

RESEARCH PAPER

# Description of five new species of the rare genus *Buluka* (Hymenoptera: Braconidae: Microgastrinae) with an updated key to the world species

Tomáš HOVORKA<sup>1</sup>, Caroline BOUDREAU<sup>2</sup>, Kees VAN ACHTERBERG<sup>3</sup> & Jose L. FERNANDEZ-TRIANA<sup>2</sup>

<sup>1</sup>Department of Entomology, National Museum of the Czech Republic, Cirkusová 1740, CZ-193 00 Praha – Horní Počernice, Czech Republic; e-mail: tomas.hovorka@nm.cz; ORCID: <https://orcid.org/0000-0002-6887-2644>

<sup>2</sup>Agriculture and Agri-Food Canada, Canadian National Collection of Insects, 960 Carling Avenue, Ottawa, Ontario, Canada K1A 0C6; e-mails: caroline.boudreault@agr.gc.ca, jose.fernandez@agr.gc.ca; ORCID: <https://orcid.org/0000-0003-0425-0309>

<sup>3</sup>Naturalis Biodiversity Center, P.O. 9517, 2300 RA Leiden, Netherlands; e-mail: kees@vanachterberg.org; ORCID: <https://orcid.org/0000-0002-6495-4853>

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**Abstract.** Five new species of the rare genus *Buluka* de Saeger, 1948 (Hymenoptera: Braconidae: Microgastrinae), *B. buntikae* Hovorka & Fernandez-Triana sp. nov. (from Thailand), *B. frederiquebakkeriae* Hovorka & Fernandez-Triana sp. nov. (from Indonesia), *B. janaorlikovae* Hovorka & Fernandez-Triana sp. nov. (from Vietnam), *B. longi* Hovorka & Fernandez-Triana sp. nov. (from Vietnam), and *B. petrjanstai* Hovorka & Fernandez-Triana sp. nov. (from Thailand), are described in this paper. The newly described species increase the total number of species in this genus to 16 (i.e., by 45%). Additionally, *Buluka achterbergi* Austin, 1989 is reported from Thailand for the first time and *B. straeleni* de Saeger, 1948 from the Republic of the Congo for the first time. An updated key to all known species of *Buluka* is provided.

**Key words.** Hymenoptera, Braconidae, Microgastrinae, key, new species, taxonomy, Oriental Region

**Zoobank:** <http://zoobank.org/urn:lsid:zoobank.org:pub:0D4B0D8A-BCD0-4EF8-9D0E-226EC54E523D>

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## Introduction

The rare genus *Buluka* de Saeger, 1948 (Hymenoptera: Braconidae: Microgastrinae) presently comprises 11 described species, and it is mostly Oriental in distribution, with a couple of taxa reaching up to Africa and Australia (AUSTIN 1989, AUSTIN & DANGERFIELD 1992, FERNANDEZ-TRIANA et al. 2020). *Buluka* was originally described by DE SAEGER (1948) from the Afrotropical Region based on specimens from Rutshuru in Virunga National Park (former Prince Albert Park) in the Democratic Republic of the Congo. Although the genus was originally described from the Afrotropical Region, the majority of newly described species are from the Oriental Region (CHOU 1985, AUSTIN 1989, LONG 2015, RANJITH et al. 2015; present study), suggesting that this region may represent its primary centre of diversity, as proposed by AUSTIN (1989). However, comprehensive studies of the African fauna have yet to be conducted. The current distribution of species ex-

tends from Africa (DE SAEGER 1948), through India, Taiwan and Southeast Asia to Australia (AUSTIN 1989, RANJITH et al. 2015; Fig. 18). The only two known host records are from a rearing of *Buluka huddlestoni* Austin, 1989 from *Imma thyriditis* Meyrick, 1906 (Lepidoptera: Immidae) in the Solomon Islands, although that lepidopteran is an introduced species there (AUSTIN 1989), and a rearing of an unidentified species of *Buluka* nr. *noyesi* from *Psimada quadripennis* Walker, 1858 (Lepidoptera: Noctuidae) (GUPTA & FERNANDEZ-TRIANA 2014).

Due to the presence of a carapace-like metasoma, *Buluka* was originally described in the subfamily Sigalphinae within the family Braconidae (see DE SAEGER 1948). However, NIXON (1965) subsequently transferred it to Microgastrinae, citing, among other features, characteristic wing venation typical of this subfamily (see NIXON 1965). For additional diagnostic features of Microgastrinae, see MASON (1981). Later, AUSTIN (1989) noted a distinctive trait in females: an oblique groove on the ventral surface



of the distal six or seven flagellomeres, bordered by a row of bent-tipped sensilla, instead of longitudinal placodes; this character seems rather unique in Microgastrinae and it certainly has diagnostic value to define the genus, although we have found that not all species of *Buluka* possess it.

A metasomal carapace, formed by the fusion of terga T2 and T3 and their expansion over the more distal tergites is a rather rare feature among Microgastrinae. It is known only in *Fornicia* Brullé, 1846, *Pseudoformicia* van Achterberg, 2015, the *Diolcogaster basimacula* (Cameron, 1905) group, and to a lesser degree in a few species of *Deuterixys* Mason, 1981 and *Pholetesor* Mason, 1981 (AUSTIN 1989).

Recent examination of specimens from Indonesia, Thailand and Vietnam has revealed five additional species of the genus *Buluka*, which increase the total number of species to 16 (i.e., by 45%). All five new species are from the Oriental Region and are described below, with an updated key to all the described species.

### Material and methods

The material for this review came primarily from samples amassed as part of the TIGER (Thailand Inventory Group for Entomological Research) project in Thailand (<https://scholars.uky.edu/en/projects/tiger-thailand-inventory-group-for-entomological-research-2>), collecting done in Vietnam, Indonesia and Malaysia by the Naturalis Biodiversity Center, Leiden, the Netherlands (RMNH), and from a few specimens available for study in the Canadian National Collection of insects, arachnids and nematodes, Ottawa, Canada (CNC). Also, we photographed some specimens in the American Entomological Institute Collection (AEIC), Logan, Utah, USA and in the Royal Museum for Central Africa (MRAC), Tervuren, Belgium. Images of the holotypes of *Buluka huddlestoni* Austin, 1989 and *Buluka noyesi* Austin, 1989 were taken by Dr Gavin Broad of the Natural History Museum (NHM), London, United Kingdom.

Photos of the preserved specimens were taken with a Keyence VHX-1000 Digital Microscope, using a lens with the range of 13–130×. Multiple images of a structure were taken through the focal plane and these were combined to produce a single in-focus image, using the software associated with the Keyence System. Some photographs by Caroline Boudreault (CB) were taken with a Canon EOS-7D Mark 2 (G) (Canon Inc., Japan) using a Canon MP-65 super-macro lens with a Yongnuo professional flash speedlight flashlight installed on a modified microscope stand; multiple images (in raw format .CR2) of a structure were taken through the focal plane, converted to .tiff images with Digital Photo Professional 4 and finally combined to produce a single in-focus image using Zerene Stacker (<http://zerenesystems.com/cms/stacker>). Final images produced by Jose Fernandez-Triana (JFT) and CB were corrected using GIMP 2.10.12 (available from: <https://www.gimp.org>). All plates were prepared using Microsoft PowerPoint 2021 and saved as .TIF files. For three figures in our paper we used other sources, all of which are acknowledged in the corresponding figure caption and in the Acknowledgements section below. Distribution map was

created using SimpleMappr web application (SHORTHOUSE 2010).

DNA barcoding data are currently available for only a single *Buluka* specimen. Therefore, it is not possible to differentiate species based on barcodes at present. However, the information for that species is included under its description to serve as a basis for future studies when hopefully more sequences can be obtained. The aim of this article is not to conduct a molecular analysis; rather, it is solely to present the single available DNA barcode sequence for this genus, which was obtained following the protocol provided below. DNA extract was obtained from a single leg using a glass fiber protocol (IVANOVA et al. 2006), and the total genomic DNA was re-suspended in 30 µl of distilled water. The barcode region, a 658 base pair (bp) region near the 5' terminus of the COI gene, was amplified using standard primers following established protocols (e.g., see references in FERNANDEZ-TRIANA et al. 2014). The sequence is available on the Barcode of Life Data System (BOLD) (RATNASINGHAM & HEBERT 2007).

Specimens were either chemically dried using a modified hexamethyldisilazane (HMDS) protocol (HERATY & HAWKS 1998, RUMPH & TURNER 1998) or critical point dried using a Leica EM CPD300 Critical Point Dryer. Specimens were then glued to points using shellac gel or white glue. The RMNH specimens were treated according to the Alcohol/Xylene-Amyl acetate method (AXA) (see VAN ACHTERBERG 2009).

For morphological identification we used the keys by AUSTIN (1989) and RANJITH et al. (2015). Material was also compared to the original descriptions and to the type material or its photographs if available.

For the species description the morphological terms and measurements of structures are mostly as used by FERNANDEZ-TRIANA et al. (2014). For the wing venation we used SHARKEY & WHARTON (1997). In the key to species, we abbreviate mediotergites 1, 2 and 3 as T1, T2 and T3. We use the term “crisula” for carina surrounding the propodeal spiracle which delimits smooth area around it (see *B. vuquangensis* Long, 2015 (Figs 7E, G), *B. taiwanensis* Austin, 1989 (Fig. 11F), and *B. frederiquebakkeriae* sp. nov. (Figs 14E, F)) (AUSTIN 1989).

Exact label data are cited and given in quotation marks for the type material. Authors' additional remarks are provided in square brackets; [p] – preceding data are printed; [hw] – preceding data are handwritten. Separate label lines are indicated by a slash (/), separate labels by a double slash (/).

### Taxonomy

#### *Buluka buntikae*

#### Hovorka & Fernandez-Triana sp. nov.

(Fig. 13)

**Type locality.** Thailand, Chiang Mai, Huai Nam Dang National Park, Thung Buatong Viewpoint, 19°17' N, 98°36' E; 1420 m a.s.l.

**Type material.** HOLOTYPE: ♀, “THAILAND: Chiang Mai, Huai / Nam Dang NP, Thung Buatong / View point, 21.-28.iv. 2008 / 19°17.56'N, 36°0.29'E, malaise / trap ; Anuchart & Thawatchi leg. / T5640 [p] // CNC / 281639 [p]”. Deposited in CNC.

**Diagnosis.** Among the species with gena and vertex smooth, the posterior rim of metasoma not overhanging the posterior margin of metasoma, T1 and T2 only partially yellow, with the yellow not covering the full width of the tergite, scutellum punctate-reticulate to rugose, and T2 and T3 with longitudinal striae only anteriorly, *Buluka buntikae* sp. nov. can be recognized by its propodeal spiracle surrounded by a well-developed cristula which delimits a relatively small, smooth, polished area (large in *B. taiwanensis*), and forewing basal and subbasal cells almost without setae or just apically with setose area around infuscation (fully setose in *B. achterbergi* and *B. quickei*). *Buluka buntikae* can be distinguished from *B. frederiquebakkeriae* sp. nov. and *B. longi* sp. nov., by having face light yellow, frons, temple and vertex dark brown, small triangular area behind ocelli orange, propodeum reticulate rugose without incomplete rugosity near median carina of propodeum, metatrochanter and metatrochantellus white-yellow, medial striae on T3 less distinct, short and narrow, impression between T2 and T3 not so deep and its striae close to each other, without polished area in between, and apex of carapace with thin, elongated, smooth central area.

**Description. Female** (Fig. 13). *Head* in anterior view  $0.93\times$  as long as wide medially, setose; first flagellomere  $1.12\times$  as long as second flagellomere,  $3.8\times$  as long as wide; second flagellomere  $4.1\times$  as long as wide; fifteenth flagellomere  $1.9\times$  as long as wide; face smooth, densely setose ventrally; frons setose; vertex smooth; gena smooth and setose; eyes setose, diverging behind antennal sockets; clypeus slightly concave, smooth and densely setose; ratio of maximum head width to minimum face width 2.58 (98/38).

*Mesosoma*  $1.33\times$  as long as high; mesoscutum punctate anteriorly and laterally; notaular courses, posterior and lateral margin of mesoscutum reticulate rugose, setose; scutellar sulcus with 7 medial carinae; scutellum reticulate rugose, setose; propodeum with medial carina, reticulate rugose, without incomplete rugosity near median carina of propodeum, glabrous; propodeal spiracle surrounded by cristulae; area around propodeal spiracle smooth, not reaching anteriorly to fore margin of propodeum; pronotum crenulate posteriorly; mesopleuron punctate, setose, smooth and glabrous anteriorly; metapleuron smooth and glabrous antero-medially, posterior part punctate reticulate, setose.

*Metasoma.* Posterior rim of metasoma shorter than carapace; T1 with crenulate median longitudinal groove with smooth polished area in basal medial half; T1  $0.7\times$  as long as wide apically, areolate in apical half; T2  $0.4\times$  as long as wide apically, with distinct longitudinal striae basally, area in between striae polished; second metasomal suture shallow and wide; T3 with longitudinal striae in basal  $0.3$  close to each other and without polished area in between; apex of T3 with thin, elongated, smooth central area; ovipositor sheath setose apically with two spatulate sensillae.

*Legs.* Metacoxa large, setose dorsally and ventrally, punctate (reticulate), with distinct transversal striae apically; metafemur  $3.5\times$  as long as wide; metatibia  $4.68\times$  as long as wide; inner metatibial spur  $0.8\times$  as long as basitarsus;

metatarsal claw with one tooth.

*Wings.* Fore wing  $2.84\times$  as long as wide; 1<sup>st</sup> discal cell sparsely setose; 1<sup>st</sup> subdiscal setose; basal and subbasal cell glabrous, only setose in their 0.2 apically; pterostigma  $4.16\times$  as long as wide; 2RS vein of fore wing more than  $2\times$  as long as r-m vein.

*Measurements.* Body length: 3.3 mm; fore wing length: 3.3 mm; second antennal segment length/width: 4.1; fifteenth antennal segment length/width: 1.9; metafemur length/width: 3.5; metatibia length: 1.25 mm; carapace length/width: 1.8; T1 length/apical width: 0.7; T2 length/apical width: 0.4.

**Color.** Head yellow to dark brown; face, clypeus, scape and pedicel light yellow; frons and gena dark brown; vertex dark brown with small orange triangular area; palpi white-yellow; mesosoma black; fore and middle legs together light yellow with telotarsus brown; metacoxa black; metatrochanter and metatrochantellus white-yellow; metafemora dark brown; metatibia dark brown with apical 0.3 white-yellow; hind basitarsus with basal 0.4 white-yellow and apical 0.6 black; hind tarsal segments 2–3 white-yellow; hind tarsal segment 4 with basal 0.4 white-yellow and apical 0.6 black; hind telotarsus brown; tegula dark brown; wing venation light brown to white-yellow; fore wing infuscate throughout below pterostigma and around vein 1-CU; T1 in basal half with wide oval light yellow area around medial longitudinal groove narrowing apically; T2 black with small central triangular light yellow area; T3 black; ovipositor sheath dark brown to black.

**Etymology.** Named after Buntika Areekul Butcher, head of the Department of Entomology at Chulalongkorn University, Thailand, who studies the systematics, biology and evolution of parasitoid wasps, particularly in the families Braconidae and Ichneumonidae.

