



Full Length Article

Three New Species of Trichogrammatidae (Hymenoptera: Chalcidoidea) from the Kingdom of Saudi Arabia

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Abstract

Tumidiclava Girault (Hymenoptera: Trichogrammatidae) is a new generic record from the Kingdom of Saudi Arabia. Three new species, *Chaetostricha bukeriaensis* M.T. Khan & F.R. Khan, spp. nov., *Oligosita missaq* M.T. Khan & F.R. Khan, spp. nov. and *T. unaizahensis* M.T. Khan & F.R. Khan, spp. nov. are described. © 2020 Friends Science Publishers

Keywords: Saudi Arabia; Trichogrammatidae; *Chaetostricha*; *Oligosita*; *Tumidiclava*; New species; New record

Introduction

The family Trichogrammatidae (Hymenoptera: Chalcidoidea) was unknown from the Kingdom of Saudi Arabia (KSA) until Khan *et al.* (2018) recorded 7 genera (*Aphelinoidea* Girault, *Oligosita* Walker, *Paracentrobia* Howard, *Pseudoligosita* Girault, *Trichogramma* Westwood, *Ufens* Girault, *Xiphogramma* Nowicki) for the first time and described the species, *X. hayati*. In this paper, the genus *Tumidiclava* Girault (1911) is recorded for the first time from Kingdom of Saudi Arabia and three new species are described in each of these genera as follows: *Chaetostricha bukeriaensis* M.T. Khan & F.R. Khan, spp. nov., *Oligosita missaq* M.T. Khan & F.R. Khan, spp. nov. and *T. unaizahensis* M.T. Khan & F.R. Khan, spp. nov.

Materials and Methods

This study is based on the trichogrammatid specimens collected from different locations of Saudi Arabia. The terminologies followed were given by Doutt and Viggiani (1968), Gibson (1997) and Pinto (2006). The body lengths are provided in millimeters measured with the help of an ocular scale attached to an Olympus SZX16 stereo zoom binocular microscope at 10× Zoom 8 (one micrometer division= 0.0123) for the specimens mounted on cards. Remaining all other measurements are in micrometer and are of body parts mounted on slides, these measurements were taken with the help of an ocular scale attached on a

Nikon Eclipse 80i compound microscope at 400× magnification (one micrometer division = 0.0025). The body colorations were recorded from specimens mounted on cards before mounting them on slides. All images were captured with a Leica DFC295 digital camera fitted on a Leica DM2500 compound microscope.

The following acronyms are used to denote various body parts: C1, C2, *etc.*= 1, 2, *etc.* antennal segment of clava; F1, F2 = 1, 2 of antennal funicle segments; PLS = placoid sensilla; TI, TII *etc.*=1, 2, *etc.* tergite of gaster; acronym for type depository: ZDAMU=Insect Collections, Department of Zoology, Aligarh Muslim University, Aligarh, India.

Results

C. bukeriaensis M.T. Khan & F.R. Khan, spp. nov.

Description

Female. Length, 0.49 mm. Frontovortex and head brown; face yellowish; gena brown. Mandibles brown. Antenna pale brown except the pale yellow third apical of scape and apex of pedicel. Mesosoma alongwith pronotum brown, mesoscutum light brown, scutellum, metanotum brown; propodeum brown. Wings hyaline; faint infuscation from below marginal and stigmal veins to posterior margin of fore wing. Fore leg brown, tarsi pale; mid and hind legs brown except knees, tarsi and apical fourth hind tibia pale. Gaster dark brown.

Head, as broad as high (12:12), in frontal view. Mandible (Fig. 1) tridentate. Antenna (Fig. 2) with scape $3\times$ as long as broad; pedicel $1.6\times$ as long as broad; 2 anelli present; funicle two-segmented (F1 and F2), F1 short and appressed to base of F2, funicle slightly broader than combined lengths of F1 and F2; clava 3-segmented (C1, C2 and C3), $2.6\times$ as long as broad; C3 longer than C1 and C2 individually; C1 with 2, C2 with 1, and C3 with 5 PLS. *Relative measurements*: head dorsal length, 5; (slide at $400\times$), antenna, length (width): scape, 27 (9); pedicel, 16 (10); funicle 11 (12); clava, 39 (15); lengths of C1, C2 and C3, 12:10:17.

