Fourth larval species of *Calyptostoma* (Acari: Prostigmata: Calyptostomatidae)

ALIREZA SABOORI¹, NAHID SOUKHTSARAI², MOHSEN YAZDANIAN² & AZADEH ZAHEDI GOLPAYEGANI¹

¹ Department of Plant Protection, College of Agriculture, University of Tehran, Karaj, Iran; e-mails: saboori@ut.ac.ir; zahedig@ut.ac.ir
² Department of Plant Protection, Faculty of Plant Production, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran; e-mails: nahidsoukhtsaraii@gmail.com; mohsenyazdanian@gau.ac.ir

Abstract

*Calyptostoma gorganica* Saboori & Soukhtsarai sp. nov. (Acari: Calyptostomatidae) is described and illustrated from larvae ectoparasitic on *Limonia caucasica* Lackschewitz, 1940 (Diptera: Tipulidae) from Shast Kalateh forest, Gorgan, Golestan Province, Northern Iran. It is the first report of the representatives of the superfamily Calyptostomatoidea from the Middle East. *Calyptostoma latiseta* and *C. simplexa* are not synonymous with *C. velutinum*. A key to larval species of *Calyptostoma* of the world is presented.

Key words: *Calyptostoma gorganica* Saboori & Soukhtsarai sp. nov., Tipulidae, larva, ectoparasite, Parasitengona, *Limonia caucasica*, new record, key

Introduction

*Calyptostoma* Cambridge, 1875, the only genus of Calyptostomatidae has seven species; four species, namely, *C. brevirostris* Wainstein, 1976, *C. caelatum* (Berlese, 1905), *C. extranea* (L. Koch, 1867) and *C. longirostris* Wainstein, 1976, are known from the adult stage and *C. velutinum* (Müller 1776) and *C. latiseta* Shiba, 1976 are known from both larval and adult stages and *C. simplexa* Shiba, 1976 is known only from the larval stage (Müller 1776; L. Koch 1867; Berlese 1905; Vistorin Theis 1974; Wainstein 1976; Shiba 1976; Beron 2008). *Calyptostoma velutinum* larvae parasitize species of Tipulinae and Limoniinae (Diptera: Tipulidae) (Wohltmann et al. 2007). This genus has a worldwide distribution, except Antarctica, with some species inquirenda in Africa (*C. exculta* (Berlese, 1917) & *C. tracheatum* Lawrence, 1944), Asia (*C. caelatum, C. latiseta & C. simplexa*), Australia (*C. extranea*) and Europe (*C. velutinum, etc.*) (Berlese 1905; Vitzthum 1926; Lawrence 1944; Shiba 1969; Womersley 1942; Southcott 1961). Vistorin Theis (1977) synonymized all but two European species with *C. velutinum*. The two remaining ones, *C. longirostris* Wainstein, 1976 and *C. brevirostris* Wainstein, 1976 from Russia, were obviously not known by her and certainly deserve re-evaluation.

The aim of the present manuscript is to describe the larva of *Calyptostoma gorganica* sp. nov. ectoparasitic on *Limonia caucasica* Lackschewitz, 1940 (Diptera: Tipulidae) from Iran.

Material and Methods

The mites were attached on leg segments of adults of *Limonia caucasica* Lackschewitz, 1940 (Diptera: Tipulidae). They were detached by an entomological pin and preserved in Oudemans' fluid,
cleared in Nesbitt’s solution and mounted on microscopic slides using Faure medium (Walter & Krantz 2009). Figures were drawn and measurements (given in micrometers) made using a BX51 phase contrast Olympus microscope equipped with a drawing tube. The terminology and abbreviations are adapted from Makol (2007) except for “cs” which is considered for the second tritorostral seta.

**Calyptostoma Cambridge, 1875**

*Diagnosis of larva*

Calyptostomatids with eyes 2 + 2; scutum almost absent, reduced to area sensilligera carrying one pair of smooth sensilla; palp tarsus with two prominent eupathidia distally and one solenidion more proximally; genu, tibia and tarsus of leg I each with > 5 solenidia, genu and tarsus of leg II each with 4–5 solenidia, tibia II with > 5 solenidia, genu III with 3–4 solenidia, Ti III with 2–4 solenidia.

*Remarks*

Most species descriptions of *Calyptostoma* are based on the adult stage except *C. velutinum* and *C. latiseta* which are described based on both larval and postlarval stages, and *C. simplexa* which is solely known for the larva. Finding another larva of this genus extends our knowledge about this little known genus.

