

A discussion on the validity of the genus *Abalakeus* (Acari: Erythraeidae) with a redescription of *A. gonabadensis*

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Original research

ABSTRACT

The validity of the genus *Abalakeus* is discussed and redefinitions are provided for the genera of *Abalakeus* and *Eatoniana*. *Abalakeus gonabadensis* is redescribed from type specimens and larvae ectoparasitic on different grasshoppers (Orthoptera: Acrididae, Tettigoniidae) from Türkiye and Iran, and a key to species of *Abalakeus* is presented.

Keywords *Bucephaloptera* sp.; *Calliptamus* sp.; key; *Heteracris littoralis*; *Oedipoda miniata*; redefinition

Introduction

The genus *Abalakeus* (with type species *A. chekei* Southcott) was established by Southcott in 1994 based on the larval stage. Since then, a new species (*A. bambusae* Zhang) from bamboo forests in Fujian, China (Zhang *et al.* 2000) and three species (*A. lorestanicus* Saboori and Lachinani; *A. jahromiensis* Sedghi, Saboori and Hakimitabar; *A. gonabadensis* Ahmadi, Hajiqanbar and Saboori) from Iran (Saboori and Lachinani 2003; Sedghi *et al.* 2010; Ahmadi *et al.* 2012) have been described. Mayoral and Barranco (2006) collected larval specimens of *A. lorestanicus* Saboori and Lachinani, 2003 in Andalusia, Spain ectoparasitic on *Steropleurus andalusius* (Rambur, 1838) (Orthoptera: Tettigoniidae) and described its nymphal stage covered with leaf-like setae on idiosoma and legs. Məkol and Sevsay (2015), obtained heteromorphic larvae, congeneric with the hitherto distinguished *Abalakeus*, from eggs laid by a “plume-footed” female, identified as *Eatoniana plumipes* from Türkiye and considered *Abalakeus* a junior synonym of *Eatoniana* Cambridge, 1898 and synonymized *E. jahromiensis* (Sedghi, Saboori and Hakimitabar, 2010) with *E. plumipes* (L. Koch, 1856). New metric data on *E. lorestanica* (Saboori and Lachinani, 2003) was presented by Noei and Rabieh (2019). Also, they corrected some mistakes in the original description and presented new metric data and a key to species of *Eatoniana*. Noei and Honarmand (2020) corrected some mistakes in the original description and presented new metric data for *E. gonabadensis* (Ahmadi, Hajiqanbar and Saboori, 2012). Recently, Xu *et al.* (2022) described a new species of *Eatoniana* from China and transferred *Erythraeus* (Er.) *yangshuonicus* Haitlinger, 2006 to *Eatoniana* and presented an updated key to species.

The study of terrestrial Parasitengona from Türkiye is still in progress. During a survey on terrestrial Parasitengona in Aydin province, Türkiye, and Semnan province, Iran, *A.*

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gonabadensis was collected and redescribed from type specimens as well as larvae collected ectoparasitic on grasshoppers. There were some mistakes in the original description and figures and they are corrected here.

Material and methods

Type specimens of *A. gonabadensis* were loaned from Acarological collection, Department of Entomology, Faculty of Agriculture, Tarbiat Modares University and from Acarological collection, Jalal Afshar Zoological Museum, Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran. Also, 25 mite larvae attached to the wings, thoraces and hind legs of *Heteracris littoralis* (Rambur, 1838), *Calliptamus* sp. (Orthoptera: Acrididae) and *Bucephaloptera* sp. (Orthoptera: Tettigoniidae) from Aydin province, Türkiye, and four larvae ectoparasitic on *Oedipoda miniata* (Pallas, 1771) (Orthoptera: Acrididae) from Semnan province, Iran were detached by an insect pin, preserved in 75% ethanol, cleared in Nesbitt's fluid and finally mounted on microscope slides using Hoyer's or Faure media (Walter and Krantz, 2009). Figures were drawn and measurements were made using an AxioImager A2 (Carl Zeiss, Germany) compound microscope with phase contrast and DIC illumination in Türkiye and an Olympus BX 51 (Olympus, Japan) compound microscope with phase contrast in Iran. Photomicrographs were taken with an AxioCam 506 color (Carl Zeiss, Germany) digital camera. Measurements are given in micrometers (µm). Abbreviations and terminology follow Wohltmann *et al.* (2007) and Saboori *et al.* (2009).

Abalakeus Southcott, 1994

Definition of larva (after Southcott 1994, updated)

Scutum with two normal setae on each side (2 + 2); coxal setal formula: 1, 1, 1; basifemoral setal formula: 2, 2, 1; TFe I with one solenidion; Ge I with one solenidion on the proximal half of the segment, Ge II with one solenidion, anterior tarsal claw hook-like, posterior tarsal claw pulvilliform with numerous ventral onychotrichs and without hook element; with two sternalae II (2a), bases of posterior sensillary (PSens) setae well-separated; palp femur and palp genu, each with one seta, odontus bifurcate at termination.

