



Three New Species of the Genus *Microplitis* Förster, 1862 (Hymenoptera: Braconidae: Microgastrinae) from Saudi Arabia

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ABSTRACT

In this study, *Microplitis tihamicus* sp. nov., *M. faifaicus* sp. nov. and *M. khamisicus* sp. nov. (Hymenoptera: Braconidae: Microgastrinae) are described. The genus *Microplitis* is recorded for the first time from Saudi Arabia. Characters of these new species and their affinities with related species are discussed.

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Authors' Contribution

HAG conceived the idea of the project. HAG and ZA carried out the sampling. ZA analysed the data and wrote the initial manuscript. KAK contributed in final preparation of manuscript. KAK and FK provided suggestions and corrections.

Key words

Taxonomy, *Microplitis*, Braconidae, Saudi Arabia, Afrotropical region, New species

INTRODUCTION

The members of the genus *Microplitis* are solitary or gregarious endoparasitoids (koinobiont) of lepidopteron larvae. The genus *Microplitis* was erected by Foerster (1862) with *Microgaster sordipes* Nees von Esenbeck as its type species. It is characterized by having fore wings with large areolet, mesopleuron without prepectal carina, propodeum roughly sculptured and often with a median longitudinal carina, and metasomal tergites 2 and 3 unsculptured with a weak suture between them (Nixon, 1970; Mason, 1981; Austin and Dangerfield, 1992, 1993; Fernandez-Triana and Boudreault, 2018). The genus *Microplitis* contains 190 species worldwide (Fernández-Triana and Ward, 2017; Yu *et al.*, 2016; Zhang *et al.*, 2019; Fernandez-Triana *et al.*, 2020). Technically, no species have been listed from the Arabian region, though the existence of eight morpho-species recorded by Fernández-Triana and van Achterberg (2017). At present, five species of *Microplitis* are reported from the afro-tropical region (Yu *et al.*, 2016).

Despite the vast size and diverse topography of Saudi Arabia, studies on the terrestrial fauna especially insects, have not been substantially explored. Among the hymenopteran parasitoids, the family Braconidae contains only 35 species from Saudi Arabia (Ghramh and Ahmad,

2016). Within such a large expanse of land, covering more than 2.15 million km², with only two species of subfamily Microgastrinae (Braconidae) had been recorded from Saudi Arabia (Fernández-Triana and van Achterberg, 2017). In this paper, we provide descriptions of three new species of the braconid genus *Microplitis* Förster in order to study the biodiversity and conservation of parasitoid wasps in the Kingdom of Saudi Arabia. Southwest region of Saudi Arabia is divided by the steep Rocky Mountains into two main subdivisions, a lowland coastal plain at the west, known as “Tihama” and a mountainous area with an elevation of 3,000 m highlands at its peak at the east, known as “Asir Mountains range (Alahmed *et al.*, 2010). Although the geographical location of the southwestern region of Saudi Arabia is debatable, many workers have considered it to belong to the Afrotropical region (Sclater, 1858; Wallace, 1876; Hölzel, 1998). Studies of several taxonomic groups of insects have revealed that this region has an apparent faunal similarity with the Afrotropical region (Cowie, 1989; Sharaf *et al.*, 2014; El-Hawagry and Al Dhafer, 2015; Abdel-Dayem *et al.*, 2018).

Abbreviations

C, Costa; SC, subcosta; 1-R1, first radius; r, transverse radial vein; 1-SR, first sectorial vein; 2-SR, second sectorial vein; 1 SR+M, First median sectorial vein; 1-M, first media; r-m, transverse radio-medial vein; M+CU, medio-cubital vein; 1-CU1, first cubital vein; 2-CU1, Second cubital vein; AOL, anterior ocellar line; POL, posterior ocellar line; OD, maximum diameter of ocelli; OOL, oculo-ocular line; F, Flagellomere; T1, First metasomal tergite; T2, Second metasomal tergite; ZDKKU, Department of Zoology, King Khalid University, Abha, Saudi Arabia.