**Calyptostoma gorganica Saboori & Soukhtsaraii sp. nov. (Figs. 1–10)**

*Diagnosis*

Larvae with the following features (n = 2): fn Sol = I (6–11–6), II (4–6–4), III (3–4–1); fnTr = 1–1–2; fζ = 2–2–1; fε = 0–0–0; microsetae on Ge I–II & Ti I with two tips; two pairs of subcapitular setae present, one of claws of leg I–III, each with one distinct prong subterminally.

*Description (n = 2):* Larva. Orange in colour.

**Idiosoma dorsum.** Scutum almost absent, reduced to area sensilligera carrying one pair of smooth sensilla. Laterally and posterior to area sensilligera, on each side one pair of eyes located on each a common ovoid, sparsely punctate sclerite, 27×57; anterior eye 22, posterior one 17. Each sclerite carries two setae (22–25) in inner mediolateral position. Rest of dorsum covered with numerous spine-like setae (1–3 spines may occur), each arising from a small platelet (Fig. 1). Dorsal idiosoma covered with strong and distinct striations (Fig. 3).

**Idiosoma venter.** Three pairs of coxae, with a pair of Claparede’s organs located in lateral position between coxae I and II. Each coxa carries numerous simple setae. Length of setae varies from 25–37 on coxa I, from 32–40 on coxae II and from 30–40 on coxae III. Anal opening (59×42) without surrounding sclerite, located medially posterior to coxae III. Rest of idiosoma covered with numerous setae, similar in shape to dorsal idiosomal setae (Fig. 2). Ventral idiosoma covered with strong and distinct striations.

**Gnathosoma.** Simple. Chelicera with cheliceral base (121) and sickle-shaped movable claw (32). Ventrally a pair of tritorostral setae (bs) smooth, about 20–21; a pair of oral setae (as) of similar shape, about 25–27, dorsally at tip of gnathosoma one pair of stout, spine-like adoral setae (cs), 7. No supracoxal setae (elcp) detected. Palp femur with one barbed seta ventrally and palp genu with one almost smooth seta dorsally and one smooth seta ventrally, seta (47–50) on palp femur longer than setae (17–37) on palp genu. Palp tibia with three smooth setae and a rather small (3) odontus. Odontus entire. Palp tarsus with two prominent eupathidia distally and a solenidion more proximally,
moreover five normal setae of which two are smooth, two are almost smooth (1–2 spine may occur), the fifth barbed (Fig. 4). There is a dorsal line on palp tibia.

**FIGURE 1.** *Calyptostoma gorganica* Saboori & Soukhtsaraii **sp. nov.** (larva), dorsal view of idiosoma.

**Legs.** Segmentation formula: 7−7−7; basi− and telofemura completely separated. Trochanter I−II each with one smooth seta and trochanter III with two smooth setae, all other leg segments covered with numerous smooth or almost smooth (1–3 spines may occur) setae, of which those in dorsal position are stronger and more spine−like. Genu and tarsus of leg I each with 6 solenidia (Figs. 5 & 6), Ti I with 11 solenidia, Ge and Ti I each with 1 microseta (κ) with two tips, Ta I with two eupathidia (ζ) (Figs. 5 & 6). Genu and tarsus of leg II each with 4 solenidia (Figs. 7 & 8), Ti II with 6 solenidia, Ge II with 1 microseta (κ) with two tips, Ta II with two eupathidia (Figs. 7 & 8). Genu III with 3 solenidia, Ti III with 4 solenidia and Ta III with one solenidion and one eupathidium (Figs. 9 & 10). All tarsi distally with paired claws (inner claw with one strong and distinct subterminal prong) and a prominent median, claw−like empodium.

**Measurements** (paratype in parenthesis): IL 851 (1040), IW 782 (~990), SD 30 (35), W 64 (75), S 112 (104), DS 27–40 (24–32), cs 7 (7), as 27 (25), bs 21 (20), Ta I (L) 129 (144), Ta I (H) 47 (52), Ti I 87 (99), Ge I 67 (77), TFe I 40 (45), BFe I 119 (124), Tr 42 (42), Cx I 119 (124), leg I 613 (655),...
Etymology

The species name is derived from type locality, Gorgan.

