



First record of a rare masked bee *Hylaeus (Indialaeus) strenuus* (Cameron, 1897) from south India with an updated checklist of *Hylaeus* species (Hymenoptera, Colletidae)

Arati Pannure, K.L. Manjunatha, Vidya Mulimani[#] and Vasuki V. Belavadi^{**}

College of Sericulture, University of Agricultural Sciences, Bengaluru, Chintamani 563125, Karnataka, India.

[#]*Department of Entomology, Gandhi Krishi Vignan Kendra, University of Agricultural Sciences, Bengaluru 560065, Karnataka, India.*

Email: vvbeldvadi@gmail.com

ABSTRACT: A rare species of masked bee *Hylaeus strenuus* (Cameron, 1897) is reported for the first time from south India. Diagnosis of the species together with the illustrations of morphological characters is presented. Images of the trap nest and nest parameters are provided. A revised checklist of all the known species of the genus *Hylaeus* from south India along with species distribution map is also provided.

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KEYWORDS: Apoidea, new report, diagnosis, checklist, distribution

INTRODUCTION

Bees in the genus *Hylaeus* Fabricius, 1793 (Family Colletidae) are one of the small sized bees (forewing length: 5–8mm) which are relatively hairless and wasp-like, with a prominent yellow/white paraocular markings on the face (yellow faced bees or masked bees). These are also called plasterer bees because of their unique nature of lining their nest cells with a self-secreted cellophane-like material. Cell lining is made of lipids and proteins which is a transparent water proof membrane, insoluble in different solvents and resistant to fungal attack (Almeida, 2008). Unlike most bees, *Hylaeus* carry pollen internally in the crop instead of on body hairs (Michener, 2007). Many species nest in preexisting cavities in plant stems and twigs, plant galls, beetle borings, old cells of bees and wasps and some nest in the ground (Michener, 2007;

Scheuchl and Willner, 2016). *Hylaeus* bees are poorly known from the Oriental region in general (Snelling, 1980; Dathe, 2011; Magnacca *et al.*, 2011). According to Ascher and Pickering (2023), though there are about 768 species of the genus *Hylaeus* worldwide only 18 species are recorded from India, six of which occur in south India (Saini *et al.*, 2021).

In this paper, *H. (Indialaeus) strenuus* (Cameron, 1897) is reported, not previously documented to occur in south India. This species shows rare distribution across its range, with earlier records from Gujarat, Sikkim and West Bengal (Saini *et al.*, 2021). In 2007, this species was reported from O'ahu, Hawaii (United States), as a recent introduction from India (Dathe, 2011; Magnacca *et al.*, 2011, 2013). Nothing is known about its biology in its native range. However, like *Ceratina*

* Author for correspondence

smaragdula (Fabricius, 1787) (Apidae), this species is reported to nest in twigs and collect pollen from *Scaevola sericea* Vahl and *Scaevola taccada* (Gaertn.) Roxb. (Goodeniaceae), *Heliotropium foertherianum* (Blanco) Mabb. (Boraginaceae), *Erythrina sandwicensis* O. Deg. (Fabaceae) and *Metrosideros polymorpha* Gaudich. (Myrtaceae) in Hawaii (Magnacca *et al.*, 2011; Magnacca and King, 2013). During a survey in south India, for the first time this species was collected from artificial trap nests installed in Chintamani, Karnataka. Brief diagnosis of the species together with the illustrations of morphological characters is given. Nest parameters are discussed. An updated checklist of species of the genus *Hylaeus* from south India is presented, with a distribution map.

MATERIALS AND METHODS

Specimens were obtained from artificial trap-nest (Bamboo stem pieces 34.00cm long and 2.00cm outer diameter) that were installed in the bee park (13°20'08"N; 78°04'55"E, 858m) at College of Sericulture, Chintamani, Karnataka, India (Fig. 3D). The study site recorded a mean maximum temperature of 30.10°C, mean minimum temperature of 18.58°C, mean precipitation of 153.69 mm, mean relative humidity of 71.81 per cent, and wind velocity of 7.90 km h⁻¹.