**Biology.** Unknown.

**Distribution.** Thailand.

### *Buluka frederiquebakkeriae* Hovorka & Fernandez-Triana sp. nov.

(Fig. 14)

**Type locality.** Indonesia, North Maluku, Sula Islands, Pulau Mangole, Buluhaya, approx.  $1^{\circ}51' S$ ,  $125^{\circ}49' E$ ; 90 m a.s.l.

**Type material.** HOLOTYPE: ♀, "INDONESIA: Sula Isl. / Mangole, Buluhaya / Mal. Trap. 18, c 90 m / 6.-23.iii.1995, C. v. Ach- / terberg & Y. Yasir, RMNH [p] // CNC / 281635 [p]". Deposited in RMNH.

**Diagnosis.** Among the species with gena and vertex smooth, the posterior rim of metasoma not overhanging the posterior margin of metasoma, T1 and T2 only partially yellow, with the yellow not covering the full width of the tergite, scutellum punctate-reticulate to rugose, and T2 and T3 with longitudinal striae only anteriorly, *Buluka frederiquebakkeriae* sp. nov. can be recognized by its propodeal spiracle surrounded by a well-developed cristula which delimits a relatively small, smooth, polished area (large in *B. taiwanensis*), and forewing basal and subbasal cells almost without setae or just apically with setose area around infuscation (fully setose in *B. achterbergi* and *B. quickei*). *Buluka frederiquebakkeriae* can be distinguished from *B. buntikae* sp. nov. by the characters discussed in

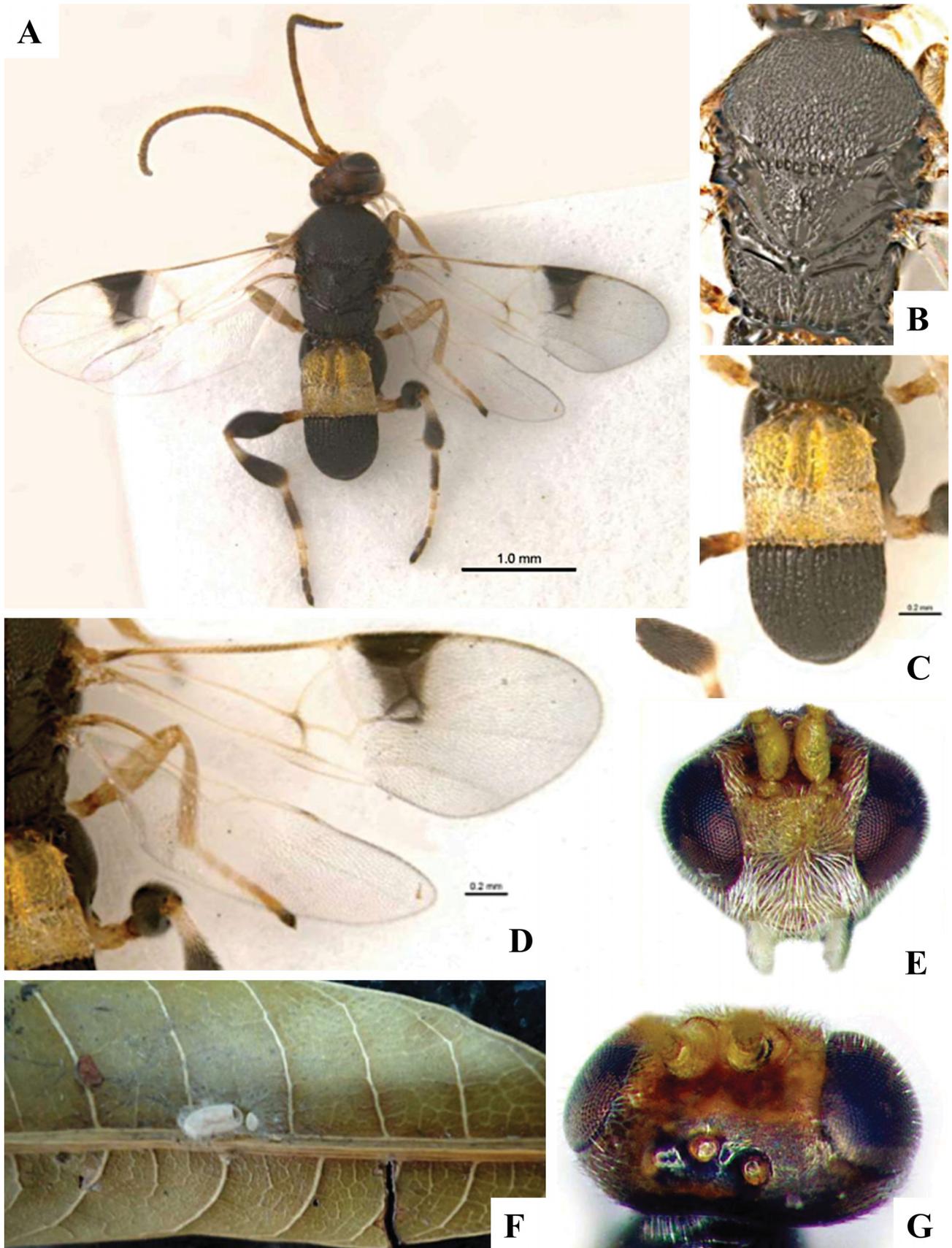


Fig. 1. *Buluka horni* Gupta, 2013, female holotype. A – full dorsal view; B – mesosoma, dorsal view; C – metasoma, dorsal view; D – fore and hind wing; E – head, frontal view; F – solitary cocoon on leaf of *Mangifera indica* L.; G – vertex, dorsal view. Taken from GUPTA (2013).

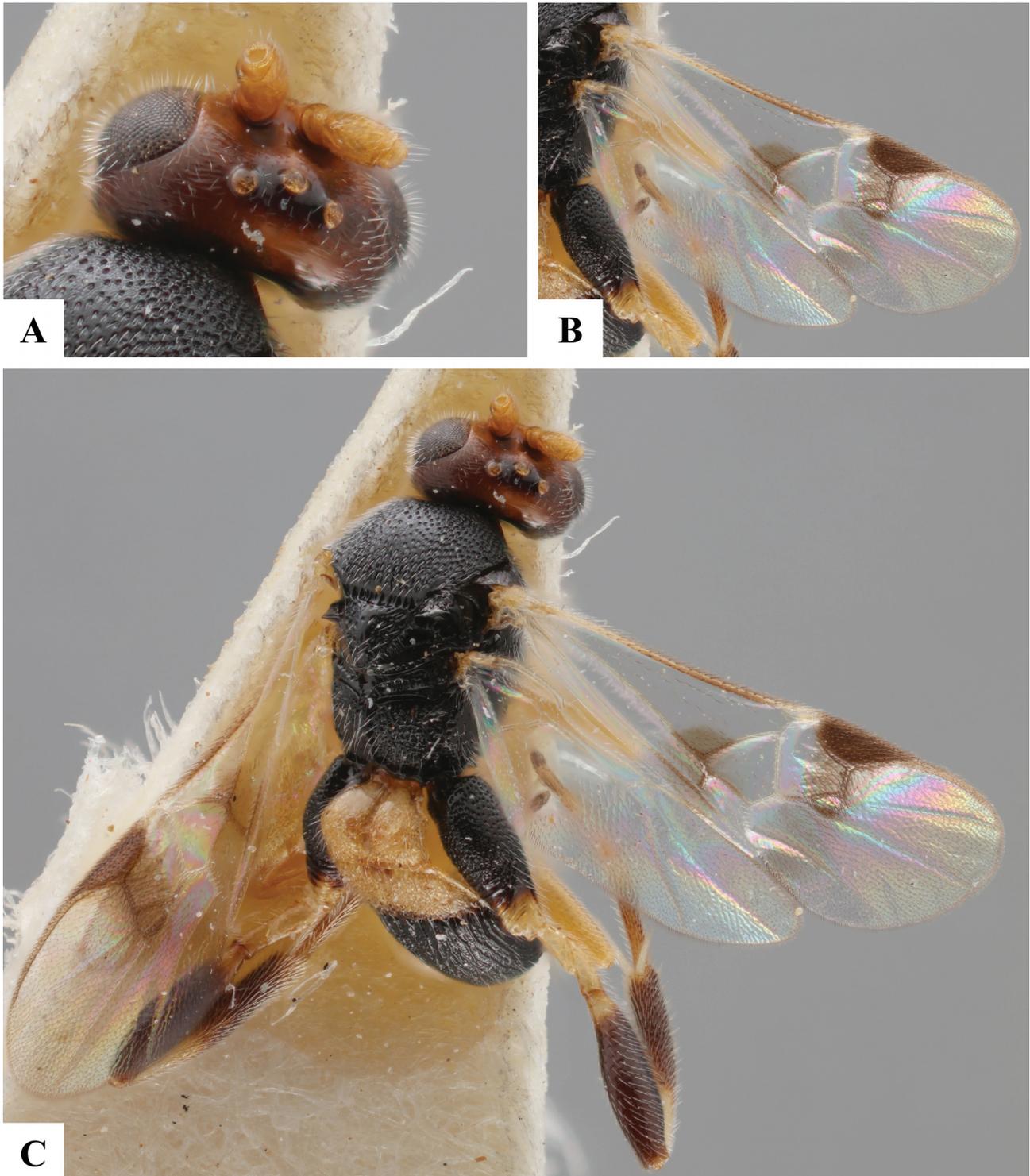


Fig. 2. *Buluka huddlestoni* Austin, 1989, female holotype from NHM. A – head, dorsal view; B – fore and hind wing; C – full dorsolateral view. Photographs by C. Boudreault.

the diagnosis of that species, and from *B. longi* sp. nov., which shares similar characteristics, by mesotibia and the first segment of metatarsus white-yellow; T2 in anterior 0.5 (laterally) or 0.7–0.8 (centrally) with sculpture consisting of striae that delimit elongated areas, reticulate sculpture limited to the posterior part of T2; and T2 with pentagonal yellow area narrowing posteriorly.

**Description. Female** (Fig. 14). *Head* in anterior view 0.77× as long as wide medially, setose; first flagellomere 1.1× as long as second flagellomere, 4.4× as long as wide;

second flagellomere 4.2× as long as wide; fifteenth flagellomere 1.3× as long as wide; face smooth, sparsely setose; frons setose; vertex smooth; gena smooth and setose; eyes setose, diverging behind antennal sockets; clypeus slightly concave, smooth and densely setose; ratio of maximum head width to minimum face width 2.32 (86/37).

*Mesosoma*. 1.39× as long as high; mesoscutum punctate anteriorly and laterally; notaular courses and posterior margin of mesoscutum reticulate rugose, with strong white setae; scutellar sulcus with 7 medial carinae; scutellum

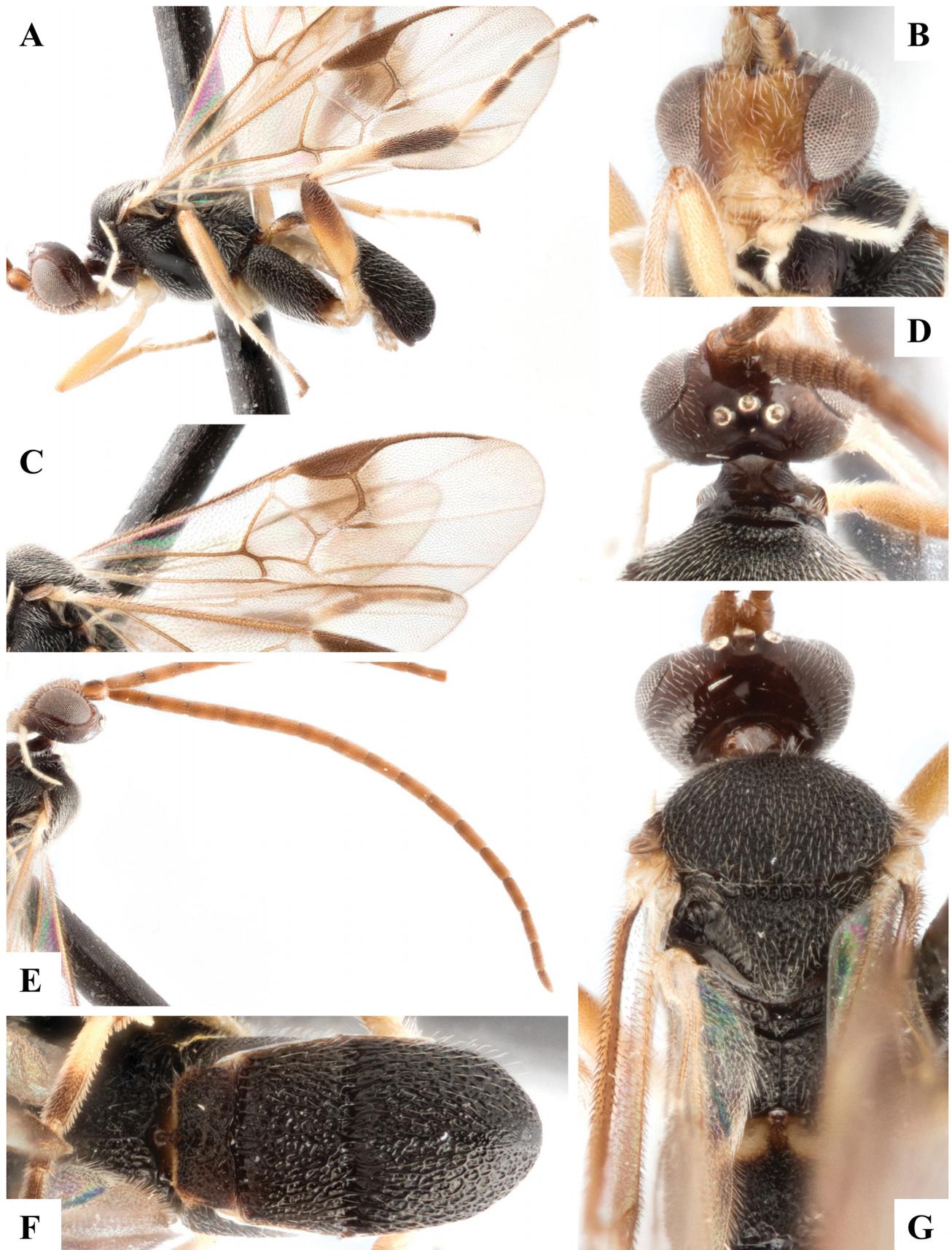


Fig. 3. *Buluka orientalis* Chou, 1985, male from AEIC. A – habitus, lateral view; B – head, frontal view; C – fore wing and hind wing; D – head, dorsal view; E – antenna; F – metasoma, dorsal view; G – scutellum, dorsal view. Photographs by C. Boudreault.



