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Research article

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A new Darwin wasp genus, *Soliga* (Hymenoptera: Ichneumonidae: Metopiinae), from India

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Abstract. Metopiinae is a relatively large subfamily of Darwin wasps with a cosmopolitan distribution. Species of this subfamily can be distinguished by a convex, and mostly undivided face and clypeus. Among 113 species in 24 genera of the Oriental region, only 24 species in eight genera are reported from India. Here, we describe and illustrate a new genus, *Soliga*, based on collections made from the Western Ghats and Eastern Himalayas, two important biodiversity hotspots. The combination of absence of epicnemial carina on dorsolateral part of mesopleuron, absence of propodeal carinae and dorsal carinae of first metasomal tergite differentiates the new genus from other metopiine genera. An illustrated key to the Indo-Australian metopiine genera is provided along with comments on new generic placement and character variability of metopiines.

Keywords. Indian Metopiinae, taxonomic key, Malaise trap, new genus.

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Introduction

The Darwin wasp subfamily Metopiinae Förster, 1869 (Hymenoptera: Ichneumonidae) has a cosmopolitan distribution and includes more than 862 species in 27 genera including two fossil genera (Broad *et al.* 2018). Metopiines can be distinguished by their stout legs (Fig. 17a), compact body (Fig. 17a), evenly convex face and clypeus (Figs 1, 6c, f, 7b–c, e–f, 17b), the former generally produced into an acute, pointed structure anteriorly between antennal sockets (Figs 1a, 17c), and pronotum laterally concave and posteriorly rounded (Figs 4a, d, 14c, f, 17e) (Gauld & Sithole 2002; Quicke 2015; Broad *et al.* 2018). Their structure (especially the clypeus and face) is superficially similar to some members of the *Orthocentrus* group of Orthocentrinae Förster, 1869; however, species of the *Orthocentrus* group are generally smaller, with an elongated scape, do not have the pointed structure extending anteriorly between the antennae and often have a strong subocular groove.

All species of Metopiinae for which the biology is known are koinobiont endoparasitoids of leaf rolling and web inhabiting lepidopteran caterpillars, except *Metopius* Panzer, 1806 which attack exposed caterpillars (Gauld & Sithole 2002; Broad *et al*. 2018). Most metopiinae genera are reported from all biogeographic realms except some less speciose genera like *Sciron* Fitton, 1984, *Cubus* Townes & Townes, 1959, *Forrestopius* Gauld & Sithole, 2002 and *Ojeulos* Khalaim, 2012, which are restricted to one geographical realm (Yu *et al*. 2016). *Exochus* Gravenhorst, 1829 (290 species) and *Metopius* (145 species) are the largest genera in the subfamily which account for nearly half of the species described so far (Gauld & Sithole 2002; Choi *et al*. 2016a). Most species are described from the Palaearctic region followed by Neotropical and Nearctic regions (Yu *et al*. 2016). In the Oriental region, 113 species in 12 genera are reported (Yu *et al*. 2016). A total of 24 species of metopiines from eight genera were reported from India. Other than a regional species catalogue (Jonathan 2003), there are no comprehensive taxonomic accounts of Metopiinae from India.

Townes (1971) revised Metopiinae and provided a key to the identification of world genera. Later Fitton (1984) and Gauld & Sithole (2002) revised Australian and Costa Rican fauna respectively. Townes (1971) mentioned the uncertain placement of *Lapton* Nees, 1816, *Ischyrocnemis* Holmgren, 1858, *Bremiella* Dalla Torre, 1901 and *Apolophus* Townes, 1971 within Metopiinae. Gauld & Sithole (2002) questionably included the above genera in Metopiinae. Later, Aubert (2000) transferred *Ischyrocnemis* and *Bremiella* to Tryphoninae Shuckard, 1840 and Ctenopelmatinae Förster, 1869, respectively. Kasparyan (2019) transferred *Ischyrocnemis* back to Metopiinae. But recently Shaw *et al*. (2022) included *Ischyrocnemis* within the Ctenopelmatinae. Gauld & Wahl (2006) synonymized *Apolophus* under ctenopelmatine genus *Scolomus* Townes & Townes, 1950 and transferred into Metopiinae. Recent observations revealed that new distribution records of the genera *Aceraspis* Uchida, 1934, *Chorinaeus* Holmgren, 1858 and *Trieces* Townes, 1946 reflect a rich diversity in India (Ranjith & Priyadarsanan 2022; Ranjith unpubl. data).

In this paper, we describe a new genus, *Soliga* along with the description of a new species, *S. ecarinata* gen. et sp. nov., collected from a dry deciduous forest of the Western Ghats and secondary wet forest of Northeast Himalayas, two important biodiversity hotspots of the world. The new genus exhibits several unusual characters within Metopiinae (e.g., loss of epicnemial carina on the dorsolateral part of the mesopleuron, loss of propodeal carinae and loss of carinae on the first metasomal tergite) which are not yet observed collectively in any other metopiine genera. A revised illustrated key to the identification of metopiine genera of the Indo-Australian region is also provided along with the illustration of the new species. Placement of *Soliga* gen. nov. is discussed including comments on character plasticity within the Metopiinae.

Material and methods

Specimens were collected using Townes style Malaise traps set up at ground level in the dry deciduous and secondary wet forests of Western Ghats and Eastern Himalayas, two important biodiversity hotspots situated diagonally across the Indian subcontinent (Fig. 21). Collected specimens were preserved in 70% ethyl alcohol prior to mounting. Specimens were later card mounted and generic identification was made with keys presented in Townes (1971), Fitton (1984) and Gauld & Sithole (2002). Images were taken of the holotype by a Keyence VHX-6000 digital microscope at 20–200 × magnification. Measurements were taken from the holotype and paratype specimens by AxioVision 4.8. Holotype and paratypes are deposited in ATREE Insect Museum, Bengaluru, India (AIMB) and will be moved to the National Insect Museum, ICAR-National Bureau of Agricultural Insect Resources (ICAR-NBAIR). Morphological terminology and wing venation follow Broad *et al*. (2018). Holotype images of *Sciron fundator* Fitton, 1984 are copyright of Australian National Insect Collection (ANIC), Australia, Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia.

Institutional abbreviations

AIMB = ATREE Insect Museum, Bengaluru, India
ANIC = Australian National Insect Collection, Australia
CSIRO = Commonwealth Scientific and Industrial Research Organization, Australia
ICAR-NBAIR = Indian Council of Agricultural Research, 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

Key to the Indo-Australian genera of Metopiinae

1. Face generally flat, with a large shield-shaped region bounded by a carina (Fig. 1a); mid tibia with one apical spur ..... ***Metopius*** Panzer, 1806
– Face entirely convex, lacking a shield-shaped region bounded by a carina (Fig. 1b); number of mid tibial spurs variable 2

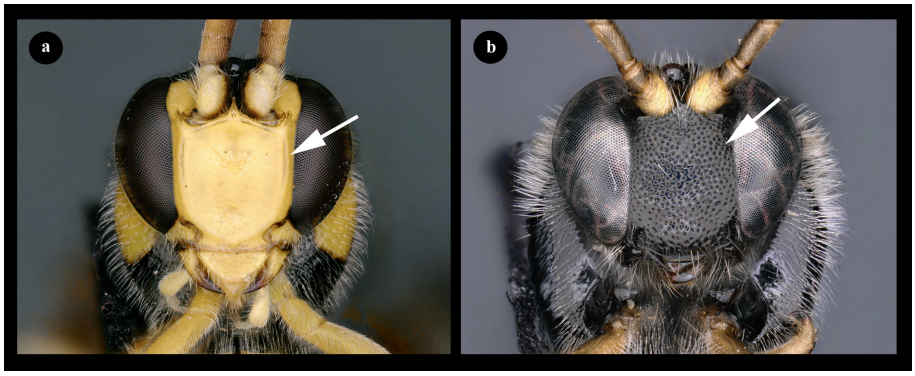

Fig. 1. a. *Metopius* sp., head, anterior view. **b**. *Triclistus* sp., head, anterior view. Arrow in Fig. 1a points to raised carina delineating shield-shaped area (compared to lack of carina in Fig. 1b).

2. Metasomal tergites 3–5 without laterotergites (Fig. 2a) 3
– Metasomal tergites 3–5 with laterotergites (Fig. 2b) 5

Fig. 2. a. *Trieces irwini* Ranjith & Priyadarsanan, 2022, metasoma, lateral view. **b**. *Exochus* sp., metasoma, lateral view. Arrow in Fig. 2a points to the lack of laterotergite on metasomal tergite 3–5 (compared to the presence of laterotergite on metasomal tergites 3–5 in Fig. 2b).