Identification of bees followed original descriptions and keys (Cameron, 1897; Snelling, 1980; Dathe, 2011; Saini *et al.*, 2021). For external morphological studies, a Nikon SMZ 800N microscope was used. Digital colour images of important diagnostic characters and habitus of species were taken using Leica SAPO stereomicroscope with Flexacam C3 camera attachment. Images were edited with Adobe Photoshop CS (Version 9.0). Morphological characters used mainly follow the terminology used by Michener (2007), Snelling (1980), Dathe (2011) and Magnacca *et al.* (2011). All measurements were taken as the maximal length of body parts measured using a Leica SAPO stereomicroscope. Body length was measured from the anterior margin of head to the posterior margin of metasomal tergum 2 (T2). Head: length- mid-ocellus to apical margin of clypeus and maximum width - between outer margins of eyes as in front view. Nest

parameters like number of cells built, cell length, the diameter of the entrance, type of the material used for remodeling nests and cell partitions and other parameters were recorded.

Voucher specimens from this study are deposited in the Insect Museum, Department of Entomology, University of Agricultural Sciences, Gandhi Krishi Vignana Kendra, Bangalore Karnataka, India. The checklist along with geographical distribution data of species was prepared by extracting published faunal records (Cameron, 1897; Snelling, 1980; Dathe, 2010; Dathe, 2011; Magnacca *et al.*, 2011; Saini *et al.*, 2021) and world checklist (Ascher and Pickering, 2023). Mapinfo Professional 7.5SCP was used for generating the distribution map of species.

RESULTS AND DISCUSSION

Systematic accounts

Family: Colletidae

Sub family: Hylaeinae

Genus: *Hylaeus* Fabricius, 1793

Subgenus: *Indialaeus*

Prosopis strenua Cameron, 1897. Loc. typ.: Barrackpore (Barakpur), West Bengal, India.

= *Hylaeus (Indialaeus) strenuus* (Cameron, 1897) sensu Dathe (2010)

***Hylaeus (Indialaeus) strenuus* (Cameron, 1897)
Figs. 1, 2**

Hylaeus strenuus (Cameron, 1897)

Prosopis striatifrons Cameron, 1897: 89 ♀ (syn.) according to Dathe (2010: 66- 67).

Prosopis strenua Cameron, 1897: 91 ♂ (syn.) according to Dathe (2010: 66- 67).

Braunsapis chandrai Gupta & Sharma in Gupta *et al.*, 2015: 373 – ♂ (syn.) according to Saini *et al.*, 2021

Material examined: INDIA: Karnataka: Chintamani, 13°20'08"N; 78°04'55"E, 858 m, 4 ♀ and 1 ♂, 25.iii.2022, Trap nest, Coll. Arati Pannure; 1 ♀, 14. iv.2023, Coll. Manjunath, K.L.; 1 ♀, 1.vi.2023, Coll. Arati Pannure; 865m, 13°16' N; 78°