Fig. 4. Diagnostic characters of the metasoma in the genus *Buluka* indicated by the red line and arrow. A – *Buluka orientalis* Chou, 1985, with the posterior rim of metasoma slightly overhanging the carapace in lateral view; B – *Buluka achterbergi* Austin, 1989, with the posterior rim of metasoma shorter than the carapace, not overhanging the posterior margin of metasoma. Photographs by C. Boudreault.

areolate rugose, setose with strong white setae along lateral and posterior margin; propodeum with medial carina not straight, polished and smooth area anteriorly, with incomplete rugosity near median carina and posterior margin of propodeum, setose laterally; propodeal spiracle surrounded by cristulae; area around propodeal spiracle smooth, not reaching anteriorly to fore margin of propodeum; pronotum crenulate posteriorly; mesopleuron rugose punctate, setose, smooth and glabrous anteriorly; metapleuron smooth and glabrous antero-medially, posterior part rugose punctate, setose.

**Metasoma.** Posterior rim of metasoma shorter than carapace; T1 with smooth median longitudinal groove basally with polished area in basal medial half; T1 0.6× as long as wide apically, areolate in apical half (laterally) with small enclosed area centrally; T2 0.5× as long as wide apically with anterior 0.5 (laterally) or anterior 0.7–0.8 (centrally) with sculpture consisting of striae that delimit elongated

areas, reticulated sculpture limited to posterior 0.5 (laterally) or posterior 0.2–0.3 (centrally); second metasomal suture deep basally, shallow and wide apically; T3 in basal 0.3 with strong longitudinal striae with polished area in between; apex of T3 fully sculptured without polished area; ovipositor sheath setose apically with two spatulate sensillae.

**Legs.** Metacoxa large, setose dorsally and ventrally, punctate reticulate, with distinct transversal striae apically; metafemur 3.4× as long as wide; metatibia 6.0× as long as wide; inner metatibial spur 0.6× as long as basitarsus; metatarsal claw with one tooth.

**Wings.** Fore wing 3.11× as long as wide; 1<sup>st</sup> discal and 1<sup>st</sup> subdiscal cell setose; basal and subbasal cell glabrous, only setose in their 0.2 apically; pterostigma 3.5× as long as wide; 2RS vein of fore wing about 2× as long as r-m vein.

**Measurements.** Body length: 2.4 mm; fore wing length: 2.4 mm; second flagellomere length/width: 4.2; fifteenth

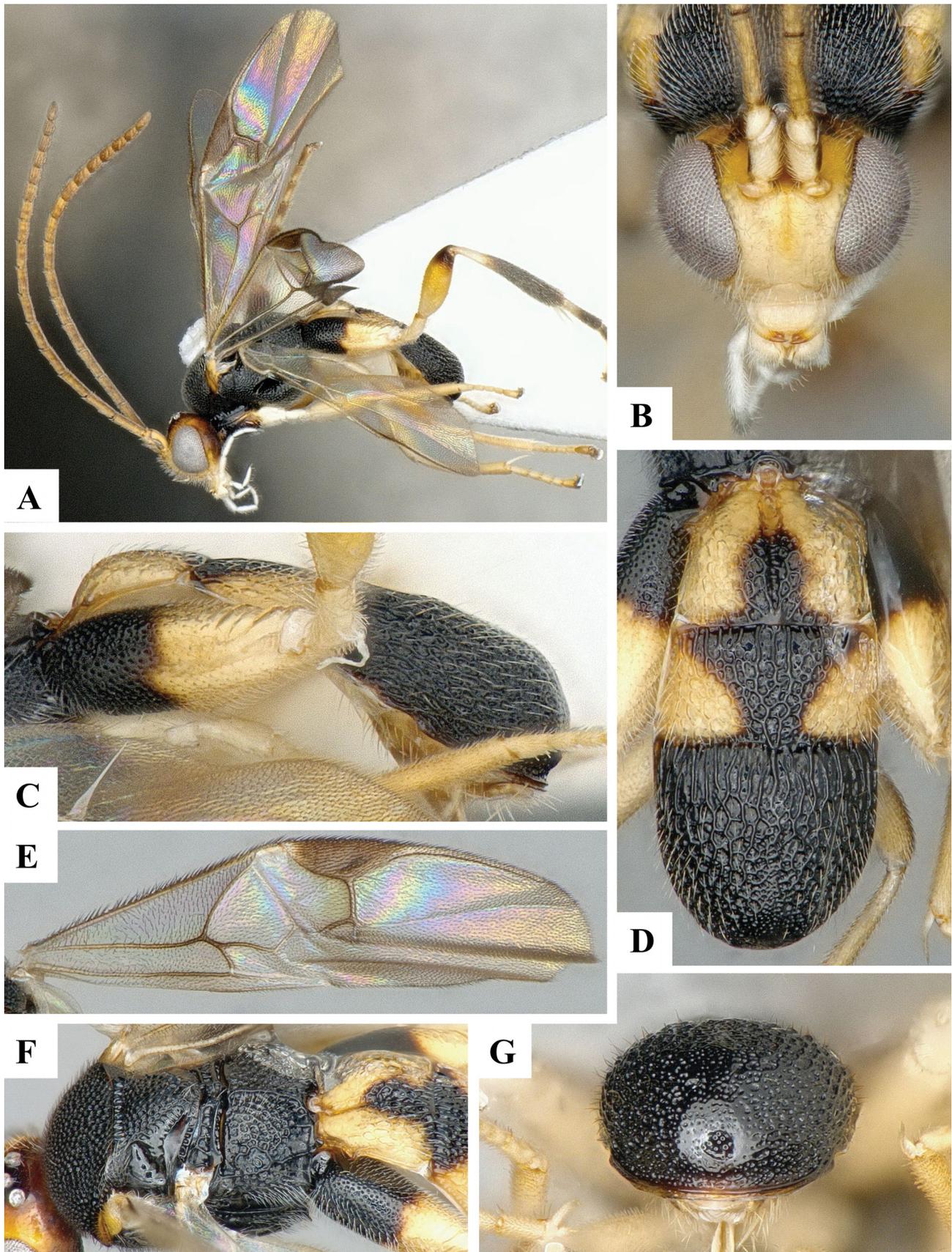


Fig. 5. *Buluka janaorlikovae* Hovorka & Fernandez-Triana sp. nov., female holotype CNC281637. A – habitus, lateral view; B – head, frontal view; C – metasoma, lateral view; D – metasoma, dorsal view; E – fore wing; F – mesosoma and propodeum, dorsal view; G – apex of metasomal carapace. Photographs by C. Boudreault.





Fig. 6. *Buluka straeleni* de Saeger, 1948, female holotype RMCA ENT 000048322. A – head, frontal view; B – habitus, lateral view; C – metasoma, dorsal view; D – mesoscutum and scutellum, dorsal view. Photographs by C. Boudreault.

antennal segment length/width: 1.3; metafemur length/width: 3.4; metatibia length: 0.9 mm; carapace length/width: 1.7; T1 length/apical width: 0.6; T2 length/apical width: 0.5.

**Color.** Head yellow to orange; clypeus light yellow; face, scape and pedicel yellow-orange; frons gena and vertex orange to brown; palpi white-yellow; mesosoma black; fore legs yellow-orange; mesocoxa and femora yellow-orange, tibiae together with tarsal segments 1–4 white-yellow, telotarsi yellow; metacoxa black; metatrochanter, metatrochantellus and metafemora dark brown; metatibia dark brown with apical 0.3 white-yellow; hind basitarsus white-yellow; hind tarsal segments 2–4 white-yellow; hind telotarsus brown; tegula brown; wing venation light brown to white-yellow; fore wing widely infusate throughout below pterostigma and around vein 1-CU; fore wing infusate area wider than pterostigma; T1 with diamond-shaped light yellow area centrally around medial longitudinal groove, narrowing posteriorly; T2 with yellow pentagonal area, narrowing posteriorly; T3 black; ovipositor sheath dark brown.

**Etymology.** Named after Frederique Bakker (Naturalis Biodiversity Center, Leiden) in recognition of her curation of the collection of Braconidae over the years, and for her help in facilitating the loan of a large collection of Microgastrinae to the last author.

**Biology.** Unknown.

**Distribution.** Indonesia (North Maluku, Sula Islands, Pulau Mangole).

***Buluka janaorlikovae* Hovorka &  
Fernandez-Triana sp. nov.**

(Fig. 5)

**Type locality.** Vietnam, Tonkin, Hoang Lien National Reserve, 10 km SW Sa Pa, 22°14' N, 103°52' E; 1550 m a.s.l.

**Type material.** HOLOTYPE: ♀, “NW Vietnam: Tonkin / Hoang Lien N.R., 10 km / SW Sa Pa, c. 1550 m / 22-29.x.1999, Malaise traps / C. v. Achterberg, RMNH'99 [p] // CNC / 281637 [p]”. Deposited in RMNH.

**Diagnosis.** This species has gena and vertex smooth and posterior rim of metasoma slightly overhanging the carapace in lateral view, which differentiates it from all known species of *Buluka* except from *B. orientalis*. *Buluka janaorlikovae* sp. nov. can be distinguished from *Buluka orientalis*, which shares similar characters, by its predominantly yellow to yellow-orange head around vertex and upper part of gena; yellow scape and tegula; yellow metafemur with a black spot restricted to the posterior 0.1; and forewing vein r-m less than 2.0× the length of vein 2RS.

**Description. Female** (Fig. 5). *Head* in anterior view 0.93× as long as wide medially, setose; first flagellomere 0.97× as long as second flagellomere, 3.16× as long as wide; second flagellomere 4.7× as long as wide; fifteenth flagellomere 2.1× as long as wide; face smooth, densely setose; eyes densely setose, diverging behind antennal sockets; clypeus slightly concave, smooth and setose; frons, vertex and gena smooth, setose; ratio of maximum head width to minimum face width 2.57 (98/38).

*Mesosoma* 1.54× as long as high; mesoscutum punctate reticulate, setose; scutellar sulcus with seven medial cari-

nae; scutellum punctate reticulate, setose; propodeum with medial carina, reticulate rugose, setose medially; propodeal spiracle surrounded by irregular cristulae; area around propodeal spiracle smaller, rather polished and not reaching anteriorly to fore margin of propodeum; pronotum crenulate posteriorly; mesopleuron punctate reticulate, setose, smooth and glabrous anteriorly; metapleuron smooth and glabrous antero-medially, posterior part punctate reticulate.

*Metasoma.* Posterior rim of metasoma slightly overhanging carapace; T1 with crenulate median longitudinal groove narrowing posteriorly; T1 0.7× as long as wide apically, reticulate rugose to areolate; T2 0.53× as long as wide apically, with longitudinal striae basally, reticulate rugose apically; second metasomal suture shallow and crenulated; T3 longitudinally striate basally, reticulate rugose medially, smooth and punctulate apically; ovipositor sheaths setose.

*Legs.* Metacoxa large, setose, punctate, transversely striate apically and with shallow rugose median sulcus dorsally; metafemur 3.6× as long as wide; metatibia 6.45× as long as wide; inner metatibial spur 0.5× as long as basitarsus; metatarsal claw with one tooth.

*Wings.* Fore wing 2.9× as long as wide, setose; basal, subbasal, 1<sup>st</sup> discal and 1<sup>st</sup> subdiscal cell fully setose; pterostigma 3.04× as long as wide; 2RS vein of fore wing less than 2× as long as r-m vein.

*Measurements.* Body length: 2.7 mm; fore wing length: 2.9 mm; second flagellomere length/width: 4.7; fifteenth antennal segment length/width: 2.1; metafemur length/width: 3.6; metatibia length: 1.1 mm; carapace length/width: 2.2; T1 length/apical width: 0.7; T2 length/apical width: 0.53.

**Colour.** Head yellow, face, clypeus, scape and pedicel light yellow-white, yellow-orange around vertex and upper part of gena; palpi white-yellow; mesosoma black; fore and middle legs light yellow, telotarsus brownish; metacoxa with basal half black, apical half yellow; metatrochanters and metatrochantellus white-yellow; metafemur yellow with black spot on posterior 0.1 or less; metatibia and basitarsus dark brown with apical 0.25 white-yellow; metatarsal segments 2–4 brown; telotarsus yellow to brown; tegula yellow; wing venation light brown; fore wing infusate band beneath pterostigma not so distinct, slightly infusate to second submarginal cell; area around vein 1-M basally, 1CUa and cu-a not infusate; T1 yellow with apical half around median groove black; T2 with black triangular area narrowing apically, yellow laterally; T3 black; ovipositor sheath yellow to brown.

**Etymology.** Named in honour of Jana Orliková, one of the world's foremost experts on the work of the Czech-born painter Alfons Mucha. This eminent Czech art historian was instrumental in the promotion of this now world-famous artist and also helped to make famous other important Czech artists such as Jan Zrzavý, Max Švabinský, Antonín Slavíček, Luděk Marold and others. She was also a great grandmother to me (TH).

**Biology.** Unknown.

**Distribution.** Vietnam.

*Buluka longi*

## Hovorka &amp; Fernandez-Triana sp. nov.

(Fig. 15)

**Type locality.** Vietnam, Dak Lak, Chu Yang Sin National Park, Krông Kmar, approx. 12°29'N, 108°20'E; 550–610 m a.s.l.

**Type material.** HOLOTYPE: ♀, “S. VIETNAM: Dak Lak / Chu Yang Sin N.P., Krông K'Mar / Mal. Trap 1-6, 550-610 m / 21.-26.x.2005, C. v. Achter- / berg & R. de Vries, RMNH'05 [p] // CNC / 721127 [p]”. Deposited in RMNH.

**Diagnosis.** Among the species with gena and vertex smooth, the posterior rim of metasoma not overhanging the posterior margin of metasoma, T1 and T2 only partially yellow, with the yellow not covering the full width of the tergite, scutellum punctate-reticulate to rugose, and T2 and T3 with longitudinal striae only anteriorly, *Buluka longi* sp. nov. can be recognized by its propodeal spiracle surrounded by a well-developed cristula which delimits a relatively small, smooth, polished area (large in *B. taiwanensis*), and forewing basal and subbasal cells almost without setae or just apically with setose area around infuscation (fully setose in *B. achterbergi* and *B. quickei*). *Buluka longi* can be distinguished from *B. buntikae* sp. nov. by the characters discussed in the diagnosis of that species, and from *B. frederiquebakkeriae* sp. nov., which shares similar characteristics, by mesotibia light brown on posterior half; first segment of metatarsus entirely dark brown to black; T2 almost entirely covered by even reticulate sculpture; and T2 entirely black.

**Description. Female** (Fig. 15). *Head* in anterior view 0.93× as long as wide medially, densely setose; first flagellomere as long as second flagellomere, 4.3× as long as wide; second flagellomere 4.2× as long as wide; fifteenth flagellomere 1.7× as long as wide; face smooth, glabrous centrally and densely setose ventrally; frons setose; vertex smooth; gena smooth and densely setose; eyes densely setose, diverging behind antennal sockets; clypeus slightly concave, smooth and setose; ratio of maximum head width to minimum face width 2.06 (101/49).

*Mesosoma* 1.38× as long as high; mesoscutum anteriorly and laterally punctate; notaular courses punctate; posterior margin of mesoscutum reticulate rugose, with strong white setae; scutellar sulcus with 6 medial carinae; scutellum areolate rugose, setose; propodeum with medial carina straight, polished and with smooth area anteriorly, with incomplete rugosity near median carina and posterior margin of propodeum; propodeal spiracle surrounded by cristulae; area around propodeal spiracle smooth, not reaching anteriorly to fore margin of propodeum; pronotum crenulate posteriorly; mesopleuron punctate, setose, smooth and glabrous antero-medially; metapleuron smooth and glabrous medially, posterior part punctate reticulate, setose.