Also, leg normal setal formula is as follows: fn Cx = 1-1-1, fn Tr = 1-1-1, fn BFe = 2-2-1, fn TFe = 5-5-5, fn Ge = 8-8-8, fn Ti = 14-15-15, fn Ta = 24-28, 22-24, 22-24 (Table 1). We checked *A. lorestanicus* and *A. gonabadensis* and fn Ta for both species is 26-23-23 and here is corrected for both species. Also, number of normal setae on Ge II of *A. checkei* was checked and it was 8, so fn Ge will be 8-8-8 in this species too. Southcott (1994) showed only 7 normal setae in Figure 3.

Corrections in the description of *A. lorestanicus*

Saboori and Lachinani (2003) mistook companion seta (z) with dorsal eupathidia as a famulus for *A. lorestanicus*. They did not consider dorsal eupathidium with a Cp by mistake. No famulus was seen in *Abalakeus*.

Discussion on *Abalakeus* and its species

After the description of *Abalakeus bambusae* (now *Eatoniana bambusae*) by Zhang *et al.* (2000), the presence of solenidion on TFe I and shape of posterior tarsal claw were considered by authors as intraspecific variations. Mayoral and Barranco (2006) reared *Abalakeus lorestanicus* and got a deutonymph that had only leaf-like setae, and without any plume-like setae on legs. Deutonymph is similar to the adult in morphology and a few characters may be different in

Table 1 Meristic data of *Abalakeus gonabadensis* larvae (holotype and Turkish specimens): when two different numbers were shown for normal setae on Ta, it means there are abnormalities and their numbers are not the same on both sides on each leg. h: holotype; 1a-1y: Turkish specimens.

	h	1a	1b	1c	1d	1e	1f	1g	1h
Ta I	1ω, 2ζ, 1z, 26n	1ω, 2ζ, 1z, 25–26n	1ω, 2ζ, 1z, 24n	1ω, 2ζ, 1z, 25–26n	1ω, 2ζ, 1z, 24n	1ω, 2ζ, 1z, 25–26n	1ω, 2ζ, 1z, 26n	1ω, 2ζ, 1z, 26n	1ω, 2ζ, 1z, 24n
Ti I	2 φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n
Ge I	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n
TFe I	10, 5n	10, 5n	10, 5n	10, 5n	10, 5n	10, 5n	10, 5n	10, 5n	10, 5n
BFe I	2	2	2	2	2	2	2	2	2
Tr I	1	1	1	1	1	1	1	1	1
Cx I	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1
Ta II	1ω, 1ζ, 23n	1ω, 1ζ, 23n	1ω, 1ζ, 23n	1ω, 1ζ, 23n	1ω, 1ζ, 23n	1ω, 1ζ, 23n	1ω, 1ζ, 23n	1ω, 1ζ, 23n	1ω, 1ζ, 23n
Ti II	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n
Ge II	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n
TFe II	5n	5n	5n	5n	5n	5n	5n	5n	5n
BFe II	2	2	2	2	2	2	2	2	2
Tr II	1	1	1	1	1	1	1	1	1
Cx II	1	1	1	1	1	1	1	1	1
Ta III	1ζ, 22–23n	1ζ, 22–23n	1ζ, 23n	1ζ, 23n	1ζ, 23n	1ζ, 23n	1ζ, 23n	1ζ, 23n	1ζ, 23n
Ti III	1φ, 15n	1φ, 15n	1φ, 15n	1φ, 15n	1φ, 15n	1φ, 15n	1φ, 15n	1φ, 15n	1φ, 15n
Ge III	1σ, 8n	1σ, 8n	1σ, 8n	1σ, 8n	1σ, 8n	1σ, 8n	1σ, 8n	1σ, 8n	1σ, 8n
TFe III	5n	5n	5n	5n	5n	5n	5n	5n	5n
BFe III	1	1	1	1	1	1	1	1	1
Tr III	1	1	1	1	1	1	1	1	1
Cx III	1	1	1	1	1	1	1	1	1
fD	42	40	36	42	42	42	40	40	42
fV	11	12	12	10	10	10	10	12	10
NDV	61	52	48	52	52	52	50	52	52