3. Areolet present (Fig. 3a); metasoma clavate, fifth and sixth segments much wider than preceding segments (Fig. 3b); mid tibia of male with one spur (Fig. 3c) .....***Aceratapsis*** Uchida, 1934
– Areolet absent (Fig. 3d); metasoma parallel sided, fifth and sixth segments not wider than preceding segments (Fig. 3e); mid tibia of male with two spurs (Fig. 3f) 4

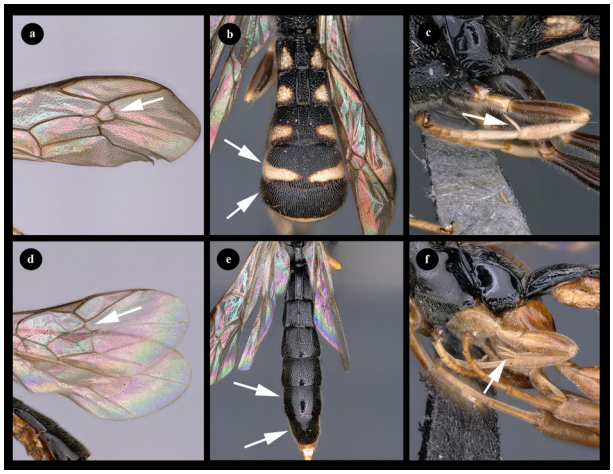

Fig. 3. a–c. *Aceratapsis* sp. **a**. Fore wing. **b**. Metasoma, dorsal view. **c**. Mid leg. **d**. *Hypsicera* sp., fore wing. **e**. *Trieces irwini* Ranjith & Priyadarsanan, 2022, metasoma, dorsal view. **f**. *Hypsicera* sp., mid leg. Arrow in Fig. 3a points to the presence of fore wing areolet (compared to the absence of fore wing areolet in Fig. 3d. Arrow in Fig. 3b points to clavate metasoma (compared to parallel sided metasoma in Fig. 3e. Arrow in Fig. 3c points to single mid tibial spur (compared to the presence of two mid tibial spurs in Fig. 3f.

4. Mesopleuron with sulcus (Fig. 4a); lateral longitudinal carina only present on metasomal tergite 1 and base of second metasomal tergite (Fig. 4b); pronotum with dorsal longitudinal depression (Fig. 4c) .....***Chorinaeus*** Holmgren, 1858
– Mesopleuron without sulcus (Fig. 4d); lateral longitudinal carina often present on metasomal tergites 1–3 (Fig. 4e); pronotum without dorsal longitudinal depression (Fig. 4f) ..... ***Trieces*** Townes, 1946

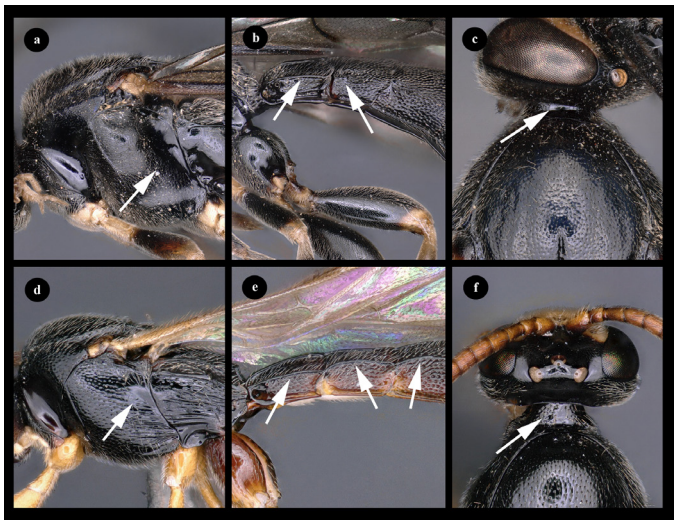

Fig. 4. a–c. *Chorinaeus* sp. **a**. Mesosoma, lateral view. **b**. Anterior metasomal tergites, lateral view. **c**. Mesosoma, dorsal view. **d–f**. *Trieces isolatus* Ranjith & Priyadarsanan, 2022. **d**. Mesosoma, lateral view. **e**. Anterior metasomal tergites, lateral view. **f**. Mesosoma, dorsal view. Arrow in Fig. 4a points to the presence of sulcus on mesopleuron (compared to the absence of sulcus on mesopleuron in Fig. 4d). Arrow in Fig. 4b points to metasomal tergites 2–3 without lateral carina (compared to metasomal tergites 1–3 with lateral carina in Fig. 4e). Arrow in Fig. 4c points to pronotum with dorsal transverse depression (compared to pronotum without dorsal transverse depression in Fig. 4f).

5. Interantennal process of face connected dorso-posteriorly to a high lamella separating the antennal sockets, this lamella with a vertical groove in it, just below the median ocellus (Fig. 5a) 6
– Interantennal process of face not produced dorsally into a lamellate structure separating the antennal sockets, but often present as a low lamella posterior to antennal bases (Fig. 5b) 7

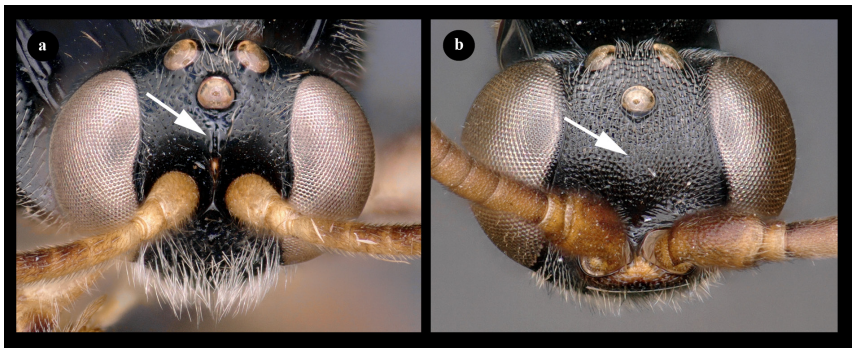

Fig. 5. a. *Triclistus* sp., head, dorsal view. **b**. *Hypsicera* sp., head, dorsal view. Arrow in Fig. 5a points to vertical lamellate structure on frons (compared to lack of lamella on frons in Fig. 5b).

6. First metasomal segment petiolate anteriorly, its spiracle near or posterior to centre (Fig. 6a); sternite 1 long, reaching more than half of length of tergite (Fig. 6b); mandible with teeth subequal (Fig. 6c) ..... ***Colpotrochia*** Holmgren, 1856
– First metasomal segment weakly to quite strongly (and evenly) tapered anteriorly, its spiracle near its anterior ⅓ (Fig. 6d); first metasomal sternite short, at most reaching about ⅓ of length of tergite (Fig. 6e); mandible with lower tooth much shorter than upper tooth (Fig. 6f) ..... ***Triclistus*** Förster, 1869

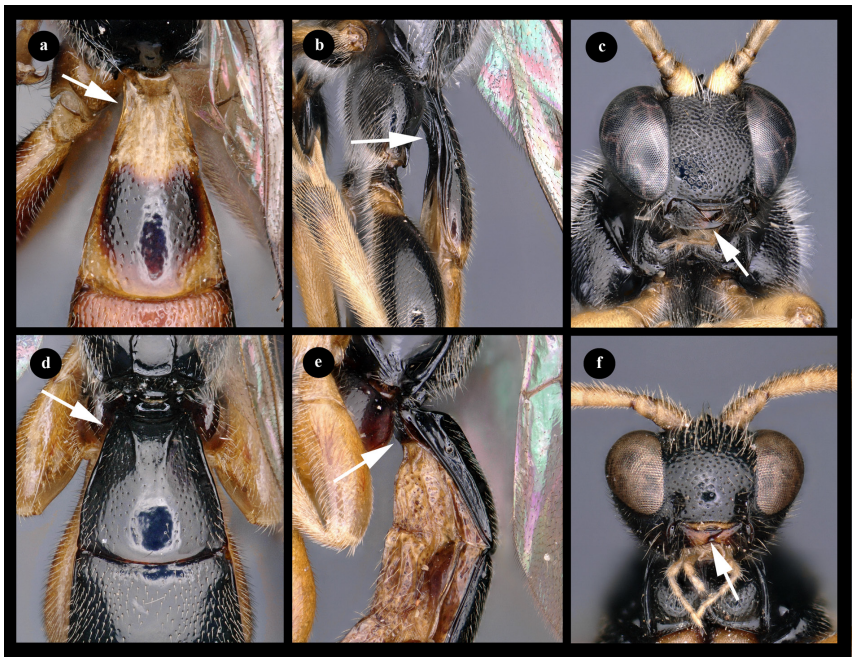

Fig. 6. a–c. *Colpotrochia* sp. **a**. Metasomal tergite 1, dorsal view. **b**. Metasomal tergite 1, lateral view. **c**. Head, antero-ventral view. **d–f**. *Triclistus* sp. **d**. Metasomal tergite 1, dorsal view. **e**. Metasomal tergite 1, lateral view. **f**. Head, antero-ventral view. Arrow in Fig. 6a points to metasoma petiolate anteriorly (compared to broad metasoma anteriorly in Fig. 6d). Arrow in Fig. 6b points to metasomal tergite 1 with long sternite (compared to metasomal tergite with short sternite in Fig. 6e). Arrow in Fig. 6c points to mandible with subequal teeth (compared to the mandible with shorter lower tooth in Fig. 6f).