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MATERIALS AND METHODS

The specimens were collected by Malaise trap from the south-western region (Asir) of Saudi Arabia. Three braconid species were encountered in this research. The collected specimens were card-mounted on triangular points, then were examined with a stereoscopic microscope Nikon SMZ1000 and metric characters were measured with an ocular micrometer. To observe the detailed characters of the wings, these fore and hind wings were detached from the body, cleared and placed in Canada Balsam, and observed under a compound light microscope. Absolute measurements are used for body length in mm. We have followed van Achterberg (1993) for the terminologies of various body parts and wing venation, and Eady (1968) for the terminology of micro-sculpture. Classification, nomenclature and distributional data of Braconidae suggested by Yu *et al.* (2016) have been followed. Digital SEM photographs were taken at the department of Physics, King Khalid University, Abha, with a JEOL JSM 6360 LA (Japan) in low vacuum mode. The type specimens were deposited in the Insect Collection of the Department of Zoology, King Khalid University, Saudi Arabia (ZDKKU).

RESULTS AND DISCUSSION

Microplitis Förster, 1862

Microplitis Förster, 1862: 245 [type species, by original designation, *Microgaster sordipes* Nees ab Esenbeck, 1834] Nixon, 1970: 3. Mason, 1981: 132. Austin and Dangerfield, 1992 (see Shenefelt (1973: 737) for complete bibliography].

Dapsilotoma Cameron, 1906: 101 (type species, by monotypy, *Dapsilotoma testaceipes* Cameron, 1906). Synonymized by Viereck (1914: 25).

Glabromicroplitis Papp, 1979: 176 (type species, *Glabromicroplitis mahunkai* Papp, 1979). Synonymized by Austin and Dangerfield (1992).

Diagnosis (after Austin and Dangerfield, 1993; Ranjith *et al.*, 2015).

Clypeal margin concave to straight; eyes large and densely setose; width of face (at widest) $0.5\times$ width of head; labial palps nearly always with three segments, rarely with four segments; pronotum with lateral furrow; mesoscutum usually with some sculpturing, sometimes completely smooth; notauli variable, ranging from virtually absent to strongly impressed and coarsely sculptured; posterior band of scutellum usually wide and smooth, interrupted medially by rugosity; prepectal carina absent; propodeum usually convexly rounded, rarely composed of two faces meeting transversely and then not at an acute angle, virtually always with a distinct percurrent medial keel, never with

an areola, surface coarsely sculptured, usually rugose to reticulate-rugose; hind coxa usually small, shorter than T1; hind tibial spurs subequal in length, short, usually reaching less than $0.3\text{--}0.4\times$ distance to hind basitarsus; fore wing usually infusate, with 1-R1 short, not reaching to SR1; 1CU-1 variable in length but always shorter than 2 CU-1; r-m present; venal lobe convex and setose throughout; metasoma with T1 much longer than wide, often parallel sided or tapering towards apex; suture between T2 and T3 faintly defined or absent, if defined then T2 usually shorter than T3, rarely equal in length; sometimes with indistinct median field on T2; metasoma apart from T1 smooth; hypopygium usually well sclerotized, never membranous and expandable, sometimes elongate medially; ovipositor usually very short, often slightly down-curved throughout length, sheaths rarely protruding much beyond apex of hypopygium, nearly always with long hairs on exposed part, often setose apically.

Microplitis tihamicus Ghramh and Ahmad, sp. nov. (Fig. 1 A-C)

Material examined

Holotype: ♀, Saudi Arabia: Abha, Almanaf, ($18^{\circ}11'52.1''\text{N}$ $42^{\circ}33'00.5''\text{E}$), 7.VIII.2017, Malaise trap, Z. Ahmad leg. (ZDKKU). Paratype, 1♀, with same data as holotype (HB-11, ZDKKU).

Description

Female: body length: 2.2 mm; length of fore wing: 1.8 mm; length of antenna: 1.8 mm.