	1i	1j	1k	1l	1m	1n	1o	1p	1q
Ta I	1ω, 2ζ, 1z, 26, 28n	-	1ω, 2ζ, 1z, 26n	1ω, 2ζ, 1z, 26n	1ω, 2ζ, 1z, 26n	1ω, 2ζ, 1z, 26n	1ω, 2ζ, 1z, 26n	1ω, 2ζ, 1z, 26n	1ω, 2ζ, 1z, 25–26n
Ti I	2φ, 1k, 1z, 14n	-	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n
Ge I	1σ, 1k, 8n	-	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n
TFe I	10, 5n	10, 5n	10, 5n	10, 5n	10, 5n	10, 5n	10, 5n	10, 5n	10, 5n
BFe I	2	2	2	2	2	2	2	2	2
Tr I	1	1	1	1	1	1	1	1	1
Cx I	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1
Ta II	1ω, 1ζ, 23n	1ω, 1ζ, 23n	1ω, 1ζ, 23n	1ω, 1ζ, 23, 24n	1ω, 1ζ, 23n	1ω, 1ζ, 23n	1ω, 1ζ, 22–23n	1ω, 1ζ, 23n	1ω, 1ζ, 23n
Ti II	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n
Ge II	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n
TFe II	5n	5n	5n	5n	5n	5n	5n	5n	5n
BFe II	2	2	2	2	2	2	2	2	2
Tr II	1	1	1	1	1	1	1	1	1
Cx II	1	1	1	1	1	1	1	1	1
Ta III	1ζ, 23n	-	1ζ, 23n	1ζ, 23, 24n	1ζ, 23n	1ζ, 23n	1ζ, 20, 22n	1ζ, 23n	1ζ, broken-22n
Ti III	1φ, 15n	-	1φ, 15n	1φ, 15n	1φ, 15n	1φ, 15n	1φ, 15n	1φ, 15n	1φ, 15n
Ge III	1σ, 8n	-	1σ, 8n	1σ, 8n	1σ, 8n	1σ, 8n	1σ, 8n	1σ, 8n	1σ, 8n
TFe III	5n	-	5n	5n	5n	5n	5n	5n	5n
BFe III	1	-	1	1	1	1	1	1	1
Tr III	1	-	1	1	1	1	1	1	1
Cx III	1	-	1	1	1	1	1	1	1
fD	39	41	40	44	40	40	40	39	39
fV	10	9	12	8	10	12	12	12	12
NDV	49	50	52	52	50	52	52	51	51

	1r	1s	1t	1u	1v	1w	1x	1y
Ta I	1ω, 2ζ, 1z, 26n	1ω, 2ζ, 1z, 25–26n	1ω, 2ζ, 1z, 26n	1ω, 2ζ, 1z, 26n	1ω, 2ζ, 1z, 24, 26n	1ω, 2ζ, 1z, 26n	1ω, 2ζ, 1z, 26n	-
Ti I	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	2φ, 1k, 1z, 14n	-
Ge I	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	-
TFe I	10, 5n	10, 5n	10, 5n	10, 5n	10, 5n	10, 5n	10, 5n	10, 5n
BFe I	2	2	2	2	2	2	2	2
Tr I	1	1	1	1	1	1	1	1
Cx I	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1	<i>el</i> + 1
Ta II	1ω, 1ζ, 23n	1ω, 1ζ, 22–23n	1ω, 1ζ, 23n	1ω, 1ζ, 23n	1ω, 1ζ, 21, 23n	1ω, 1ζ, 23n	1ω, 1ζ, 23n	1ω, 1ζ, 23n
Ti II	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n	2φ, 15n
Ge II	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n	1σ, 1k, 8n
TFe II	5n	5n	5n	5n	5n	5n	5n	5n
BFe II	2	2	2	2	2	2	2	2
Tr II	1	1	1	1	1	1	1	1
Cx II	1	1	1	1	1	1	1	1
Ta III	1ζ, 23n	1ζ, 21, 23n	1ζ, 23n	1ζ, 23n	1ζ, 23n	1ζ, 23–24n	1ζ, 23n	-
Ti III	1φ, 15n	1φ, 15n	1φ, 15n	1φ, 15n	1φ, 15n	1φ, 15n	1φ, 15n	-
Ge III	1σ, 8n	1σ, 8n	1σ, 8n	1σ, 8n	1σ, 8n	1σ, 8n	1σ, 8n	-
TFe III	5n	5n	5n	5n	5n	5n	5n	-
BFe III	1	1	1	1	1	1	1	-
Tr III	1	1	1	1	1	1	1	-
Cx III	1	1	1	1	1	1	1	1
fD	42	40	38	38	40	38	38	38
fV	12	12	10	12	12	12	12	12
NDV	54	52	48	50	52	50	50	50

terrestrial Parasitengona e.g. number of acetabula. Mağol and Sevsay (2015) reared a plume-footed female of *Eatoniana plumipes* and obtained larvae without solenidion on TFe I. They assumed the presence of solenidion on TFe I is an intraspecific variation and considered it as an optional character in the diagnosis. Also, they did not consider tarsal claws as an important character. We added more characters in the diagnosis of *Abalakeus* which helps to separate it from *Eatoniana* in the larval stage. Mayoral and Barranco (2006) did not present a diagnosis for post-larval forms of *Abalakeus* and only considered leaf-like setae as the most important character of the genus. For a better separation of these two genera at larval stage, we present an updated diagnosis of *Eatoniana*.