7. Pronotum with upper part inflated, the pronotal lobes appear as large triangular structures in dorsal view (Fig. 7a); upper tooth of mandible broadly lobate, lower tooth acute and turned upwards (Fig. 7b); interantennal process separated from upper face by a sharp transverse carina (Fig. 7c) .... ***Stethoncus*** Townes & Townes, 1959
– Pronotum with upper part not exceptionally inflated (Fig. 7d); upper tooth of mandible triangular and acutely pointed, the lower tooth generally small and always straight (Fig. 7e); interantennal process never separated from upper face by a carina (Fig. 7f) 8

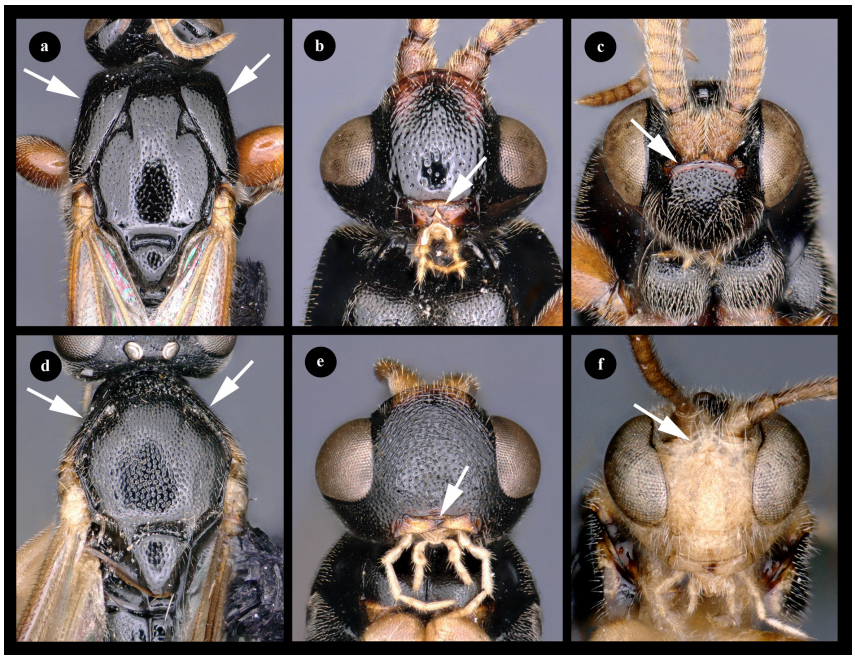

Fig. 7. a–c. *Stethoncus* sp. **a**. Mesosoma, dorsal view. **b**. Head, antero-ventral view. **c**. Head, antero-dorsal view. **d–f**. *Exochus* sp. **d**. Mesosoma, dorsal view. **e**. Head, antero-ventral view. **f**. Head, antero-dorsal view. Arrow in Fig. 7a points to inflated upper part of pronotum (compared to normally curved upper part of pronotum in Fig. 7d). Arrow in Fig. 7b points to lobe like upper tooth of mandible (compared to triangular, acutely pointed upper tooth of mandible in Fig. 7e). Arrow in Fig. 7c points to the presence of a sharp transverse carina separating interantennal processes and upper face (compared to the absence of transverse carina separating interantennal processes and upper face in Fig. 7f).

8. Areolet present (Fig. 8a) 9
– Areolet absent (Fig. 8b) 11

Fig. 8. a. *Colpotrochia* sp., fore wing. **b**. *Trieces orientalis* Ranjith & Priyadarsanan, 2022, fore wing. Arrow in Fig. 8a points to fore wing with areolet (compared to fore wing without areolet in Fig. 8b).

9. Occipital carina entirely absent (Fig. 9a) ..... ***Carria*** Schmiedeknecht, 1924
– Occipital carina present at least laterally (Fig. 9b) 10

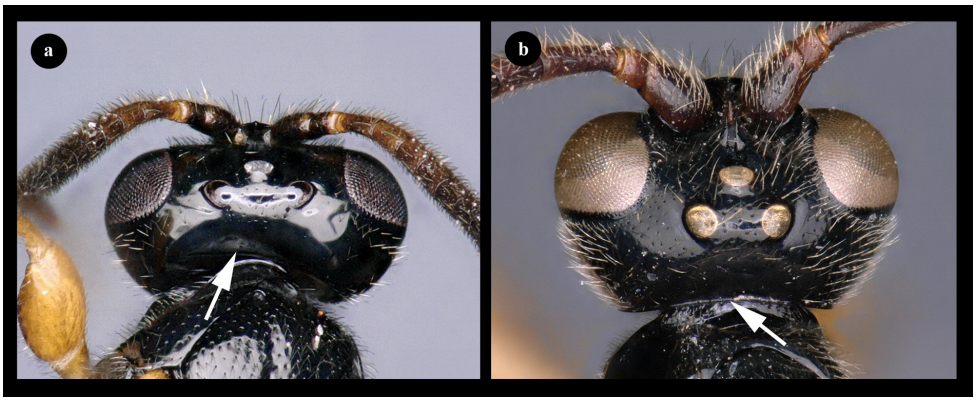

Fig. 9. a. *Carria* sp., head, dorsal view. **b**. *Hypsicera* sp., head, dorsal view. Arrow in Fig. 9a points to the absence of occipital carina (compared to the presence of occipital carina in Fig. 9b).

10. Notaulus present (Fig. 10a); first metasomal tergite distinctly narrowing basally (Fig. 10b) .... ***Sciron*** Fitton, 1984 (part)
– Notaulus absent (Fig. 10c); first metasomal tergite broad basally (Fig. 10d) .... ***Seticornuta*** Morely, 1913

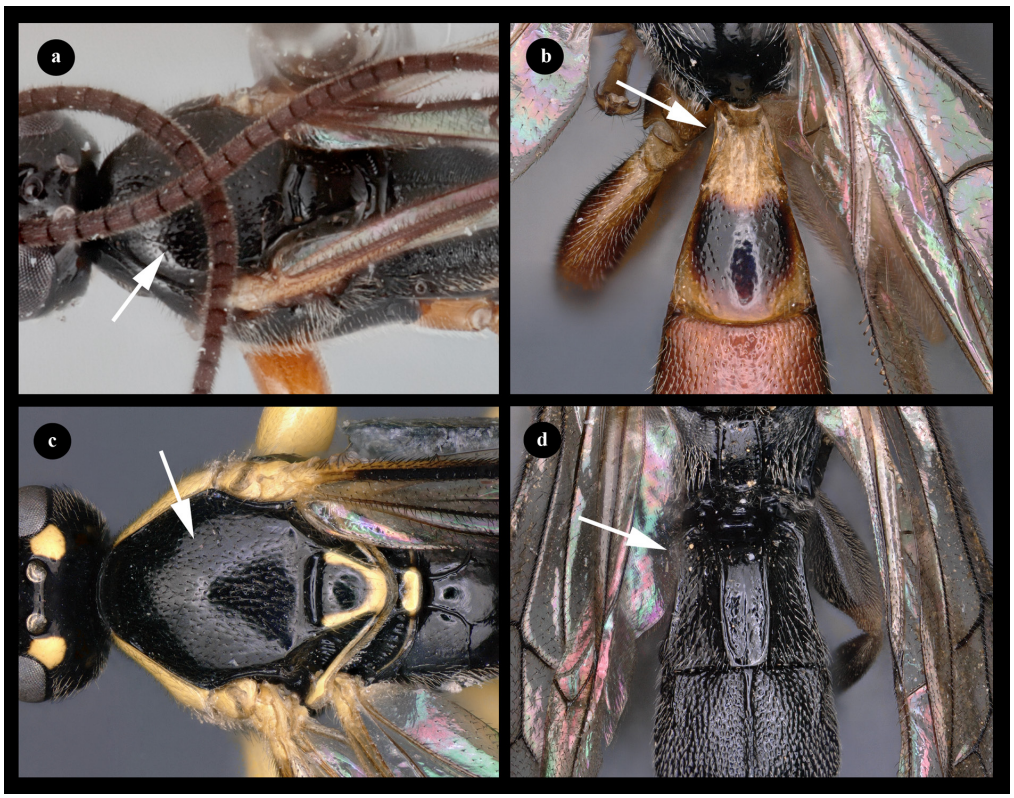

Fig. 10. a. *Sciron fundator* Fitton, 1984, mesosoma, dorsal view. **b**. *Colpotrochia* sp., metasomal tergite 1, dorsal view. **c**. *Exochus* sp., mesosoma, dorsal view. **d**. *Trieces orientalis* Ranjith & Priyadarsanan, 2022, metasomal tergite 1, dorsal view. Arrow in Fig. 10a points to the presence of notauli on mesoscutum (compared to the absence of notauli on mesoscutum in Fig. 10c). Arrow in Fig. 10b points to metasoma petiolate anteriorly (compared to broad metasoma anteriorly in Fig. 10d).

