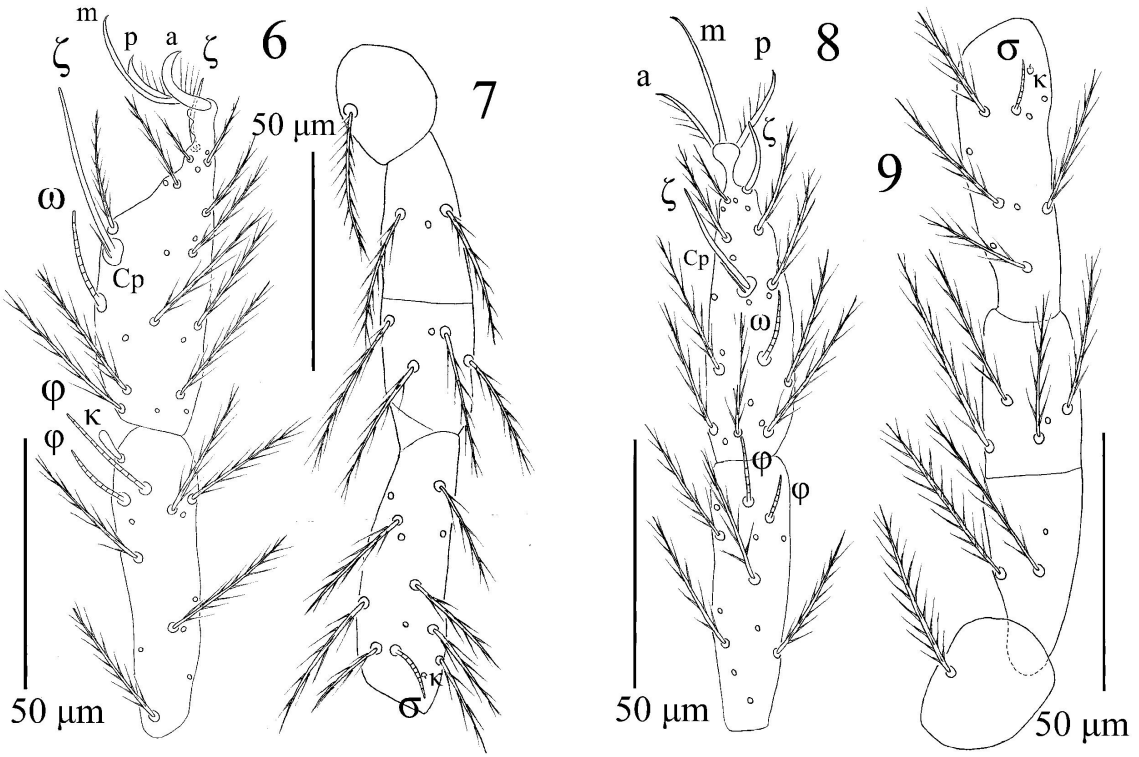


Figures 1–2. *Bursaustium zabolensis* Noei **sp. nov.** (larva) – 1. Dorsal view of idiosoma; 2. Dorsal scutum.

