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Original Article

Four new species of fig-associated Pteromalidae (Hymenoptera, Chalcidoidea) from the Western Ghats, India

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ABSTRACT. This paper describes four new species of fig-associated Pteromalidae wasps from the Western Ghats of India. These new species belong to the genera *Philotrypesis* Förster, 1878, and *Sycoryctes* Mayr, 1885, both of which are obligately associated with *Ficus* species. The newly described taxa include *Philotrypesis virentis* **sp. nov**. (ex. *Ficus virens* Aiton), *Philotrypesis talbotii* **sp. nov.** (ex. *Ficus talbotii* King), *Sycoryctes racemosae* **sp. nov.** (ex. *Ficus racemosa* L.), and *Sycoryctes tsjakelae* **sp. nov.** (ex. *Ficus tsjakela* Burm.f.). The research provides detailed morphological descriptions, illustrations, and diagnostic features to distinguish each new species from other existing species.

KEYWORDS: Fig wasp, *Philotrypesis*, Pteromalinae, Otitesellini, *Sycoryctes*

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INTRODUCTION

The family Pteromalidae (Hymenoptera: Chalcidoidea) is a hyperdiverse group of parasitoid wasps, playing critical ecological roles in various terrestrial ecosystems. Several pteromalid genera, such as *Apocrypta* Coquerel, 1855, *Philotrypesis* Förster, 1878, and *Sycoryctes* Mayr, 1885 are intimately associated with *Ficus*, often exhibiting high levels of host specificity and contributing significantly to the overall insect biodiversity found within fig fruits (Segar et al. 2012; Jousselin et al. 2008). Recent phylogenetic studies have classified genus *Philotrypesis* and *Sycoryctes* under the tribe *Otitesellini* in subfamily Pteromalinae of family Pteromalidae, demonstrating the monophyletic lineage of the fig wasps (Burks et al. 2022; Cruaud et al. 2024). The biology of *Philotrypesis* and *Sycoryctes* is still poorly known. Studies on some species, such as *Philotrypesis caricae*, show they are cleptoparasitic, consuming the gall formed by the agaonid pollinator at an early stage and thereby feeding on both plant tissue and the young larva or egg of the pollinator (Joseph 1955, 1958, 1959).

In India, the chalcidoid fauna of the Western Ghats remains incompletely documented, with a small fraction of its species described (Sureshan 2000; Priyadarsanan 2000). This knowledge gap is particularly evident for fig-associated wasps, where many species await discovery and description (e.g., Satheesan & Santhosh 2023, 2024). This paper describes four new species of pteromalid wasps from Kerala, India, associated with different *Ficus* hosts. For each new species, we provide detailed morphological descriptions, including key diagnostic features, and compare them with their closest known relatives.

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MATERIAL AND METHODS

We collected nearly mature D-phase figs (syconia) of *Ficus virens*, *Ficus talbotii*, *Ficus racemosa,* and *Ficus tsjakela*, then transported them to the laboratory. Figs were then sectioned, and the emergence of the fig wasps was monitored. Later, the fig wasps were transferred to 70 per cent alcohol, labelled, and transferred to 90 per cent alcohol for long-term storage. The specimens were card-mounted on triangular cards (14×5mm) after passing through alcohol series (95% and 100%) and drying in HMDS solution. The specimens were examined, identified, and described using a LEICA® M205 stereo zoom microscope and imaged with an attached LEICA® DFC 2900 digital camera. Measurements were obtained using Leica LAS software (Leica Application Suite V3.80), and images taken at varying focal depths were stacked using LAS. Final illustrations were enhanced for contrast and brightness using Adobe® Photoshop CS5 (Version 12.0 x 64) software. The holotype is deposited in the National Zoological Collection of Zoological Survey of India, Western Ghat Regional Centre, Kozhikode (ZSIK).

The general abbreviations of the terms are as follows: POL – distance between posterior ocelli; OOL - distance between posterior ocellus and eye margin; SMV – submarginal vein; MV – marginal vein; STV – stigmal vein; PMV – post marginal vein; Gt_x – gaster tergal segments, x, tergum number; F_x – antennal flagellomere, x, flagellomere number. All lengths are measured medially, and widths are measured at the maximum wider area, unless mentioned otherwise. All measurements are based on the holotype specimen. Ratios are presented as mode values derived from multiple measurements of this single specimen.

RESULTS

Order Hymenoptera Linnaeus, 1758

Superfamily Chalcidoidea Latreille, 1817

Family Pteromalidae Dalman, 1820

Subfamily Pteromalinae Dalman, 1820

Tribe Otitesellini Joseph, 1964

Genus *Philotrypesis* Förster 1878

Polanisa Walker, 1875:17. **Type species.** *Polanisa lutea* Walker, by monotypy; *Philotrypesis* Foerster, 1878:59. **Type species.** *Philotrypesis longicauda* Förster, original designation and monotypy; *Sycoscaptella* Westwood, 1883:36. **Type species.** *Sycoscaptella affinis* Westwood, by monotypy; *Idarnella* Westwood, 1883:37. **Type species.** *Idarnes transiens* Walker, original designation and monotypy; *Idarnodes* Westwood, 1883. **Type species.** *Cynips caricae* Linnaeus, by subsequent designation of Boucek, Z. (1988); *Tetranemopteryx* Ashmead, 1904:239. **Type species.** *Sycoscaptella quadrisetosa* Westwood, original designation and monotypy; *Philotrypomorpha* Abdurahiman & Joseph, 1976:541. **Type species.** *Philotrypomorpha indica* Abdurahiman & Joseph, by monotypy.