11. Mid tibia with outer spur distinctly shorter than inner spur (Fig. 11a) 12
– Mid tibia with outer spur as long as inner spur (Fig. 11b) 13

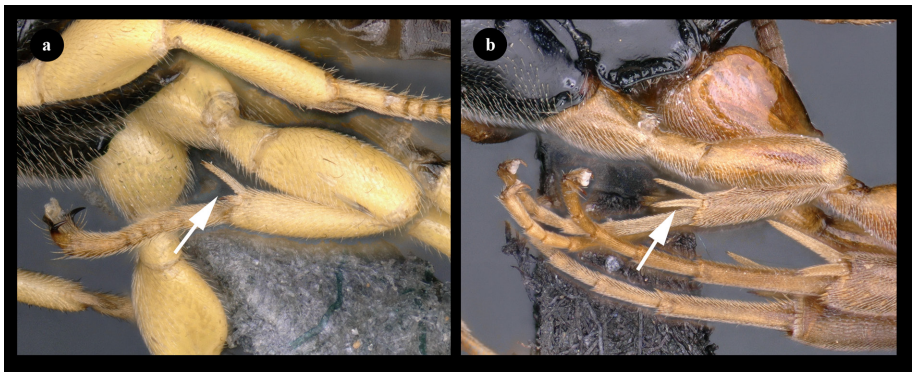

Fig. 11. a. *Exochus* sp., mid leg. **b**. *Hypsicera*, mid leg. Arrow in Fig. 11a points to mid tibia with shorter outer spur (compared to subequal midtibial spurs in Fig. 11b).

12. Occiput vertical (Fig. 12a); posterior transverse carina of mesosternum convexly bulging medio-posteriorly (Fig. 12b); first metasomal tergite with distinct lateromedian carina often extending 0.8 × of tergite (Fig. 12c) ..... ***Hypsicera*** Latreille, 1829 (part)
– Occiput rounded to steeply declivous (Fig. 12d); posterior transverse carina of mesosternum straight medio-posteriorly (Fig. 12e); first metasomal tergite without or with lateromedian carina, if present extending 0.5 × of tergite (Fig. 12f) ..... ***Exochus*** Gravenhorst, 1829

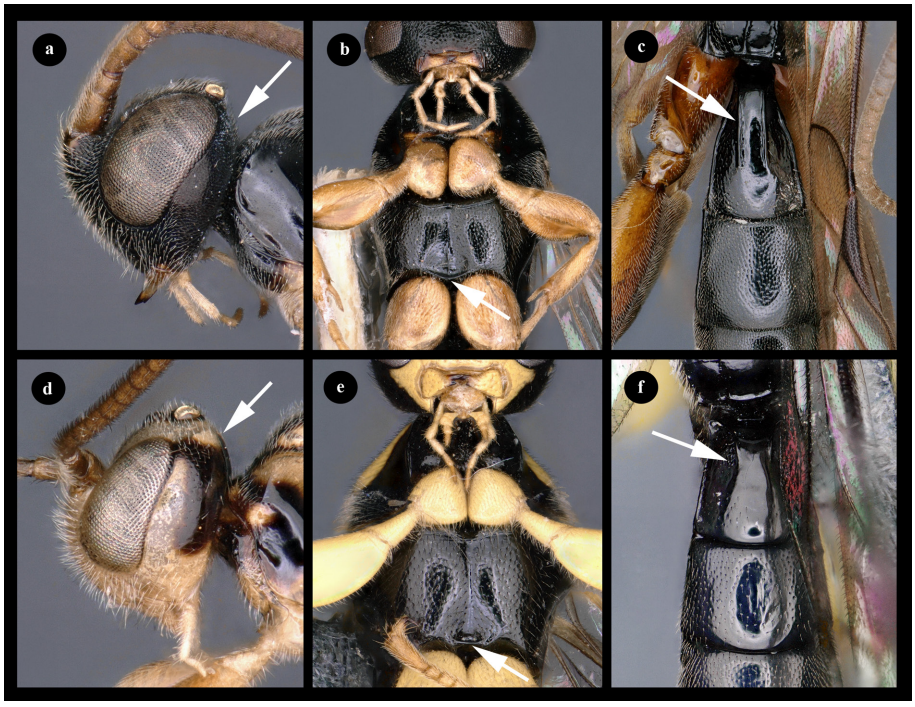

Fig. 12. a–c. *Hypsicera* sp. **a**. Head, lateral view. **b**. Mesosoma, ventral view. **c**. Metasomal tergite 1, dorsal view. **d–f**. *Exochus* sp. **d**. Head, lateral view. **e**. Mesosoma, ventral view. **f**. Metasomal tergite 1, dorsal view. Arrow in Fig. 12a points to vertical occiput (compared to rounded occiput in Fig. 12d). Arrow in Fig. 12b points to posterior transverse carina on mesosternum convex medio-posteriorly (compared to straight posterior transverse carina on mesosternum in Fig. 12e). Arrow in Fig. 12c points to the long lateromedial carina on first metasomal tergite (compared to the short lateromedial carina on first metasomal tergite in Fig. 12f).

13. Notaulus present (Fig. 13a); first metasomal tergite narrowing basally (Fig. 13b) .... ***Sciron*** Fitton, 1984 (part)
– Notaulus absent (Fig. 13c); first metasomal tergite not narrowing basally (Fig. 13d) 14

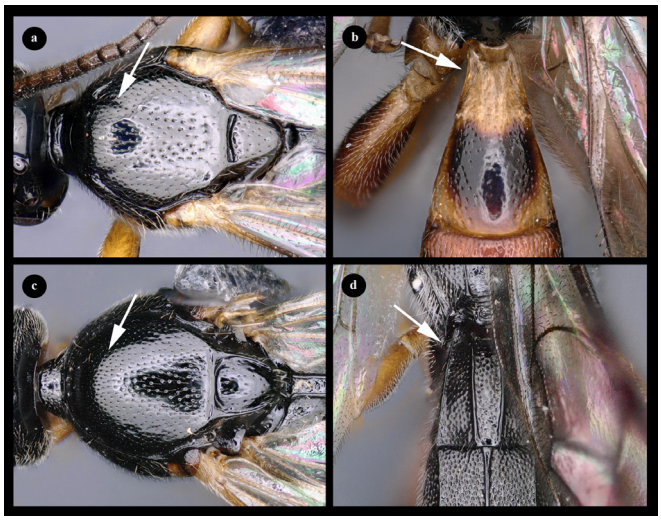

Fig. 13. a. *Carria* sp., mesosoma, dorsal view. **b**. *Colpotrochia* sp., metasomal tergite 1, dorsal view. **c**. *Trieces irwini* Ranjith & Priyadarsanan, 2022, mesosoma, dorsal view. **d**. *Trieces orientalis* Ranjith & Priyadarsanan, 2022, metasomal tergite 1, dorsal view. Arrow in Fig. 13a points to the presence of notauli on mesoscutum (compared to the absence of notauli on mesoscutum in Fig. 13c). Arrow in Fig. 13b points to first metasomal tergite narrow basally (compared to first metasomal tergite broad basally in Fig. 13d).

14. Propodeum without traces of carina (Fig. 14a); first metasomal tergite without carina (Fig. 14b); epicnemial carina largely incomplete or absent dorsolaterally (Fig. 14c) ..... ***Soliga*** gen. nov.
– Propodeum with distinct carina (Fig. 14e); first metasomal tergite with longitudinal carina (Fig. 14f); epicnemial carina complete (Fig. 14d) 15

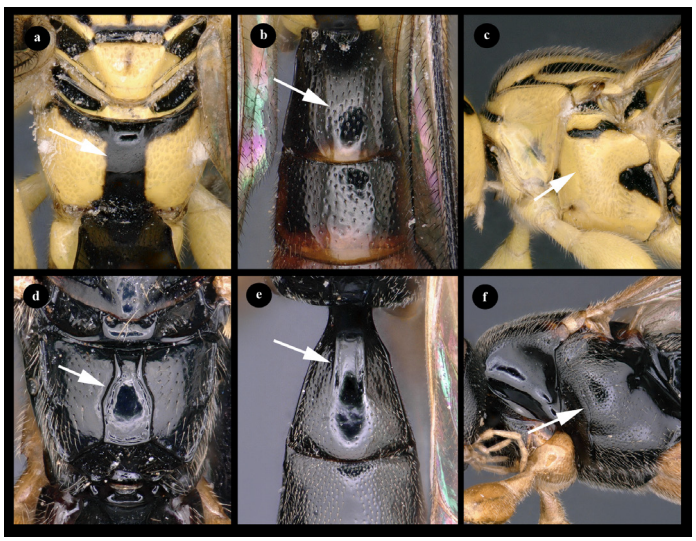

Fig. 14. a–c. *Soliga ecarinata* gen. et sp. nov. **a**. Propodeum, dorsal view. **b**. Metasomal tergites 1–2, dorsal view. **c**. Mesosoma, lateral view. **d–f**. *Triclistus* sp. **d**. Propodeum, dorsal view. **e**. Metasomal tergites 1–2, dorsal view. **f**. Mesosoma, lateral view. Arrow in Fig. 14a points to the absence of propodeal carinae (compared to the presence of propodeal carinae in Fig. 14d). Arrow in Fig. 14b points to the absence of dorsal carinae on first metasomal tergite (compared to the presence of dorsal carinae on first metasomal tergite in Fig. 14e). Arrow in Fig. 14c points to the incomplete epicnemial carina (compared to the complete epicnemial carina in Fig. 14f).