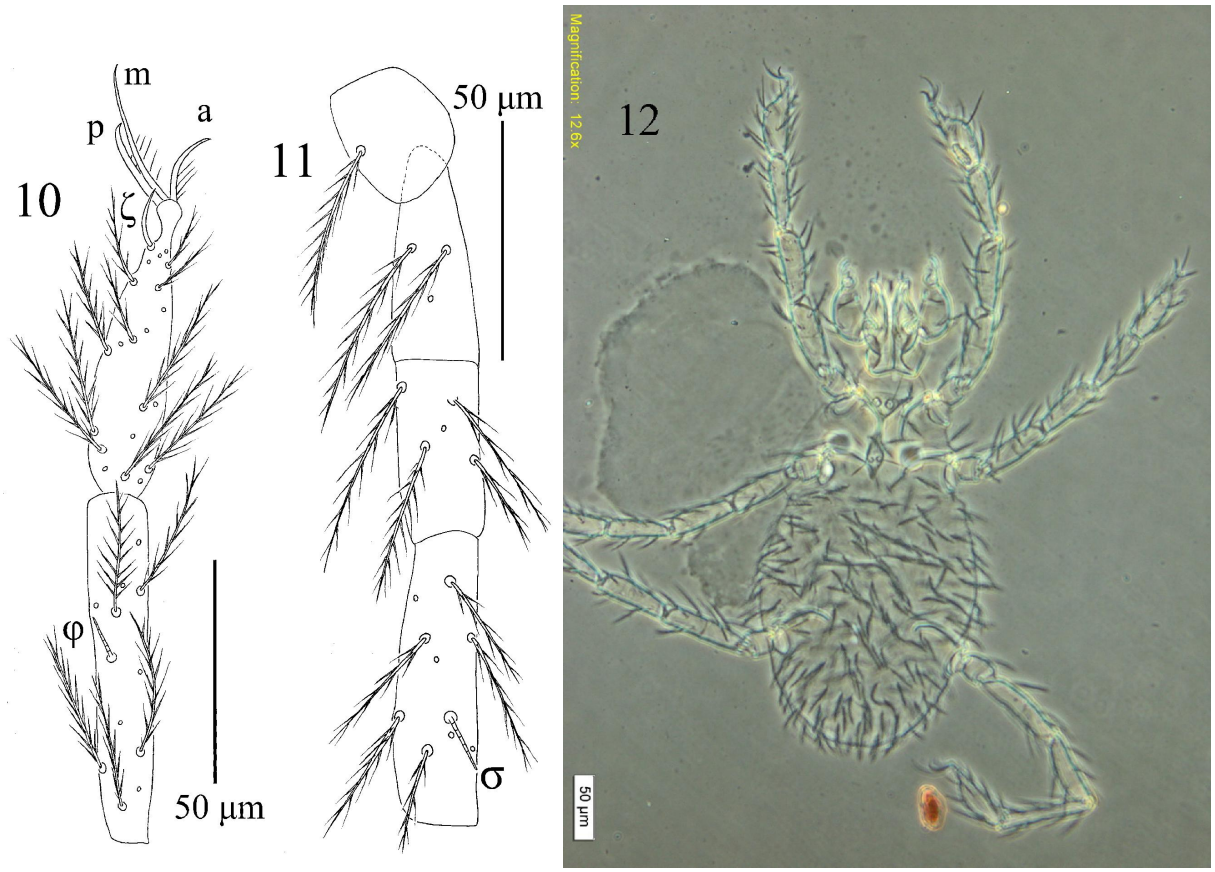
Legs – Leg segmentation formula 7-7-7. Leg setal formula (Table 2): Leg I: Ta - 1ω, 2ζ, 1Cp, 19–20n (20n in holotype, ARS-20181127-2a and one paratype, ARS-20181127-2b and 19n in three paratypes, ARS-20181127-2c, d, e); Ti - 2φ, 1κ, 11n; Ge - 1σ, 1κ, 11n; TFe - 5n; BFe - 3n; Tr - 1n (Figs. 6–7). Leg II: Ta - 1ω, 2ζ, 1Cp, 18–20n (18/19n in one paratype, ARS-20181127-2c and in one paratype uncountable, ARS-20181127-2e); Ti - 2φ, 11n; Ge - 1σ, 1κ, 9n (10n in one paratype on the left side, ARS-20181127-2b); TFe - 5n; BFe - 3n; Tr - 1n (Figs. 8–9). Leg III: Ta - 1ζ, 21n; Ti - 1φ, 11n; Ge - 1σ, 9n; TFe - 5n (4n in one paratype on the right side, ARS-20181127-2b which is an abnormality); BFe - 3n; Tr - 1n (Figs. 10–11). Each leg tarsus with lateral falciform claws and a claw-like empodium. The lateral falciform claws with relatively long onychotrichs.ventrally.



Figures 3–5. *Bursaustium zabolensis* Noei **sp. nov.** (larva) – 3. Ventral view of idiosoma; 4. Ventral view of palpal tibia and tarsus; 5. Dorsal (right) and ventral (left) view of gnathosoma.



Figures 6–9. *Bursaustium zabolensis* Noei **sp. nov.** (larva) – 6. Ti I-Ta I; 7. Tr I-Ge I; 8. Ti II -Ta II; 9. Tr II-Ge II.



Figures 10–12. *Bursaustium zabolensis* Noei **sp. nov.** (larva) – 10. Ti III-Ta III; 11. Tr III-Ge III; 12. Habitus.

Metric data are given in Table 1. Tables 1 and 2 show differences between all species of the genus.

Etymology

The specific epithet is derived from the type locality, Zabol, Sistan and Baluchestan province, Iran.

Type material

The holotype (ARS-20181127-2a) was collected from soil and litter sample (off host) under a *Tamarix aphylla* (Linnaeus) (Tamaricaceae), IRAN: Sistan and Baluchestan province, Zabol city, Jazinak (30° 54' 07" N, 61° 41' 34" E), 27 April 2018, col. F. Minab Podineh; four paratype (ARS-20181127-2b, c, d, e) larvae same data as holotype except Zahak (30° 54' 20" N, 61° 40' 24" E), 20 April 2018 under *Tamarix stricta* Boiss.