*Metasoma.* Posterior rim of metasoma shorter than carapace with crenulate median longitudinal groove and polished area in basal 0.4; T1 0.7× as long as wide apically, areolate in apical half; T2 0.4× as long as wide apically, almost entirely covered by even reticulate sculpture; second metasomal suture shallow and wide; T3 with strong longitudinal striae in basal 0.3 with polished area in between; apex of T3 seems fully sculptured without polished area

(apex of T3 hard to see since specimen is glued dorsally on the point); ovipositor sheath setose apically with two spatulate sensillae.

*Legs.* Metacoxa large, setose, punctate reticulate with distinct transversal striae apically; metafemur 3.3× as long as wide; metatibia 4.9× as long as wide; inner metatibial spur 0.75× as long as basitarsus; metatarsal claw with one tooth.

*Wings.* Fore wing 2.6× as long as wide; 1<sup>st</sup> discal and 1<sup>st</sup> subdiscal cell setose; basal and subbasal cell glabrous, only setose in their apical 0.2; pterostigma 3× as long as wide; 2RS vein of fore wing more than 2× as long as r-m vein.

*Measurements.* Body length: 2.9 mm; fore wing length: 2.5 mm; second flagellomere length/width: 4.2; fifteenth antennal segment length/width: 1.7; metafemur length/width: 3.3; metatibia length: 1 mm; carapace length/width: 1.4 (length measured laterally since the specimen is glued dorsally on the point); T1 length/apical width: 0.7; T2 length/apical width: 0.4.

**Color.** Head yellow-orange to brown; face, clypeus, scape and pedicel yellow to orange; frons, gena and vertex brownish; palpi white-yellow; mesosoma black; fore and middle legs yellow to light brown with tarsal segments 1–4 whitish and telotarsus brown; metacoxal black; metatrochanter, metatrochantellus and metafemora dark brown; metatibia black with apical 0.2 white-yellow; hind basitarsus dark brown to almost black; hind tarsal segments 2–4 white-yellow; hind telotarsus brown; tegula brown; wing venation light brown to white-yellow; fore wing with wide infuscate area below pterostigma (wider than pterostigma) and around vein 1-CU; T1 in basal 0.4 with light yellow area, rest of T1 black; median longitudinal groove of T1 light yellow; T2 and T3 black; ovipositor sheath dark brown.

**Etymology.** Named after Khuat Dang Long (Institute of Ecology & Biological Resources, Vietnam Academy of Science & Technology), who studies the taxonomy of the family Braconidae in the Oriental Region and is the author of the description of many new species of this family.

**Biology.** Unknown.

**Distribution.** Vietnam.

*Buluka petrijanstai*

## Hovorka &amp; Fernandez-Triana sp. nov.

(Fig. 10)

**Type locality.** Thailand, Trang Nayong Khaochong, 7°33' N, 99°47' E; 75 m a.s.l.

**Type material.** HOLOTYPE: ♀, “THAILAND: Trang Nayong / Khaochong 24-27.vi.2005 / 7°33.038'N 99°47.369'E / elev. 75m Malaise T#6 [p] // Buluka sp. [hw] // CNCH1562 [p]”. Deposited in CNC.

**Diagnosis.** Among the species with gena and vertex smooth, the posterior rim of metasoma not overhanging the posterior margin of metasoma, the propodeal spiracle surrounded by well-developed cristula which delimits a smooth, polished area, and T1 and T2 at least partially black, *Buluka petrijanstai* can be distinguished by having T1 partially yellow and T2 almost entirely yellow, with the yellow covering the full width of the tergite except for a black margin on the anterior 0.1. Other species have

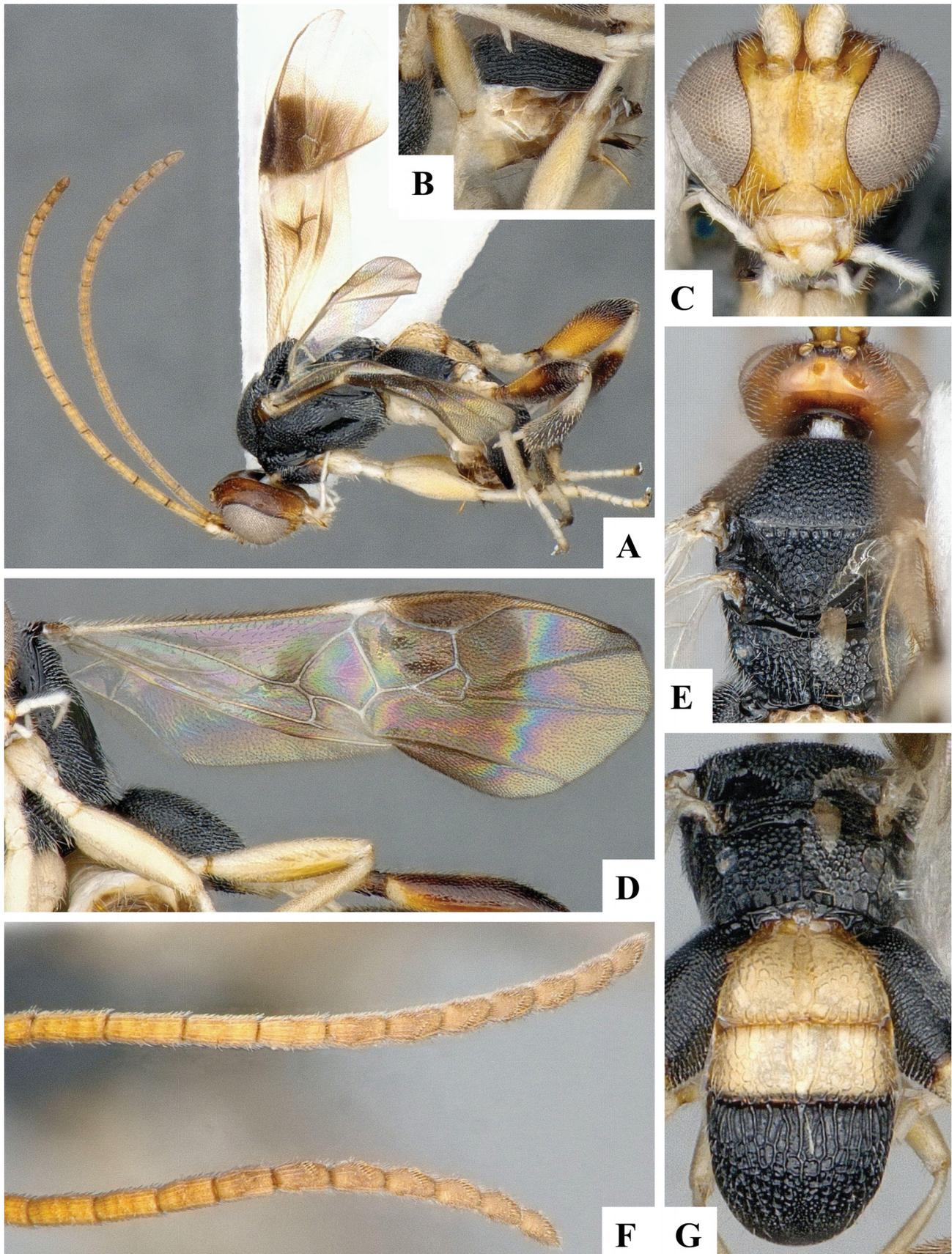


Fig. 7. *Buluka vuquangensis* Long, 2015, female CNC281638. A – habitus, lateral view; B – ovipositor and ovipositor sheaths; C – head, frontal view; D – fore wing; E – mesosoma and propodeum, dorsal view; F – apical antennal segments with placodes; G – metasoma, dorsal view. Photographs by C. Boudreault.

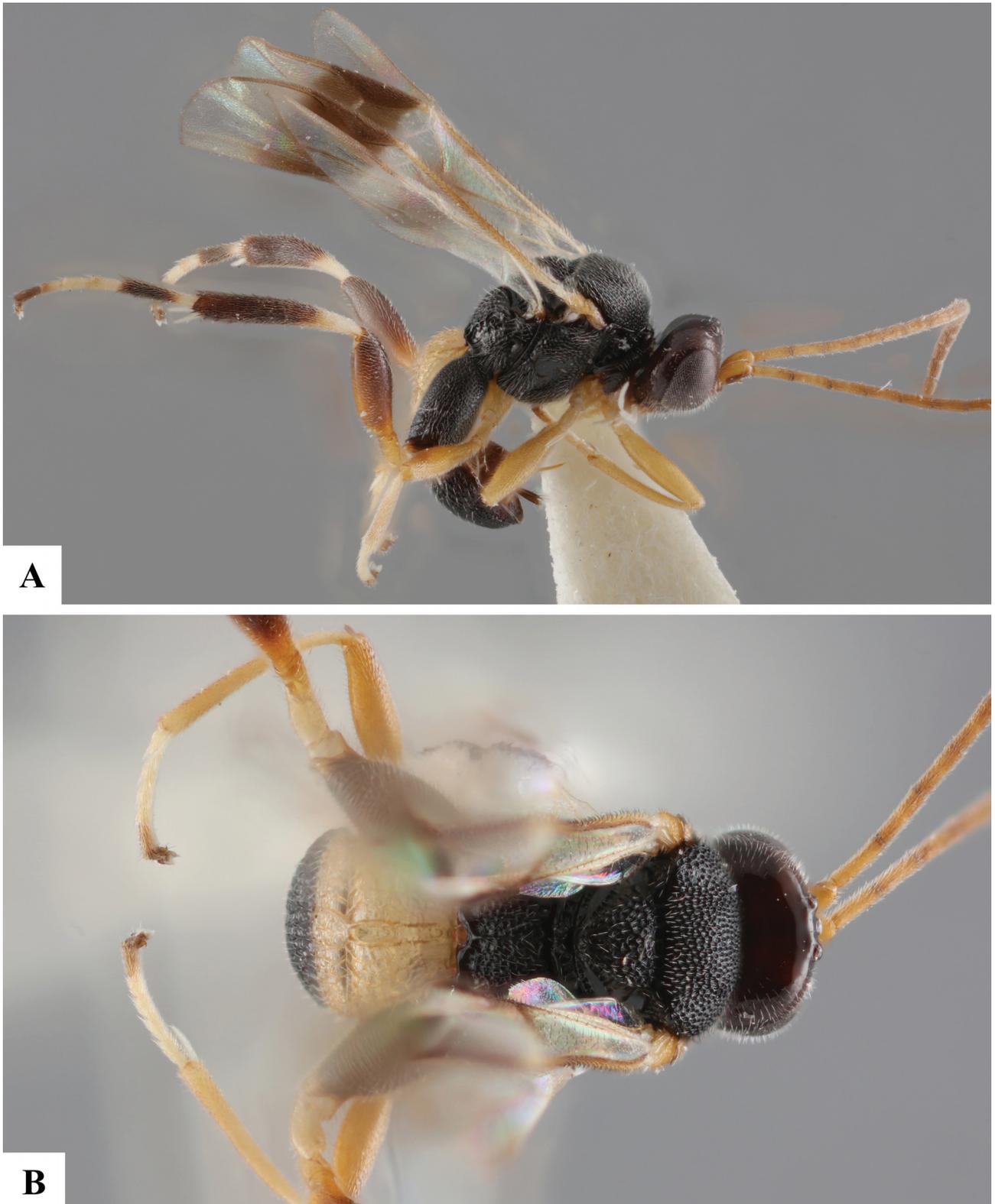


Fig. 8. *Buluka noyesi* Austin, 1989, female holotype from NHM. A – habitus, lateral view; B – mesoscutum, scutellum and metasoma, dorsal view. Photographs by C. Boudreault.

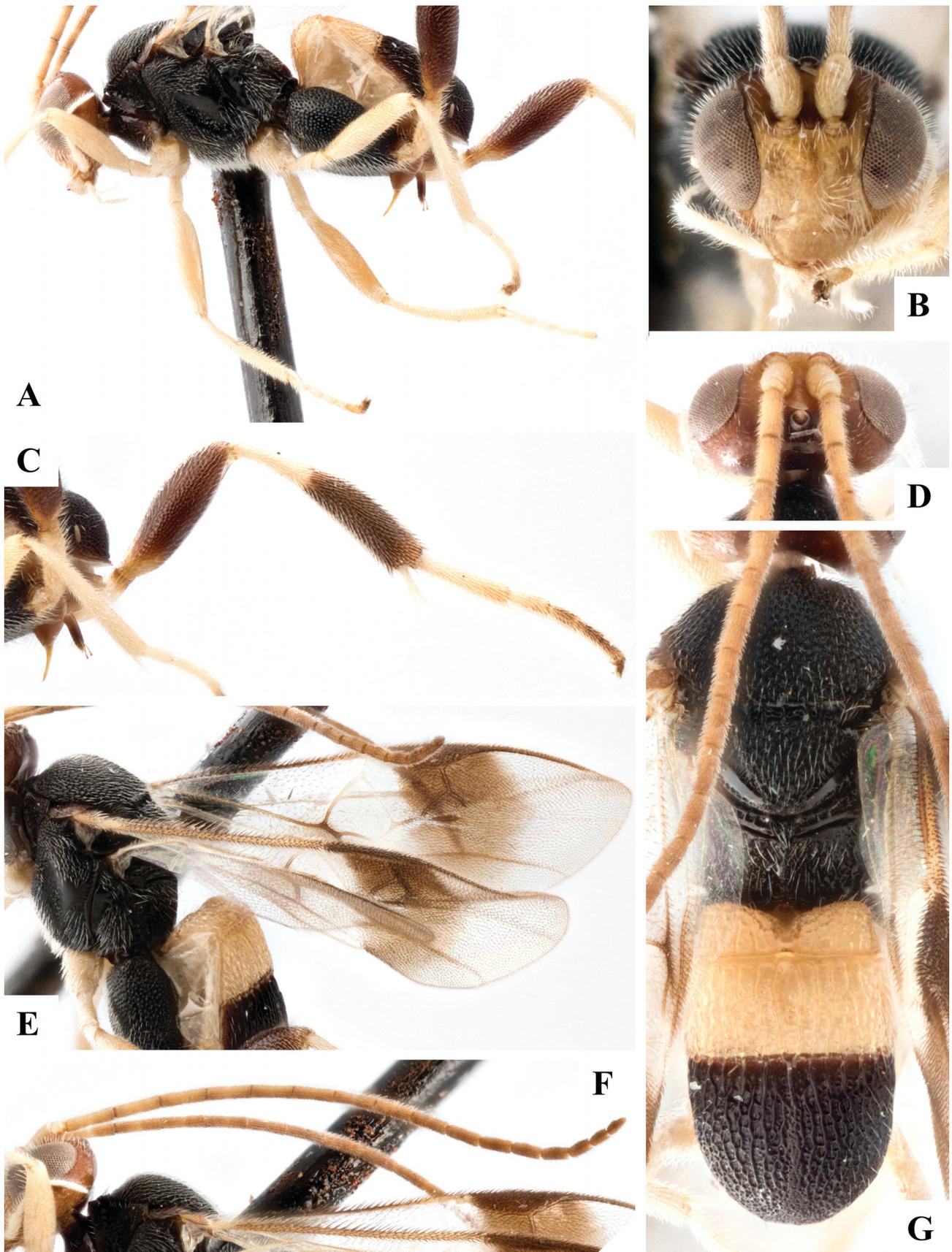


Fig. 9. *Buluka townesi* Austin, 1989, female holotype from AEIC. A – habitus, lateral view; B – head, frontal view; C – hind leg; D – head, dorsal view; E – fore and hind wings; F – antenna; G – mesoscutum, scutellum and metasoma, dorsal view. Photographs by C. Boudreault.