Differential diagnosis

The new species closely resembles with *Microplitis isis* (de Saeger, 1944) from Congo; however, it can be separated from all other described species of *Microplitis* in the afro-tropical region by the combination of the following features: small size (body length 2.1-2.2 mm, fore wing length 1.7-1.8 mm), entirely dark brown to black coloration (excluding yellowish legs), slightly infusate wings.

Head

Head ca. $2\times$ as wide as long in dorsal view, subcircular in anterior view; length of eye $0.8\times$ as long as temple in dorsal view; OOL: POL: AOL: OD = 6: 3: 2: 1.5; inner margin of eyes subparallel; face distinctly convex medially, flattened laterally and punctate-rugose with faint trace of median longitudinal carina; clypeus smooth and evenly convex; malar space ca. $2\times$ as long as its basal width of mandible; vertex dull with micro punctures; lateral temples punctate-rugose and moderately setose; antenna about as

long as body with 14-segmented flagellomeres, F 1 as long as F 2 , apical flagellomere pointed.

Mesosoma

Mesosoma 1.35× as long as wide; mesoscutum dull, rugulose with hairs medially while lateral sides and posterior side smooth, notauli indistinct (Fig. 1A); scutellum smooth, scutellar lunules wide divided by seven carinae, pre-scutellar furrow poorly developed without any groove, medio-posterior depression of scutellum elliptical (Fig. 1A); propodeum reticulate rugose with a percurrent medial longitudinal carina, its sculpture rather prominent (Fig. 1A); mesopleuron rugulose anteriorly, rest is smooth; length of hind femur 3.1× its width; length of hind tibia 6.0× its width; length of hind tibial spurs 0.30, 0.25× hind basitarsus; hind tarsal claw normal size.

Wings

Fore wing 2.5× as long as wide; pterostigma 2.2× as long as wide; 1-R1 ca. 0.8× length of pterostigma; 1-M straight (Fig. 1C); 1SR+M almost straight; areolet somewhat triangular, 3-SR hardly extending from origin, perpendicular to vein r (Fig. 1C); 1-CU1 0.33× as long as 2-CU1; 2- CU1 slightly curved posteriorly; angle between C+SC+R and 1-SR 90°

Metasoma

T1 1.8× as long as wide with a prominent shallow depression in anterior 2/3, strongly rugulose laterally, almost parallel-sided (Fig. 1B); T2 sub-rectangular, smooth, suture between T2 and T3 weak; T3 1.2× longer than T2, smooth with irregular rows of sparse setae, remaining tergites smooth (Fig. 1B); hypopygium small, shorter than tip of metasoma; ovipositor sheath short, approximately 1.2× as long as second hind tarsomere, acute apically and sparsely setose.; hypopygium small, slightly shorter than tip of metasoma; ovipositor sheath short, approximately 1.3× as long as second hind tarsomere, acute apically, almost without setae.

Colour

Body generally black, T1 brown, palps yellow, legs yellow except hind coxae, hind tibial spurs yellow, wings hyaline with infuscations apically, venation brown, setae on wings and body brown, pterostigma yellow basally half, rest black.

Male

Unknown.

Distribution

Saudi Arabia (Asir).

Host

Unknown

Etymology.

The name of the species originated from its type locality.

Variation

Body length 2.1–2.2 mm and length of fore wing 1.7–1.8 mm. The number of carinae dividing the scutellar lunules varies from six–seven.