Diagnosis. The female of this genus can be recognised by its long, tubular gastral tergites of terminal segments and its subquadrate narrow pronotum. Both antennae in a common broad scrobe, toruli slightly apart, their inner margins low but separated in the middle by a low prominence of crest; scape cylindrical, flagellar segments cylindrical with longitudinal sensilla; head posteriorly often with thin long bristles.

Key to species of genus *Philotrypesis* commonly reported from India (female)

1	Body colour black or metallic green.	**2**
—	Body colour yellowish brown or yellow.	**3**
2	Pronotum 1.3× longer than mesonotum; MV length 5.8× STV length.	***P. virentis* sp. nov.**
—	Pronotum 0.76× mesonotum length; MV length 3.5× STV length.	***P. anguliceps*** (Westwood, 1883)
3	Head 1.2× wider than long; eye 1.8× its width; pronotum 2.5× mesonotum length, Scape length 5× its width.	***P. marginalis*** (Priyadarsanan, 2000)

– Head >1.2× wider than long; eye ≤1.5× its width; pronotum < 2.5× mesonotum length; scape length different. **4**

4 Antennae with 2 anelli, eye 1.5× its width, scape length 3.3× its width; pedicel 1.6× its width. ..... ***P. indica*** (Abdurahiman & Joseph, 1976)

– Antennae with 3 anelli; eye < 1.5× its width, scape and pedicel length to width ratio different. **5**

5 Eye 0.5× gena length; Eye length ≥ 1.3× its width. **6**

– Eye < 0.5× gena length; Eye length < 1.3× its width. 7

6 Head 1.68× wider than long; POL 1.4× OOL; pronotum 0.4× mesonotum length; SMV 1.7× MV; MV 6.3× STV. ..... ***P. longispinosa*** (Joseph, 1954)

– Head 1.76× wider than long; POL 1.6× OOL; pronotum 0.84× mesonotum length; SMV 1.46× MV; MV 3.2× STV. ..... ***P. affinis*** (Westwood, 1883)

7 Head 1.5× wider than long; pedicel length 1.5× its width; scape length 4.5× its width; pronotum as long as mesonotum length; SMV 2.5× MV; MV 2.6× STV. ..... ***P. talbotii* sp. nov.**

– Head >1.5× wider than long; pedicel length ≥ 2× its width; scape length ≥ 5× its width; pronotum less than mesonotum length; SMV almost equal to MV; MV > 4× STV. **8**

8 Head 1.9× wider than long; pedicel length 2× its width; scape length 5× its width; MV 4.6× STV. ..... ***P. pilosa*** Mayr, 1906

– Head 1.6× wider than long; pedicel length over 2× its width; scape length 6× its width; MV 4.4× STV. .. .. ***P. quadrisetosa*** (Westwood, 1883)

Philotrypesis talbotii sp. nov.

https://zoobank.org/urn:lsid:zoobank.org:act:EDCFD57D-68ED-4B66-963B-FDD52A2347AE

[Fig. 1A–F]

***Type material*.** Holotype ♀: INDIA, Wayanad, Kerala, 11°54'11.88"N, 76°3'42.84"E, 08.III.2019, ex *Ficus talbotii* King, deposited in Zoological Survey of India, Western Ghats Regional Centre, Calicut, leg.: Shilpa K. Satheesan. **Paratypes** 7♀♀, same collection data as holotype.

Description. — **Female** (Holotype, Fig. 1). Head, mesosoma and gaster yellow. Ovipositor sheath smoky brown; legs except coxa pale yellow; antennae except scape and pedicel brownish yellow; eye pink and ocelli silver; body length 1.071 mm; gaster length 0.356 mm; ovipositor sheath length 0.963 mm.

Head. Smooth; eye 1.23× longer than wide; malar sulcus absent; antennal formula 11353. Head 1.48× wider than long; scape 4.3× longer than wide; inter torular distance 2.09× longer than the diameter of torulus. POL 1.36× OOL. Torulus to inner eye distance almost equal to inter torular distance; inter torular distance 1.4× torulus diameter; pedicel 1.5× as long as wide; antennae with a single row of longitudinal sensilla; antennae located near the anterior margin of the eye; supra clypeal area not clearly demarcated.

Mesosoma. Pronotum strigate, mesoscutum and axilla transverse strigulate, scutellum reticulate; propodeum smooth, normal; notauli complete and distinct; pronotum 1.36× wider than long; pronotum almost as long as mesonotum; mesonotum 2× wider than long; scutellum as long as wide. Scutellum length almost equal to pronotum length and mesonotum length. Propodeal spiracles circular; wing sparsely and evenly setose; fore wing length 2× its width, and 2.3× SMV length; SMV length 2.5× MV length, 6.5× STV length, 3.6× PMV length; MV length 2.6× STV length, 1.45× PMV length; PMV length 1.8× STV length. Fore coxa 2.1× longer than wide; femur 2.8× longer than wide; coxa length 0.52× femur length; mid coxa 2× longer than wide; femur 4.5× longer than wide; coxa length 0.36× femur length; tibia 12.8× longer than wide; femur length 0.63× tibia length. Hind coxa 2.45× longer than wide; femur 3.55× longer than wide; tibia 6× longer than wide; tibia with two spurs; tibia length 0.79× total tarsal length; coxa length 0.7× femur length and 0.7× tibia length; femur length as long as tibia length, femur length 0.8× total tarsal length; first tarsomere longest, its length 0.9× the combined length of tarsomeres 2–5.