Type deposition

The holotype (ARS-20181127-2a) and three paratype larvae (ARS-20181127-2b, c, d) are deposited in the Acarological Collection, Jalal Afshar Zoological Museum (JAZM), Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran; one paratype larva (ARS-20181127-2e) is deposited in the collection of the Department of Plant Protection, College of Agriculture, University of Zabol, Iran (DPPZ).

Remarks

The new species belongs to the genus *Bursaustium* based on the diagnostic characters of *Bursaustium* in the present paper. *Bursaustium zabolensis* Noei **sp. nov.** is similar to *B. norbakhshi*

Saboori, 2002 in leg setal formulae but differs from it in the longer MW (31–33 vs. 24 in *B. norbakhshi*), ML (25–30 vs. 19), ASens (53–55 vs. 36), *2a* (17–21 vs. 12), *2b* (19–22 vs. 12), *3b* (21–24 vs. 12), *cs* (16–20 vs. 12), Ti I (55–60 vs. 39), Ge I (57–62 vs. 48), TFe I (27–30 vs. 19), leg I (281–324 vs. 237), Ta II (45–55 vs. 36), Ti II (47–52 vs. 31), Ge II (50–55 vs. 39), TFe II (25–30 vs. 14), BFe II (35–37 vs. 24), leg II (269–296 vs. 202), Ta III (47–57 vs. 39), Ti III (70–77 vs. 43), Ge III (57–62 vs. 51), TFe III (32–35 vs. 21), BFe III (35–45 vs. 27), leg III (311–349 vs. 244), IP (867–969 vs. 683), shorter MA (15–17 vs. 24), number of cheliceral teeth (with a median tooth vs. without tooth), and differs from *B. gaspari* (data from Haitlinger 2000, 2006) in the longer ASens (53–55 vs. 20–30), Ti III (70–77 vs. 52–65), Ge III (57–62 vs. 48–52) and IP (867–969 vs. 744–844).

Leg setal formula was not determined for *B. gaspari* in recent re-examination and thus no comparison with the new species is presented. Collecting further specimens of *B. gaspari* from the original location will allow to analyze the range of normal setae for comparison.

Table 1. Comparison of larval measurements in species of the genus *Bursaustium*: *B. zabolensis* Noei **sp. nov.** - 2a, holotype; 2b–2e, paratypes; *B. gaspari* (from Turkey, A; from Greece, B) and *B. norbakhshi* (Haitlinger 2000, 2006; Saboori 2002).

Character	2a	2b	2c	2d	2e	Range	*B. gaspari* (A)	*B. gaspari* (B)	*B. norbakhshi*
IL	310	400	460	225	460	225–460	394	355	495
IW	182	237	270	137	230	137–270	254	209	218
SD	75	77	79	70	79	70–79	-	-	-
W	51	51	50	45	44	44–51	-	-	-
AW	40	40	44	39	37	37–44	40	38	36
MW	32	32	32	31	33	31–33	-	32	24
PW	15	12	15	12	14	12–15	22	18	-
MA	16	17	17	15	15	15–17	-	-	24
AA	10	10	10	9	9	9–10	10	8	10
SB	5	5	6	6	6	5–6	6	6	7
ISD	47	48	52	48	46	46–52	54	42	41
AP	40	40	42	40	32/35	32–42	36	36	31
AL	17	17	16	16	15	15–17	22	-	~12
ML	25	30	25	25	25	25–30	-	18	19
PL	29	30	28	27	-	27–30	26	22	24
ASens	53	53	55	55	55	53–55	20	30	36
PSens	23	22	24	22	-	22–24	20	20	~24
DS Min.	25	25	20	20	22	20–25	16	16	17
DS Max.	30	27	27	25	27	25–30	30	20	24
1a	20	22	19	19	20	19–22	-	16	15
1b	30	25	27	26	27	25–30	30	16	22
2a	20	20	21	20	17	17–21	-	-	12
2b	20	22	20	19	20	19–22	24	10	12
3a	20	17	16	16	17	16–20	-	-	-
3b	24	23	21	23	22	21–24	18	12	12
GL	80	80	80	75	72	72–80	90	76	78
cs	18	20	19	16	18	16–20	-	-	12
as	12	12	11	11	10	10–12	-	-	12
bs	32	34	37	30	27	27–37	36 (sc1)	-	24
PaScFed	27	25	33	32	32	25–33	22	26	-
PaScFev	30	30	31	31	30	30–31	28	-	-
PaScGed	55	45	50	50	50	45–55	30	-	-
Ta I (L)	57	55	55	47	50	47–57	56	46	44
Ta I (H)	22	27	25	20	22	20–27	-	-	17
Ti I	60	55	57	55	55	55–60	54	40	39
Ge I	62	62	62	62	57	57–62	54	44	48
TFe I	30	30	30	27	27	27–30	28	22	19