Microplitis faifaicus Ghramh and Ahmad, sp. nov. (Fig. 2 A-C)

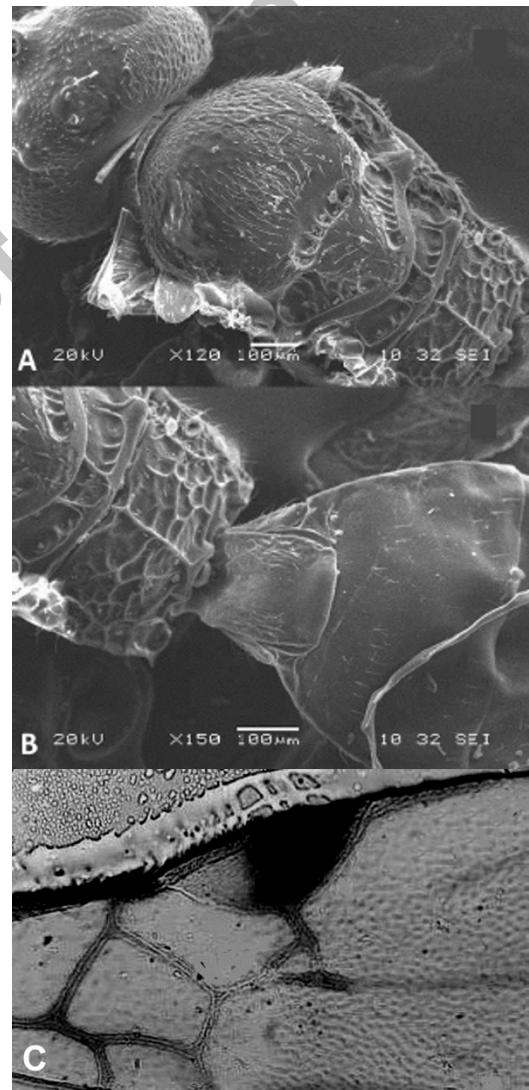


Fig. 1. *Microplitis tihamicus* sp. nov: A, Mesosoma, dorsal lateral view; B, Metasoma, dorsal view; C, Forewing (10x).

Differential diagnosis

The new species closely resembles with *Microplitis hova* (Granger, 1949) from Madagascar; however, it can be separated from all other described species of *Microplitis* in the afro-tropical region by the combination of the following features: entirely dark brown to black coloration (excluding all legs which are yellowish except hind coxae), infuscate wings, forewing areolate quadrangular shape and high altitudinal distribution.

This new species differs from *M. tihamicus* sp. nov., by having: forewing areolate quadrangular (in *M. tihamicus* forewing areolate almost triangular); propodeum coarsely reticulate rugose, with an impression of medial longitudinal carina originated with same texture of rugosity (in *M. tihamicus* propodeum reticulate rugose with a percurrent medial longitudinal carina); vein ISR+M straight (in *M. tihamicus* vein ISR+M curved); ovipositor sheath acute apically, almost without setae (in *M. tihamicus* ovipositor sheath rounded apically, with few setae).

Material examined

Holotype: ♀, Saudi Arabia: Faifa, (17°13'25.3"N 43°05'25.8"E), 7.III.2016, Malaise trap, Z. Ahmad leg. (ZDKKU). Paratype, 1♀, with same data as holotype (HB-12, ZDKKU).

Description

Female: body length: 2.5 mm; length of fore wing: 2.3 mm; length of antenna: 2.0 mm.

Head

Head ca. 2× as wide as long in dorsal view, subcircular in anterior view; length of eye 0.7× as long as temple in dorsal view; temple and vertex shiny with indistinct punctures; OOL: POL: AOL: OD = 6: 3: 2: 1.5; inner margin of eyes subparallel; face distinctly convex medially, and punctuate-rugose with faint trace of median longitudinal carina; clypeus smooth and evenly convex; malar space ca. 2.1× as long as its basal width of mandible; vertex dull with micro punctures; lateral temples punctuate-rugulose and densely setose; antenna about as long as body with 14-segmented flagellomeres, F 1 as long as F 2, apical flagellomere pointed.

Mesosoma

Mesosoma 1.35× as long as wide; mesoscutum densely setose, rugulose punctate, notauli indistinct (Fig. 2A); scutellum with few punctures, scutellar lunules wide divided by seven carinae, medio-posterior depression of scutellum elliptical (Fig. 2A); propodeum coarsely reticulate rugose, with an impression of medial longitudinal carina originated with same texture of rugosity (Fig. 2A);

mesopleuron rugulose anteriorly, rest is smooth; length of hind femur 3.0× its width; length of hind tibia 6.1× its width; length of hind tibial spurs 0.33, 0.26× hind basitarsus; hind tarsal claw normal size.

