



Research article

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First description of the metopiine genus *Trieces* Townes, 1946 (Hymenoptera: Ichneumonidae) from the Indomalayan region with three new species from India

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Abstract. *Trieces* Townes, 1946 is one of the largest metopiine genera for which species have been described from all zoogeographical regions except the Indomalayan. The present study reports a major range extension of *Trieces* with the description of three new species from India. The described species are members of the *onitis* species group. An identification key to the Palearctic and Indomalayan species of the *onitis* group is included with the revised generic diagnosis and a key to separate *Trieces* from its closest genus *Chorinaeus*. Distribution pattern and character plasticity of *Trieces* are also discussed.

Keywords. Darwin wasps, Metopiinae, Karnataka, Nagaland, redefinition.

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Introduction

The Darwin wasp subfamily Metopiinae Förster, 1869 comprises larval-pupal koinobiont endoparasitoids of Lepidoptera Linnaeus, 1758 (Gauld *et al.* 2002; Mazón & Bordera 2016; Broad *et al.* 2018). This subfamily has more than 862 species in 27 genera (Yu *et al.* 2016). The metopiine genus *Trieces* Townes, 1946 includes 72 extant species distributed in all geographical regions except the Indomalayan region (Gauld *et al.* 2002; Tolkanitz 2010; Choi *et al.* 2016; Yu *et al.* 2016; Mazón & Bordera 2020). The majority of species have been reported from the Nearctic and Neotropical region (Townes 1971; Gauld *et al.* 2002; Melo *et al.* 2015; Mazón & Bordera 2016, 2020). Metopiines are reported as larval-pupal parasitoids of lepidopteran families like Elachistidae Bruand, 1850, Geometridae Leach, 1815, Pyralidae Latreille, 1809, Tortricidae Latreille, 1803, Yponomeutidae Stephens, 1829 and Oecophoridae Bruand, 1851 (Aeschlimann 1973, 1975; Tolkanitz 2010; Zhang *et al.* 2016; Broad *et al.* 2018). Most of the known species are reported from dry shrubby habitats (Townes & Townes 1959; Zhang *et al.* 2016).

Trieces can be separated from other metopiine genera by the absence of a mesopleural suture, the apomorphic character of the genus (Gauld *et al.* 2002). In addition to this, the absence of a pocket structure on the lower pronotum is found to be a possible synapomorphy to distinguish *Trieces* from related genera such as *Chorinaeus* Holmgren, 1858 and *Hemimetopius* Benoit, 1955. This genus is very similar to the genus *Chorinaeus* except for the following characters: mesopleuron without mesopleural suture; pronotum without dorso-lateral depression, and metasomal tergites 1–3 with a lateral carina (Townes & Townes 1959; Townes 1971; Aeschlimann 1973; Gauld *et al.* 2002; Tolkanitz 2010). Even though *Trieces* and *Chorinaeus* are distinguishable by several characters, these genera are morphologically not well separated as at least one species, *T. ranjithi* Mazón & Bordera, 2021, was found to be intermediate between them (Mazón & Bordera 2020, 2021). An examination of more material and application of molecular phylogeny need to be done to resolve the taxonomic complication between *Trieces* and *Chorinaeus* and to delimit the species groups.

Townes & Townes (1959) divided *Trieces* into four different species groups (*dentatus*, *integer*, *onitis* and *texanus*) based on morphology. The species of the *onitis* group can be defined by the presence of a posterior slit-like depression on the metapleuron (Townes & Townes 1959; Tolkanitz 2010). This species group includes fewer than 10 species which are mostly distributed in the Palearctic region (Yu *et al.* 2016; Choi *et al.* 2016). The new species described in the present study belong to the *onitis* species group.

Gauld (1984) and Townes & Townes (1959) mentioned the occurrence of species of *Trieces* in the Australian and Indomalayan regions, respectively (but yet to be described taxonomically). The present study reports on the distribution of *Trieces* for the first time from the Indomalayan region with the description of three new species, *T. irwini* sp. nov., *T. isolatus* sp. nov. and *T. orientalis* sp. nov. from India. Identification keys for the separation of *Trieces* from *Chorinaeus* and identification of Palearctic and Indomalayan species of the *onitis* group are provided along with illustrations of new species. The distribution pattern of species of *Trieces* and morphological delimitation of the *onitis* group are discussed.

Material and methods

Specimens for the present study were collected by Malaise traps from the dry deciduous and evergreen forests of Biligiri Rangaswamy Temple Tiger Reserve (BRT), Chamarajanagar District, Karnataka and secondary wet forest of Zapami Village, Phek District, Nagaland. The collected specimens were kept in 95% alcohol and later mounted on card points and identified. Images were taken with a Keyence VHX-6000 digital microscope with a magnification of 200×. Final images were edited in Adobe Photoshop CS8 for removing artifacts formed during stacking. Measurements of body parts were taken from the holotypes by AxioVision 4.8. The type material of the new species is deposited in the collection of ATREE Insect Museum, Bengaluru, India (AIMB). Later, holotypes of the new species will be moved to the national repository at NBAIR, Bangalore. For morphological terminology and wing venation we follow Broad *et al.* (2018). For body sculpture we follow Eady (1968).

Institutional abbreviations

AIMB = ATREE Insect Museum, Bengaluru, India

NBAIR = National Bureau of Agricultural Insect Resources, Bengaluru, India

Results

Taxonomic account

Class Insecta Linnaeus, 1758
Order Hymenoptera Linnaeus, 1758
Superfamily Ichneumonoidea Latreille, 1802
Family Ichneumonidae Latreille, 1802
Subfamily Metopiinae Förster, 1869

Genus *Triece*s Townes, 1946

*Triece*s Townes, 1946: 60. Type species: *Exochus texanus* Cresson, 1872.