Mesosoma (Fig. 4). Mesoscutum mid lobe $1.14\times$ as broad as long and with elongated reticulate sculpture; scutellar sculpture similar to that of mesoscutum; propodeum medially $2\times$ as long as metanotum. Fore wing (Fig. 3) with apex almost rounded, $1.77\times$ as long as broad, moderately dense setae on disc arranged in rows; RS1 present with 8 setae, slightly curved away from cubitus; stigmal vein slightly constricted at base, 3 long setae present on marginal vein and longer than the collective lengths of premarginal and stigmal veins; 3 setae present at the base of premarginal vein; fore wing marginal fringe short, $0.12\times$ of wing width; hind wing $8.84\times$ as long as broad, with marginal fringe $3.33\times$ wing width. Legs with dentition as shown in Fig. 6. *Relative measurements*: mesosoma length, 89; metanotum median length, 4; propodeum median length, 8; fore wing length (width), 192 (108); length of marginal vein, 37; length of premarginal vein, 18; length of stigmal vein, 17; marginal fringe of fore wing length, 14; fore, mid and hind tibiae lengths, 43:62:63.

Metasoma. Gaster (Fig. 5) longer than mesosoma, (140:89); mesophragma reaching anterior TIII of gaster; ovipositor (Fig. 5) extending from anterior TIV of gaster, hardly exerted and $1.61\times$ as long as hind tibia; hypopygium reaching posterior TV of gaster. *Relative measurement*: length of ovipositor, 102.

Material examined: Holotype, ♀ (on slide). KSA [KINGDOM OF SAUDI ARABIA]: Al-Qassim, Bukeria, 10.iii.2018, coll. FR Khan (ZDAMU, registration No. HYM.CH.828).

Host: Unknown.

Comments: The present species is similar to *C. fumipennis* (Yousuf and Shafee 1988) and *C. miridiphaga* (Viggiani 1971) in the wing setation and basal infuscation of the fore wing and in the shape of antenna. It differs from *C. fumipennis* in the following characters: funicle subrectangular; fore wing with marginal vein longer than premarginal and stigmal veins lengths together; ovipositor extending from anterior tergite TIV of gaster, hardly exerted and $1.61\times$ as long as hind tibia. In *C. fumipennis*: funicle subglobose; fore wing with marginal vein shorter than collective lengths of premarginal and stigmal veins; ovipositor extending from posterior tergite TII of gaster, slightly exerted and $1.81\times$ as long as hind tibia.

This new species also differs from *C. miridiphaga* in the following characters: head dorsal width $2.4\times$ as long as

head dorsal length; lengths of pedicle, anelli and funicle combined longer than scape; funicle nearly rectangular; mesophragma restricted to anterior tergite TIII but not reaching the middle of gaster; fore wing with marginal vein longer than premarginal and stigmal veins lengths collectively; ovipositor hardly exerted. In *C. miridiphaga*: head dorsal width about as long as head dorsal length; length of pedicle, anelli and funicle combined as long as scape; funicle subglobose; mesophragma extending middle of gaster; fore wing with marginal vein shorter than collective lengths of premarginal and stigmal veins; ovipositor slightly exerted.

Etymology: The name of new species after the locality of type 'Bukeria' from where the specimen was collected.

***Oligosita missaq* M.T. Khan & F.R. Khan, spp. nov.**

Description

Female. Length, 0.46–0.51 mm. Head dark brown; eyes black. Mandibles brown, with dark brown tip. Antenna dark brown. Mesosoma dark brown except the yellowish mesoscutum. Fore wing hyaline, with infuscated band medially extending from anterior to posterior wing margins and a dark infuscation below stigmal vein, also a light infuscation around base of premarginal vein. Legs dark brown uniformly. Gaster dark brown uniformly.

Antennal toruli placed marginally above the base of lower margin of eye on head. Tridentate mandibles (Fig. 7). Scape of antenna (Fig. 8) $3.37\times$ as long as broad and $1.92\times$ as long as pedicel; pedicel broad apically, $1.55\times$ as long as broad; 1 anellus present; funicle unsegmented, $0.87\times$ as long as broad; 3-segmented clava (C1, C2 and C3), $1.66\times$ as long as broad; C3 with 2 rod-like sensillae at apex. *Relative measurements*: (slide at $400\times$) antennal segments, length (width): scape, 27 (8); pedicel, 14 (9); funicle 7 (8); clava, 25 (15).

Mesosoma (Fig. 10). Polygonal cells present at the mesoscutum mid lobe, mesosoma about $0.92\times$ as broad as long and $1.95\times$ as long as scutellum; mesoscutum mid lobe and scutellum each has a pair of setae. Elongated reticulate striations present on propodeum, and it is $3.5\times$ as long as metanotum medially. Fore wing (Fig. 9) $2.7\times$ as long as broad, disc with sparsely arranged setae; marginal vein longer than premarginal and stigmal veins lengths together; marginal fringe long, $0.67\times$ wing width.