Diagnosis *Eatoniana* (larva) (updated from Mağol and Sevsay 2015)

Scutum with two normal setae on each side (2 + 2); coxal setal formula: 1, 1, 1; basifemoral setal formula: 2, 2, 1; TFe I without solenidion; Ge I with one solenidion on the distal half of the segment, Ge II without solenidion, anterior and posterior tarsal claw feather-like; without sternalae II (2a), bases of posterior sensillary setae close together (similar to ASens bases); palp femur and palp genu, each with one seta, odontus bifurcate at termination.

So, *Abalakeus* can be distinguished from *Eatoniana* in the larval stage with the following key:

1. TFe I and Ge II each with one solenidion, anterior tarsal claw hook-like, with two sternalae II (2a), bases of posterior sensillary (PSens) setae well-separated *Abalakeus*
— TFe I and Ge II without solenidion, anterior tarsal claw feather-like, without sternalae II (2a), bases of posterior sensillary (PSens) setae close together *Eatoniana*

Abalakeus gonabadensis Ahmadi, Hajiqaanbar & Saboori, 2012

(Figures 1–4)

Diagnosis

Idiosomal setae leaf-like, some normal setae on legs blunt-ended, with two pairs of sternalae III; one solenidion on Ge III; fD = 36–44, fV = 8–12; Ti I 121–162, Ti III 118–227.

Redescription (N = 33)

Color red when alive. Idiosoma oval with 36–44 leaf-like dorsal setae with short barbs (Figures 1A and 4D). Scutum semi-oval (Figure 1A) or circular (Figure 4A) or semi-quadrangle (Figure 4B) in outline wider than long with slightly concave anterior border, and convex other borders; AL longer than PL, both leaf-like with short barbs. Anterior pair of sensilla (ASens) shorter than posterior one (PSens), both barbed in distal ¼. Scutum punctate and finely striated; distance between the SBp bases greater than SBa; ISD greater than AP (Fig. 4).

Two eyes posterolateral to scutum on each side (Figure 1A). Eye plate absent. Anterior lens 16–25 and posterior one 10–20 in diameter. Ventral surface of idiosoma bearing 8–12 leaf-like barbed setae posterior to coxae III shorter and narrower than dorsal ones (Figure 1B). Sternalae (1a, 2a, 3a) leaf-like with short barbs. There are two pairs of sternalae III (3a). Coxae I–III each with one leaf-like seta; coxalae 1b longer than other coxalae, all coxalae with fine barbs (Figure 1B). Coxal fields punctate. Supracoxal seta of leg I (eI) small, peg-like and 3–9 long (Figure 4B). Tarsi with median claw-like empodium, falciform anterior claw; posterior claw a rod which is spoon-like, without hook element but with numerous onychotrichs. NDV = [36–44] + [8–12] = [48–54].

Subcapitulum with striation and punctation. Palpal trochanter, femur and genu with striations and punctations. Galealae (cs) smooth or with 1–2 short barbs, (31–56) long, hypostomalae (bs) smooth or with 1–2 short barbs, hypostomalae (as) spine-like and minute.



Figure 1 *Abalakeus gonabadensis* (larva). A – Dorsal view of idiosoma; B – Ventral view of idiosoma; C – Gnathosoma.