Diagnosis

Eyes glabrous or sparsely setose, slightly emarginated near antennal torulus (Figs 1B, 3B, 5B). Face often wider than long (Figs 1B, 3B, 5B), rarely longer than wide, sometimes narrowing posteriorly (Figs 3B, 5B). Interantennal process distinct, acute (Figs 1B, 3B, 5B). Clypeus transverse, separated from face by shallow transverse impression, apical margin sharp and more or less truncate, weakly convex or slightly concave. Mandible often with upper and lower teeth, rarely lower tooth absent. Frons depressed, without midlongitudinal lamella (Figs 1C, 3C, 5C). Temple not bulged behind eyes in dorsal view (Figs 1C, 3C, 5C). Pronotum evenly convex without impression. Propleuron weakly swollen (Figs 1E, 3E, 5E). Mesonotum without notauli (Figs 1F, 3F, 5D). Scutoscuteellar groove small, smooth (Figs 1F, 3F, 5D). Scutellum with distinct lateral carina (Figs 1F, 3F, 5D). Mesopleuron without sternaulus (Figs 1E, 3E, 5E). Epicnemial carina present and complete (Figs 1E, 3E, 5E). Mesopleural suture absent (Figs 1E, 3E, 5E). Metapleuron with or without longitudinal wrinkles and posterior slit (Figs 1E, 3E, 5E). Propodeum with distinct pleural carina and a pair of submedial carinae, posterior transverse carina absent (Figs 2A, 4A, 5F). Fore and mid tarsal claws pectinate, hind tarsal claw simple. Fore wing without areolet (Figs 2B, 4B, 6C). Fore wing vein 1cu-a interstitial to postfurcal (Figs 2B, 4B, 6C). Hind wing vein CU1b absent. Metasomal tergites without laterotergites (Figs 2C, 4D, 6A). First metasomal tergite broad posteriorly with dorsal and dorso-lateral carinae (Figs 2D, 4C, 6B), and rarely with ventro-lateral carina (Fig. 2C). Spiracle of first metasomal tergite at anterior $\frac{1}{3}$ rd (Figs 2C, 4D, 6A). Second metasomal tergite with midlongitudinal and lateral carinae (Figs 2D, 4C, 6B). Third metasomal tergite often with complete midlongitudinal carina and lateral carina (Figs 2D, 4C, 6B). Fourth metasomal tergite often without lateral carina (Figs 2C, 4D, 6A). Ovipositor slender apically (Fig. 4D).

Distribution

Though Yu *et al.* (2016) listed this as a cosmopolitan genus, there were no described species of this genus so far from the Indomalayan region.

Biology

Larval-pupal endoparasitoids of Lepidoptera particularly Tortricidae and Yponomeutidae (Gauld *et al.* 2002; Broad *et al.* 2018).

Key to separate *Triece*s Townes, 1946 from *Chorinaeus* Holmgren, 1858

1. Mesopleuron with mesopleural suture (Fig. 7A, C); lateral longitudinal carina only present on metasomal tergite 1 and base of second metasomal tergite (Fig. 7A, D–F); pronotum with dorsal longitudinal depression (Fig. 7B) (weak in *C. brevicar* Thomson, 1887) *Chorinaeus* Holmgren, 1858

- Mesopleuron without mesopleural suture (Figs 1E, 3E, 5E); lateral longitudinal carina present on metasomal tergites 1–3 (absent in *T. ranjithi*) (Figs 2D, 4C, 6B); pronotum without dorsal longitudinal depression (weakly present in *T. flabenis* Gauld & Sithole, 2002) *Trieces* Townes, 1946

Key to the Palearctic and Oriental species of *Trieces* Townes, 1946 (*onitis* group)

1. Metapleuron without posterior slit-like depression other *Trieces* species groups
 - Metapleuron with distinct posterior slit-like depression (Figs 1E, 3E, 5E) 2 (*Trieces onitis* group)
2. Occipital carina absent; ocellar area elevated; face black; metapleuron glabrous or sparsely setose 3
 - Occipital carina present (Figs 1C, 3C, 5C); ocellar area flat; face yellow or with brownish patches (Figs 1B, 3B, 5B); metapleuron densely or moderately setose (Figs 1E, 3E, 5E) 4
3. Face as wide as long; antenna with 18–19 flagellomeres; first flagellomere 1.3 × as long as wide [Japan and Russia] *Trieces hokkaidensis* Kusigemati, 1967
 - Face wider than long; antenna with 22–23 flagellomeres; first flagellomere 1.6 × as long as wide [Japan and Russia] *Trieces mandiblaris* Kusigemati, 1971
4. Face completely yellow without brown patches (Fig. 1B); mandible with only upper tooth (Fig. 1D); antenna with 19 flagellomeres; first metasomal tergite with distinct wide, smooth longitudinal groove laterally (Fig. 2C); fore wing vein 1cu-a interstitial (Fig. 2B); temple posterior half yellow; mandible, scape and pedicel yellowish brown [India] *Trieces irwini* sp. nov.
 - Face yellow with midlongitudinal brown patches or entirely black with yellow spot antero-medially (Figs 3B, 5B); mandible with upper and lower teeth; antenna with 20–33 flagellomeres; first metasomal tergite without longitudinal groove laterally, if present then indistinct (Figs 4D, 6A); fore wing vein 1cu-a postfurcal (Figs 4B, 6C); temple posterior half black; mandible, scape and pedicel dark brown 5
5. Mesopleuron without longitudinal wrinkles posteriorly; metapleuron densely setose; propleuron densely setose; area superomedia smooth [Japan, Russia and South Korea] *Trieces homonae* Kusigemati, 1967
 - Mesopleuron with longitudinal wrinkles posteriorly (Figs 3E, 5E); metapleuron only posteriorly setose, rest glabrous (Figs 3E, 5E); propleuron glabrous (Figs 3E, 5E); area superomedia with wrinkles (Figs 4A, 5F) 6
6. Temple longer than transverse diameter of eye in lateral view; antenna with 33 flagellomeres; face black with yellow spot antero-medially; midlongitudinal carina of third metasomal tergite 0.7 × as long as tergite [South Korea] *Trieces koreanus* Choi & Lee, 2016
 - Temple shorter than transverse diameter of eye in lateral view (Figs 3E, 5E); antenna with 20–23 flagellomeres; face yellow with brown longitudinal patch medially; midlongitudinal carina of third metasomal tergite 0.5 × as long as tergite (Figs 4C, 6B) 7
7. Metapleural slit short, isolated (Fig. 3E); metapleuron longitudinally striated (Fig. 3E); mesopleuron and propodeum distantly punctate (Figs 3E, 4A); submedial carinae of first metasomal tergite parallel posteriorly (Fig. 4C) [India] *Trieces isolatus* sp. nov.
 - Metapleural slit long, curved (Fig. 5E); metapleuron basal half smooth (Fig. 5E); mesopleuron and propodeum closely punctate (Figs 5E, F); submedial carinae of first metasomal tergite narrowing posteriorly (Fig. 6B) [India] *Trieces orientalis* sp. nov.

Descriptions

*Triece*s *irwini* sp. nov.

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Figs 1–2

Differential diagnosis

The new species, *Triece*s *irwini* sp. nov. differs from the other species of the *onitis* group in having the following combination of characters: i) mandible has only upper tooth, ii) first metasomal tergite with ventro-lateral carina. This new species is more or less similar to *T. homonae* in having yellow face, but differs from the latter based on the following characters: mesopleuron with distinct longitudinal wrinkles posteriorly (vs without longitudinal wrinkles posteriorly in *T. homonae*), propodeum sparsely setose (vs densely setose in *T. homonae*), scutellum sparsely setose (vs densely setose in *T. homonae*), epicnemial carina joining with subtegular ridge (vs not joining with subtegular ridge in *T. homonae*).