Relative measurements: (slide at $400\times$): mid lobe of mesoscutum, length (width), 39 (42); length of scutellum, 20; median length of metanotum, 4; propodeum median length, 14; length (width) of fore wing, 184 (68); marginal vein length, 35; length of premarginal vein, 26; length of stigmal vein, 7; marginal fringe of fore wing length, 46; fore, mid and hind tibia lengths, 42:56:66.

Metasoma (Fig. 11). Gaster longer than mesosoma, (140:85); mesophragma reaching posterior tergite TII of gaster; ovipositor (Fig. 11) extending from TIII of gaster

Table 1: Characters to distinguish the new species from known species

| Genera | Species | Characters | | | |
|----------------------|----------------------------------|---|---|---|---|
| | | Head | Antennal structure | Fore wing | Gaster and ovipositor/ male genitalia |
| <i>Chaetostricha</i> | <i>C. bukeriaensis</i> spp. nov. | head dorsal width 2.4× as long as pedicle, anelli and funicle combined longer than scape | subrectangular; lengths of fore wing with marginal vein longer than pre-marginal and stigmal veins | longer than pre-marginal and stigmal veins together | ovipositor extending from anterior tergite TIV of gaster, hardly exerted |
| | <i>C. fumipennis</i> | head dorsal length slightly shorter than pedicle, anelli and funicle combined longer than scape | subglobose; lengths of fore wing with marginal vein shorter than collective lengths of pre-marginal and stigmal veins | and stigmal veins | ovipositor extending from posterior tergite TII of gaster, slightly exerted |
| | <i>C. miridiphaga</i> | head dorsal width about as long as head dorsal length | subglobose; lengths of pedicle, anelli and funicle combined as long as scape | and than collective lengths of pre-marginal and stigmal veins | shorter than collective lengths of pre-marginal and stigmal veins |
| <i>Oligosita</i> | <i>O. missaq</i> spp. nov. | | antenna with scape 1.92× as long as pedicel | fore wing 2.7× as long as broad; a broad infuscated band medially extending from anterior to posterior margins of fore wing | male genitalia anteriorly expanded |
| | <i>O. japonica</i> | | scape 1.5× as long as pedicel | fore wing about 3× as long as broad; infuscated band below stigmal vein at fore wing | male genitalia not expanded |
| <i>Tumidiclava</i> | <i>T. unaizahensis</i> spp. nov. | | antennal clava with C3 with PLS | 4 fore wing without basal infuscation and disc sparsely setose | ovipositor 1.13× as long as hind tibia |
| | <i>T. subcaudata</i> | | antennal clava with C3 with PLS | 7 fore wing with basal infuscation and disc densely setose | ovipositor 1.8× as long as hind tibia |



Fig. 1–6: *Chaetostricha bukeriaensis* spp. nov., female: 1, mandible; 2, antenna; 3, fore wing; 4, mesosoma; 5, body; 6, fore leg showing dentition

and not exerted, 1.42× as long as hind tibia; hypopygium extending not beyond the apical part of gaster. *Relative measurement:* Ovipositor length, 94.

Male. Length, 0.52 mm. Similar to female; antenna

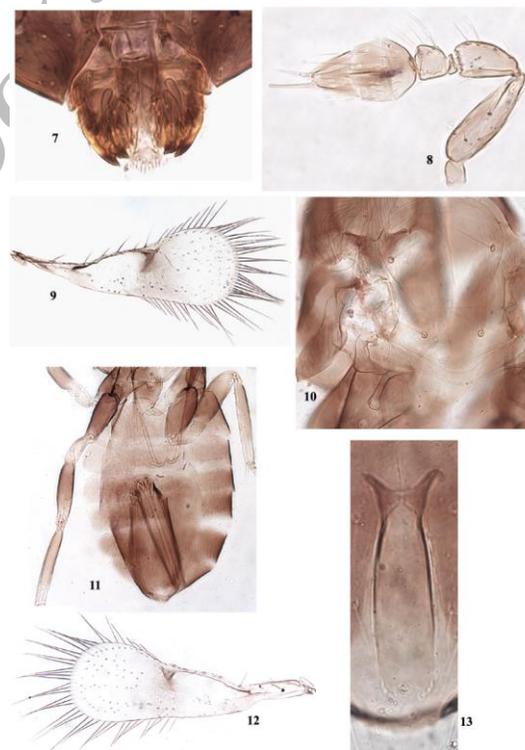


Fig. 7–13: *Oligosita missaq* spp. nov., female: 7, mandible; 8, antenna; 9, fore wing; 10, mesosoma; 11, metasoma. Male: 12, fore wing; 13, male genitalia

with scape, 2.77× as long as broad; pedicle 1.5× as long as broad; funicle a little longer than broad; clava 2.55× as long as broad; fore wing (Fig. 12) hyaline, sparsely arranged setae on fore wing disc, 3.06× as long as broad; marginal fringe long, 0.78× wing width; hind wing