15. Propodeum without anterior transverse carina (Fig. 15a); at least anterior ⅓ of second metasomal tergite with distinct longitudinal carina (Fig. 15b) ..... ***Drepanoctonus*** Pfankuch, 1911
– Propodeum with anterior transverse carina (Fig. 15c); second metasomal tergite without distinct longitudinal carina (Fig. 15d) 16

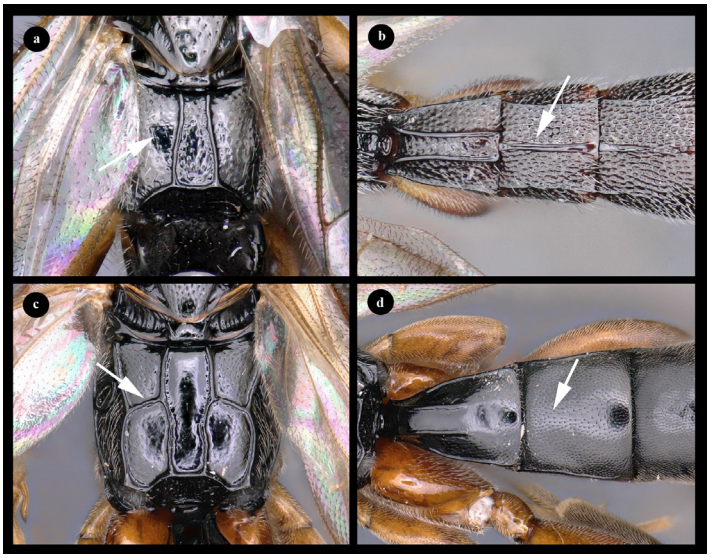

Fig. 15. a. *Carria* sp., propodeum, dorsal view. **b**. *Trieces isolatus* Ranjith & Priyadarsanan, 2022, anterior metasomal tergites, dorsal view. **c–d**. *Hypsicera* sp. **c**. Propodeum, dorsal view. **d**. Anterior metasomal tergites, dorsal view. Arrow in Fig. 15a points to the absence of anterior transverse carina of propodeum (compared to the presence of anterior transverse carina of propodeum in Fig. 15c). Arrow in Fig. 15b points to the presence of midlongitudinal carina on second metasomal tergite (compared to the absence of midlongitudinal carina on second metasomal tergite in Fig. 15d).

16. Occiput vertical (Fig. 16a); metasomal tergite 2 with wide laterotergite (Fig. 16b) .... ***Hypsicera*** Latreille, 1829 (part)
– Occiput roundly sloping (Fig. 16c); metasomal tergite 2 with narrow laterotergite (Fig. 16d) .... ***Macromalon*** Townes & Townes, 1959

Fig. 16. a–b. *Hypsicera* sp. **a**. Head, lateral view. **b**. Metasoma, ventral view. **c–d**. *Macromalon* sp. **c**. Head, lateral view. **d**. Metasoma, ventral view. Arrow in Fig. 16a points to vertical occiput (compared to rounded occiput in Fig. 16c). Arrow in Fig. 16b points to wide laterotergite on metasomal tergite 2 (compared to narrow laterotergite on metasomal tergite 2 in Fig. 16d).

Descriptions

Genus ***Soliga*** gen. nov.
urn:lsid:zoobank.org:act:AC6052D2-5479-4BC8-8B78-52FBB227F04D
Figs 14a–c, 17–20

Type species

Soliga ecarinata gen. et sp. nov.

Comparative diagnosis

The new genus *Soliga* gen. nov. is found to be unique in having the following combination of characters; propodeum without carinae, first metasomal tergite without dorsal carinae, midtibial spurs are equal in length and epicnemial carina largely incomplete or absent dorsally. We provisionally place the new genus to the group of four genera (*Sciron*, *Drepanoctonus*, *Hypsicera* and *Macromalon*) in having two mid tibial spurs equal in length. Apart from the apomorphic characters, the new genus differs from *Sciron* in having mesoscutum without notaulus, first metasomal tergite broad basally, laterotergite 3 narrow basally and ovipositor without subapical dorsal notch. *Soliga* differs from *Drepanoctonus* in having propodeum without carinae, smooth metapleuron and seventh metasomal tergite distinctly exposed. In addition to this the new genus can be distinguished from *Hypsicera* and *Macromalon* from the absence of laterotergite on second metasomal segment. Based on the presence of subequal midtibial spurs, *Soliga* comes close to *Hypsicera* along with other similar characters like absence of fore wing areolet, exposed seventh metasomal tergite and the presence of vertical carina anterior to epicnemial carina. But the new genus differs from the former in having propodeum and first metasomal tergite without carinae and posterior transverse carina of mesosternum straight medio-posteriorly. Even though reduction of epicnemial carina is found in one species of *Exochus* (*E. obezus* Gauld & Sithole, 2002) the new genus can be distinctly separated from *Exochus* by following character, midtibial spurs are equal in length (outer spur distinctly shorter than inner spur in *Exochus*).

Etymology

The new genus is named after ‘Soligas’, the indigenous tribe inhabiting the forests of Biligiri Rangana Hills and adjoining Male Mahadeshwara Hills of Chamarajnagar district, Karnataka. Largely dependent on the forests for livelihood, Soligas are known for their intimate knowledge about biodiversity and the forests. Recognising their stewardship towards forests and the wildlife, the community Forest rights of Soligas have been legally recognized - a first time inside a Tiger Reserve in India. Now the tiger reserve is co-managed by Soligas and the Karnataka State Forest Department.

Description

Head. Head wider than long (Fig. 17b). Eyes glabrous (Figs 17a–e, 18a, 19a), slightly emarginated near antennal torulus (Fig. 17b–c). Face convex in lateral view, distinctly setose (Fig. 17a, d–e). Face and clypeus smooth, sparsely setose, upper part of face produced dorso-medially into a triangular projection, not connected dorsally with longitudinal lamella between bases of antennae (although a low, lamella present), lamella not extending posterior to posterior edge of antennal torulus (Fig. 17c). Clypeus transverse, apical margin straight, slightly concave medially (Fig. 17b). Tentorial pit large (Fig. 17b). Malar space as long as basal width of mandible (Fig. 17b). Malar groove slightly impressed (Figs 17b, 18a, 19a). Mandible stout, not twisted with lower tooth distinctly reduced, upper tooth pointed (Figs 17b, 18a). Labrum concealed (Fig. 17b). Maxillary palps with five segments. Labial palps with four segments. Frons slightly elevated medially without median longitudinal groove or carina (Fig. 17c). Temple roundly narrowed behind eye (Fig. 17c). Posterior of head roundly sloping from posterior ocelli to level of occipital carina (Fig. 17e). Occipital carina complete dorsally (Fig. 17c), ventrally absent, not meeting with hypostomal carina (Fig. 19a). Antenna with flagellomeres longer than wide. Terminal flagellomere acuminate (Fig. 17a).

Mesosoma. Mesosoma longer than high, not distinctly depressed (Fig. 17a, e). Propleuron not inflated laterally (Figs 17a, d–e, 19a). Epomia moderately strong, not meeting with dorsal edge of pronotum (Figs 17a, d–e, 19a). Mesoscutum without notauli except for a pair of large pit anteriorly (Fig. 17f). Scuto-scutellar sulcus smooth without crenulations (Fig. 17f). Scutellum without lateral carina (Fig. 17f). Mesopleuron inflated medially (Figs 17a, d–e, 19a). Epicnemial carina largely incomplete