Etymology

This species is named after veteran dipterologist Prof. Michael Edward Irwin (emeritus professor, University of Illinois, Urbana-Champaign, USA), who is a well-wisher and supporter of ATREE Insect taxonomy and Conservation Laboratory.

Material examined

Holotype

INDIA • ♀; Karnataka, Chamarajanagar, Biligiri Ranga Biligiri Rangaswamy Temple Tiger Reserve, Vellachy Metty; 14–30 Sep. 2005; Malaise trap; D.R. Priyadarsanan leg.; AIMB.

Paratype

INDIA • 1 ♂; Karnataka, Chamarajanagar, Biligiri Ranga Hill Wild Life Sanctuary, Gombekallu; 11°54.363' N, 77°11.235' E; 17Aug.–21 Sep. 2006; Malaise trap; D.R. Priyadarsanan leg.; AIMB.

Description

Female

MEASUREMENTS. Body length 5.5 mm, length of fore wing 3.4 mm.

HEAD. Head transverse in dorsal view, not narrowed posteriorly behind eyes, $1.8\times$ as wide as long medially; frons smooth, setose; occiput smooth, glabrous medially rest setose; temple smooth dorsally, not convex, length $0.6\times$ as long as transverse diameter of eye in lateral view. Occipital carina present. Eyes sparsely setose. Distance from lateral ocellus to eye equal to diameter of ocellus. Distance between lateral ocellus $2.0\times$ distance from lateral ocellus to eye. Face not convex in lateral view, $1.4\times$ as wide as long in anterior view, slightly narrowed posteriorly, smooth, setose. Clypeus separated from face by shallow depression, sculptured similar to face, with lower margin weakly convex in middle. Length of malar space equal to basal width of mandible. Mandible with only upper tooth. Antennae with 19 flagellomeres; all flagellomeres longer than wide; first flagellomere $1.6\times$ as long as maximum width, $1.2\times$ as long as second flagellomere.

MESOSOMA. Mesosoma $1.6\times$ as long as high; mesonotum densely, distantly punctate, interspace smooth, without notauli. Scutellum smooth, sparsely punctate with distinct lateral carina. Mesopleuron punctate with longitudinal wrinkles posteriorly, sparsely setose. Epicnemial carina distinct, reaching anterior margin of mesopleuron. Propodeum sparsely punctate anteriorly rest smooth with parallel longitudinal dorsal carinae; spiracles small, elliptical, separated from pleural carina. Metapleuron smooth, setose

anteriorly rest glabrous, with distinct longitudinal slit and several short longitudinal rugae ventrally. Fore wing $3.7\times$ as long as wide. Vein 1cu-a weakly postfurcal. Hind femur $2.4\times$ as long as its maximum width in lateral view. Hind tibia $3.0\times$ as long as its maximum width. Ratio of length of hind tarsomeres 1–5, 3: 1.4: 1: 1: 1.6.

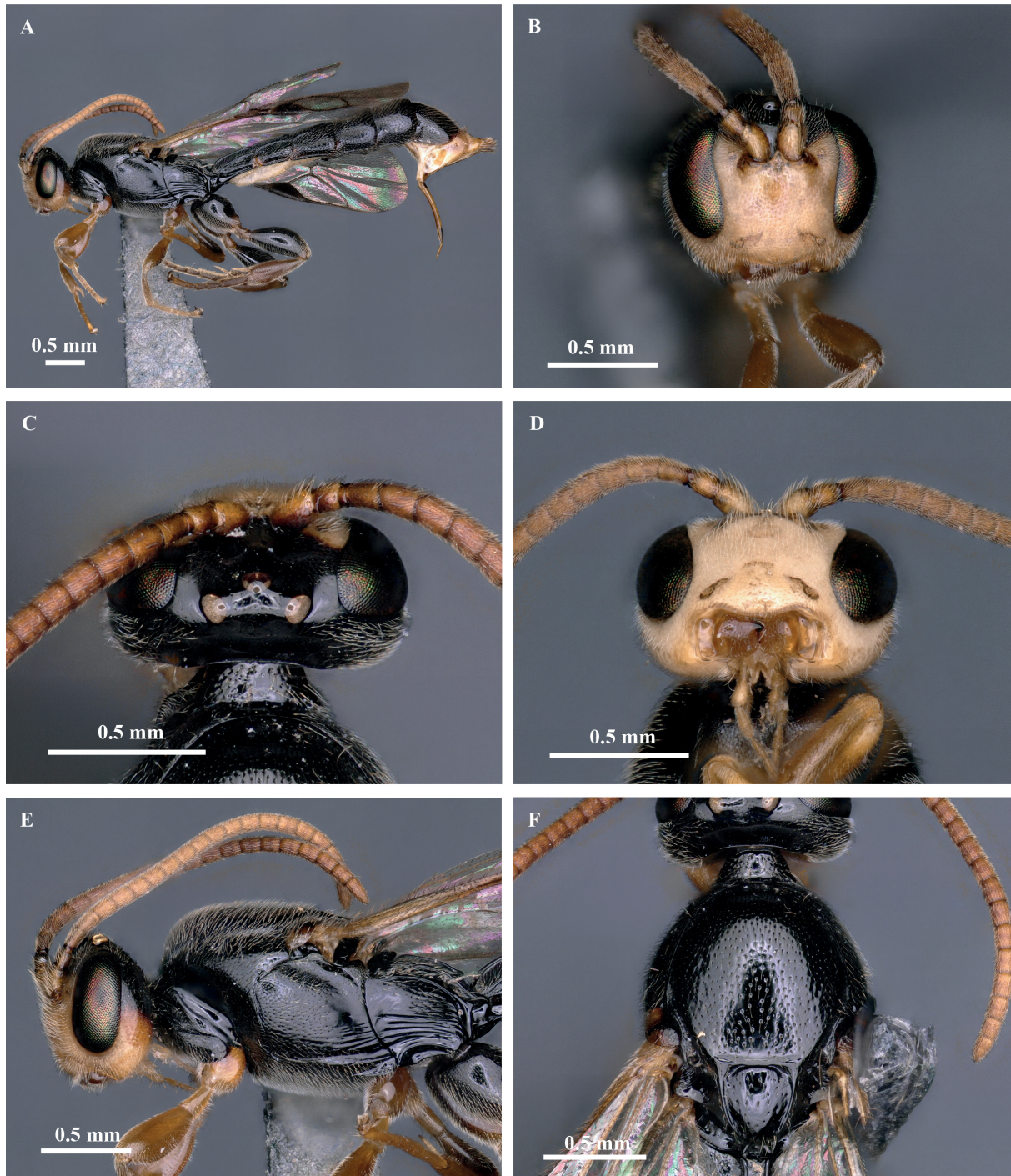


Fig. 1. *Trieses irwini* sp. nov., holotype, ♀ (AIMB). **A.** Habitus, lateral view. **B.** Head, anterior view. **C.** Head, dorsal view. **D.** Head, ventral view. **E.** Head and mesosoma, lateral view. **F.** Mesosoma, dorsal view.