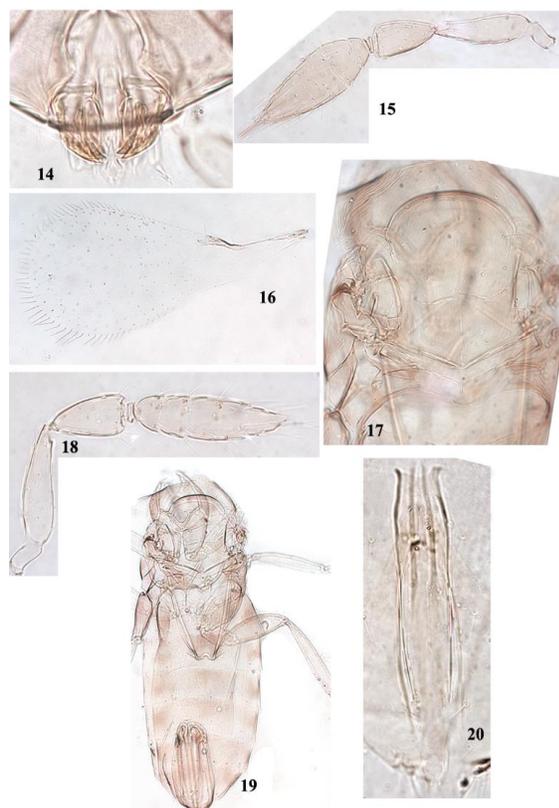


Fig. 14–20: *Tumidiclava unaizahensis* spp. nov., female. 14, mandible; 15, antenna; 16, fore wing; 17, mesosoma; 18, antenna; 19, body. Male: 20, male genitalia

11.6× as long as broad; male genitalia almost tubular (Fig. 13), anteriorly expanded, apodemes absent; 0.51× as long as hind tibia.

Material examined: Holotype, ♀ (on slide). KSA: Al-Qassim, Bukeria, 24.xi.2018, coll. FR Khan (ZDAMU, registration No. HYM.CH.817).

Paratypes, 2 ♀ (on slides). KSA: Al-Qassim, Buraidah, Melida, 6.xi.2012, Coll. F.R. Khan; 1 ♂ (on slide). KSA: Al-Qassim, Bukeria, 15.xi.2012, coll. FR Khan, (ZDAMU, HYM.CH.817).

Host: Unknown.

Comments: *Oligosita missaq* spp. nov. is similar to *O. japonica* Yashiro (1979) in the structure of fore wing but varies from it in the following characters: antenna with scape 1.92× as long as pedicel, fore wing 2.7× as long as broad; a broad infuscated band medially extending from anterior to posterior margins of fore wing; male genitalia anteriorly expanded. In *O. japonica*; scape 1.5× as long as pedicel; fore wing about 3× as long as broad; infuscated band below stigmal vein at fore wing; male genitalia not expanded.

Etymology: The name of this new species *O. missaq* is an anagram of Qassim, the province from where the specimens were collected.

Genus *Tumidiclava* Girault

Diagnosis

Female. Antennal formula, 1,1, (2), 0, 3; funicle absent; a rod-like sensilla at apex in the apical claval segment; mesoscutum mid-lobe and scutellum each with 2 pairs (2+2) of setae; propodeum length equals to metanotum; fore wing with short stigmal vein, disc sparsely setose, setae scattered; marginal vein longer than premarginal vein, Gaster with short ovipositor, hardly exerted.

Male. Antennal formula 1, 1, (2), 0, 4; funicle absent; clava without apical sensilla. Genitalia digiti and denticles absent; apodemes present; aedeagus apically bifurcated.

Species: 20 species worldwide (Noyes 2019).

Hosts: Coleoptera: Attelabidae (Yousuf and Shafee 1988). Lepidoptera: Cossidae (Lim and Pan 1979; Pan and Lim 1980), Pyralidae (Scheibelreiter 1976), Noctuidae (Scheibelreiter 1980).

Distribution: Cosmopolitan.