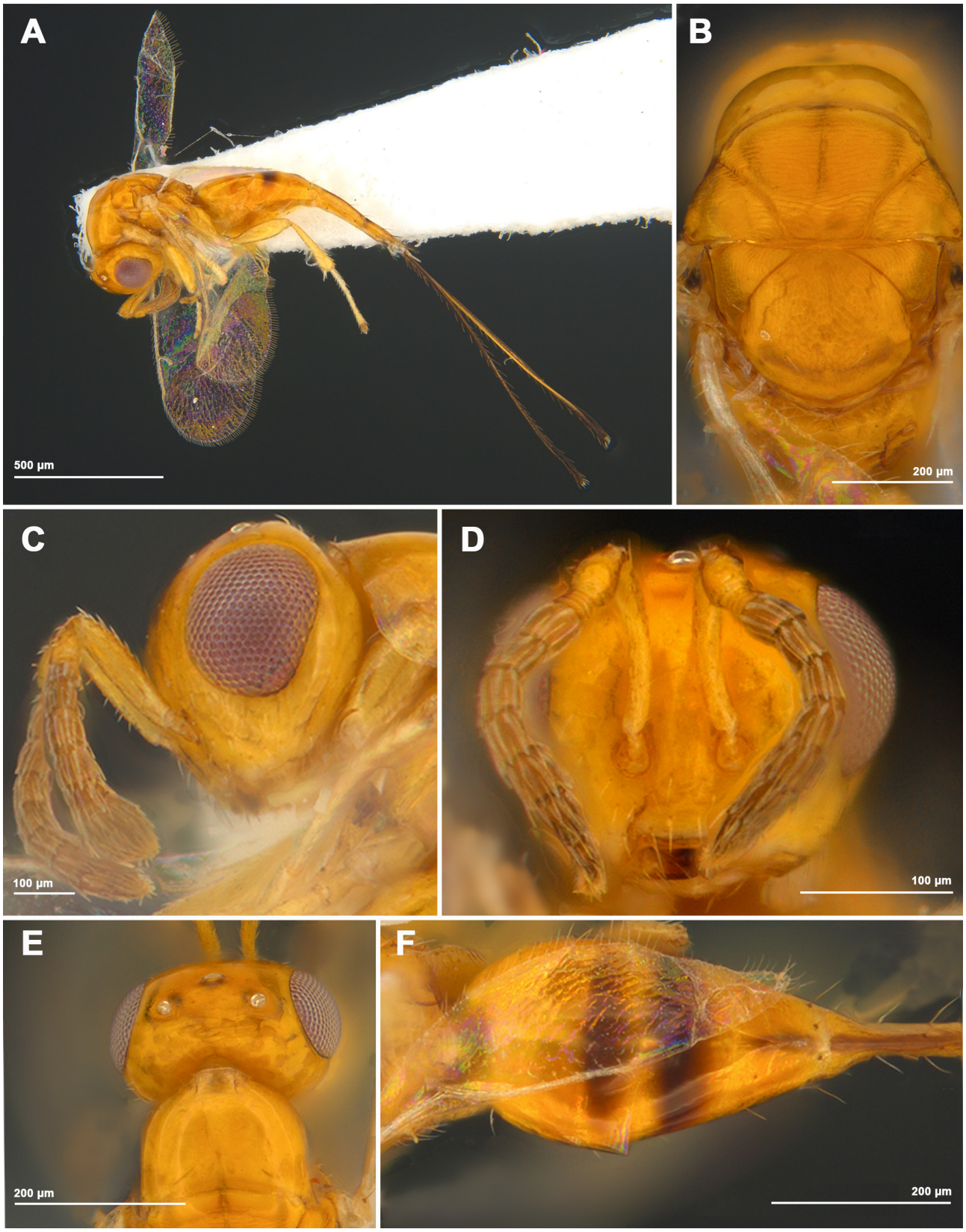

Figure 1. *Philotrypesis talbotii* **sp. nov.** Holotype ♀. **A.** Habitus, lateral view; **B.** Mesosoma, dorsal view; **C.** Head, lateral view; **D.** Head, frontal view; **E.** Pronotum and vertex, dorsal view; **F.** Metasoma, dorsal view.

***Metasoma*.** Gaster smooth and shiny with two transverse bands of brown colour on Gt_3 and Gt_4; a row of setae on the distal tergites; gaster (excluding ovipositor) slightly less than the length of mesosoma.

Male. Unknown

Host. Associated with the syconia galls of *Ficus talbotii*.

Etymology: 'talbotii' derived from the name of the host plant, *Ficus talbotii*.

Comparative diagnosis. *P. talbotii* **sp. nov.** is similar to *P. pilosa* Mayr in having same body colour; same number of anelli and same eye length to width and eye length to gena length ratio; but different in having head width 1.5× length (compared to head width 1.9× its length in *P. pilosa*); scape length 4.3× its width (compared to scape length 5.4× width in *P. pilosa*); pedicel length 1.5× width (compared to pedicel length 2× width in *P. pilosa*); pronotum as long as mesonotum (compared to pronotum shorter than mesonotum in *P. pilosa*); SMV length 2.5× MV length (compared to SMV 1.2× MV in *P. pilosa*); MV length 2.6 × STV length (compared to MV 6.3× STV in *P. pilosa*).

Philotrypesis virentis sp. nov.

https://zoobank.org/urn:lsid:zoobank.org:act:8E59DEF9-254E-4BAD-B706-EA67E1962F50

[Fig. 2A–F]

Type material. **Holotype** ♀: INDIA, Wayanad, Kerala, 11°53'13.2"N, 76°4'7.32"E, 21.I.2019, ex *Ficus virens* Aiton., deposited in Zoological Survey of India, Western Ghats Regional Centre, Calicut, leg.: Shilpa K. Satheesan. **Paratypes** 12♀♀, same data as holotype.

Description. **— Female** (Holotype, Fig. 2). Head, mesosoma and gaster black; posterior coxa, femur, tibia and tarsus yellow; antennae brownish yellow; eye and ocelli pink; body length 1.302 mm; ovipositor sheath length 1.9 mm.