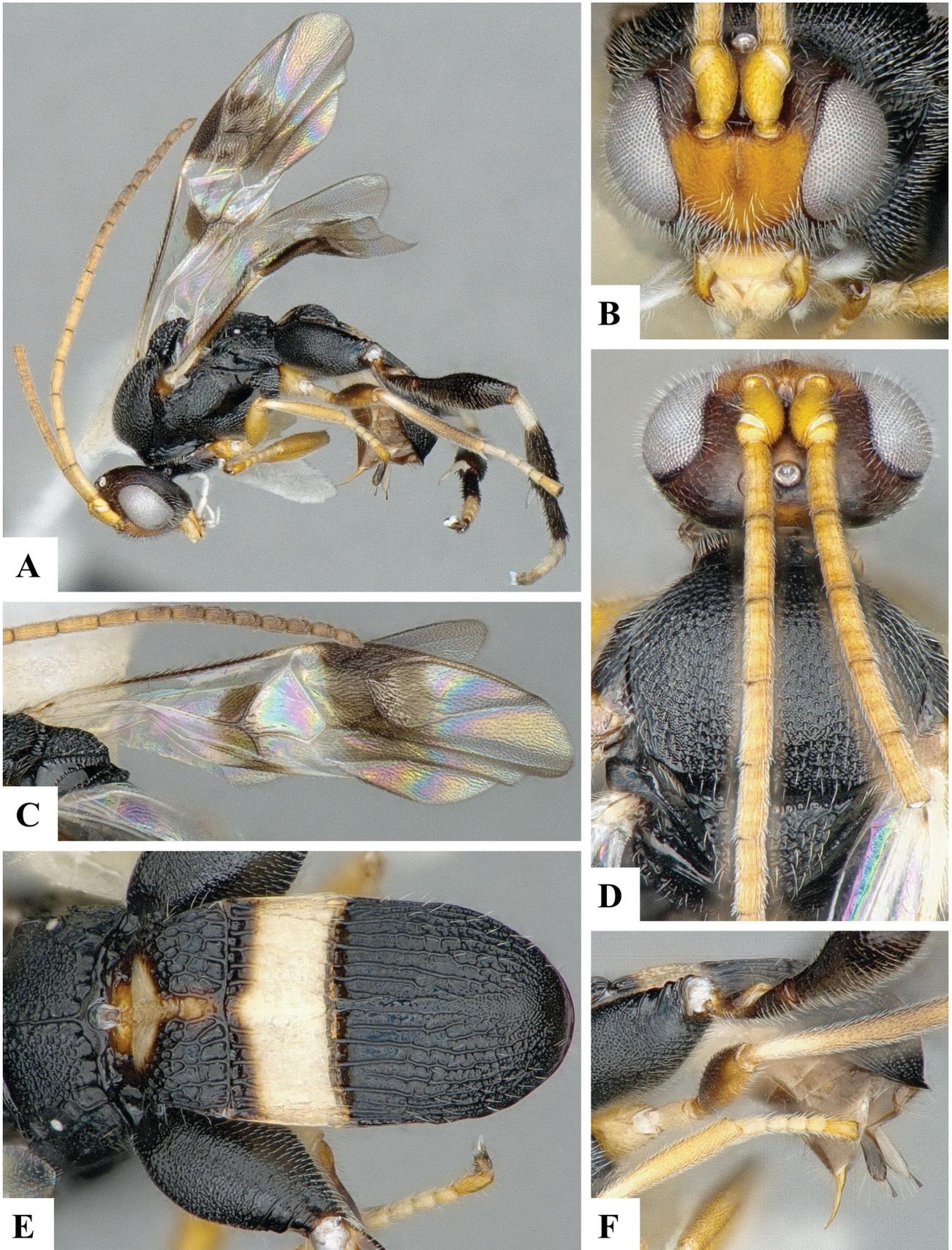


Fig. 10. *Buluka petrjanstai* Hovorka & Fernandez-Triana sp. nov., female holotype CNCH1562. A – habitus, lateral view; B – head, frontal view; C – fore wing; D – head, mesoscutum and scutellum, dorsal view; E – propodeum and metasoma, dorsal view; F – ovipositor sheaths and ovipositor, lateral view. Photographs by C. Boudreault.

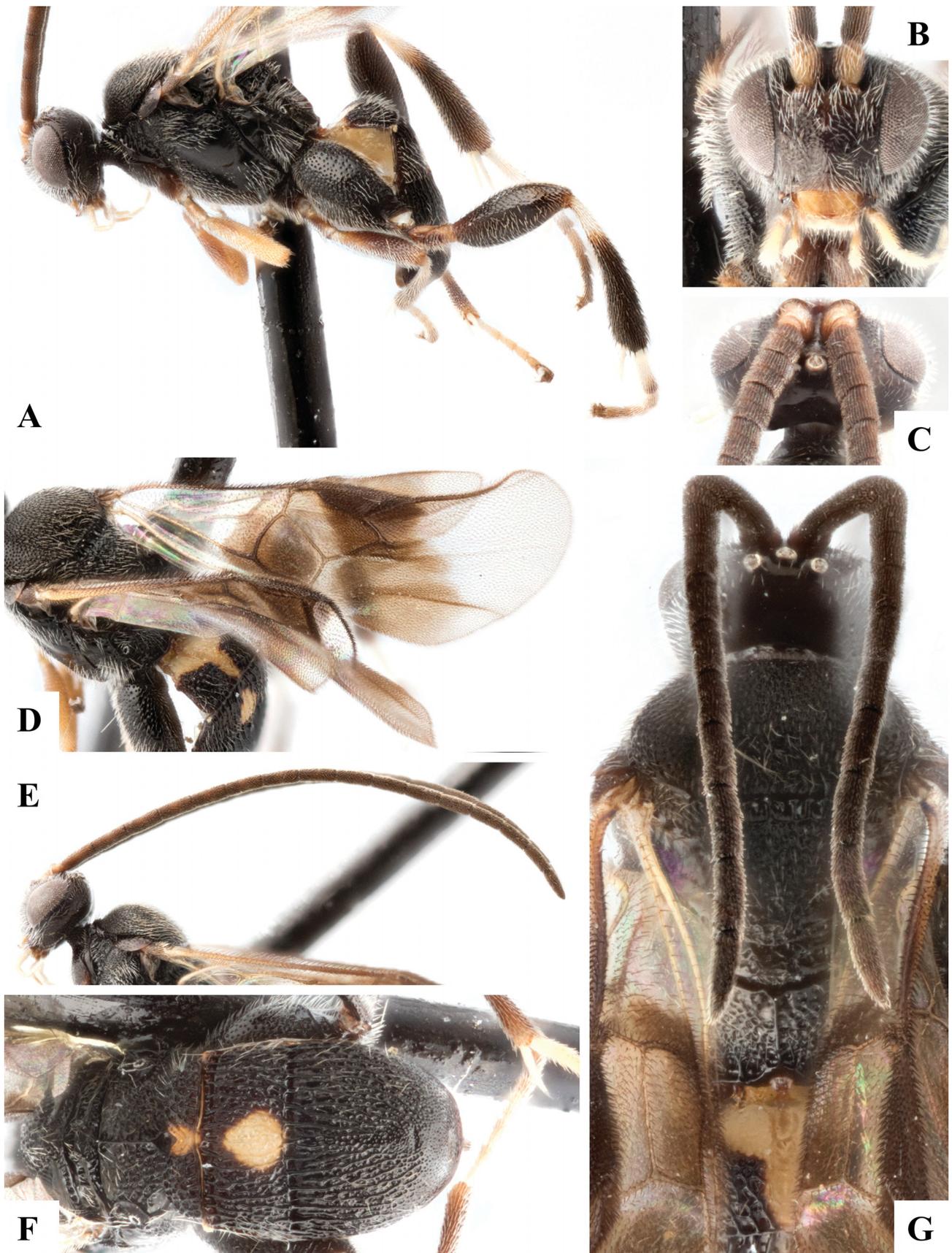


Fig. 11. *Buluka taiwanensis* Austin, 1989, male paratype from AEIC. A – habitus, lateral view; B – head, frontal view; C – head, dorsal view; D – fore wing; E – antenna; F – propodeum and metasoma, dorsal view; G – mesoscutum, scutellum, propodeum, dorsal and apical antennal segments. Photographs by C. Boudreault.



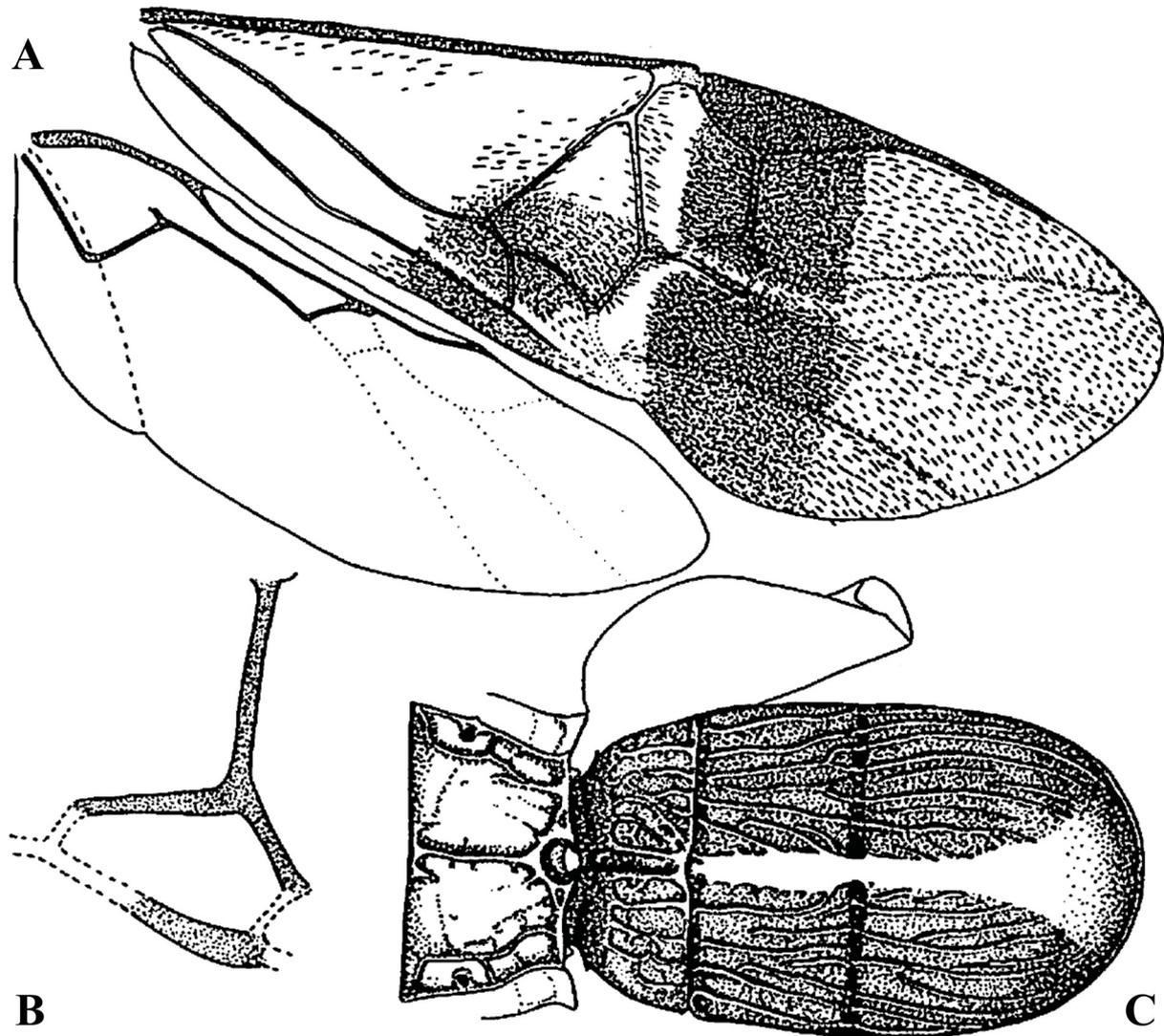


Fig. 12. *Buluka collesi* Austin & Dangerfield, 1992, male holotype. A – fore and hind wing; B – second submarginal cell; C – metasoma, dorsal view. Illustrations taken from AUSTIN & DANGERFIELD (1992).

either T1 and T2 entirely yellow (*B. townesi*, *B. noyesi*, and *B. vuquangensis*), completely black (*B. achterbergi*), or T1 and T2 only partially yellow, with the yellow not covering the full width of the tergite (e.g., *B. taiwanensis* and *B. buntikae* sp. nov.).

**Description. Female** (Fig. 10). *Head* in anterior view  $0.9\times$  as long as wide medially, setose; first flagellomere as long as second flagellomere,  $4.2\times$  as long as wide; second flagellomere  $4.2\times$  as long as wide; fifteenth flagellomere  $2.0\times$  as long as wide; face smooth, densely setose ventrally; frons setose; vertex smooth; gena smooth, sparsely setose; eyes setose, diverging behind antennal sockets; clypeus almost straight to slightly concave, smooth and densely setose; ratio of maximum head width to minimum face width  $2.30$  ( $74/32$ ).

*Mesosoma*  $1.44\times$  as long as high; mesoscutum punctate crenulate anteriorly and laterally; notaular courses, posterior and lateral margin of mesoscutum reticulate, setose; scutellar sulcus with 10 medial carinae; scutellum reticulate rugose with strong setae; propodeum with medial carina,

finely reticulate rugose, glabrous; propodeal spiracle surrounded by cristulae; area around propodeal spiracle large, polished but not reaching anteriorly to fore margin of propodeum; pronotum smooth posteriorly; mesopleuron mostly punctate crenulate (reticulate) and setose, smooth and glabrous anteriorly; metapleuron smooth and glabrous antero-medially, posterior part punctate reticulate.

*Metasoma*. Posterior rim of metasoma shorter than carapace; T1 with crenulate median longitudinal groove with smooth polished area in basal medial half; T1  $0.6\times$  as long as wide apically, reticulate rugose in lateral parts of its basal half, areolate in apical half; T2  $0.4\times$  as long as wide apically, all covered with longitudinal striae; second metasomal suture shallow and crenulated; T3 with narrow longitudinal groove smooth basally, punctate apically, longitudinally striate in basal half, reticulate and punctate apically; ovipositor sheaths with two spatulate sensillae apically.