***T. unaizahensis* M.T. Khan & F.R. Khan, spp. nov.**

Description

Female. Length, 0.55 mm. Head brown uniformly. Mandible dark brown. Eyes and ocelli red. Antennae yellowish except the brown clava in apical half. Mesosoma brown except for the medially pale brown scutum. Fore wing hyaline. Legs including coxae brown, pale yellow trochanters; pale brown femora, tibiae and tarsi. Metasoma uniformly brown.

Head. Mandible (Fig. 14) tridentate. Antenna (Fig. 15) with scape 3.62–3.75× as long as broad; conical pedicel, 1.8–1.9× as long as broad; 2 anelli present, second anellus closely appressed into the base of C1; 3-segmented clava (C1, C2 and C3), 2.53–2.85× as long as broad; C3 longer than collective lengths of C1 and C2 and with 4 PLS. **Relative measurements:** head dorsal length, 4; antennal segments length (width), scape, 29 (8); pedicel, 18 (10); clava, 38 (15); lengths of C1, C2 and C3, 4:8:25.

Mesosoma (Fig 17). Mesoscutum mid lobe 1.17× as broad as long and with polygonal cells anteriorly; cells broadly elongate except medially with cells narrower; propodeum medially a little longer than metanotum. Fore wing (Fig. 16), 2.04–2.17× as long as broad, sparsely arranged setae on fore wing disc, setae not arranged in rows; short stigmal vein, marginal vein broad at apex; fore wing marginal fringe short, 0.07× wing of width; hind wing 10.4× as long as broad. **Relative measurements:** length of mesosoma, 78; length (width) of mid lobe of mesoscutum 35 (41); median length of metanotum, 4; propodeum median length, 7; fore wing length (width): 200 (92); marginal vein length, 15; premarginal vein length, 10; length of stigmal vein, 5; marginal fringe length, 7; hind wing length (width),

156 (15); fore, mid and hind tibiae lengths, 41:50:60.

Metasoma. Gaster (Fig. 19) longer than mesosoma, (145:78); ovipositor (Fig. 19) extending from TIV of gaster, 1.13–1.22× as long as hind tibia. *Relative measurement*: ovipositor length, 68.

Male. Length, 0.52 mm. Body with antenna, mesosoma, legs and gaster yellow except the brown tarsal claws; eyes and ocelli red; antenna (Fig. 18) with scape, 3.37× as long as broad, pedicel 1.7× as long as broad, clava 4-segmented (C1, C2, C3, C4) with C3 longest; fore wing hyaline, marginal fringe short, sparsely arranged setae on fore wing disc; male genitalia (Fig. 20) 1.19× as long as hind tibia.

Material examined: Holotype, ♀ (on slide). SAUDI ARABIA: Al Qassim, Unaizah, 30.v.2013, coll. FR Khan (ZDAMU, registration No. HYM.CH.816).

Paratypes. 1 ♀, 1 ♂ (on slides), same data as holotype. (ZDAMU, HYM.CH.816).

Host: Unknown.

Comments: This species is similar to *T. subcaudata* Nowicki (1936), but differs from it in the following characters: antennal clava with C3 with 4 PLS; fore wing without basal infuscation and disc sparsely setose; ovipositor 1.13× as long as hind tibia. In *T. subcaudata*: antennal clava with C3 with 7 PLS; fore wing with basal infuscation and disc densely setose; ovipositor 1.8× as long as hind tibia.

Etymology: This new species name based on the type locality 'Unaizah' from where the specimens were collected.

Discussion

Family Trichogrammatidae is poorly known from the Middle-Eastern region of the world. There are only 30 species (0.03% of the world fauna) belonging to 13 genera described and recorded so far (Noyes 2019).

In the present study, we treat *C. bukeriaensis*, *Oligosita missaq* and *T. unaizahensis* as new species. These new species are distinguished from the previously described species on the basis of important key characters such as head dorsal length and width, antennal structure, ratio of fore wing venation and setation, and ratio of ovipositor to hind tibia length (Table 1).

Conclusion

The findings of three new species in the present paper enriched the faunal diversity of family Trichogrammatidae from Kingdom of Saudi Arabia. With the description of these three new species the total number of described species from the KSA now are four, though a small number as compared to the more than 1012 described species around the globe (Noyes 2019). The systematic and faunistic studies on this important group of eco-friendly parasitoids should be conducted on priority basis for the exploration of new and known species and their

incorporation in integrated pest management for long-term sustainability of the ecosystem.

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Author Contributions

MTK prepared the material for study, identified specimens, took the photographs, and prepared the manuscript. FRK collected the specimens and helped in the identification and preparation of manuscript. SSA and X-XC helped in the identification and preparation of manuscript.

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