Head. Smooth and shiny; sparsely setose; eye 1.2× longer than wide; malar sulcus 0.05 mm; antennal formula 11353; head 1.55× wider than long; POL 1.58× OOL. Inter torular distance 2.7× longer than the diameter of torulus; torulus to inner eye distance as long as inter torular distance; pedicel 1.5× as long as wide; scape 6.3× as long as wide; scape 2.8× as long as pedicel; pedicel length 1.4× F_1 length; clava 1.4× longer than wide; malar sulcus present; eye length 2.7× malar space.

Mesosoma. Pronotum, mesonotum, propodeum reticulate, black; pronotum 1.78× wider than long; pronotum 1.3× longer than mesonotum; mesonotum 2.4× wider than long; scutellum 1.05× longer than wide; scutellum length 1.25× pronotum length, 1.6× mesonotum length. Propodeal spiracles circular and distance between them is 0.134 mm. Wing hyaline with the basal third bare; wing fringes with setae; fore wing length 2.8× SMV; SMV with nine setae; SMV length 1.5× MV length, 8.6× STV length, 1.8× PMV length; MV length 5.8× STV length, 1.2× PMV length; PMV length 4.8× STV length. Fore coxa 2.3× longer than wide; femur 3.1× longer than wide; coxa length 0.62× femur length. Mid coxa 2.1× longer than wide; femur 5× longer than wide; coxa length 0.4× femur length; tibia 12.8× longer than wide; femur length 0.66× tibia length. Hind coxa 2.6× longer than wide; femur 3.7× longer than wide; tibia 6× longer than wide; tibia with two spurs; tibia length 0.85× total tarsal length; coxa length 0.73× femur length and 0.73× tibia length; femur length as long as tibia length, femur length 0.85× total tarsal length; first tarsomere longest, its length 0.9× the combined length of tarsomeres 2–5.

Metasoma. Reticulate; Gt_1 and Gt_2 invaginated medially; gaster (including extended ovipositor sheath) 2.3× as long as mesosoma; last few tergites with long setae.

Male. Unknown.

Host. Associated with the syconia galls of *Ficus virens*.

Etymology. 'virentis' derived from the name of the host plant, *Ficus virens*.

Comparative diagnosis. *Philotrypesis virentis* **sp. nov.** is similar to *P. anguliceps* (Westwood) in having the same body colour, the same number of anelli and the same eye length to width and head length to width ratio. However, it differs in having a longer scape (6.3× as long as wide, *versus* 5.2× in *P. anguliceps*); a shorter pedicel (1.5× as long as wide, *versus* 2×); and a pronotum slightly longer than mesonotum (versus slightly shorter in *P. anguliceps*); a shorter SMV compared to MV length (SMV 1.5× MV, versus 1.8×) and a longer MV relative to MV length (MV 5.8 × STV, versus 3.5×).