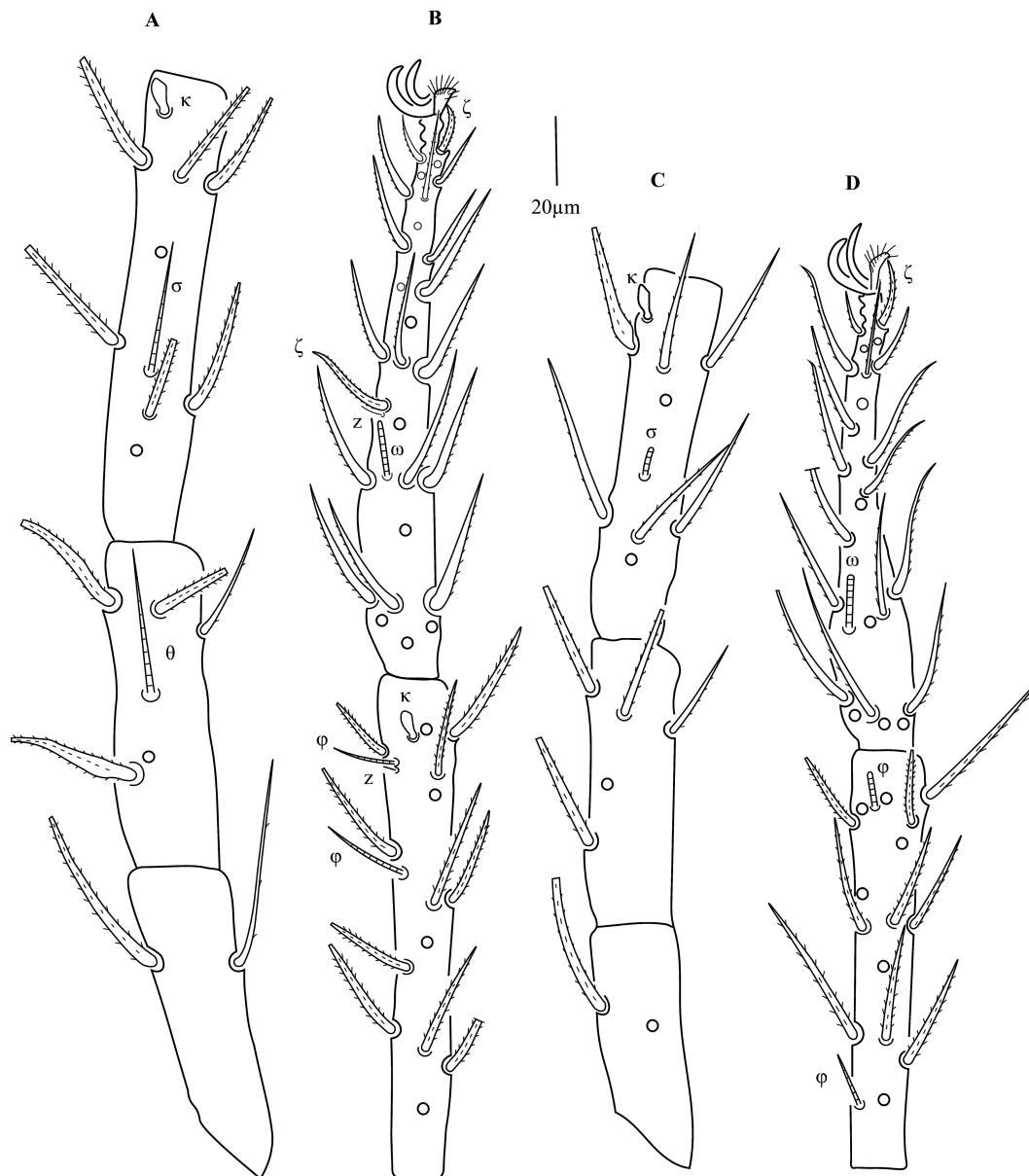


Figure 2 *Abalakeus gonabadensis* (larva). A – BFe-Ge I; B – Ti and Ta I; C – BFe-Ge II; D – Ti and Ta II.

Palp trochanter without seta, palpal femur and genu each with one barbed seta, tibia with three barbed setae; palpal tibial claw bifid. Tarsus with six setae including a solenidion and an eupathidium (Fig. 1C). fPp = 0-B-B-BBB₂-4Nωζ. Cheliceral bases punctate and finely striate. Supracoxal seta of palp (*eP*), minute, peg-like, 4–10 long.

Leg setal formula: Leg I (Figure 2A–B): Ta- 1ω, 2ζ, 1z, 24–28n; Ti- 2φ, 1z, 1κ, 14n; Ge- 1σ, 1κ, 8n; TFe- 1θ, 5n; BFe- 2n; Tr- 1n. Leg II (Figure 2C–D): Ta- 1ω, 1ζ, 22–24n; Ti- 2φ, 15n; Ge- 1σ, 1κ, 8n; TFe- 5n; BFe- 2n; Tr- 1n. Leg III (Figure 3): Ta- 1ζ, 20–24n; Ti- 1φ, 15n; Ge- 1σ, 8n; TFe- 5n; BFe- 1n; Tr- 1n. Abnormalities are considered in the leg setal formula. Leg segments punctate, all leg setae with small barbs. Some normal setae on leg segments are blunt-ended and others pointed. Meristic data is given in Table 1 for the holotype and Turkish specimens.