*Legs*. Metacoxa large, setose dorsally and ventrally, reticulate, with distinct transversal striae apically; metafe-

mur  $3.5\times$  as long as wide; metatibia  $4.16\times$  as long as wide; inner metatibial spur  $0.6\times$  as long as basitarsus; metatarsal claws with one tooth.

**Wings.** Fore wing  $3.25\times$  as long as wide; fore wing apically and in apical 0.2 of basal and subbasal cells setose, basally glabrous; basal, subbasal, 1<sup>st</sup> discal and 1<sup>st</sup> subdiscal cell glabrous; pterostigma  $3.45\times$  as long as wide; 2RS vein of fore wing less than  $2\times$  as long as r-m vein.

**Body measurements.** Body length: 2.5 mm; fore wing length: 2.7 mm; second flagellomere length/width: 4.2; fifteenth antennal segment length/width: 2.0; metafemur length/width: 3.5; metatibia length 1.1 mm; carapace length/width: 1.9; T1 length/apical width: 0.6; T2 length/apical width: 0.4.

**Color.** Head orange to dark brown; face orange; apex of clypeus, malar space, frons, vertex and temples dark brown to black near occipital carina; palpi white-yellow; mesosoma black; fore and middle legs yellow with tarsal segments 1–4 whitish; metacoxa, metatrochanter, metatrochantellus and metafemora black; metatibia black with apical 0.3 white-yellow; hind basitarsus black; hind tarsal segments 2–4 white-yellow; hind telotarsus brown; tegula light brown; wing venation light brown; fore wing infuscate throughout below pterostigma and around vein 1-CU; T1 in basal half with oval light yellow area around medial longitudinal groove; T2 almost fully light yellow except for  $0.1\times$  in anterior margin which is black; T3 black; ovipositor sheath dark brown to black.

**Molecular data.** BIN BOLD:AAH1225.

**Etymology.** Named after Petr Janšta (Charles University, Prague, Czech Republic), a dear colleague and friend, as well as a world expert on Chalcidoidea and the family Torymidae.

**Biology.** Unknown.

**Distribution.** Thailand.

### New records

#### *Buluka achterbergi* Austin, 1989

(Fig. 16)

*Buluka achterbergi* Austin, 1989: 162, figs 3, 5, 8, 9, 12, 13, 15, 28.

*Buluka achterbergi*: AUSTIN & DANGERFIELD (1992: 18); LONG (2015: 283); RANJITH et al. (2015: 31, 32).

**Material examined.** THAILAND: TRANG PROVINCE: 1 ♀, Khoa Chong, Forest Research Stn.,  $7^{\circ}33'2''N$ ,  $99^{\circ}47'23''E$ , 75m, xi.2005, D. Lohman lgt., CNC281641; SURAT THANI PROVINCE: 1 ♀, Khao Sok NP, Klong Morg Unit,  $8^{\circ}53'44''N$ ,  $98^{\circ}39'02''E$ , 87 m, 10–17.iii.2009, MT, Pongphan lgt., CNC1152997; 1 ♀, Khao Sok NP, Klong Morg Unit,  $8^{\circ}54'00''N$ ,  $98^{\circ}39'00''E$ , 87 m, 6–13.i.2009, MT, Pongphan lgt., CNC1143847; 1 ♀, Khao Sok NP, Klong Morg Unit,  $8^{\circ}53'44''N$ ,  $98^{\circ}39'02''E$ , 87m, 10–17.iii.2009, MT, Pongphan lgt., CNC1152994; 1 ♀, Khao Sok NP headquarters,  $8^{\circ}54'54''N$ ,  $98^{\circ}31'49''E$ , 155 m, 9–16.vi.2009, MT, Pongphan lgt., CNC1159308.

**Distribution.** Malaysia (AUSTIN 1989) and Thailand (new record).

#### *Buluka straeleni* de Saeger, 1948

(Fig. 6)

*Buluka straeleni* de Saeger, 1948: 65, figs 26–27.

*Buluka straeleni*: NIXON (1965: 265, fig. 337); SHENEFELT (1973: 683); MASON (1981: 121, figs 93: A–D); AUSTIN (1989: 156, figs 1, 4, 7, 11, 14, 19, 30); LONG (2015: 282, 283); RANJITH et al. (2015: 30).

**Material examined.** REPUBLIC OF THE CONGO: DEPARTMENT POOL: 1 ♀, Iboubikro, Lesio-Loun Pk,  $3^{\circ}16'12''S$ ,  $15^{\circ}28'16''E$ , 330 m, 25.viii.–1.ix.2008, MT#6, Sharkey M. & Braet Y. lgt., JMICO534.

**Distribution.** Democratic Republic of Congo, Cameroon, South Africa (DE SAEGER 1948, NIXON 1965, AUSTIN 1989) and Republic of the Congo (new record).

### Key to the world species of *Buluka* de Saeger, 1948

Modified from AUSTIN (1989) and RANJITH et al. (2015) to include all species described till now. For the species not dealt with here, we provide their distribution between brackets, as well as host (only known for one species), references to descriptions and illustrations. An asterisk (\*) indicates a new country record.

- 1 Gena and vertex striate, at least laterally (Figs 1G; 2A). ..... 2
- Gena and vertex smooth (Figs 3D; 5A; 6D; 7E; 9D; 10D; 11C; 13G; 14D; 15C; 16E; 17C). ..... 3
- 2 Scutellum reticulate rugose medially; fore wing vein 2RS  $1.2\times$  as long as vein r-m; T1 with a projection laterally resembling a horn; tegula pale orange; metafemur apically brown to fully black; fore wing without infuscation around vein 1CUa (Figs 1A–D). ..... *B. horni* Gupta, 2013 [India. Description and illustrations in GUPTA (2013).]
- Scutellum smooth and polished medially; fore wing vein 2RS as long as vein r-m; T1 without lateral projections; tegula black; metafemur yellow anteriorly; fore wing without infuscation around vein 1CUa (Figs 2B, C). ..... *B. huddlestoni* Austin, 1989 [Solomon Islands. Host: *Imma thyridis* Meyrick (Lepidoptera: Immidae). Description and illustrations in AUSTIN (1989).]
- 3 Posterior rim of metasoma slightly overhangs carapace in lateral view (Figs 3A; 4A; 5C). ..... 4
- Posterior rim of metasoma usually shorter than carapace, if rarely longer, then carapace, in lateral view, not overhanging posterior margin of metasoma (Figs 4B; 6B; 9A; 10A, 14A; 15A; 16D). ..... 5
- 4 Head mostly brown, darker around vertex and gena; scape brown marked with black, tegula black; metafemur black on posterior 0.7; body length 2.6–3.1 mm; fore wing vein r-m more than  $3.5\times$  length of vein 2RS (Figs 3A–G). ..... *B. orientalis* Chou, 1985 [Taiwan. Description and illustrations in CHOU (1985) and AUSTIN (1989).]
- Head mostly yellow to yellow-orange around vertex and upper part of gena; scape and tegula yellow; metafemur yellow with only black spot on posterior 0.1; body length 2.7 mm; fore wing vein r-m less than  $2.0\times$  length of vein 2RS (Figs 5A, B, D–F). ..... *B. janaorlikovae* sp. nov. [Vietnam]
- 5 Propodeum rugose around spiracle, usually without well-developed surrounding cristula, if cristula present then not delimiting smooth area around spiracle, rather with striae radiating from spiracle (Figs 6A–D; see also illustrations in AUSTIN (1989)). ..... *B. straeleni* de Saeger, 1948

- [Democratic Republic of Congo, Cameroon, \*Republic of the Congo, South Africa. Description and additional illustrations in AUSTIN (1989).]
- Propodeal spiracle surrounded by well-developed cristula which delimits smooth polished area (Figs 7E, G; 11F; 12C; 14E). ..... 6
  - 6 T1 and T2 entirely yellow (Figs 7G; 8B; 9G). ..... 7
  - T1 and T2 at least partially black (Figs 10E; 11F; 12C; 13E; 14E; 15E). ..... 9
  - 7 Larger species, approximately 3.6 mm in length; ratio of minimum face width to maximum head width 2.3 (Fig. 9). .... **B. townesi** Austin, 1989 [India, Malaysia]
  - Smaller species, 2.5–2.8 mm in length; ratio of minimum face width to maximum head width 2.6–2.8 (Fig. 7). ..... 8
  - 8 Head black; ratio of carapace length/width (across anterior margin of T2) for female 1.4–1.6 (Figs 8A, B). ..... **B. noyesi** Austin, 1989 [India]
  - Head light coloured, yellow (face and frons) to yellow-orange (vertex) to light brown (gena); ratio of carapace length/width (across anterior margin of T2) for female 2.0 (Figs 7A, C, E, G). ..... **B. vuquangensis** Long, 2015 [Vietnam]
  - 9 Metasoma with T1 partially and T2 almost completely yellow (yellow covering whole width of tergite except for black margin on anterior 0.1) (Fig. 10E). ..... **B. petranstai** sp. nov. [Thailand]
  - Metasoma either completely black or with T1 and T2 only partially yellow (yellow area not covering whole width of tergite) (Figs 11F; 12C; 13E; 14E; 15E; 16F; 17F). ..... 10
  - 10 Smooth area around propodeal spiracle large and reaching anterior margin of propodeum; wings very dark, venation and infuscate areas of fore wing deeply pigmented (Figs 11D, F). ..... **B. taiwanensis** Austin, 1989 [Taiwan]
  - Smooth area around propodeal spiracle relatively small, not reaching anterior margin of propodeum; wings dark, venation and infuscate areas of fore wing not so deeply pigmented, translucent (Figs 12A, C; 13B, E; 14C, E; 15D, E). ..... 11
  - 11 Fore wing basal and subbasal cells almost without setae or just apically with setose area around infuscation (Figs 12A; 14C; 15D). ..... 12
  - Fore wing basal and subbasal cells fully setose (Figs 16A; 17A). ..... 15
  - 12 Scutellum relatively smooth antero-medially; T2 and T3 with coarse longitudinal striae covering whole tergites (with rugose background); head reddish-brown (Fig. 12). ..... **B. collesi** Austin & Dangerfield, 1992 [Australia. Description and illustrations in AUSTIN & DANGERFIELD (1992).]
  - Scutellum punctate-reticulate to rugose; T2 and T3 with longitudinal striae only anteriorly and reticulate-rugose posteriorly; head of different colour (Figs 13D–F; 14D). ..... 13
  - 13 Head with face light yellow, frons, temple and vertex dark brown, small triangular area behind ocelli orange; propodeum reticulate rugose (without incomplete rugos-

- ity near median carina of propodeum); metatrochanter and metatrochantellus white-yellow; medial striae on T3 less distinct, short and narrow; impression between T2 and T3 not so deep and its striae close to each other, without polished area in between; apex of carapace with thin, elongated, smooth central area (Figs 13A, C–G). ..... **B. buntikae** sp. nov. [Thailand]
- Head entirely orange-yellow (back of head slightly darker but still orange-yellow); propodeum finely sculptured, with polished area near anterior margin of propodeum (i.e., lacking rugosity near median carina of propodeum anteriorly); metatrochanter and metatrochantellus brown; distinct medial striae on T3 long (and wide); impression between T2 and T3 deep and its striae with polished area in between; apex of carapace fully sculptured without polished area (Figs 14A, B, D–F; 15B, C, E). ..... 14
- 14 Mesotibia and first segment of metatarsus white-yellow; T2 with yellow area pentagonal-shaped, narrowing posteriorly; T2 in anterior 0.5 (laterally) or anterior 0.7–0.8 (centrally) with sculpture consisting of striae that delimit elongated areas; reticulated sculpture limited to posterior 0.5 (laterally) or posterior 0.2–0.3 (centrally) (Figs 14A, E). ..... **B. frederiquebakkeriae** sp. nov. [Indonesia]
- Mesotibia light brown on posterior half and first segment of metatarsus entirely dark brown (almost black); T2 entirely black; T2 almost entirely covered by even reticulate sculpture (Figs 15A, E). ..... **B. longi** sp. nov. [Vietnam]
- 15 Area around spiracle smooth; infuscate area behind pterostigma as wide as pterostigma; fore wing vein 2-SR as long as vein r-m; T1 smooth and polished anteriorly with complete medial longitudinal groove; T2 with medial striae extending beyond middle of the tergite; T2 without yellow marking postero-medially (Figs 16A, F). ..... **B. achterbergi** Austin, 1989 [Malaysia, \*Thailand]
- Area around spiracle sculptured; infuscate area behind pterostigma distinctly wider than pterostigma; fore wing vein 2-SR 1.9× as long as vein r-m; T1 entirely rugose medial longitudinal groove not complete; T2 with medial striae not extending beyond middle of the tergite; T2 with yellow marking postero-medially (Figs 17A, E, F). ..... **B. quickei** Ranjith, 2015 [India]

## Conclusions

This paper describes five new species of the genus *Bulka* from the Oriental Region. Additionally, we report *B. achterbergi* for the first time from Thailand and *B. straeleni* for the first time from the Republic of the Congo. As stated in FERNANDEZ-TRIANA et al. (2020) this genus is restricted to the Old World tropics, similar to other microgastrine genera (e.g., *Agupta* Fernandez-Triana, 2018, *Alloplitis* Nixon, 1965, *Miropotes* Nixon, 1965, *Parion* Nixon, 1965 and *Pseudofornicia* van Achterberg, 2015). Previously, 11 species were known, most of them from the Oriental Region (8 species), but also two from the Australian (Oceanian) Region and one from tropical Africa (Fig. 18).