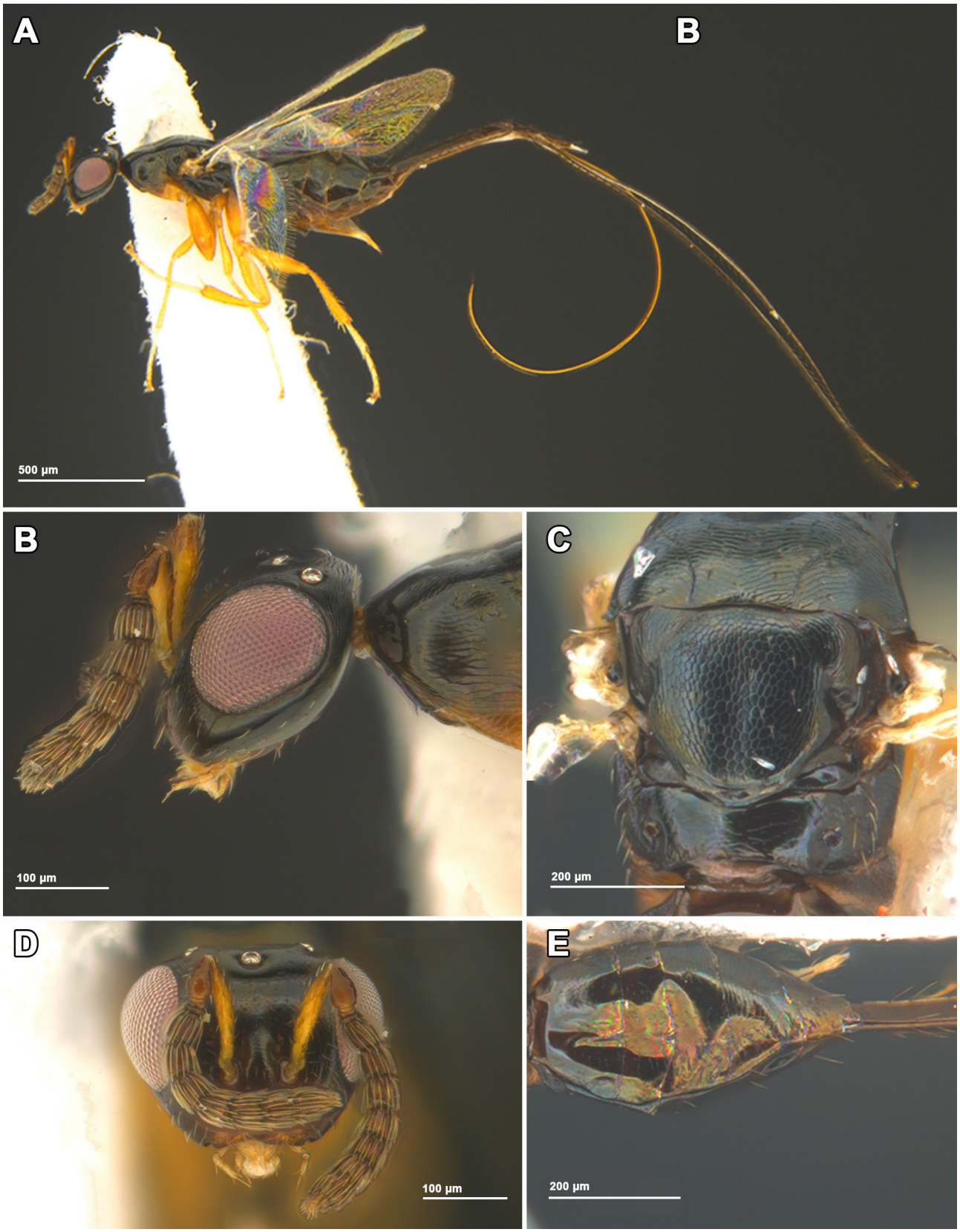

Figure 2. *Philotrypesis virentis* **sp. nov.** Holotype ♀. **A.** Habitus, lateral view; **B.** Head, lateral view; **C.** Mesosoma, dorsal view; **D.** Head, frontal view; **E.** Metasoma, dorsal view.

Genus *Sycoryctes* Mayr, 1885

Sycoryctes Mayr 1885. **Type species**. *Sycoryctes patellaris* Mayr, 1885. by subsequent designation of Ashmead (1904).

Diagnosis. Female is characterised by a long, slender ovipositor and its sheaths, slightly swollen at the apex, the entire length of ovipositor being covered over by the extended last tergites; the marginal vein much longer than the stigmal vein, while post marginal vein almost equal to the marginal vein. Antenna 11 or 12 segmented with one or two anelli and five funicular segments; stigmal knob small, not produced downward. Scape slender; mandible bidentate.

Key to species of genus *Sycoryctes* reported from India (female)

1	SMV 2× MV; ovipositor >5× the gastral length; gena < 0.5× eye length. **2**
—	SMV not 2× MV; ovipositor < 5× the gastral length; gena ≤ 0.5× eye length. **3**
2	Antennal torulli positioned above the anterior margin of the eye; gena 0.25× eye length; ovipositor 6.5× the gastral length. ..... ***Sycoryctes callosa*** Abdurahiman & Joseph, 1975
—	Antennal torulli positioned at the anterior margin of the eye; gena < 0.4× eye length; ovipositor 8× the gastral length. .....***Sycoryctes nervosae*** Priyadarsanan, 2000
3	SMV ≥ 3× MV; ovipositor 3× the gastral length; Gena 0.5× eye length; POL 1.4× OOL. .... ***Sycoryctes religiosae*** Wiebes, 1967
—	SMV < 3× MV; ovipositor >3× the gastral length; Gena ≤ 0.35× eye length; POL > 1.4× OOL. **4**
4	SMV 1.6 × MV; MV 1.76× STV; torulus to eye distance 3× diameter of torulus; pedicel length 1.3× F_1 length; intertorular distance is equal to torular diameter. ..... ***Sycoryctes racemosae*** **sp. nov.**
—	SMV 1.84 × MV; MV 2× STV; torulus to eye distance 2× diameter of torulus; pedicel length 2.4× F_1 length; intertorular distance is less than torular diameter. .....***Sycoryctes tsjakelae*** **sp. nov.**

Sycoryctes racemosae sp. nov.

https://zoobank.org/urn:lsid:zoobank.org:act:20158D51-7081-4F1B-9EB3-FC72AC8AEED2

[Fig. 3A–F]

Type material. **Holotype** ♀: INDIA, Wayanad, Kerala, 11°38'37.02"N, 76°18'5.22"E, 12.II.2019, ex *Ficus racemosa* L., deposited in Zoological Survey of India, Western Ghats Regional Centre, Calicut, leg.: Shilpa K. Satheesan. **Paratypes** 5♀♀, collection data as holotype.

Diagnosis. Body generally metallic green with yellow on the anterior portion of the head, the posterior coxa, femur, tibia and tarsus yellow; antennae brownish yellow; eye and ocelli pink. Head 1.5× wider than long; eye 1.4× longer than wide. Antenna with 11 antennomeres, antennal formula: 11153. Scape 4.6× as long as wide; pedicel 1.3× as long as wide. Pronotum, mesonotum, propodeum reticulate and metallic green. Wing hyaline, basal part of wing bare; wing length 2.3× as long as its width.

Description. — Female (Holotype, Fig. 3). Generally metallic green with yellow at anterior portion of the head. Posterior coxa, femur, tibia and tarsus yellow; antennae brownish yellow; eye and ocelli pink. Length 2.8 mm; ovipositor sheath length 1.8 mm.

Head. Reticulate, metallic green with yellow at anterior portion of the head. Antennal formula: 11153; head 1.5× wider than long; eye 1.4× longer than wide; POL 1.5× OOL. Torulus to inner eye distance 3× inter torular distance; torulus diameter 1.2× inter torular distance. Scape 4.6× as long as wide; scape 2.5× as long as pedicel; pedicel 1.3× as long as wide; pedicel length 1.3× as long as F_1 length; clava 2× longer than wide. Malar sulcus absent. Gena length 0.35× eye length.