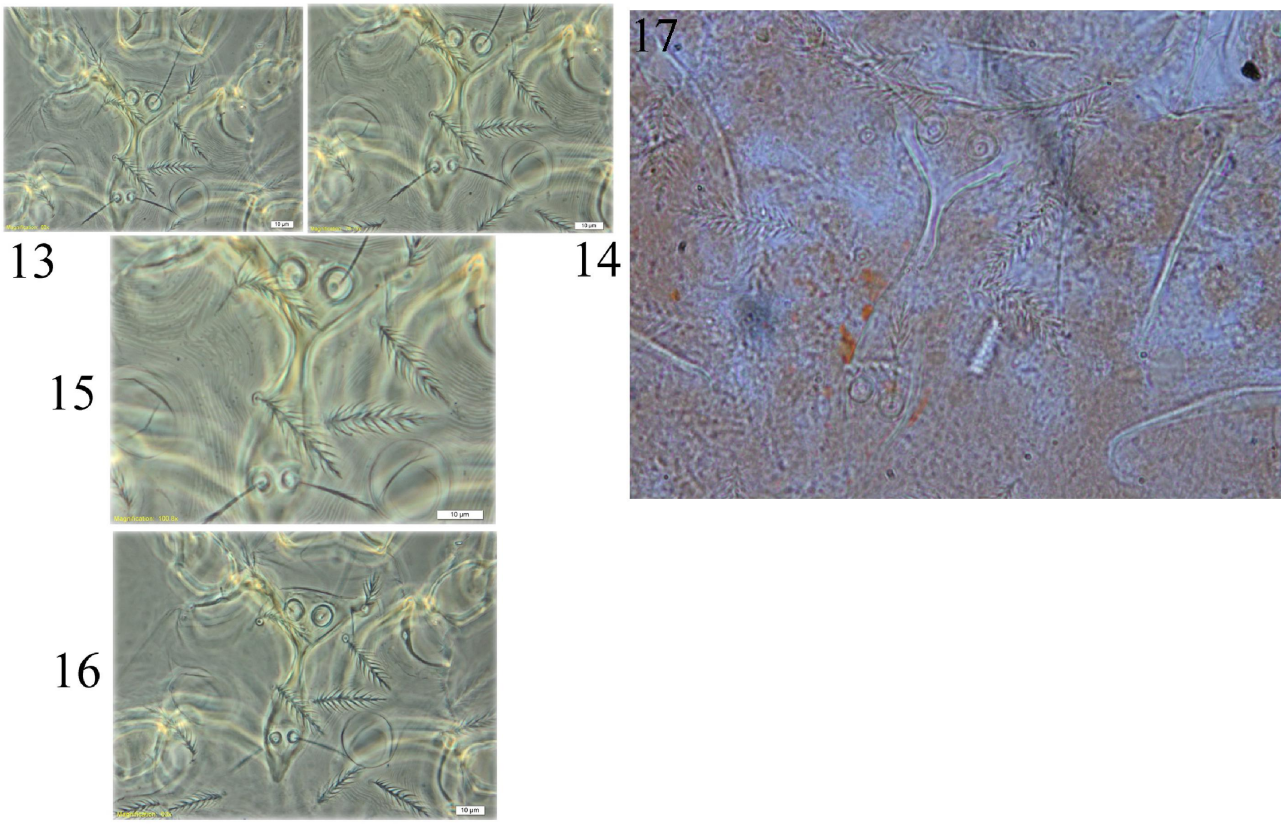
Table 1. Continued.