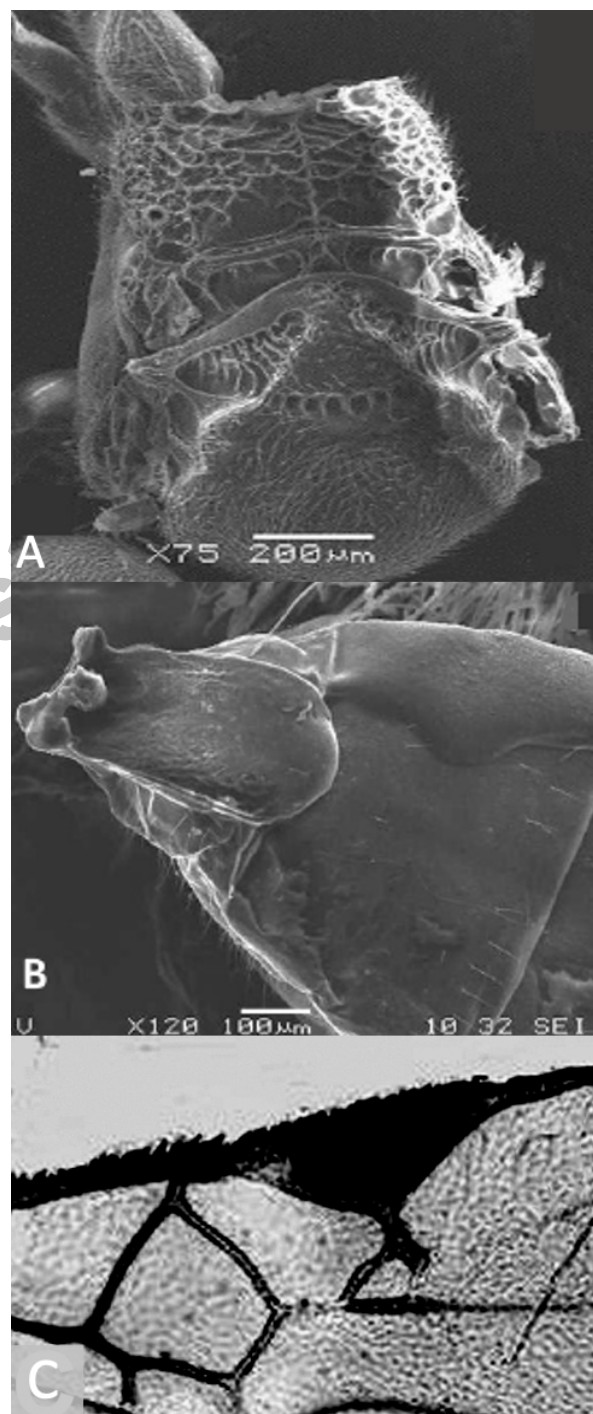


Fig. 2. *Microplitis faifaicus* sp. nov: A, Mesosoma, dorsal lateral view; B, Metasoma, dorsal view; C, Forewing (10×).

Wings

Fore wing $2.7\times$ as long as wide; pterostigma $2.0\times$ as long as wide; 1-R1 ca. as long as pterostigma; 1-M almost straight; 1SR+M slightly curved downwards (Fig. 2C); areolet quadrangular, 3-SR $0.75\times$ as long as vein r (Fig. 2C); 1-CU1 $0.33\times$ as long as 2-CU1; 2- CU1 almost straight; angle between C+SC+R and 1-SR 70° .