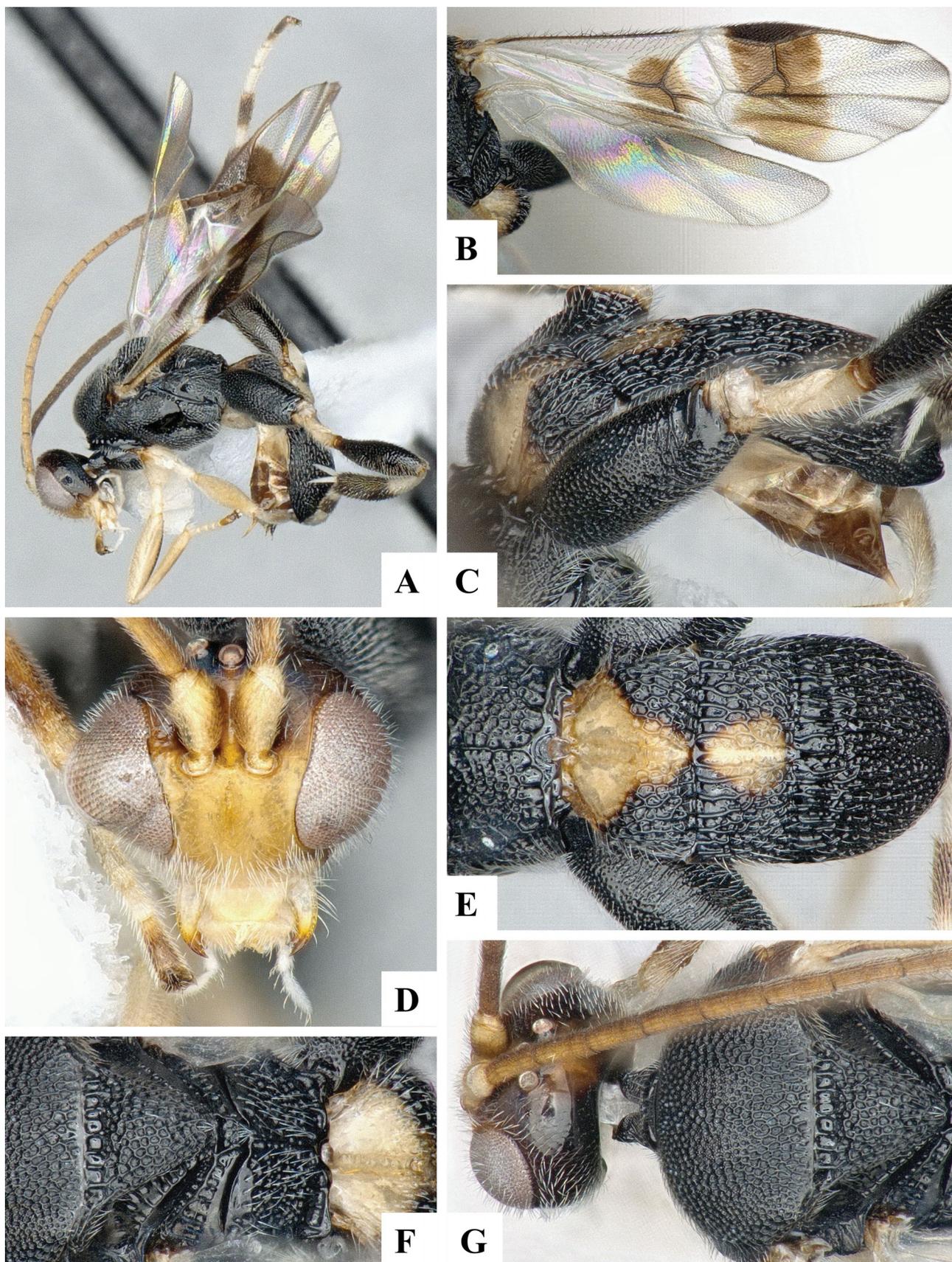


Fig. 13. *Buluka buntikae* Hovorka & Fernandez-Triana sp. nov., female holotype CNC281639. A – habitus, lateral view; B – wings; C – metasoma, lateral view; D – head, frontal view; E – propodeum and metasoma, dorsal view; F – scutellum and propodeum, dorsal view; G – head, mesoscutum and scutellum, dorsal view. Photographs by C. Boudreault.

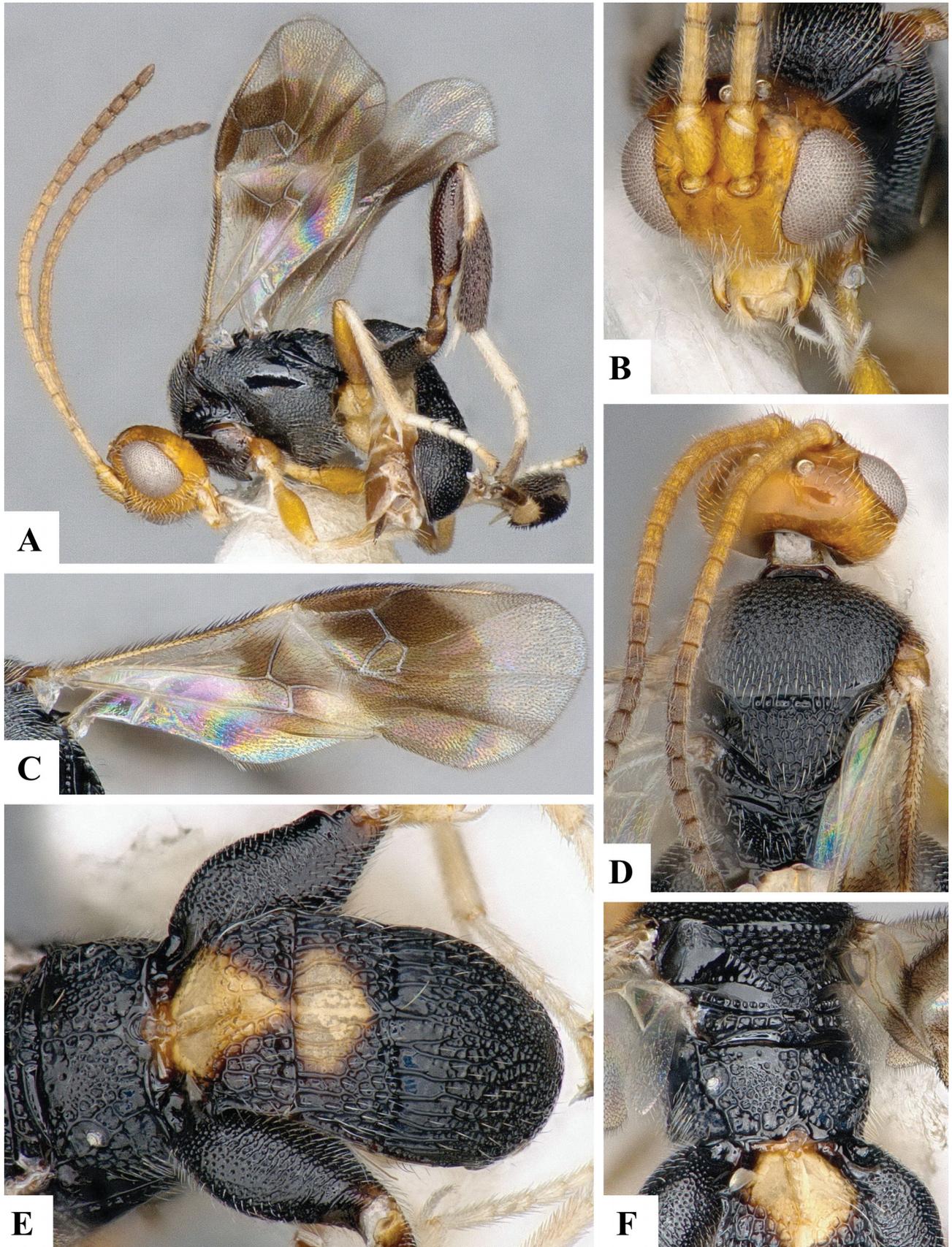


Fig. 14. *Buluka frederiquebakkeriae* Hovorka & Fernandez-Triana sp. nov., female holotype CNC281635. A – habitus, lateral view; B – head, frontal view; C – fore wing; D – head, mesoscutum and scutellum, dorsal view; E – propodeum and metasoma, dorsal view; F – scutellum, propodeum and T1, dorsal view. Photographs by C. Boudreault.

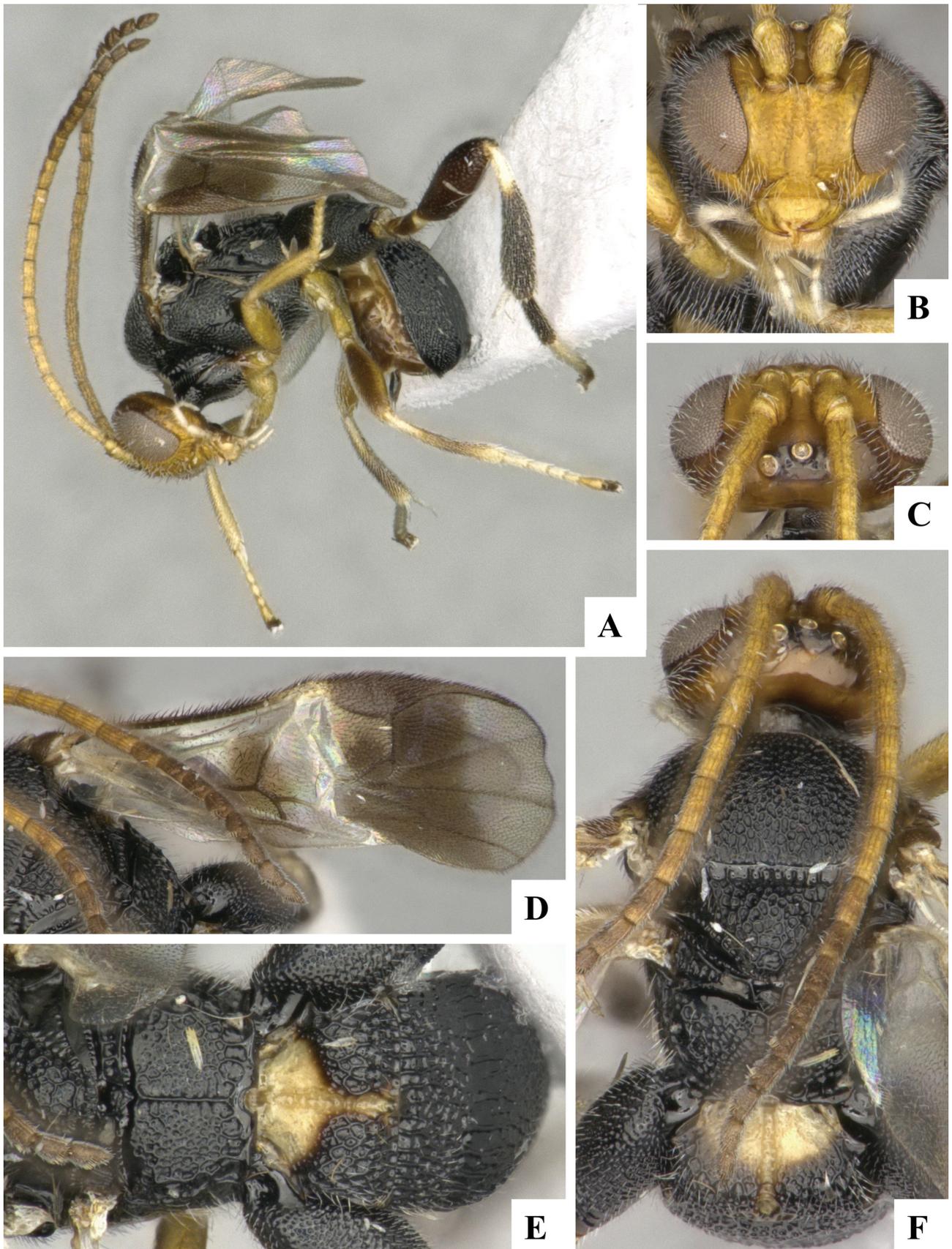


Fig. 15. *Buluka longi* Hovorka & Fernandez-Triana sp. nov., female holotype CNC721127. A – habitus, lateral view; B – head, frontal view; C – head, dorsal view; D – fore wing; E – propodeum and metasoma, dorsal view; F – scutellum, propodeum and T1, dorsal view. Photographs by C. Boudreault.

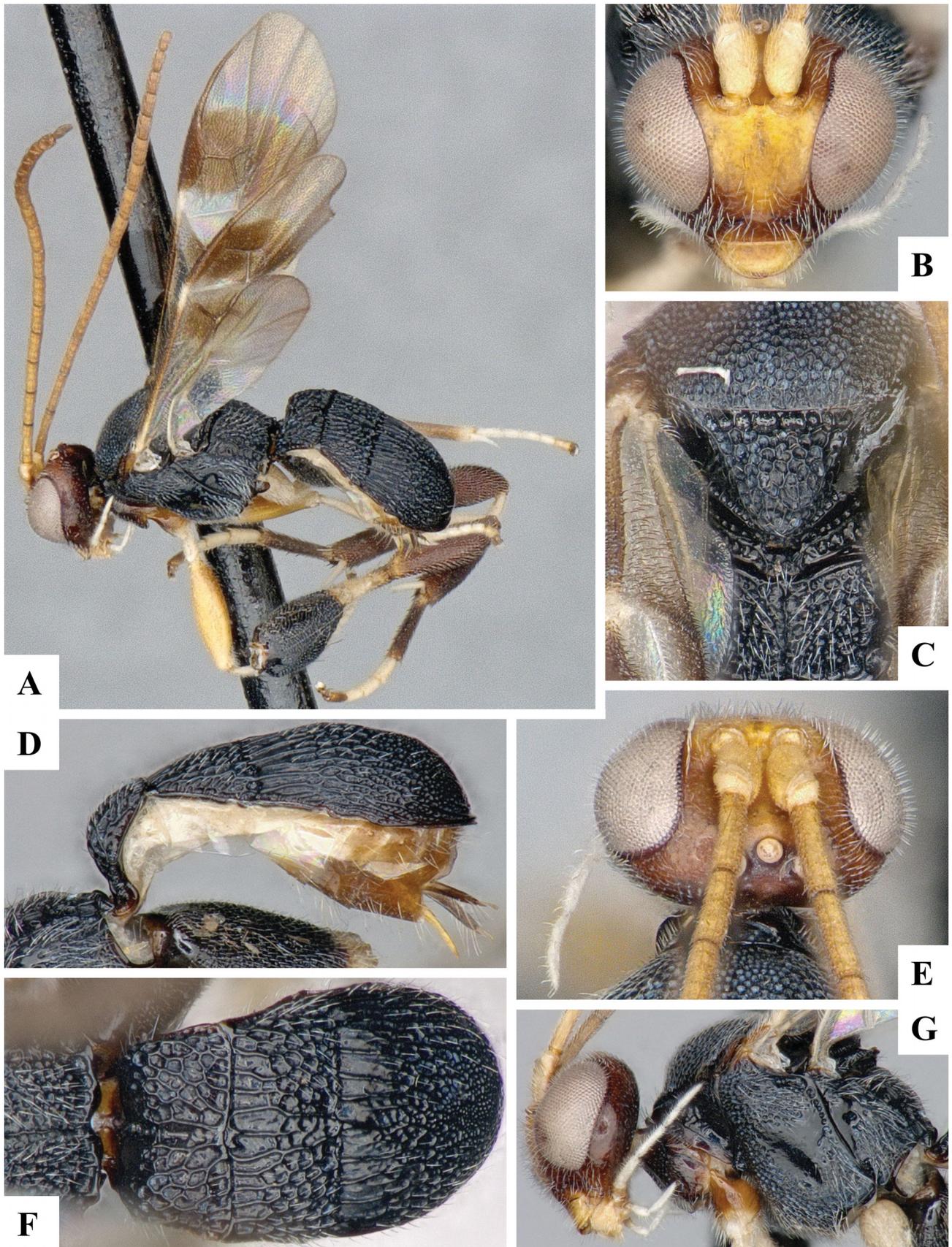


Fig. 16. *Buluka achterbergi* Austin, 1989, female CNCHYM00244. A – habitus, lateral view; B – head, frontal view; C – mesoscutum and scutellum, dorsal view; D – metasoma, lateral view; E – head and first antennal segments, dorsal view; F – metasoma, dorsal view; G – mesosoma, lateral view. Photographs by C. Boudreault.