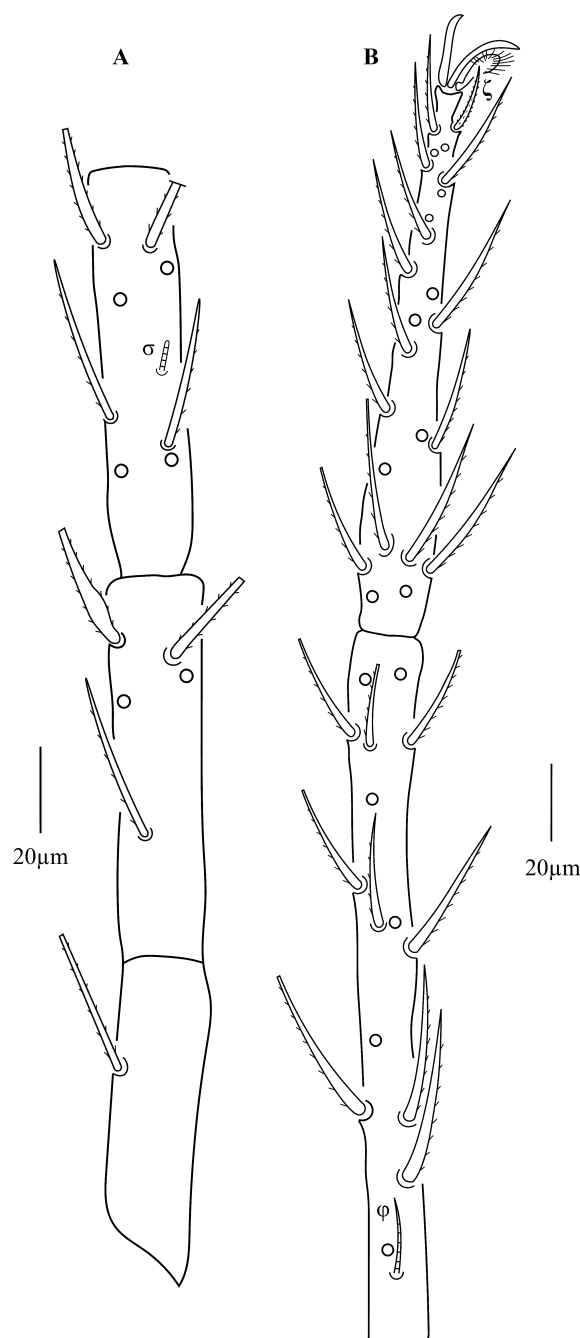


Figure 3 *Abalakeus gonabadensis* (larva). A – BFe-Ge III; B – Ti and Ta III.

Measurements are given in Table 2.

Remarks on scutum and cheliceral bases punctations and striations

Punctations and striations on the scutum and cheliceral bases depend on the sclerotization of the body at the time of sampling. When the sclerotization is not completed and the body is soft (newly emerged larva), punctations cannot be seen or are weak whereas striations can be seen easily on scutum and cheliceral bases (Figure 4C). When sclerotization of the cheliceral bases