Mesosoma. Pronotum, mesonotum, propodeum reticulate, metallic green. Pronotum 3.2× wider than long; mesonotum 1.9× wider than long; scutellum 1.1× longer than wide. Wing hyaline, basal third of the wing bare; wing length 2.3× as long as its width; SMV 1.6× MV, 2.8× STV, 1.4× PMV; MV 1.8× STV; PMV length 2.2× STV length and 1.1× MV length; stigmal vein with two setae. Fore coxa 2.1× longer than wide; femur 3.9× longer than wide; coxa length 0.72× femur length. Mid coxa 1.4× longer than wide; femur 6.2× longer than wide; coxa length 0.34× femur length; tibia 8.4× longer than wide; femur length 0.9× tibia length. Hind coxa 3.4× longer than wide; femur 3× longer than wide; tibia 6.6× longer than wide; tibia length 1.6× tarsi length; coxa length 0.65× femur length; coxa length 0.5× tibia length; femur length 0.8× tibia length, 1.3× total tarsal length.

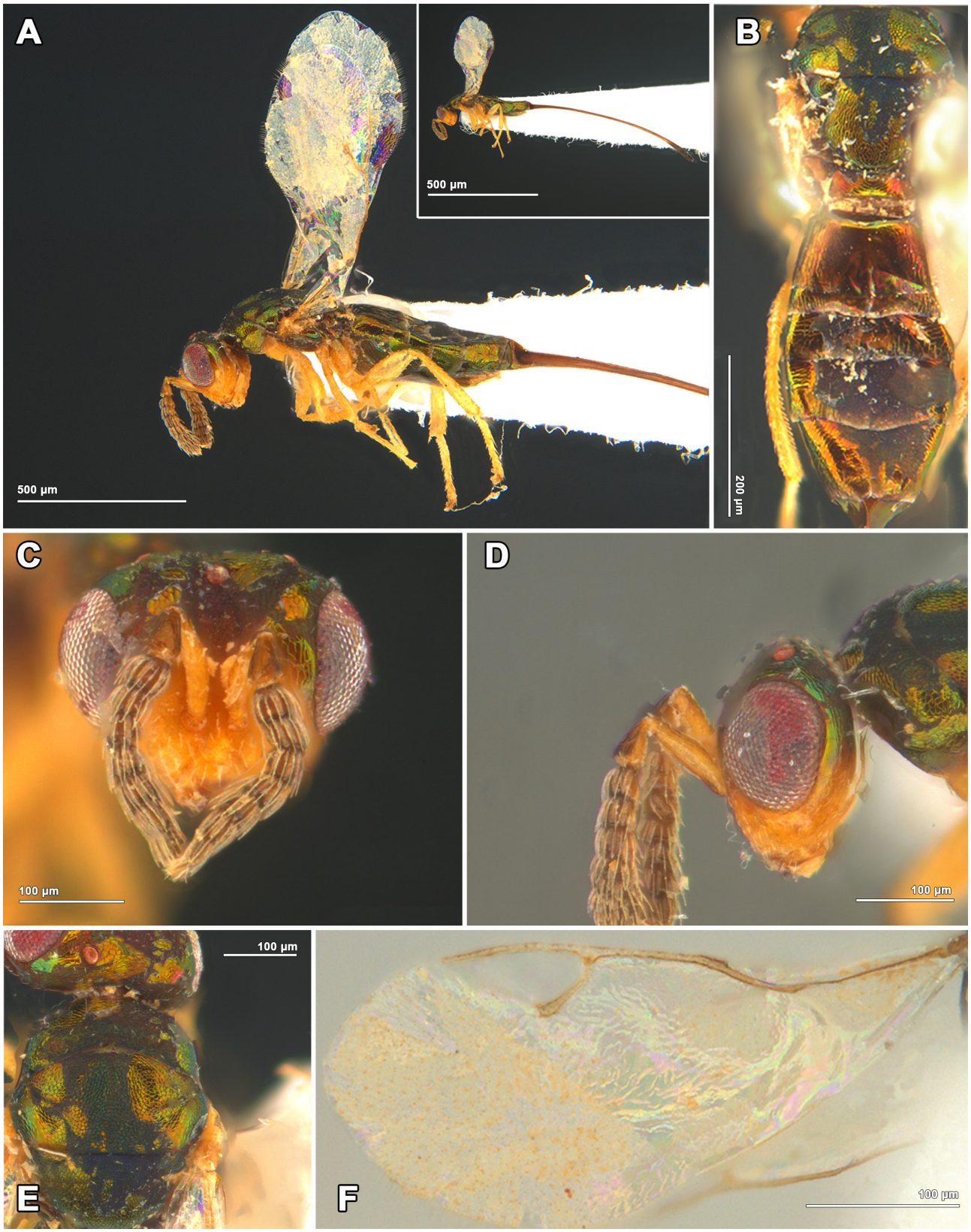

Figure 3. *Sycoryctes racemosae* **sp. nov.** Holotype ♀. **A.** Habitus, lateral view; **B.** Mesosoma & Metasoma, dorsal view; **C.** Head, frontal view; **D.** Head, lateral view; **E.** Pronotum & Mesonotum, dorsal view; **F.** Fore wing.

Metasoma. Gaster 1.4× as long as the mesosoma; ovipositor 1.6× as long as gaster; reticulate, with a single row of setae on Gt_3 onwards.

Male. Unknown

Host. Reared from syconia galls of *Ficus racemosa* L.

Etymology. 'racemosae' derived from the name of the host plant, *Ficus racemosa.*

Comparative diagnosis. *Sycoryctes racemosae* **sp. nov.** is similar to *S. religiosa* Wiebes in having a similar ovipositor to gaster length; same antennal formula; similar MV: STV: PMV ratio; POL to OOL ratio; differs from it in having gena 0.35× eye length (compared to gena 0.5× eye length in *S. religiosa*); SMV 1.6× MV (compared to SMV 3× MV in *S. religiosa*); body closely reticulate in *S. racemosae* **sp. nov.** (compared to body strigulate or longitudinally reticulate in *S. religiosa*)

Sycoryctes tsjakelae sp. nov.

https://zoobank.org/urn:lsid:zoobank.org:act:83402D22-D205-437E-ADF1-8972FA16FD42

[Fig. 4A–F]

Type material. **Holotype** ♀: INDIA, TBGRI, Palode, Thiruvananthapuram, Kerala, 08°45'16.06"N, 77°02'3.80"E, 17.I.2021, ex *Ficus tsjahela* Burm. f., deposited in Zoological Survey of India, Western Ghats Regional Centre, Calicut, leg.: Shilpa K. Satheesan. **Paratypes** 3♀♀, collection data as holotype.