METASOMA. Metasoma coarsely and densely punctate. First metasomal tergite $1.1 \times$ as long as apical width, with distinct dorso-lateral, ventro-lateral and pair of mid longitudinal carinae. Second metasomal tergite $0.7 \times$ as long as its apical width, with distinct dorso-lateral carina and midlongitudinal carinae. Third metasomal tergite $0.7 \times$ as long as its apical width, with dorso-lateral and midlongitudinal carinae distinct in basal half.

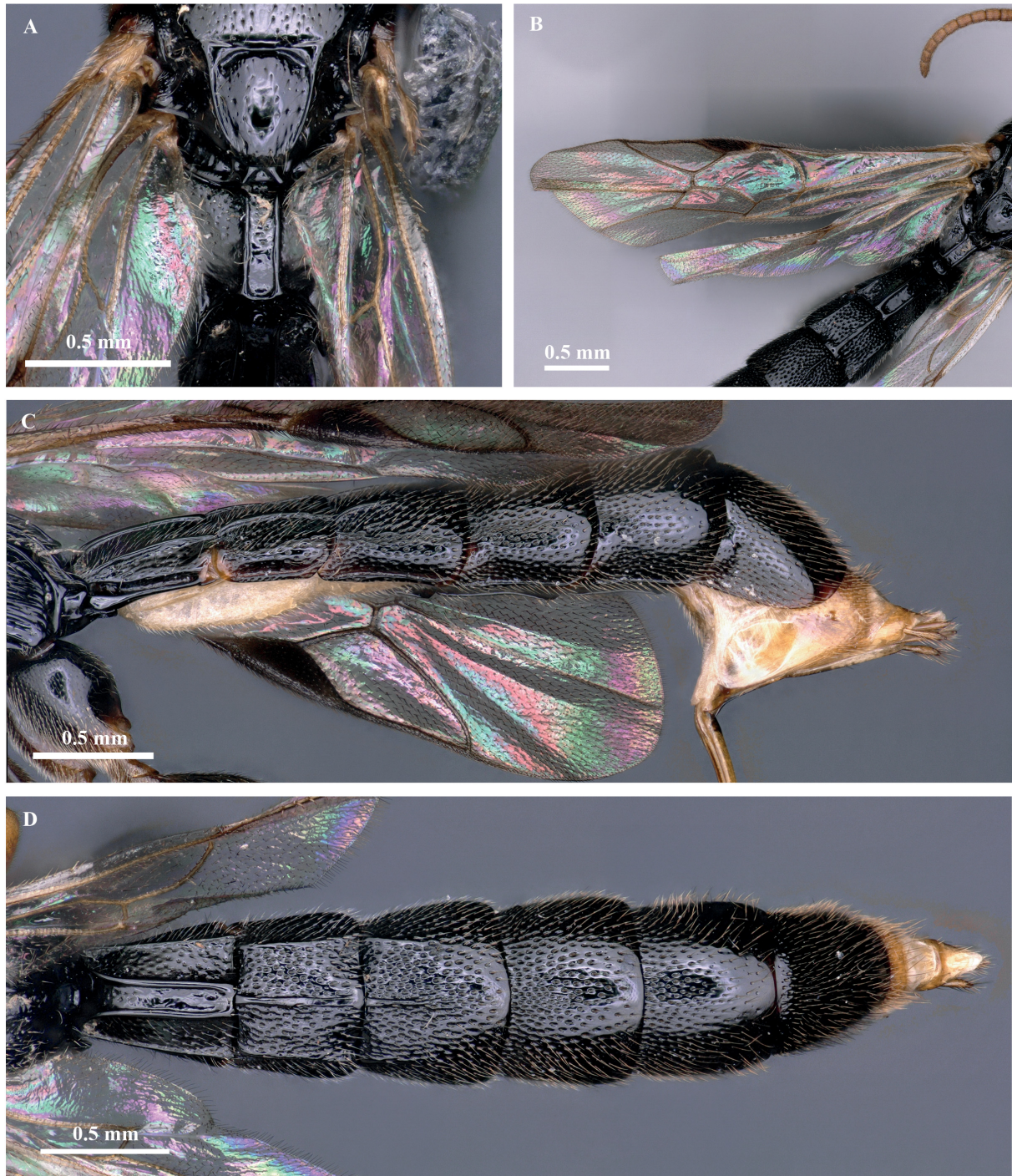


Fig. 2. *Triece irwini* sp. nov., holotype, ♀ (AIMB). **A.** Propodeum, dorsal view. **B.** Fore wing. **C.** Metasoma, lateral view. **D.** Metasoma, dorsal view.

COLOR. Body mostly black; antennae, face, lateral temples posterior half, maxillary and labial palps, fore and mid legs, hind coxae apically, metasomal sternites and ovipositor sheath yellow to yellowish brown, hind tibiae, tarsi reddish brown.

Male

Same as female.

Distribution

India (Karnataka).

Biology

Unknown.

Trieces isolatus sp. nov.

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Figs 3–4

Differential diagnosis

The new species comes closer to *T. orientalis* sp. nov. but differs based on the characters listed in the taxonomic key. Additionally, *T. isolatus* sp. nov. differs from the latter in having the following characters: hind coxa yellowish brown (vs black in *T. orientalis* sp. nov.), pterostigma yellow (vs black in *T. orientalis* sp. nov.), first metasomal tergite longer than wide (vs wider than long in *T. orientalis* sp. nov.), antenna with 20 flagellomeres (vs 23 in *T. orientalis* sp. nov.).

Etymology

The species name refers to the isolated pit below the metapleural slit.

Material examined

Holotype

INDIA • ♀; Karnataka, Chamaraajanagar, Biligiri Ranga Hill Wild Life Sanctuary, Parasakatte; 12°01.414' N, 77°06.551' E; 795 m a.s.l.; 30 Sep.–14 Oct. 2005; Malaise trap; D.R. Priyadarsanan leg.; AIMB.

Description

Female

MEASUREMENTS. Body length 3.6 mm, length of fore wing 2.4 mm.