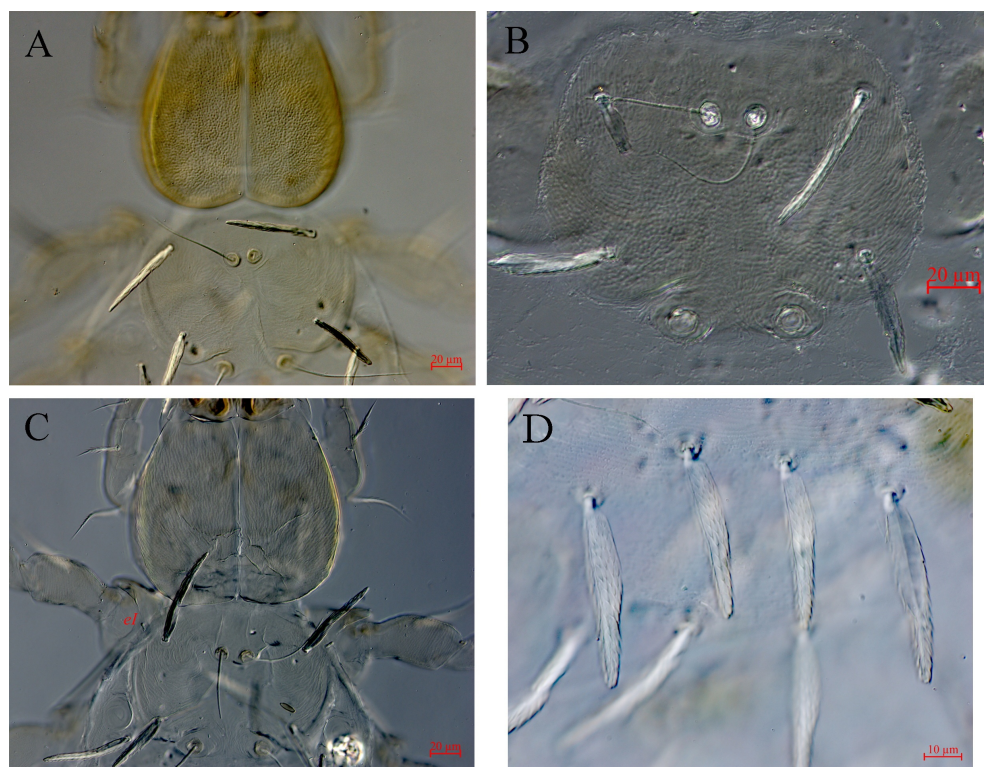


Figure 4 *Abalakeus gonabadensis* (larva). A – Scutum circular with striations and cheliceral bases with punctations and faint striations; B – Semi-rectangular scutum; C – Scutum and cheliceral bases with striations; D – Dorsal idiosomal setae.

is completed, then punctations can be seen easily but striations will be difficult to see and the same time scutum sclerotization may not be completed and striations can be seen easily but punctations may be too weak or cannot be seen (Figure 4A) while punctations can be seen easily on scutum and cheliceral bases in completely sclerotized specimens and striations are difficult to be seen. These observations suggests that punctations and striations on the scutum and cheliceral bases may not be a good character for comparison of species and may not be good taxonomic characters.

Material studied

Holotype and three paratypes as in the original paper. Four larvae (ARS-20221001-1a, 1b, 1i, 1j), Faculty of Agriculture, Aydin Adnan Menderes University, Aydin, Türkiye, 37°4536.0"N; 27°4514.6"E, 120 m.a.s.l, Cihan Aslı and Mesut Sayan col., ectoparasitic on *Heteracris littoralis* (Rambur, 1838) (Orthoptera: Acrididae: Eyprepocnemidinae), 11 October 2022; five larvae (ARS-20221001-1c, 1f, 1g, 1h, , 1k), the same data except collected ectoparasitic on *Calliptamus* sp. (Orthoptera: Acrididae: Calliptaminae); two larvae (ARS-20221001-1d, 1q), the same as latter except collected on 10 October 2022 and 4 August 2022, respectively; 13 larvae (ARS-20221001-1l to 1y), the same except collected on 26 August 2022; and one larva (ARS-20221001-1e), Kazan pond, Muğla, Türkiye, 37°1735.1"N; 28°1250.8"E, 480 m a.s.l, Alperen Kapankaya col., ectoparasitic on *Bucephaloptera* sp. (Orthoptera: Tettigoniidae: Tettigoniinae) on 6 September 2022. Four specimens, Mayamey mountains, Mayamey city, Semnan province, Iran, 36°2149.39"N, 55°4058.04"E, 1753 m a.s.l., Masoud Hakimitabar col., ectoparasitic on *Oedipoda miniata* (Orthoptera: Acrididae: Oedipodinae), 4 June 2018. Ten specimens (ARS-20221001-1a to 1j) are deposited in the Acarological Collection, Jalal Afshar Zoological Museum, Department of Plant Protection, Faculty of Agriculture, University of

Tehran, Karaj, Iran, and 10 specimens (ARS-20221001-1k to 1o & 1u to 1y) are deposited in the Acarological Collection, Acarological Society of Iran, Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran, five specimens (ARS-20221001-1p to 1t) and more than 20 extra specimens in the Acarological Collection, Department of Plant Protection, Faculty of Agriculture, Aydın Adnan Menderes University, Aydın, Türkiye; Iranian specimens will be deposited in the Acarological Collection, Acarological Society of Iran, Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran.

Corrections in the descriptions of *A. gonabadensis*

Ahmadi *et al.* (2012) did not consider dorsal eupathidium with a Cp by mistake. We checked holotype of *A. gonabadensis* and confirm Noei and Honarmand (2020) which Ge I has only 8 normal setae and there are four sternalae 3a. Ahmadi *et al.* (2012) mentioned 9 normal setae on Ge I by mistake. Also, we confirm that there is a minute spine-like anterior hypostomal seta *as* in both species which is not reported in the original descriptions. Noei and Rabieh (2019) pointed the presence of spine-like anterior hypostomal seta *as* and showed its shape in Fig. 1 of their paper. Noei and Honarmand (2020) pointed out that there is anterior hypostomal seta *as* but nothing written about its shape. Moreover, leaf-like setae on dorsal idiosoma and blunt-ended setae on leg segments are not pointed out in the original description. Ahmadi *et al.* (2012) showed that solenidion on TFe I placed on 1/3 distal end of the segment whereas we checked, and it is placed on the middle of the segment. Also, there are three barbed setae on palpal tibia as pointed out by Noei and Honarmand (2020). Number of dorsal and ventral

Table 2 Comparison of metric data of *Abalakeus gonabadensis* larvae from different localities.