Diagnosis. Body generally metallic green with yellow at anterior portion of the head, posterior coxa, femur, tibia and tarsus yellow; antennae brownish yellow; eye and ocelli pink. Head 1.8× wider than long; eye 1.3× longer than wide. Antennal formula 11153. Scape 4.3× as long as wide; pedicel 1.6× as long as wide. Pronotum, mesonotum, propodeum reticulate, metallic green. Wing hyaline, proximal 1/3rd of the wing bare; fore wing length 2.8× SMV.

Description. **—** Female (Holotype, Fig. 4). Generally metallic green with yellow at anterior portion of the head and ventral region. Posterior coxa, femur, tibia and tarsal yellow; antennae brownish yellow; eye and ocelli pink. Length 1.98 mm; ovipositor sheath length 1.24 mm.

Head. Reticulate, metallic green with yellow at anterior portion of the head. Head 1.8× wider than long; eye 1.3× longer than wide; length from upper margin of clypeus to lower margin of clypeus 0.03 mm. Antennal formula 11153. POL 1.48× OOL. Torulus to inner eye distance 2.1× torular diameter; inter torular distance a little less than torulus diameter. Scape 4.3× as long as wide; pedicel 1.6× as long as wide; scape 2× as long as pedicel; pedicel 2.4× F_1 length; clava 2.7× longer than wide. Malar sulcus absent. Gena length 0.34× eye length.

Mesosoma. Pronotum, mesonotum, propodeum reticulate, metallic green. Pronotum small and dorsally almost invisible; mesonotum 2.2× wider than long; scutellum 1.1× wider than long; spiracles circular. Wing hyaline, basal half of the wing bare, setae present on the distal half of the wing fringes; fore wing length 2.8× SMV; SMV 2× MV, 3.6× STV, 1.8× PMV; PMV 2× STV and PMV almost equal to MV length; stigmal vein with four sensilla. Mid coxa 1.4× longer than wide; femur 6.2× longer than wide; coxa length 0.34× femur length; tibia 11× longer than wide; tibia length 1.3× tarsal length. Hind coxa 3.4× longer than wide; hind femur 2.2× longer than wide; hind tibia 5.7× longer than wide; hind tibia length 1.3× tarsi length; femur length 0.6× tibia length, 0.72× total tarsal length.

Metasoma. Gaster 1.8× longer than mesosoma; ovipositor 1.84× gaster; last few tergites with a single row of setae.

Male. Unknown

Host. Reared from syconia galls of *Ficus tsjakela* Burm.f.

Etymology. 'tsjakelae' derived from the name of the host plant, *Ficus tsjakela.*

Comparative diagnosis. *Sycoryctes tsjakelae* **sp. nov**. is similar to *S. racemosae* **sp. nov**. in having comparable gena-to-eye length, ovipositor-to-gaster length, antennal formula, MV:STV:PMV ratio, POL-to-OOL ratio, and eye length-to-width ratio. However, *S. tsjakelae* **sp. nov**. differs from *S. racemosae* **sp. nov**. in having a longer SMV relative to MV (SMV 2× MV, versus 1.6× in *S. racemosae*), a shorter scape (4.3× as long as wide, versus 4.6×), a relatively broader head (head width 1.8× its length, versus 1.5×), a shorter distance from torulus to inner eye margin (2× torular diameter, versus 3×), and a longer pedicel (1.6× as long as wide, versus 1.3×). In addition, in *S. tsjakelae* **sp.nov.**, the scape is 2× the length of the pedicel (versus 2.5× in *S. racemosae*), the pedicel is 2.4× the length of F_1 (versus pedicel length

approximately equal to F_1), the intertorular distance is less than the torular diameter (versus equal to the torular diameter), and the pronotum is laterally visible but dorsally almost invisible (versus pronotum completely visible dorsally).