HEAD. Head transverse in dorsal view, not narrowed posteriorly behind eyes, $1.7\times$ as wide as long medially; frons smooth, setose; occiput smooth, glabrous medially rest setose; temples smooth dorsally, setose, not convex, their length $0.7\times$ as long as transverse eye diameter in lateral view. Occipital carina present. Eyes sparsely setose. Distance from lateral ocellus to eye equal to diameter of ocellus. Distance between lateral ocelli $2.0\times$ distance from lateral ocellus to eye. Face not convex in lateral view, $0.9\times$ as wide as long in anterior view, slightly narrowed posteriorly, punctate, setose. Clypeus separated from face by shallow indistinct depression, sculptured similarly to face, with lower margin weakly convex. Length of malar space equal to basal width of mandible. Mandible with upper and lower teeth. Antennae with 20 flagellomeres; all flagellomeres longer than wide; first flagellomere $1.3\times$ as long as maximum width, as long as second flagellomere.

MESOSOMA. Mesosoma $1.6\times$ as long as high; mesonotum densely, closely punctate, interspace smooth, without notauli. Scutellum smooth, with distinct lateral carina, distantly punctate. Mesopleuron punctate with longitudinal wrinkles, posteriorly setose. Epicnemial carina distinct, reaching anterior margin of mesopleuron. Propodeum distantly punctate with parallel longitudinal dorsal carinae; spiracles small,

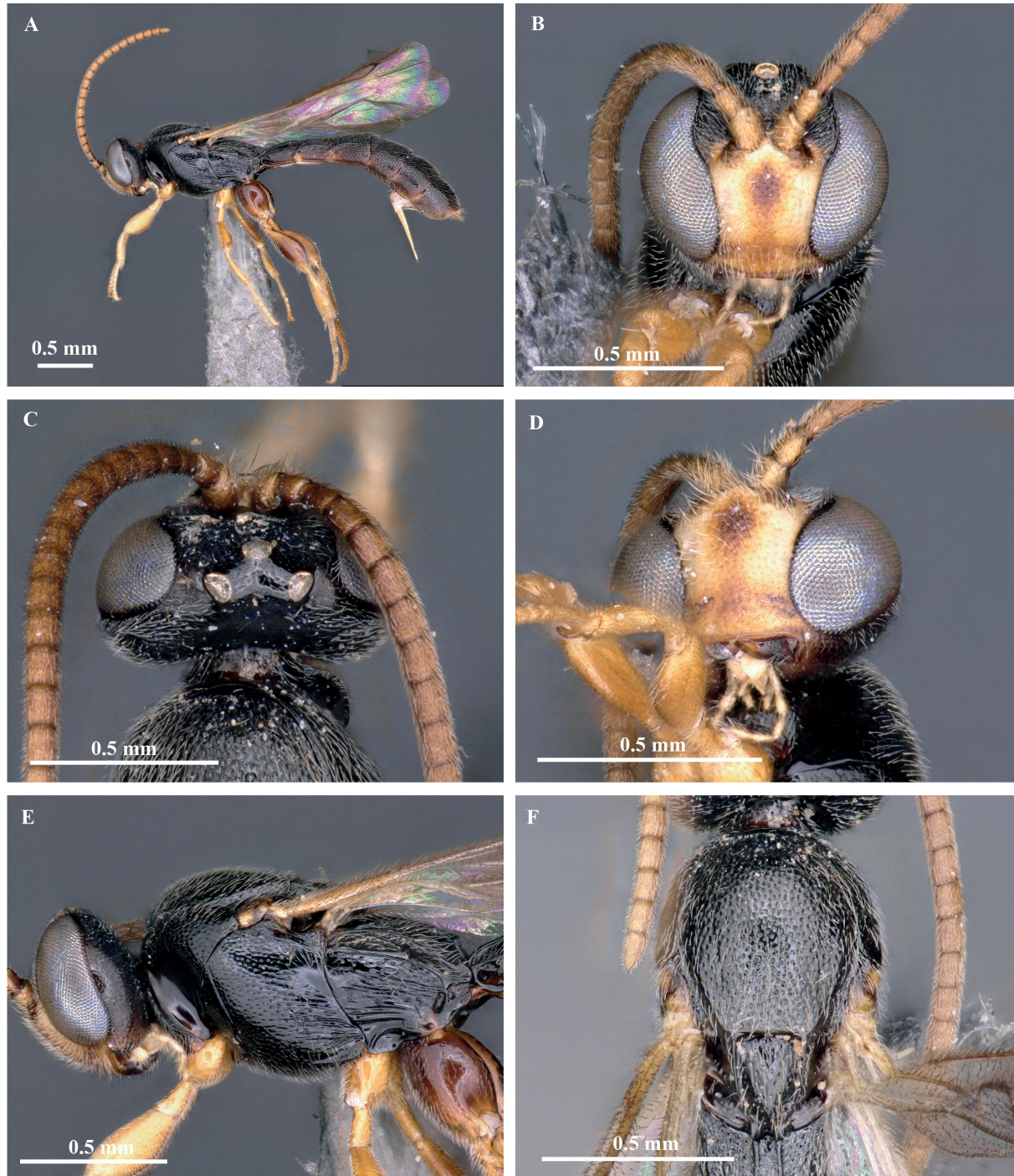


Fig. 3. *Trieces isolatus* sp. nov., holotype, ♀ (AIMB). **A.** Habitus, lateral view. **B.** Head, anterior view. **C.** Head, dorsal view. **D.** Head, latero-ventral view. **E.** Head and mesosoma, lateral view. **F.** Mesosoma, dorsal view.

elliptical, separated from pleural carinae. Metapleuron smooth only at extreme base rest distinctly longitudinally striate, setose medially rest glabrous, with distinct isolated, longitudinal slit. Fore wing $3.4\times$ as long as wide. Vein 1cu-a distinctly postfurcal. Hind femur $2.2\times$ as long as its maximum width in lateral view. Hind tibia $3.0\times$ as long as its maximum width. Ratio of length of hind tarsomeres 1–5, 3: 1.5: 1.3: 1: 1.8.