Character	2a	2b	2c	2d	2e	Range	*B. gaspari* (A)	*B. gaspari* (B)	*B. norbakhshi*
BFe I	40	37	37	37	35	35–40	36	32	31
Tr I	30	27	30	22	22	22–30	22	22	19
Cx I	45	42	40	37	35	35–45	46	44	37
Leg I	324	308	311	287	281	281–324	296	250	237
Ta II (L)	55	52	52	45	45	45–55	46	44	36
Ta II (H)	17	25	20	17	15	15–25	-	-	17
Ti II	52	50	52	47	50	47–52	46	34	31
Ge II	55	52	55	52	50	50–55	42	36	39
TFe II	30	27	27	25	27	25–30	20	20	14
BFe II	35	35	35	35	37	35–37	32	32	24
Tr II	27	27	27	25	27	25–27	22	22	19
Cx II	42	47	42	40	40	40–47	44	42	39
Leg II	296	290	290	269	276	269–296	252	230	202
Ta III (L)	57	52	52	47	52	47–57	46	42	39
Ta III (H)	17	22	20	17	20	17–22	-	-	17
Ti III	77	72	75	72	70	70–77	62	52	43
Ge III	60	60	62	60	57	57–62	52	48	51
TFe III	35	32	35	32	32	32–35	28	24	21
BFe III	45	45	45	40	35	35–45	42	28	27
Tr III	30	27	27	25	27	25–30	22	26	24
Cx III	45	45	47	35	42	35–47	44	44	39
Leg III	349	333	343	311	315	311–349	296	264	244
IP	969	931	944	867	872	867–969	844	744	683
fD	146	139	~130	~120	~120	~120–146	168	-	~154
fV	57	57	59	~55	~50	~50–59	59	-	62
Setae between Cx II–III	77	72	66	~55	~50	~50–77	90	-	89
NDV	280	266	255	~230	~220	~220–280	317	-	305
Setae between Cx I–II	8	8	8	8	8	8	6	-	8

Table 2. Leg chaetotaxy of *Bursaustium zabolensis* Noei **sp. nov.** (larva); *B. gaspari* and *B. norbakhshi* (Haitlinger 2000; Saboori 2002).

Character	*B. zabolensis* Noei **sp. nov.**	*B. gaspari**	*B. norbakhshi*
Ta I	1ω, 2ζ, 1Cp, 20n	1ω, 2ζ, 1Cp (z), 13n	1ω, 2ζ, 19n
Ti I	2φ, 1κ, 11n	2φ, 1κ, 11n	2φ, 1κ, 11n
Ge I	1σ, 1κ, 11n	1σ, 1κ, 11n	1σ, 1κ, 11n
TFe I	5n	5n	5n
BFe I	3n	3n	3n
Tr I	1n	1n	1n
Cx I	1n	1n	1n
Ta II	1ω, 2ζ, 1Cp, 20n	1ω, 2ζ, 1Cp (z), 13n	1ω, 1ζ, 21n
Ti II	2φ, 11n	2φ, 1κ, 10n	2φ, 11n
Ge II	1σ, 1κ, 9n	1σ, 8n	1σ, 1κ, 9n
TFe II	5n	5n	5n
BFe II	3n	3n	3n
Tr II	1n	1n	1n
Cx II	1n	1n	1n
Ta III	1ζ, 21n	1ζ, 17n	1ζ, 21n
Ti III	1φ, 11n	1φ, 10n	1φ, 11n
Ge III	1σ, 9n	1σ, 8n	1σ, 9n
TFe III	5n	5n	5n
BFe III	3n	3n	3n
Tr III	1n	1n	1n
Cx III	1n	1n	1n

* Based on recent re-examination of the holotype of *B. gaspari* by Prof. Haitlinger, fn TFe was 5-5-5 not 4-4-5 but the determination number of setae on the other part of legs because of bad condition the specimen has been difficult.



Figures 13–17. 13–16. *Bursaustium zabolensis* Noei **sp. nov.** (larva) – Dorsal scutum position on dorsal surface of propodosoma; 17. Dorsal scutum of the holotype of *B. gaspari*, sent by Prof. R. Haitlinger.

Key to species of *Bursaustium* (larva)

1. ASens 53–55, Ti III 70–77 ..... *B. zabolensis* Noei **sp. nov.**
– ASens ≤ 36, Ti III ≤ 62 2
2. ASens 36, Ti III 43 ..... *B. norbakhshi* Saboori, 2002
– ASens 20–30, Ti III 52–62 ..... *B. gaspari* Haitlinger, 2000

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تغییر مشخصات جنس *Bursaustium* (Acari: Erythraeidae) همراه با توصیف گونه‌ای جدید از جنوب شرق ایران

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چکیده

مشخصات جنس *Bursaustium* Haitlinger, 2000 تغییر داده می‌شود و گونهٔ *Bursaustium zabolensis* Noei **sp. nov.** (Acari: Trombidiformes: Erythraeidae) از نمونه خاک (بدون میزبان) زیر درختان گز از شهر زابل، استان سیستان و بلوچستان، ایران توصیف می‌شود. این سومین گونهٔ شناخته شده این جنس و دومین گونهٔ این جنس از ایران است. کلید شناسایی گونه‌های جنس *Bursaustium* (لارو) نیز ارایه می‌شود.

واژگان کلیدی: Balaustiinae؛ *B. gaspari*؛ *B. norbakhshi*؛ لارو؛ گز؛ Trombidiformes.

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