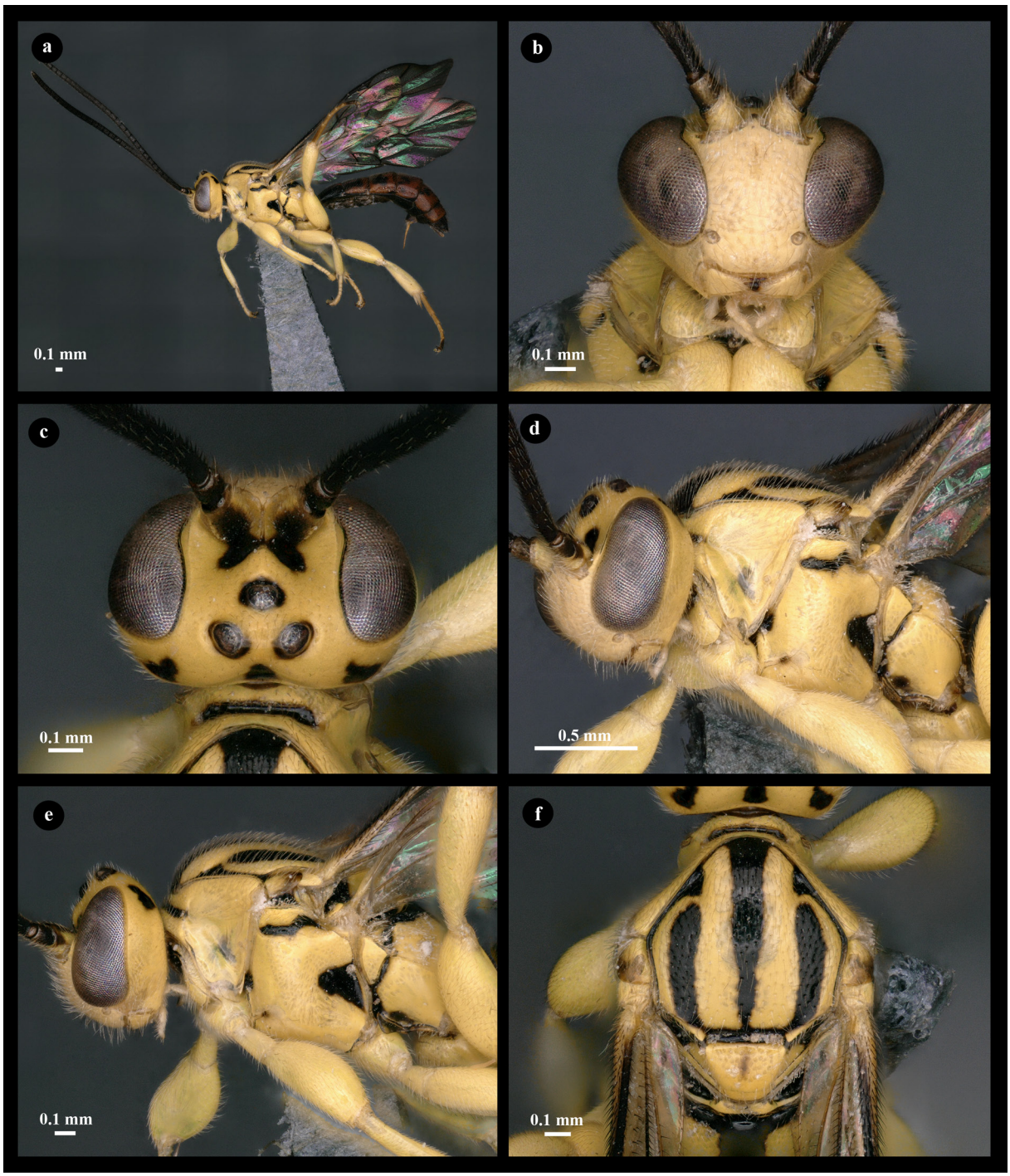

Fig. 17. *Soliga ecarinata* gen. et sp. nov., holotype, ♀ (AIMB). **a**. Habitus, lateral view. **b**. Head, anterior view. **c**. Head, dorsal view. **d**. Head and mesosoma, oblique view. **e**. Head and mesosoma, lateral view. **f**. Mesosoma, dorsal view.

or absent laterally, extending just dorsal to ventral edge of pronotum (Figs 17a, d–e, 19a), present ventrally (Fig. 18a). Epicnemium with a short carina anterior to epicnemial carina (Figs 17a, d–e, 19a). Sternaulus absent (Figs 17a, d–e, 19a). Mesopleural groove not impressed (Figs 17a, d–e, 19a). Mesosternum without posterior transverse carina, at most medioventrally produced into a distinct flange (Figs 17a, d–e, 19a). Mesosternum with posterior transverse carina absent both medially and laterally, submedially with posteriorly protruding, triangular projections (Fig. 18a). Propodeum smooth without trace of carinae (Fig. 18b). Pleural carina present (Fig. 17a, d–e). Metapleuron with distinct metapleural flange (Fig. 17d). Juxtacoxal carina absent (Fig. 17d). Submetapleural carina complete, strongly raised anteriorly to a distinct large lobe (Fig. 17d).

Wings. Fore wing without areolet (Fig. 18d). Vein 1cu-a strongly inclivous and distad M&RS (Fig. 18d). Vein 2rs-m distinctly shorter than vein M between 2rs-m and 2m-cu veins (Fig. 18d). Vein 2m-cu more or less straight (Fig. 18d). Hind wing with distal abscissa of CU distinct (Fig. 18d).

Legs. Robust, all femora thickened (Fig. 17a). Fore tarsomeres 2–4 transverse (Fig. 18a). Fore tibia without apical tooth (Fig. 18a). Fore and mid trochanter undifferentiated (Fig. 18a). Hind and mid tibiae with two spurs (Fig. 18a, c). Mid tibial spurs equal (Fig. 18c). Outer spur of hind tibia shorter than inner spur (Fig. 18c). Apical tarsomeres without hooked lobe on inner side. Claws simple (Figs 18a, 19b).

Metasoma. Metasoma with seven visible tergites (Figs 17a, 18e). Metasomal tergites 1 and 2 separated (Fig. 18f). Metasomal tergite 1 slightly longer than posteriorly wide, broad posteriorly with lateral carina, dorsal and midlongitudinal carina absent (Fig. 18f). Second metasomal tergite without longitudinal carina (Fig. 18f). Metasomal tergites 2–7 wider than long (Fig. 18f). Metasomal tergites 3–5 with distinct laterotergites (Figs 18e, 19b). Laterotergite of metasomal tergite 2 narrow. Laterotergite of metasomal tergite 3 narrow basally broadly widened and rounded apically (Fig. 19b). Laterotergites 3–4 separated by a sharp crease (Fig. 19b). Laterotergite 5 not separated by crease (Fig. 19b). Metasomal tergite 7–8 distinctly exposed in male and female (Figs 17a, 18e). Metasomal sternites moderately sclerotized (Fig. 19b). Female subgenital plate straight apically in lateral view (Figs 17a, 18e), not incised ventrally. Ovipositor sheath exerted (Figs 17a, 18e). Ovipositor short without subapical notch (Figs 17a, 18e).

Male genitalia. Paramere straight basally, separated in dorsal view (Fig. 20a–b). Paramere semicircularly incised apically forming pointed lobes, with long setae medio-laterally rest glabrous (Fig. 20a–b). Outer margin of paramere straight posterior half, diagonally narrowing anterior half (Fig. 20a–b). Inner margin of paramere not folded over, concave submedially, straight posterior half (Fig. 20a–b). Basal ring dorsally complete, angulate ventro-laterally, straight medially (Fig. 20a–b). Apodeme slightly longer than aedaegus (Fig. 20a–b).

Biology

Unknown.

Distribution

India (Karnataka and Nagaland) (Fig. 21).

Soliga ecarinata gen. et sp. nov.
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Figs 14a–c, 17–21

Etymology

The new species is named accordingly, denoting the absence of propodeal carinae, and carinae on metasomal tergites.

Material examined

Holotype

INDIA • ♀; Karnataka, Chamarajanagar, Biligiri Ranga Hill Wild Life Sanctuary; 12°00.345′ N, 77°07.526′ E; 976 m a.s.l.; 20 Oct.–21 Nov. 2005; D.R. Priyadarsanan leg.; Malaise trap; dry deciduous forest; AIMB.