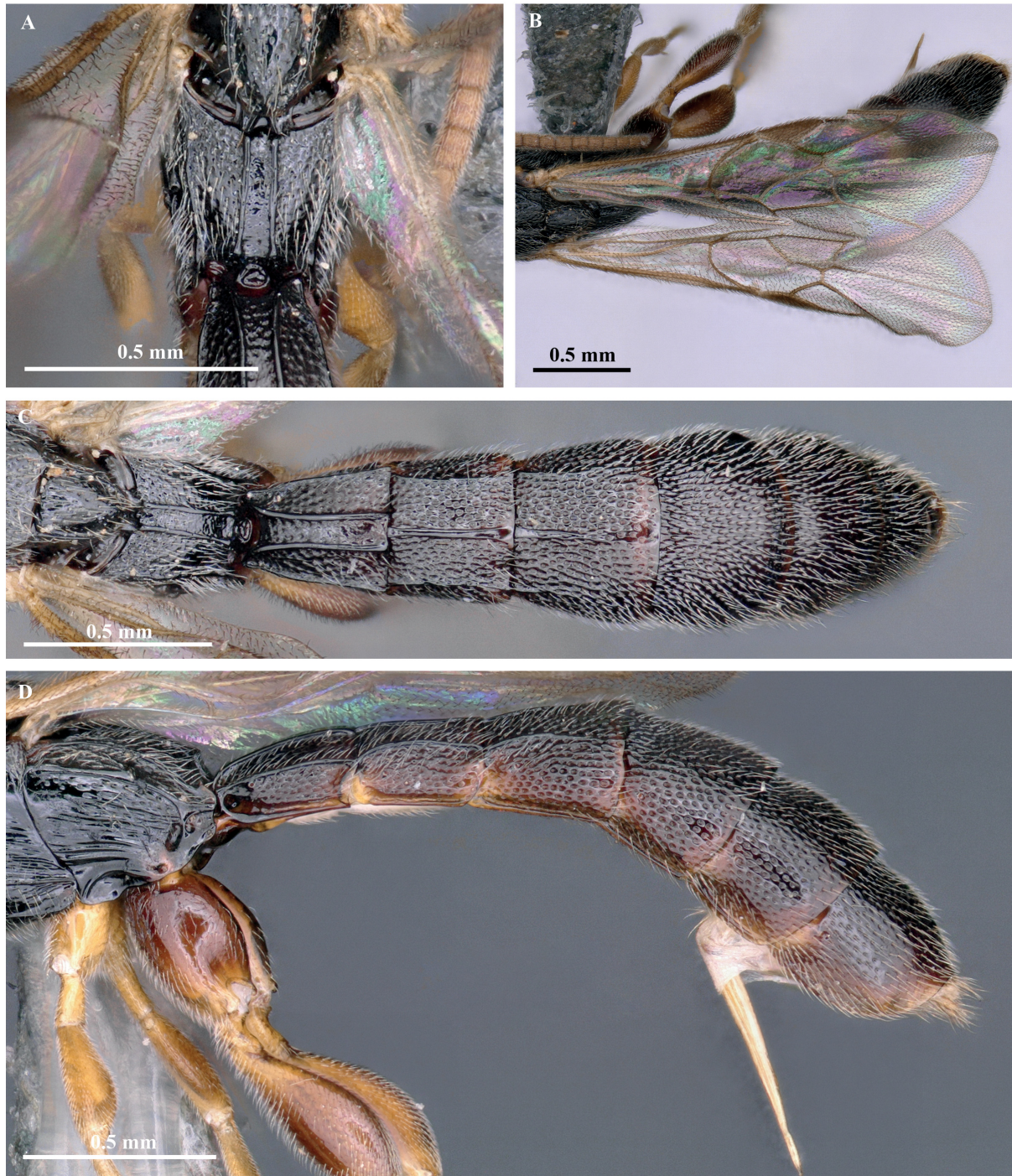


Fig. 4. *Trieses isolatus* sp. nov., holotype, ♀ (AIMB). **A.** Propodeum, dorsal view. **B.** Fore wing. **C.** Metasoma, dorsal view. **D.** Metasoma, lateral view.

METASOMA. Metasoma coarsely and densely punctate. First metasomal tergite $1.1 \times$ as long as apical width, with distinct dorso-lateral and pair of mid longitudinal carinae, ventro-lateral carina absent. Second metasomal tergite $0.8 \times$ as long as its apical width, with distinct dorso-lateral carina and midlongitudinal carinae. Third metasomal tergite $0.8 \times$ as long as its apical width, with dorso-lateral and midlongitudinal carinae distinct in basal half.

COLOR. Body mostly blackish brown except antennae, face except medially, maxillary and labial palps, fore and mid legs, hind tibiae, tarsi, metasomal sternites, ovipositor sheath yellow.

Male

Unknown.

Distribution

India (Karnataka).

Biology

Unknown.

Triece orientalis sp. nov.

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Figs 5–6

Differential diagnosis

The new species comes closer to *T. koreanus* but differs based on the characters listed in the taxonomic key. Additionally, *T. orientalis* sp. nov. differs from the latter in having the following characters: temple distinctly and closely punctate (vs sparse and indistinctly punctate in *T. koreanus*), first flagellomeres $1.6 \times$ as long as maximum width (vs first flagellomeres $1.9 \times$ as long as maximum width in *T. koreanus*), first metasomal tergite $0.8 \times$ as long as apical width (vs first metasomal tergite $1.7 \times$ as long as apical width in *T. koreanus*).

Etymology

The species is named after the distribution extension of the genus to the Indomalayan (= Oriental) region.

Material examined

Holotype

INDIA • ♀; Nagaland, Zapami Village; 25°53.4' N, 94°24.502' E; 18–21 Mar. 2021; Malaise trap; A.P. Ranjith leg.; AIMB.

Description

Female

MEASUREMENTS. Body length 4.3 mm, length of fore wing 2.6 mm.

HEAD. Head transverse in dorsal view, not narrowed posteriorly behind eyes, $1.7 \times$ as wide as long medially; frons smooth, setose; occiput smooth, glabrous medially rest setose; temples smooth dorsally, not convex, their length $0.5 \times$ as long as transverse eye diameter in lateral view. Occipital carina present. Eyes sparsely setose. Distance from lateral ocellus to eye equal to diameter of ocellus. Distance between lateral ocellus $1.8 \times$ distance from lateral ocellus to eye. Face not convex in lateral view, $0.8 \times$ as wide as long in anterior view, slightly narrowed posteriorly, punctate, setose. Clypeus separated from face by

shallow depression, sculptured similarly to face, with lower margin weakly convex in middle. Length of malar space equal to basal width of mandible. Mandible with upper and lower teeth. Antennae with 23 flagellomeres; all flagellomeres longer than wide; first flagellomere $1.6\times$ as long as maximum width, as long as second flagellomere.