Character	Ahmadi <i>et al.</i> (2012), n = 4	Noei and Honarmand (2021), n = 11	Turkish specimens (present study), n = 25	Mayamey, Iran (present study), n = 4	Character	Ahmadi <i>et al.</i> (2012), n = 4	Noei and Honarmand (2021), n = 11	Turkish specimens (present study), n = 25	Mayamey, Iran (present study), n = 4
IL	382–1019	-	291–1240	222–420	Ta I (L)	139–155	137–170	144–173	139–148
IW	263–599	-	217–862	104–222	Ta I (H)	18–23	-	20–25	25–27
SD	89–105	107–125	94–129	101–116	Ti I	121–154	135–162	128–161	120–143
W	132–154	127–155	117–172	129–136	Ge I	110–129	120–147	105–145	120–143
AW	82–93	90–105	80–111	84–101	TFe I	81–87	80–105	82–107	84–101
PW	81–86	85–102	55–110	82–106	BFe I	76–84	75–97	69–97	79–89
MA	29–42	37–42	35–47	37–42	Tr I	50–60	62–75	54–69	57–72
SBa	16–20	15–18	12–20	10–14	Cx I	71–84	82–100	65–92	69–82
SBp	35–44	37–45	35–53	30–37	Leg I	670–735	699–853	598–816	735–673
ISD	72–89	65–80	60–89	72–90	Ta II (L)	121–134	107–137	122–152	116–136
AP	47–59	45–62	51–68	56–60	Ta II (H)	18–22	-	20–30	27–29
AL	50–59	52–70	50–69	47–54	Ti II	102–118	113–132	103–133	111–126
PL	32–43	41–52	39–54	32–42	Ge II	81–110	100–120	89–115	104–116
ASens	42–50	55–66	48–68	50–68	TFe II	68–79	72–92	75–94	79–87
PSens	79–82	75–95	71–100	93–99	BFe II	63–76	62–75	55–74	67–69
DS	31–33	32–42	33–66	33–45	Tr II	50–58	62–75	49–68	55–67
PDS	36–43	25–42	31–52	37–45	Cx II	76–84	77–92	62–87	62–79
1a	28–38	30–40	30–62	37–45	Leg II	577–630	608–708	556–743	633–656
1b	53–60	55–72	54–76	45–52	Ta III (L)	116–136	115–147	125–155	136–143
2a	30–38	25–37	30–43	28–34	Ta III (H)	16–22	-	17–22	27–29
2b	26–37	32–40	31–45	32–45	Ti III	118–179	175–212	168–207	175–227
3a	22–29	27–35	20–40	40–42	Ge III	95–108	95–115	89–117	99–121
3b	25–37	32–47	30–43	22–35	TFe III	79–89	90–115	92–117	94–111
GL	145–190	165–192	184–233	146–166	BFe III	60–76	67–87	67–87	61–82
PaScFed	31–37	32–45	33–51	42–45	Tr III	50–63	65–75	53–71	69–77
PaScGed	22–29	27–40	22–39	30–34	Cx III	66–81	72–87	56–80	67–87
bs	23–39	37–45	30–55	38–40	Leg III	627–717	687–827	663–807	730–819
cs	21–26	37–40	31–56	30–42	IP	1893–2015	1994–2372	1880–2308	2000–2234
as	4	3	3–6	4					

idiosomal setae are 42 and 12 whereas it was written 50 and 11 in the original description respectively.

Remarks

Abalakeus gonabadensis is unique among all species of *Abalakeus* by having leaf-like setae on idiosoma and blunt-ended normal setae on legs. Also, it differs from *A. chekei* in the number of solenidia on Ta I (1 vs. 2), Ge III (1 vs. 0), number of sternalae III (2 pairs vs. 1 pair), fD (36–44 vs. ~ 52), fV (8–12 vs. 17); and from *A. lorestanicus* in the shorter TFe I (80–107 vs. 116–131), Ge I (105–147 vs. 177–199), Ti I (120–162 vs. 192–213), TFe II (68–94 vs. 102–109), Ge II (81–120 vs. 138–155), Ti II (102–133 vs. 172–187), TFe III (79–117 vs. 128–138), Ge III (89–121 vs. 133–145), Ti III (118–227 vs. 262–301).

Key to species of the *Abalakeus* of the world (larva)

1. One solenidion on Ge III 2
 — Without solenidion on Ge III *A. chekei* Southcott, 1994
2. Dorsal idiosomal setae leaf-like, some normal setae on leg segments truncate, Ti III 118–227, Ti I 120–162 *A. gonabadensis* Ahmadi *et al.*, 2012
 — Dorsal idiosomal setae not leaf-like, all normal setae on leg segment pointed, Ti III 262–301, Ti I 177–213 *A. lorestanicus* Saboori & Lachinani, 2003

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