Metasoma

T1 $2.0\times$ as long as wide with a shallow depression in anterior 2/3, moderately rugulose laterally, almost slightly broadening posteriorly (Fig. 2B); T2 sub-rectangular, smooth, suture between T2 and T3 weak; T3 $1.25\times$ longer than T2, smooth with irregular rows of sparse setae, remaining tergites smooth (Fig. 2B); hypopygium small, shorter than tip of metasoma; ovipositor sheath short, approximately $1.2\times$ as long as second hind tarsomere, acute apically and sparsely setose.; hypopygium small, shorter than tip of metasoma; ovipositor sheath short, approximately $1.2\times$ as long as second hind tarsomere, acute apically, almost without setae.

Colour

Body generally black, T1 brown, palps yellow, legs yellow except hind coxae, hind tibial spurs yellow, wings infuscate, venation brown, setae on wings and body brown, pterostigma yellow basally 1/3, rest is black.

Male

Unknown.

Distribution

Saudi Arabia (Asir).

Host

Unknown

Etymology

The name of the species originated from its type locality.

Variation

Body length 2.2-2.5 mm. The number of carinae dividing the scutellar lunules varies from six–seven. Scutellum smooth and setose.

***Microplitis khamisicus* Ghramh and Ahmad, sp. nov.**
(Fig. 3 A-C)

Material examined

Holotype: ♀, Saudi Arabia: Khamis Mushyat (18°20'39.7"N 42°39'18.7"E), 7.IV.2017, Malaise trap, Z.

Ahmad leg. (ZDKKU). Paratype, 2♀, with same data as holotype (HB-13, ZDKKU).

Differential diagnosis

The new species closely resembles with *Microplitis bambusanus* (de Saeger, 1944) from Congo and Rwanda; however, This species can be separated from all other described species of *Microplitis* in the afro-tropical region by the combination of the following features: body covered with dense setae, entirely dark brown to black coloration (excluding all legs and laterotergites dorsolaterally which are yellowish), infuscate wings, pterostigma black, notauli well defined and T1 slightly widening apically.

This new species can be easily separated from other new species viz., *M. tihamicus* and *M. faifaicus* by having: body size large 3.0-3.1 mm (in *M. tihamicus* and *M. faifaicus* body length 2.0-2.5mm); head and mesosoma densely setose (in *M. tihamicus* and *M. faifaicus* head and mesosoma moderately to sparsely setose); notauli present (in *M. tihamicus* and *M. faifaicus* notauli absent); laterotergites yellowish dorsolaterally (in *M. tihamicus* and *M. faifaicus* laterotergites blackish brown)

Head

Head ca. $2\times$ as wide as long in dorsal view, subcircular in anterior view; length of eye $0.8\times$ as long as temple in dorsal view; temple and vertex shiny with indistinct punctures; OOL: POL: AOL: OD = 9: 6: 4: 3; inner margin of eyes subparallel; face distinctly convex medially, and punctate-rugose with a median longitudinal carina; clypeus smooth and evenly convex; malar space ca. $1.8\times$ as long as its basal width of mandible; vertex dull with micro punctures; lateral temples punctate-rugulose and densely setose (Fig. 3A); occiput smooth and shiny; antenna about as long as body with 14-segmented flagellomeres, F 1 as long as F 2 , apical flagellomere pointed.

Mesosoma

Mesosoma ca. $1.5\times$ as long as wide; mesoscutum densely setose, largely punctate, its posterior surface rather smooth with a median longitudinal rugose groove merging posteriorly into the notauli (Fig. 3A); notauli well defined, rugose and meeting posteriorly before scutellar sulcus (Fig. 3A); scutellum densely setose with few punctures, scutellar lunules wide divided by six carinae (Fig. 3A); propodeum coarsely reticulate rugose with a percurrent medial longitudinal carina; mesopleuron rugulose anteriorly, rest is smooth; length of hind femur $4.0\times$ its width; length of hind tibia $7.1\times$ its width; length of hind tibial spurs 0.27, $0.20\times$ hind basitarsus; hind tarsal claw normal size.