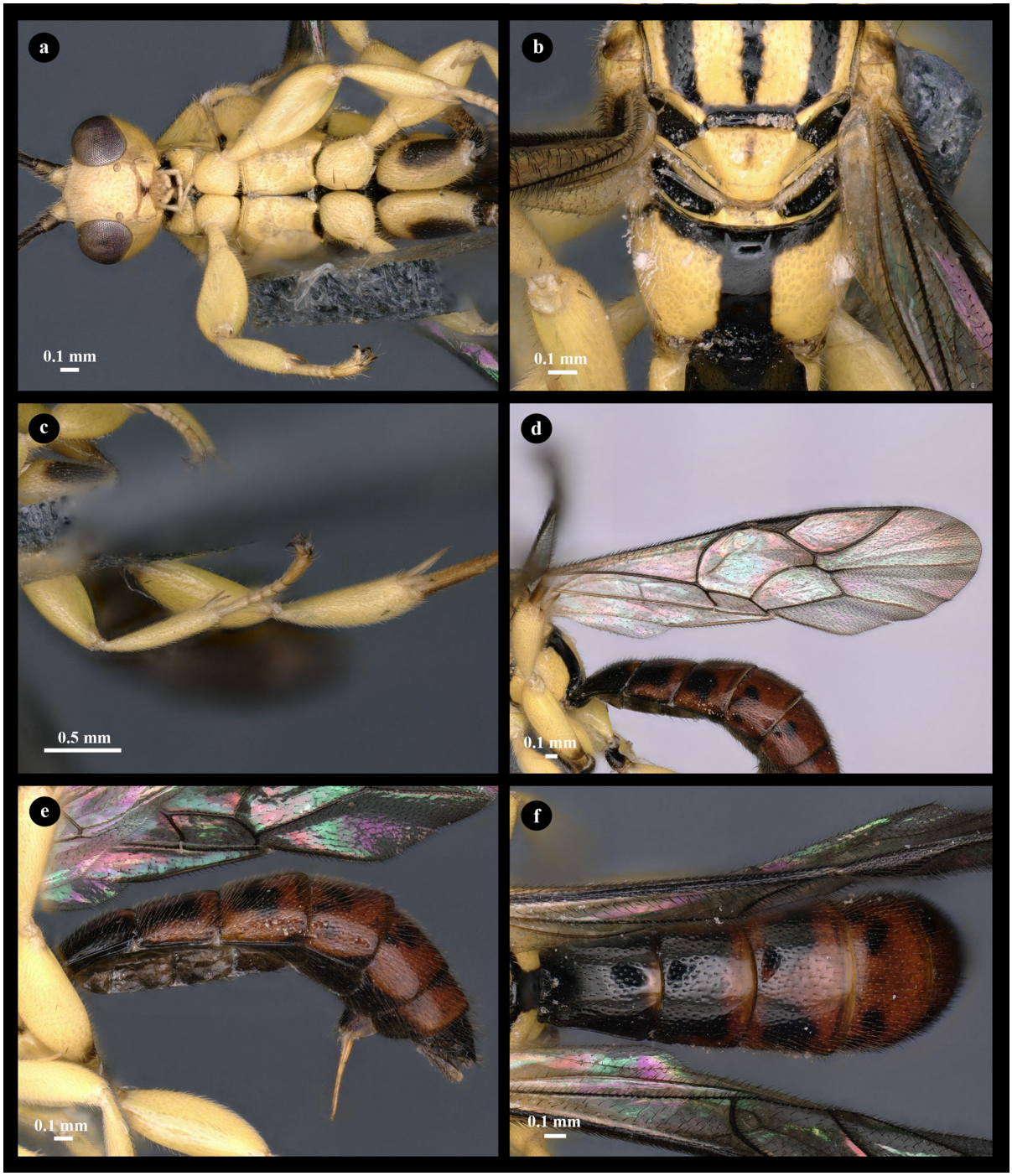

Fig. 18. *Soliga ecarinata* gen. et sp. nov., holotype, ♀ (AIMB). **a**. Head and mesosoma, ventral view. **b**. Propodeum, dorsal view. **c**. Fore and mid legs. **d**. Fore wing. **e**. Metasoma, lateral view. **f**. Metasoma, dorsal view.

Paratypes

INDIA – **Nagaland** • 1 ♀; Phek, Zapami Village, 25°53.3933′ N, 94°24.4991′ E; 18–21 Mar. 2021; A.P. Ranjith leg.; Malaise trap; AIMB. – **Karnataka** • 2 ♀♀; same collection data as for holotype; AIMB • 1 ♀, 1 ♂; Chamarajanagar, Biligiri Ranga Hill Wild Life Sanctuary, Gombekallu; 11°54.363′ N, 77°11.235′ E; 3 Apr.–16 May 2005; D.R. Priyadarsanan leg.; Malaise trap; evergreen forests; AIMB.

Description

Female (holotype)

Measurements. Body length 4.0 mm, fore wing length 3.0 mm.

Head. Head 1.3× as wide as long in anterior view, 1.6× as wide as long in dorsal view. Face 1.1× as long as wide. Face and clypeus not separated by transverse groove (Fig. 17b). Clypeus 2.2× as wide as long, sparsely setose (Fig. 17b). Mandible sparsely setose (Figs 17b, 18a). Malar groove incomplete (Figs 17b, 18a, 19a). Maxillary and labial palps short and stout (Fig. 18a). Temple 0.75× as long as transverse diameter of eye in lateral view. Frons and vertex smooth, sparsely setose (Fig. 17c). Ratio of OOL: diameter of posterior ocellus: POL = 11: 11: 12. Antenna with 29 flagellomeres (Fig. 17a). First flagellomere 1.4× as long as second, 2.0× as long as wide. Second flagellomere 1.4× as long as wide. Terminal flagellomere 3.0× as long as wide.

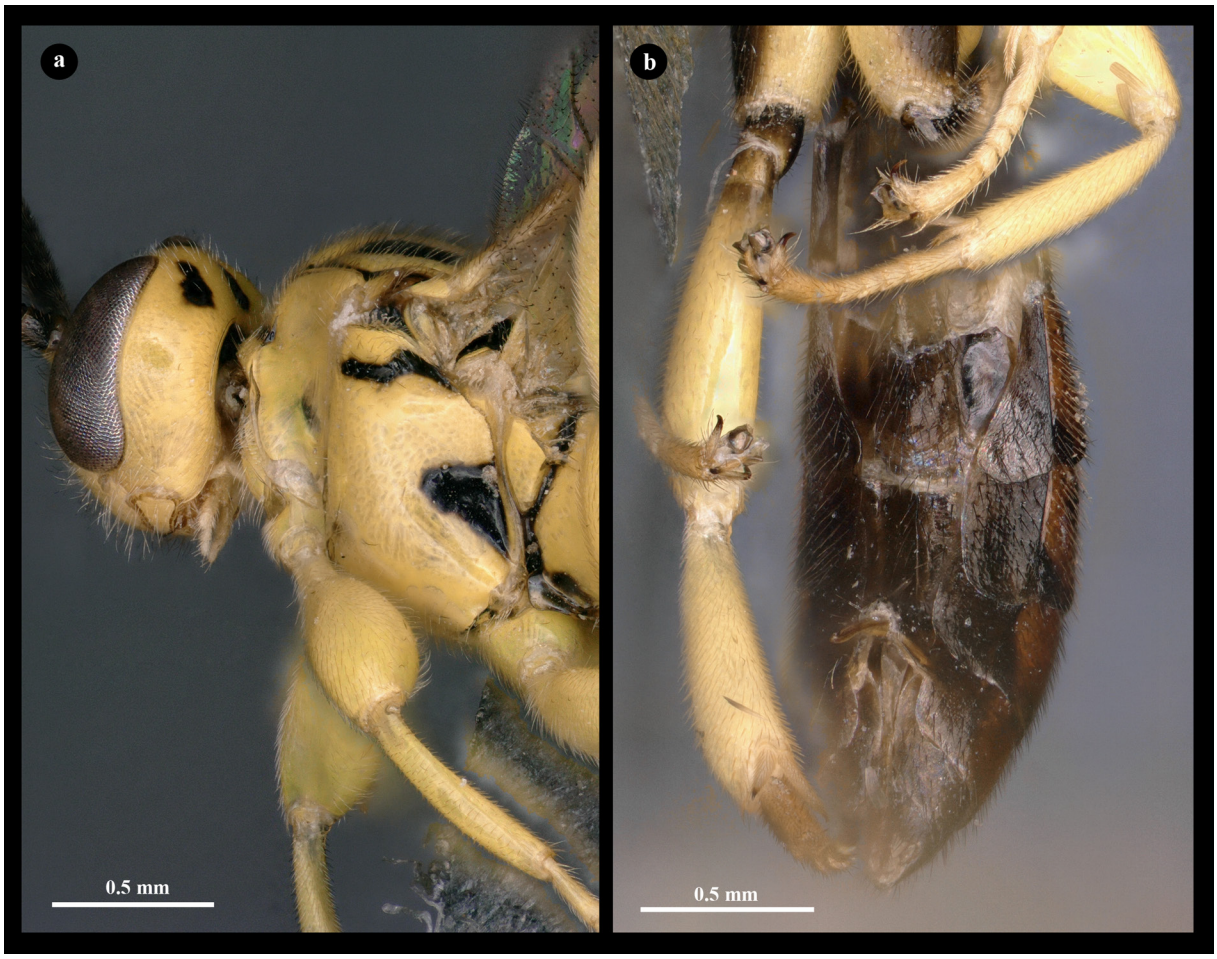

Fig. 19. *Soliga ecarinata* gen. et sp. nov., holotype, ♀ (AIMB). **a**. Head, ventro-lateral view. **b**. Metasoma, ventral view.

Mesosoma. Mesosoma 1.5 × as long as high. Pronotum medio-dorsally smooth (Fig. 17f), glabrous, laterally concave (Fig. 17a, d–e). Mesoscutum as long as wide, smooth, sparsely setose (Fig. 17f). Scutellum 0.7 × as long as wide basally, smooth, sparsely setose (Fig. 17f). Propodeum smooth, sparsely setose (Fig. 18b). Mesopleuron smooth, sparsely setose (Figs 17a, d–e, 19a). Metapleuron smooth mostly glabrous (Fig. 17d). Pleural carina bend downwards bordering anterior transverse groove (Figs 17a, d–e, 19a).

Metasoma. Metasomal tergites smooth and polished, distantly punctate, sparsely setose (Figs 17a, 18e–f). First metasomal tergite 1.1 × as long as apical width. Second metasomal tergite 0.7 × as long as apically wide. Third metasomal tergite 0.6 × as long as apically wide. Subgenital plate smooth, setose (Figs 18e, 19b). Ovipositor sheath setose (Fig. 18e).

Colour. Body (generally) yellow, eye grey; flagellomeres, scape and pedicel laterally, tip of mandible, pterostigma, wing venation, tarsal claws, metasomal sternites, laterotergites, ovipositor sheath brown; ocellar region, occiput laterally and medially with black patches; pronotum dorsally with black transverse band; mesoscutum with medial and lateral longitudinal black bands, with black margin laterally and anteriorly; scutoscutellar groove black; mesopleuron with black band anteriorly and medio-posteriorly; metapleuron with black band anteriorly; propodeum with black transverse band basally and broad longitudinal band medially; first and second metasomal tergites black except apical yellowish band, third metasomal tergite with a pair of sublateral broad spots basally, fourth metasomal tergite with black spots baso-laterally, fifth and sixth metasomal tergites with black spots baso-laterally; first and second metasomal tergite apically, metasomal tergites 3–6 except baso-laterally reddish brown.