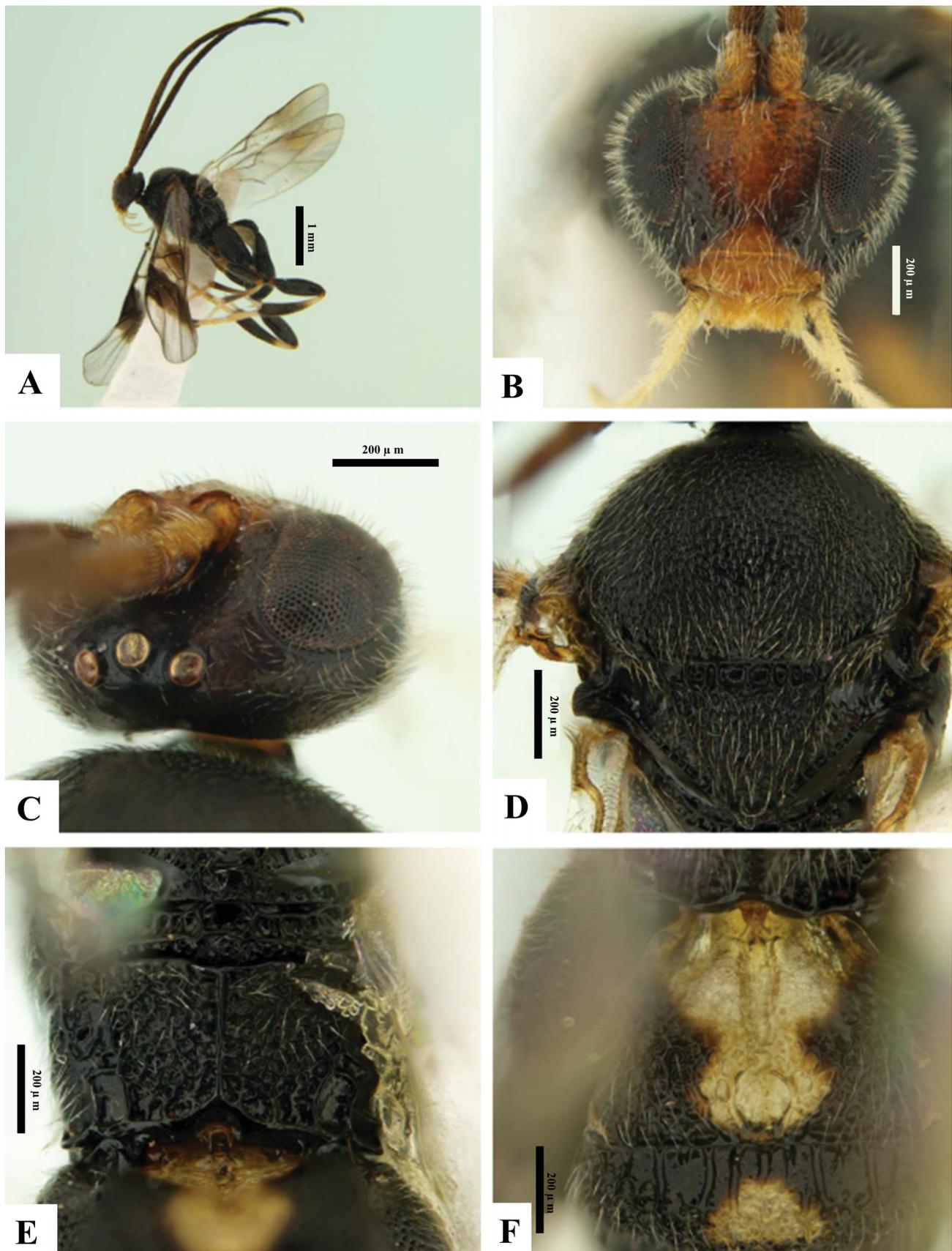


Fig. 17. *Buluka quickei* Ranjith, 2015, female holotype. A – habitus, lateral view; B – head, frontal view; C – head, dorsal view; D – mesoscutum and scutellum, dorsal view; E – propodeum, dorsal view; F – metasoma T1 and T2, dorsal view. Taken from RANJITH et al. (2015).



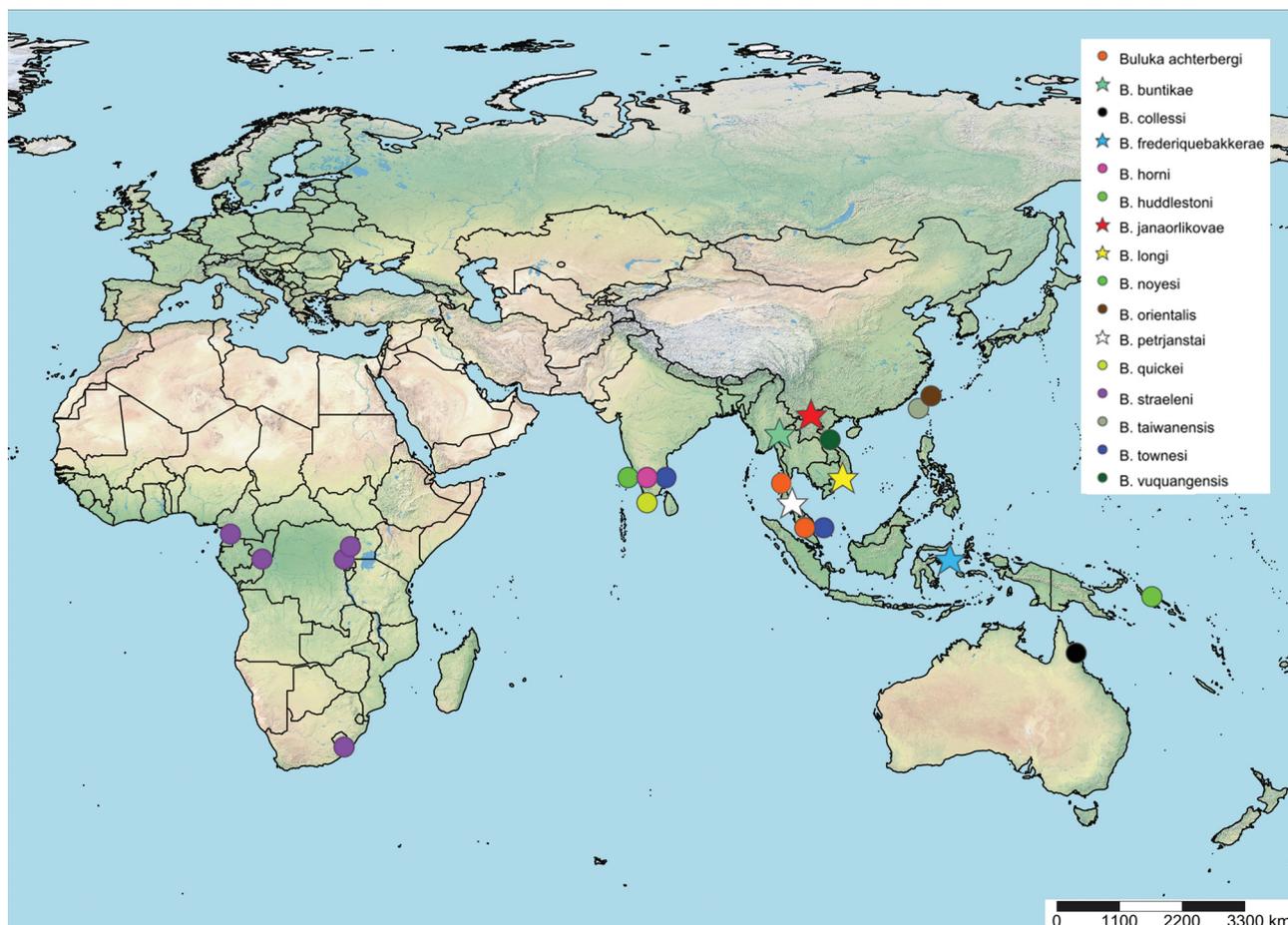


Fig. 18. Distribution map of known *Buluka* species (newly described species are marked with an asterisk).

To date, most species have been described from the mainland part of the Oriental Region, namely India, Malaysia, Thailand and Vietnam. Two species, *B. orientalis* and *B. taiwanensis*, were described from Taiwan by AUSTIN (1989). In our work we describe another new species from the Sula Islands (North Maluku, Pulau Mangoli) east of Sulawesi, *B. frederiquebakkeriae* sp. nov. Based on the data so far, this appears to be a widespread genus in both the mainland and island parts of the Oriental Region, and with more intensive surveys of other areas of Sundaland, more new species can be expected.

The only known species from the Afrotropical Region is *Buluka straeleni*, which is widespread from the central tropics to southern Africa. Among the African material that we have been able to see, some specimens seem to represent additional species but further study is needed (including getting fresh material for genetic analysis besides morphological approaches). Surprisingly, the majority of recently sampled individuals for DNA barcoding did not yield any results (i.e., no sequences were obtained). The underlying cause for the lack of DNA barcodes in these individuals remains unknown. However, similar challenges have been documented in other genera of Microgastrinae, where DNA barcoding results are often poor or entirely absent (SMITH et al. 2012). This issue is also recognized in other taxa within the family Braconidae (ZALDÍVAR-

RIVERÓN 2010).

With the newly described species in this paper, the current diversity in the genus *Buluka* is 16 species globally (a total of 45% increase of species richness in this genus). FERNANDEZ-TRIANA et al. (2020) estimated the global diversity of the genus *Buluka* to be 20 species; however, based on newly described species and what we have found in collections so far, it is likely that the diversity is higher.

Unfortunately, we were unable to find host records for any of the newly described species as all of them were found in Malaise trap samples.

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## References

- ACHTERBERG C. VAN 2009: Can Townes type Malaise traps be improved? Some recent developments. *Entomologische Berichten* (Amsterdam) **69**: 129–135.
- AUSTIN A. D. 1989: Revision of the genus *Buluka* de Saeger (Hymenoptera: Braconidae: Microgastrinae). *Systematic Entomology* **14**: 149–163.
- AUSTIN A. D. & DANGERFIELD P. C. 1992: Synopsis of Australasian Microgastrinae (Hymenoptera: Braconidae), with a key to genera and description of new taxa. *Invertebrate Systematics* **6**: 1–76.
- CHOU L. 1985: A new species of *Buluka* (Hymenoptera: Braconidae) from Taiwan. *Chinese Journal of Entomology* **5**: 85–88.
- FERNANDEZ-TRIANA J., SHAW M. R., BOUDREAULT C., BEAUDIN M. & BROAD G. R. 2020: Annotated and illustrated world checklist of Microgastrinae parasitoid wasps (Hymenoptera, Braconidae). *ZooKeys* **920**: 1–1089.
- FERNANDEZ-TRIANA J., WHITFIELD J. B., RODRIGUEZ J. J., SMITH M. A., JANZEN D. H., HALLWACHS W., HAJIBABAEI M., BURNS J. M., SOLIS M. A., BROWN J., CARDINAL S., GOULET H. & HEBERT P. D. N. 2014: Review of *Apanteles sensu stricto* (Hymenoptera, Braconidae, Microgastrinae) from Area de Conservación Guanacaste, northwestern Costa Rica, with keys to all described species from Mesoamerica. *ZooKeys* **383**: 1–565.
- GIMP DEVELOPMENT TEAM 2019: *GIMP*. Retrieved from <https://www.gimp.org>.
- GUPTA A. 2013: Three new species of reared parasitic wasps (Hymenoptera: Braconidae: Microgastrinae) from India. *Zootaxa* **3701**: 365–380.
- GUPTA A. & FERNANDEZ-TRIANA J. 2014: Diversity, host association and cocoon variability of reared Indian Microgastrinae (Hymenoptera: Braconidae). *Zootaxa* **3800**: 1–101.
- HERATY J. & HAWKS D. 1998: Hexamethylidisilazane – A chemical alternative for drying insects. *Entomological News* **109**: 1–4.
- IVANOVA N. V., WAARD J. R. DE & HEBERT P. D. N. 2006: An inexpensive, automation-friendly protocol for recovering high-quality DNA. *Molecular Ecology Notes* **6**: 998–1002.
- LONG K. D. 2015: New record of the genus *Buluka* de Saeger (Hymenoptera: Braconidae: Microgastrinae) with description of a new species from Vietnam. *Academia Journal of Biology* **37**: 282–287.
- MASON W. R. M. 1981: The polyphyletic nature of *Apanteles* Foerster (Hymenoptera: Braconidae): A phylogeny and reclassification of Microgastrinae. *Memoirs of the Entomological Society of Canada* **113** (115): 1–147.
- NIXON G. E. J. 1965: A reclassification of the tribe Microgasterini (Hymenoptera: Braconidae). *Bulletin of the British Natural History Museum, Entomology, Supplement* **2**: 1–284.
- RANJITH A. P., VEENA T., PRIYADHARSHAN D. R. & NASEER M. 2015: Revision of *Buluka* de Saeger (Hymenoptera: Microgastrinae) with the description of one new species from south India. *Biosystematica* **9**: 29–38.
- RATNASINGHAM S. & HEBERT P. D. N. 2007: BOLD: The Barcode of Life Data System (<http://www.barcodinglife.org>). *Molecular Ecology Notes* **7**: 355–364.
- RUMPH J. A. & TURNER W. J. 1998: Alternative to critical point drying for soft-bodied insect larvae. *Annals of the Entomological Society of America* **91**: 693–699.
- SAEGER H. DE 1948: Genre *Buluka* nov. Pp. 64–68. In: SAEGER H. DE (ed.): *Cardiochilinae et Sigalphinae* (Hymenoptera, Apocrita) Fam. Braconidae. *Exploration du Parc National Albert. Fascicula* 53. Institut des Parcs Nationaux du Congo Belge, Bruxelles, 272 pp.
- SHARKEY M. J. & WHARTON R. A. 1997: Morphology and terminology. Pp. 19–37. In: WHARTON R. A. MARSH P. M. & SHARKEY M. J. (eds): *Identification Manual to the New World Genera of Braconidae*. The International Society of Hymenopterist, Washington DC, 476 pp.
- SHENEFELT R. D. 1973: Braconidae 5. Microgasterinae & Ichneutinae. *Hymenopterorum Catalogus (Nova Editio)* **11**: 669–812.
- SHORTHOUSE D. P. 2010: *SimpleMapppr*, an online tool to produce publication-quality point maps. <https://www.simplemapppr.net>.
- SMITH M., FERNANDEZ-TRIANA J. L., EVELEIGH E., GÓMEZ J., GUCLU C., HALLWACHS W., HEBERT P. D. N., HRCEK J., HUBER J. T., JANZEN D., MASON P. G., MILLER S., QUICKE D. L. J., RODRIGUEZ J. J., ROUGERIE R., SHAW M. R., VÁRKONYI G., WARD D. F., WHITFIELD J. B. & ZALDÍVAR-RIVERÓN A. 2012: DNA barcoding and the taxonomy of Microgastrinae wasps (Hymenoptera, Braconidae): impacts after 8 years and nearly 20 000 sequences. *Molecular Ecology Resources* **13**: 168–176.
- ZALDÍVAR-RIVERÓN A., MARTÍNEZ J. J., CECCARELLI F. S., JESÚS-BONILLA V. S. DE, RODRÍGUEZ-PÉREZ A. C., RESÉN-DIZ-FLORES A. & SMITH M. A. 2010: DNA barcoding a highly diverse group of parasitoid wasps (Braconidae: Doryctinae) from a Mexican nature reserve. *Mitochondrial DNA* **21**: 18–2