Wings

Fore wing $2.3\times$ as long as wide; pterostigma $2.0\times$ as long as wide; 1-R1 ca. as long as pterostigma; 1-M almost straight; 1SR+M straight (Fig. 3C); areolet quadrangular, 3-SR $0.4\times$ as long as vein r (Fig. 3C); 1-CU1 $0.30\times$ as long as 2-CU1; 2- CU1 curved; angle between C+SC+R and 1-SR 75° .

Metasoma

T1 $1.8\times$ as long as wide, smooth with shallow depression in anterior half, slightly broadening posteriorly (Fig. 3B); T2 sub-rectangular, smooth, its median field slightly raised, suture between T2 and T3 weak (Fig. 3B); T3 $1.2\times$ longer than T2, smooth with irregular rows of sparse setae, remaining tergites smooth; hypopygium small, shorter than tip of metasoma; ovipositor sheath short, approximately $1.2\times$ as long as second hind tarsomere, acute apically and sparsely setose.

Colour

Body generally black, T1 reddish brown, legs yellow except hind coxae, hind tibial spurs yellow, wings infusate, venation brown, pterostigma black, setae on wings brown while setae on the head and thorax whitish, laterotergites 2 and 3 yellow dorsolaterally, T2 yellow dorsally.

Male

Unknown.

Distribution

Saudi Arabia (Asir).

Host

Unknown

Etymology

The name of the species originated from its type locality.

Variation

Body size 3.0-3.1 mm. The number of carinae dividing the scutellar lunules varies from six–seven, hind femur and tibia brown basally in few paratypes.

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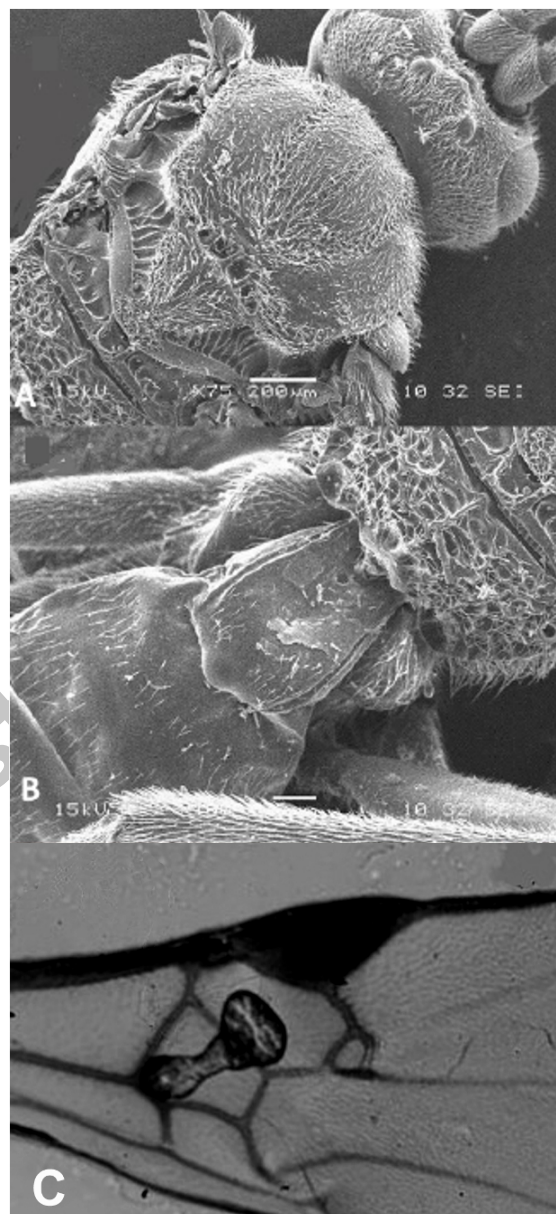


Fig. 3. *Microplitis khamisicus* sp. nov: A, Mesosoma, dorsal lateral view; B, Metasoma, dorsal view; C, Forewing (10x).

Statement of conflict of interest

The authors have declared no conflict of interest.

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