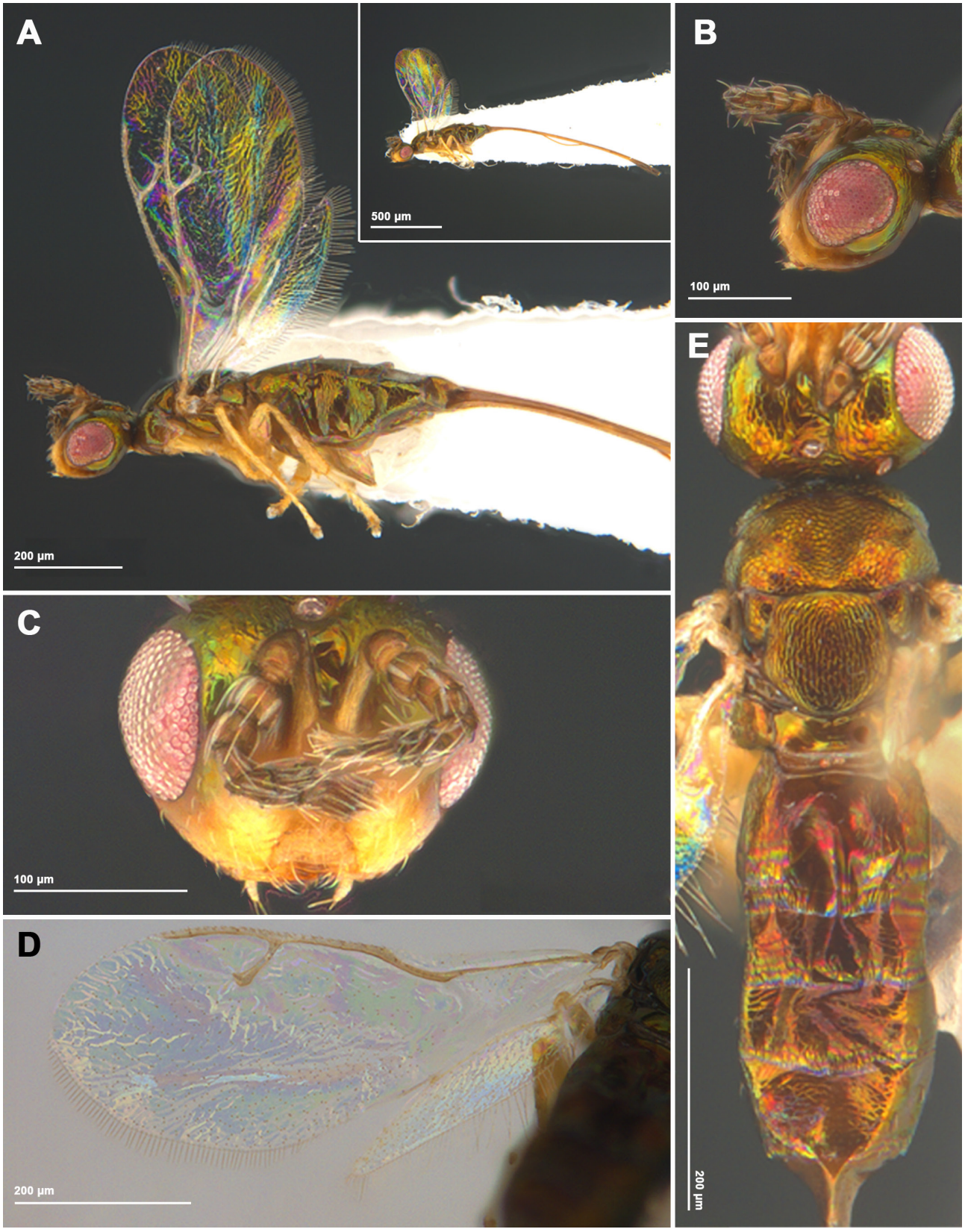

Figure 4. *Sycoryctes tsjakelae* **sp. nov.** Holotype ♀. **A.** Habitus, lateral view; **B.** Head, lateral view; **C.** Head, frontal view; **D.** Fore wing; **E.** Mesosoma & Metasoma, dorsal view.

DISCUSSION

Globally, approximately 30 genera of pteromalids are known to be associated with figs. These fig-associated pteromalids form a monophyletic group within the tribe Otitesellini (subfamily Pteromalinae) (Burks et al. 2022; Cruaud et al. 2024). The Oriental region supports 18 of these genera, while the Indian fauna comprises 50 species distributed across 10 genera. Among these, *Philotrypesis* and *Sycoscapter* are the most diverse, together accounting for 26 species (UCD 2023). The present study describes four new species, expanding the known Indian fauna. The two new species of *Philotrypesis* bring the total to 15, while the two additions to *Sycoryctes* increase its Indian representation to eight species. The intricate relationships within these fig-wasp communities suggest that many more species await discovery. Thus, continued taxonomic exploration of this biodiverse region is indispensable for understanding the co-evolutionary dynamics that shape these ecological systems.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: S.K. Satheesan: Collecting the specimens, identification of the specimens, and drafting the manuscript; S. Santhosh: Supervision, validation, and revising the manuscript. The authors read and approved the final version of the manuscript.

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AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in Zoological Survey of India, Western Ghats Regional Centre, Calicut and are available from the curator upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study only included arthropod material, and all required ethical guidelines for the treatment and use of animals were strictly adhered to in accordance with international, national, and institutional regulations. No human participants were involved in any studies conducted by the authors for this article.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

GENERATIVE AI STATEMENT

The authors used AI to improve the readability of the introduction and discussion. The tool was used strictly for language refinement; it was not used for content generation or data analysis. The authors have reviewed and edited all suggestions and take full responsibility for the manuscript's content.

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چهار گونه جدید از زنبورهای Pteromalidae (Hymenoptera, Chalcidoidea) مرتبط با انجیر از گهات غربی، هند

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چکیـده: این مقاله به توصیف چهار گونه جدید از زنبورهای Pteromalidae وابسته به انجیر از گهات غربی هند می‌پردازد. گونه‌های جدید متعلق به جنس‌های *Philotrypesis* Förster, 1878 و *Sycoryctes* Mayr, 1885 و هر دو به طور الزامی با گونه‌های *Ficus* مرتبط هستند. گونه‌های تازه توصیف شده شامل *Philotrypesis virentis* **sp. nov.** از *Ficus virens* Aiton، *Philotrypesis talbotii* **sp. nov.** از *Ficus talbotii* King، *Sycoryctes racemosae* **sp. nov.** از *Ficus racemosa* L. و *Sycoryctes tsjakelae* **sp. nov.** از روی *Ficus tsjakela* Burm.f. می‌باشند. در این مقاله، توصیف جزییات ریخت‌شناسی ، تصاویر و خصوصیات افتراقی برای تمایز هر گونه جدید از سایر گونه‌های موجود ارایه شد..

واژگـان کلیدی: زنبور انجیر، *Philotrypesis*، Pteromalinae، Otitesellini، *Sycoryctes*