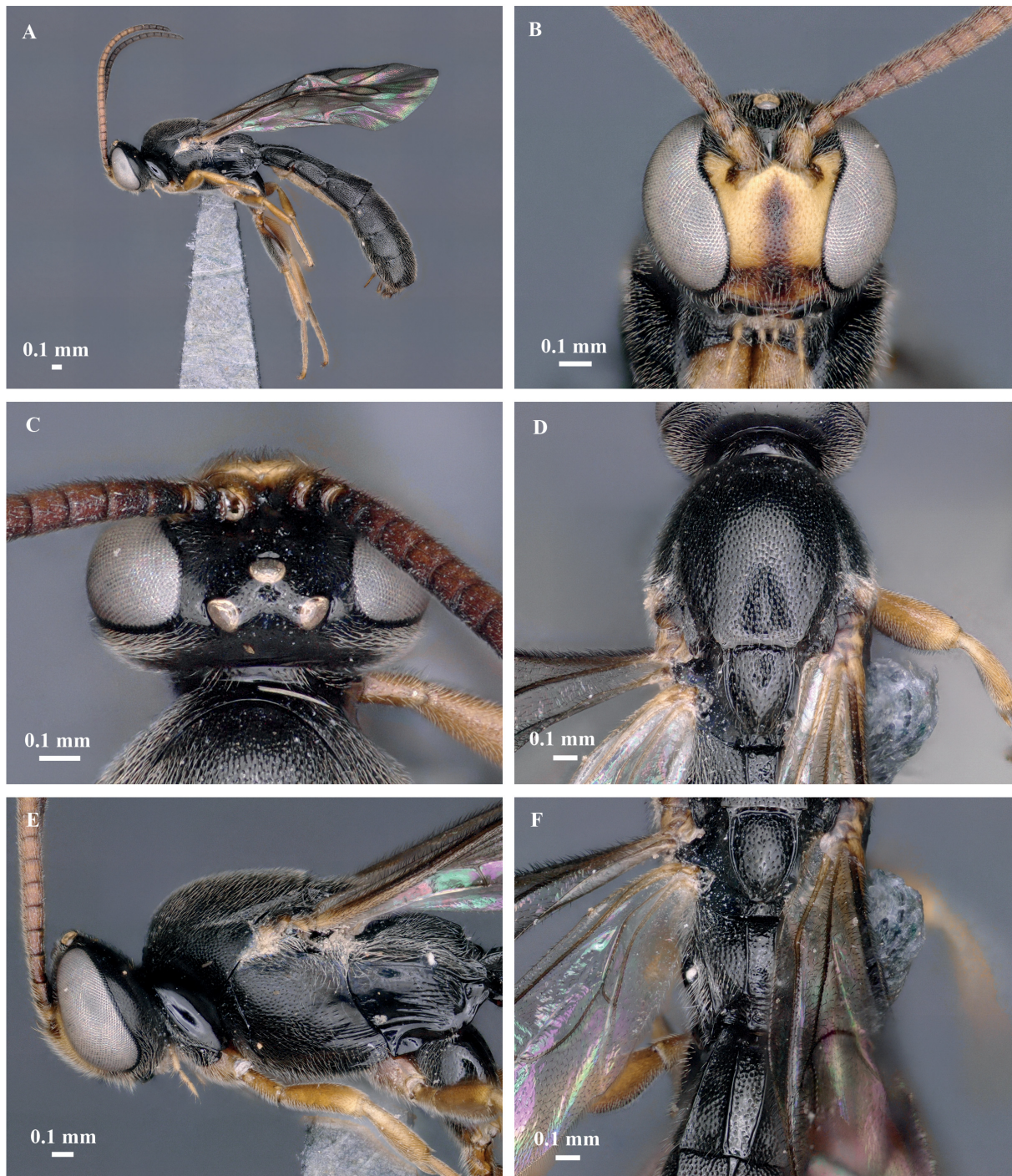


Fig. 5. *Triecece orientalis* sp. nov., holotype, ♀ (AIMB). **A.** Habitus, lateral view. **B.** Head, anterior view. **C.** Head, dorsal view. **D.** Mesosoma, dorsal view. **E.** Head and mesosoma, lateral view. **F.** Propodeum, dorsal view.

MESOSOMA. Mesosoma $1.6 \times$ as long as high; mesonotum densely, closely punctate, interspace smooth, without notauli. Scutellum smooth, closely punctate with distinct lateral carina. Mesopleuron punctate with longitudinal wrinkles posteriorly, setose. Epicnemial carina distinct, reaching anterior margin of mesopleuron. Propodeum punctate with parallel longitudinal dorsal carinae; spiracles small, elliptical, separated from pleural carinae. Metapleuron smooth, setose anteriorly and posteriorly rest glabrous, with distinct longitudinal slit and several short longitudinal rugae ventrally. Fore wing $3.2 \times$ as long as wide.



Fig. 6. *Triece orientalis* sp. nov., holotype, ♀ (AIMB). **A.** Metasoma, lateral view. **B.** Metasoma, dorsal view. **C.** Fore wing.

Vein 1cu-a distinctly postfurcal. Hind femur $3.0\times$ as long as its maximum width in lateral view. Hind tibia $3.9\times$ as long as its maximum width. Ratio of length of hind tarsomeres 1–5, 3.8: 1.8: 1.5: 1: 1.7.

METASOMA. Metasoma coarsely and densely punctate. First metasomal tergite $0.8\times$ as long as apical width, with distinct dorso-lateral and pair of mid longitudinal carinae, ventro-lateral carina absent. Second metasomal tergite $0.8\times$ as long as its apical width, with distinct dorso-lateral carina and midlongitudinal