Type material

The holotype (ARS−20101223−1a) and paratype (ARS−20101223−1b), ectoparasitic on Limonia caucasica (Diptera: Tipulidae), were collected by N. Soukhtsaraii, 19. 04. 2010 in Shast Kalateh forest, Gorgan city (36˚ 46’ N, 54˚ 21’ E, 290 m a.s.l), Golestan Province, North of Iran. The holotype and paratype are deposited in the Acarological Collection, Jalal Afshar Zoological Museum, College of Agriculture, University of Tehran, Karaj, Iran.
FIGURE 4. *Calyptostoma gorganica* Saboori & Soukhtsuraii sp. nov. (larva), ventral view (left) and dorsal view (right) of gnathosoma.

**Remarks**

*Calyptostoma gorganica* sp. nov. differs from *C. velutinum* in the number of normal setae on Tr III (2 vs. 1), Ge II and Ta II each with 4 solenidia (> 5 in *C. velutinum*), Ta III with one solenidion (without solenidion in *C. velutinum*), Ge III without microseta (with microseta in *C. velutinum*), microseta on Ge I, Ti I and Ge II with two tips (entire in *C. velutinum*), Ta I without famulus (with 1 famulus in *C. velutinum*) and inner claw of legs I–III with one subterminal prong (without subterminal prong in *C. velutinum*); from *C. latiseta* in absence of leaf-shaped setae on idiosoma and legs, microseta on Ti I with two tips (entire in *C. latiseta*), Ta I with 6 solenidia (with 1 solenidion in *C. latiseta*) and number of subcapitular setae (3 pairs vs. 2 pairs), inner claw of legs I–III with one subterminal prong (both claws with subterminal prong in *C. latiseta*) and from *C. simplexa* in longer dorsal idiosomal setae (24–40 vs. 15), dorsal idiosomal setae with cup-shaped stalk (vs. without), number of setae on coxae (24–26–15 vs. 16–18–11–7), number of subcapitular setae (3 pairs vs. 1 pair), Ta I with 6 solenidia (with 1 solenidion in *C. simplexa*), Ta II with 4 solenidia (with 1 solenidion in *C. simplexa*), longer Ta I (129–144 vs. 95), Ti I (87–99 vs. 52), Ta II (111–124 vs. 80), leg I (613–655 vs. 275), leg II (540–615 vs. 250), leg III (619–660 vs. 273).
Status of validity of *Calyptostoma latiseta* and *C. simplexa*

Beron (2008) considered *C. latiseta* and *C. simplexa* as junior synonyms of *C. velutinum*, but we consider these two species different from *C. velutinum*. *Calyptostoma latiseta* differs from *C. velutinum* in having larvae with several leaf-shaped setae on the idiosoma and legs, the number of solenidia on Ta I & II (1 vs. > 5), claws of legs I–III with one subterminal prong each (without
subterminal prong in *C. velutinum*), longer leg I (> 428 vs. 340), leg II (> 370 vs. 306), leg III (> 408 vs. 350), and in having adults with several leaf-shaped setae on idiosoma and legs, longer S (225 vs. 108), shorter leg I (< 900 vs. 1020), leg II (< 850 vs. 935), leg III (< 800 vs. 935) and leg IV (< 1000 vs. 1200). *Calyptosoma simplex* differs from *C. velutinum* in having dorsal idiosomal setae without a cup-shaped stalk (vs. with), the number of subcapitular setae (2 pairs vs. 1 pair), Ta I & II with one solenidion (with > five solenidia in *C. velutinum*), and the inner claw of legs I–III with one subterminal prong (without subterminal prong in *C. velutinum*). For these reasons they are not synonymous with *C. velutinum*.

**FIGURES 7–8.** *Calyptostoma gorganica* Saboori & Soukhtsaraii sp. nov. (larva), 7, Tr–Ge II; 8, Ti and Ta II.
FIGURES 9–10. *Calyptostoma gorganica* Saboori & Soukhtsaraii sp. nov. (larva), 9, Tr–Ge III; 10, Ti and Ta III.

Key to larval species of *Calyptostoma* of the world

1. Ta I with one solenidion ................................................................. 2
   - Ta I with more than 5 solenidia .................................................. 3
2. Idiosoma and legs with several leaf-shaped setae .............................. C. latiseta
   - Idiosoma and legs without several leaf-shaped setae ........................ C. simplex
3. Tr III with one seta, Ta II with more than 5 solenidia ......................... C. velutinum
   - Tr III with two setae, Ta II with less than 5 solenidia .................... C. gorganica sp. nov.
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