Male

Same as female.

Biology

Unknown.

Distribution

India (Karnataka and Nagaland).

Fig. 20. *Soliga ecarinata* gen. et sp. nov., paratype, ♂(AIMB). **a**. Genitalia, dorsal view. **b**. Genitalia, ventral view.

Discussion

The cosmopolitan ichneumonid subfamily Metopiinae belongs to the clade Ophioniformes Gauld, 1985 (Bennett *et al*. 2019), more specifically to the basal Ophioniformes along with Banchinae Wesmael, 1845, Ctenopelmatinae, Neorhacodinae Hedicke, 1922, Oxytorinae Thomson, 1883, Phrudinae Townes & Townes, 1949 (as a synonym of Tersilochinae Schmiedeknecht, 1910), Stilbopinae Townes & Townes, 1949, Sisyrostolinae Townes, 1961, Tersilochinae and Tryphoninae (Quicke *et al*. 2009). It has been suggested that metopiines are derived from Ctenopelmatinae (Gauld & Wahl 2006). However, based on a total evidence parsimony analysis considering morphological, biological and molecular data, Bennett *et al*. (2019) rejected this hypothesis and placed metopiines closer to Banchinae and Stilbopinae. Most genera of the subfamily Metopiinae show rather wide distribution except some endemic genera like *Hemimetopius* Benoit, 1955 (Afrotropical), *Sciron* (Australian region), *Bothromus* Townes & Townes, 1959 (Nearctic), *Cubus*, *Forrestopius* and *Ojeulos* (Neotropical) (Yu *et al*. 2016). The recent discovery of *Trieces* from the Oriental region and new generic distribution record of metopiine genera from the Eastern Palaearctic and Oriental regions further support this argument (Choi *et al*. 2016b; Ranjith & Priyadarsanan 2022). Until now only 24 metopiine species belonging to eight genera are known from India (Yu *et al*. 2016). The new distribution of several genera like *Aceraspis*, *Chorinaeus* and *Trieces* evidently support the rich diversity of metopiines in this region (Ranjith & Priyadarsanan 2022; Ranjith unpublished data). Though metopiine species are reported from a wide elevational gradient (0–4100 m a.s.l.), their diversity is found to decrease above 1600 m a.s.l. (Gauld & Sithole 2002). In the meantime, the endemism is found to increase with elevation. Many endemic genera like *Forrestopius* are seen only at higher elevation (Gauld & Sithole 2002; Alvarado & Palacio 2021). Discovery of the new

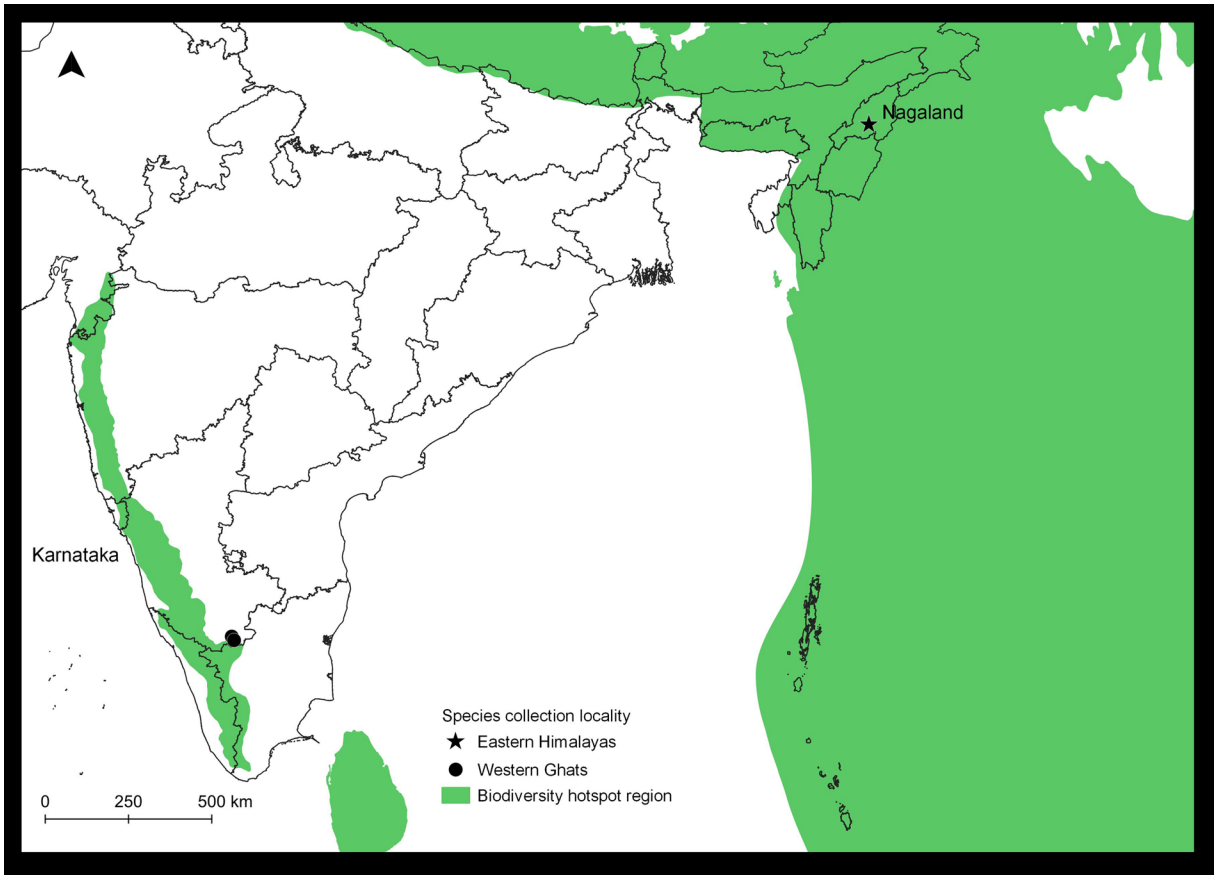

Fig. 21. Collection localities of *Soliga ecarinata* gen. et sp. nov.

genus, *Soliga* evidently supports this trend as it was collected from higher elevation (>1400 m a.s.l.), though the traps were deployed between 0–1600 m a.s.l.

We place *Soliga* gen. nov. in the group of the genera *Sciron*, *Drepanoctonus*, *Hypsicera* and *Macromalon* based on the presence of mid tibial spurs equal in length which is a putative synapomorphic character of these group of genera. Though this character helps us to delineate two different groups of genera, we found that this could be nearly a variable character by considering Costa Rican species of *Hypsicera* (Gauld & Sithole 2002). The new genus *Soliga* is very distinctive among all metopiines by the loss of the epicnemial carina in the dorsolateral part of the mesopleuron. Reduction of the epicnemial carina is found to be a very unusual character within the Metopiinae as only the genus *Metopius* shows this character at subgeneric level (in subgenera *Cultrarius* Davis, 1897 and *Peltocarus* Thomson, 1887) (Townes 1971). In addition to this, one species of *Exochus* (*E. obezus*) exhibits a partly reduced epicnemial carina (Gauld & Sithole 2002). Additionally, loss of carinae on the propodeum and metasomal tergites is found to be the apomorphic characters which can be seen in different metopiine genera (Townes 1971; Fitton 1984; Berry 1990; Gauld & Sithole 2002). It is probable that the character, reduction of propodeal and metasomal carina evolved multiple times in different genera like *Triclistus*, *Sciron* and *Exochus* as species of these genera exhibit these characters either separately or combined (Fitton 1984; Berry 1990; Gauld & Sithole 2002).

Based on the deeply incised paramere of male genitalia the new genus is similar to the genus *Triclistus* (in *T. slimellus* Gauld & Sithole, 2002 (Gauld & Sithole, 2002)), but distinctly differs by the absence of longitudinal groove present between interantennal process and median ocellus and hooked lobe on the inner side of metatarsomeres (found only in females) which is reported as an apomorphic character of most species of *Triclistus* (Gauld & Sithole 2002). Character like presence or absence of fore wing areolet is another variable character within the genera of Metopiinae (Fitton 1984) as three genera *Leurus* Townes, 1946, *Sciron* and *Triclistus* are polymorphic for this character. In conclusion the intergeneric classification of Metopiinae is somewhat unstable due to indistinct delimitation of genera like *Chorinaeus* and *Trieces* (Ranjith & Priyadarsanan 2022) and *Hypsicera* and *Stethoncus* (Broad *et al*. 2018). Most of the regional revisions did not yield a clearer picture about the supraspecific relationships rather than some informal comments. Comprehensive analyses combining molecular and morphological data would be needed to depict a clearer picture of metopiine taxonomy and systematics by considering global fauna.

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