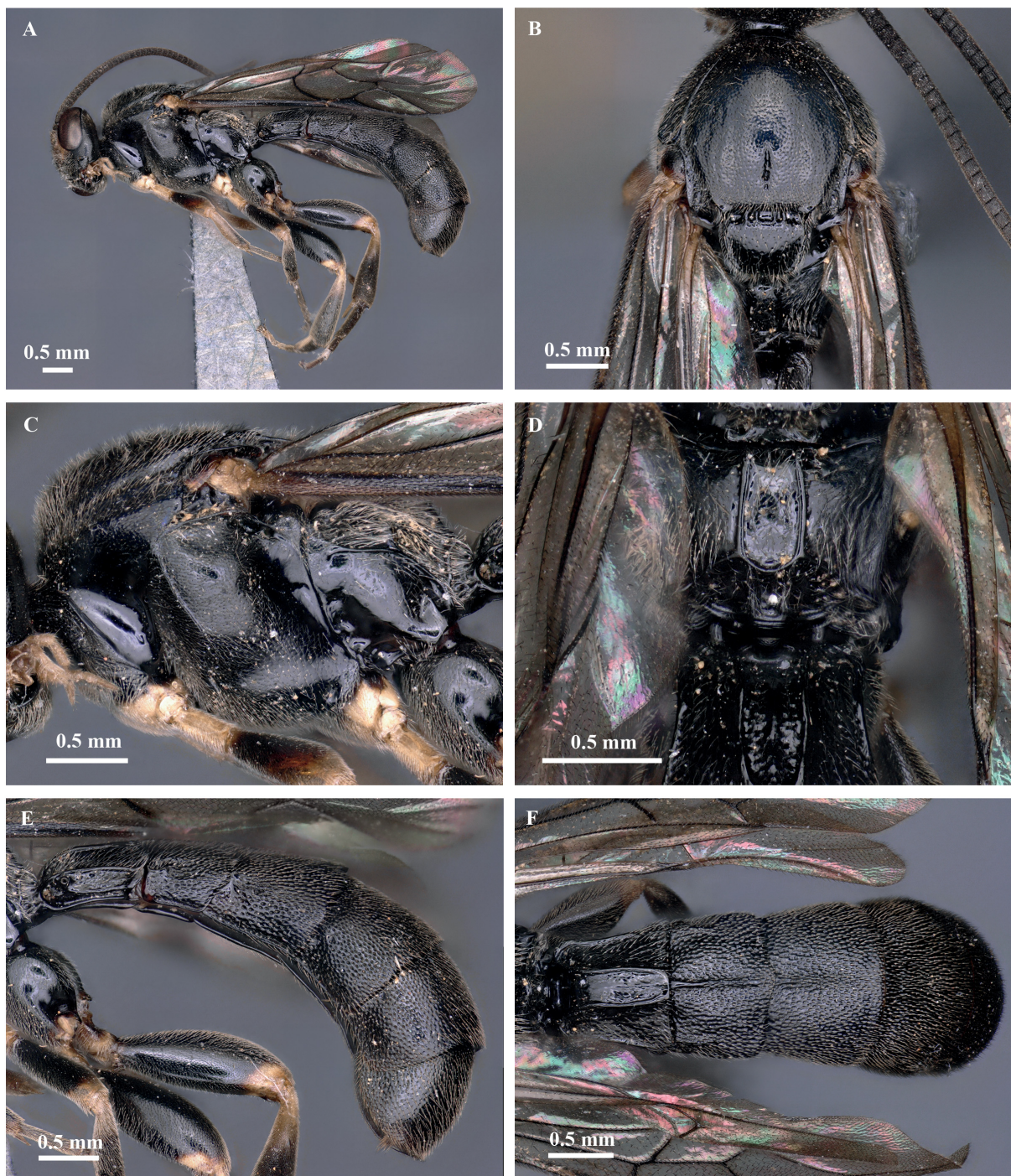


Fig. 7. *Chorinaeus* sp., ♂ (AIMB). **A.** Habitus, lateral view. **B.** Mesosoma, dorsal view. **C.** Mesosoma, lateral view. **D.** Propodeum, dorsal view. **E.** Metasoma, lateral view. **F.** Metasoma, dorsal view.

carinae. Third metasomal tergite $0.7 \times$ as long as its apical width, with dorso-lateral and midlongitudinal carinae distinct in basal half.

COLOR. Body black except antennae, face, maxillary and labial palps, fore and mid legs, hind coxae apically, hind tibiae, tarsi, metasomal sternites, ovipositor sheath yellow to yellowish brown.

Male

Unknown

Distribution

India (Nagaland).

Biology

Unknown.

Discussion

Redefinition and character plasticity of *onitis* species group

Townes & Townes (1959) defined the *onitis* species group of the genus *Trieces* based on the following morphological characters: head wide to very wide; eyes sparsely setose; metapleuron setose anteriorly, with longitudinal wrinkles on posterior half and a distinct posterior slit-like depression. Presence of the metapleural slit is considered an apomorphic character of the species group (Kusigemati 1967; Tolkanitz 2010). Earlier studies have suggested that the presence of an occipital carina is a character of generic importance (Townes & Townes 1959), but in some species this character is found to be very plastic as occipital carina is absent in some species such as *T. hokkaidensis* and *T. mandiblaris*. So, even though the occipital carina is absent in two Eastern Palearctic species, *T. hokkaidensis* and *T. mandiblaris* are included in the *onitis* species group based on the presence of the metapleural slit (Kusigemati 1967, 1971; Tolkanitz 2010). Moreover, the addition of *T. homonae* to this group is supported by the presence of a metapleural slit, irrespective of the absence of longitudinal wrinkles on mesopleuron. The new species described in the present study point to the metapleural slit being the only constant character for this group.

Species of this group exhibit a very wide face ($1.5\text{--}2.25 \times$ as wide as long) in general (Walley 1969). But in the new species *T. orientalis* sp. nov. and *T. irwini* sp. nov., the face is not as wide as in other species of the group ($<1.5 \times$ as wide as long). This leads to the notion that Indomalayan species of the *onitis* group differ markedly and can form a different clade within the group. Generally, in species of this group, the median and lateral longitudinal carinae extend to the anterior half of the third metasomal tergite (Walley 1969). It is noted that the midlongitudinal carina extends $\frac{3}{4}$ the length of the tergite in *T. koreanus* (Choi *et al.* 2016). By considering all these morphologically variable characters it is important to mention that the character boundaries of *onitis* group of *Trieces* are more extending than previously assumed. Considering the newly defined characters like longer face and reduced number of flagellomeres suggest that Indomalayan fauna of *Trieces* of *onitis* group might form a different clade among the other species. Species delimitation and sexual dimorphism in the *onitis* group can be identified by the difference in number of flagellomeres (Walley 1969). Species of this group have at least 24 flagellomeres. In the Nearctic region the intraspecific variation based on the number of flagellomeres ranges from 1 to 6 segments (Walley 1969). This trend in the difference of number of the flagellomeres between males and females can also be expected in the Palearctic and Oriental faunas by studying the male of the new species described here.

Distribution of *Trieces*

Species of *Trieces* have been described from the Afrotropical, Nearctic, Neotropical and Palearctic regions so far, but the existence of undescribed species from other regions has been published (Townes & Townes 1959; Gauld 1984; Yu *et al.* 2016). Until now no species has been taxonomically described from the

Indomalayan region. The present study confirms the distribution of *Trieces* to this region. The discovery of species of *Trieces* from the Indomalayan region fairly supports the observation of Townes & Townes (1959), where they mentioned the occurrence of undescribed species from the Philippines. It is important to note that the distribution range of none of the known species overlaps two different zoogeographical regions. Until now, most of the species have been collected from dry habitats (Gauld *et al.* 2002). The species described in this paper are collected from dry deciduous, evergreen and wet forests of the Biligiri Rangaswamy Hills, Karnataka and Zapami Village, Nagaland. This fairly supports the fact that species of *Trieces* can also withstand wet climates. Species of *Trieces* are more abundant in the Northern Hemisphere and only 15 species are known from the Southern Hemisphere (Benoit 1955; Gauld *et al.* 2002; Mazón & Bordera, 2016; Yu *et al.* 2016). Gauld (1984) pointed to the occurrence of undescribed species from Australian region. The present study fairly supports the increased abundance pattern in the Northern Hemisphere.

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