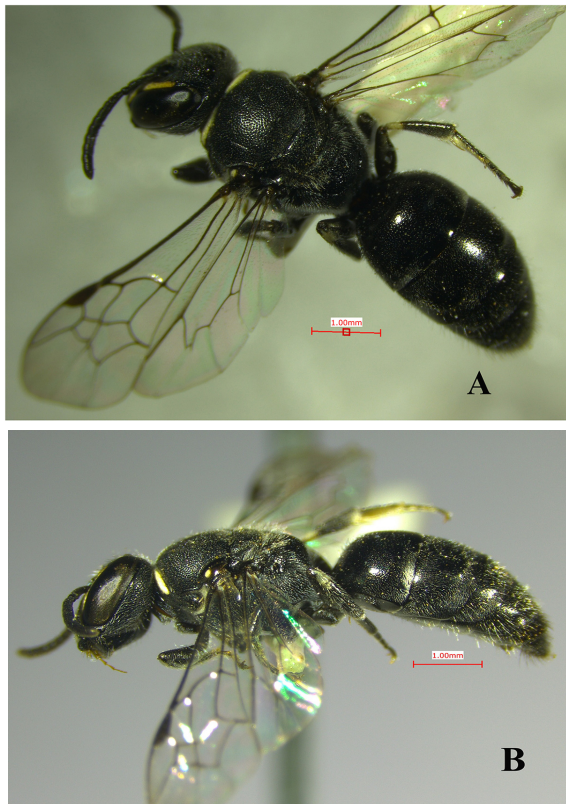


Fig. 1 Habitus of *Hylaeus (Indialaeus) strenuus* (Cameron, 1897), -Female
A - dorsal view; B - lateral view. Scale bar=1mm

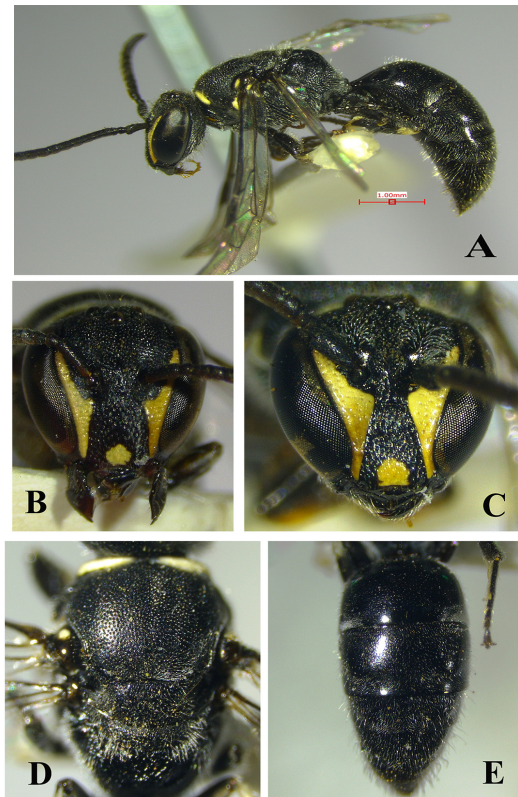


Fig. 2 A, Habitus of *Hylaeus (Indialaeus) strenuus* (Cameron, 1897), Male, lateral view; B, C, head, frontal view (Facial maculation patterns of female (B) and male (C)); D, Mesosoma (Female); E, Abdomen (Female)

12° E, 1 ♀, 22.iii.2023, Coll. Pampareddy.

Measurements: Female. Body length: 4.40-4.80 mm (Head + mesosoma + T1+T2). Head: median length- 1.45mm (n=4) & maximum width - 1.83 (n=4). Scutum median length – 1.19 and maximum width 1.57. Total length of fore wing 5.04mm.

Male. Body length: 4.27 mm (n=1). Head: median length- 1.40mm and maximum width - 1.72 (n=4). Scutum median length – 0.97mm and maximum width 1.50. Total length of fore wing 4.60mm.

Diagnosis: The species differs from the other known species of the *Hylaeus* in India by the following characters: This species possesses strong and coarse punctures on head and mesosoma. Mesopleura with smooth ground sculpture, highly shiny especially in males. Clypeus striate-punctate; supraclypeal area and area above it on frons finely

strigate. Orbits strongly convergent below. Lateral margin of clypeus distinctly separated from inner eye margin (Figs. 2B, C). Mandibles clearly bidentate; preapical notch of mandible strong, a distinct preapical tooth present. **Female** mandibles are unusually broad (Fig. 2B). Median area of the propodeum is rugose only medially, with distinct smooth impunctate area laterad; bordered by a stout transverse semicircular keel/carina which is incomplete medially. **Males:** Copulatory apparatus with long setae; apical lobe of sternum 8 with setae. Males have long, attenuate gonoforceps which protrude slightly beyond the apex of the abdomen even when retracted. Both sexes have first tergum with apicolateral pubescent patch of appressed, plumose pubescence; the apical area of second metasomal tergite distinctly depressed, with the posterior rim shining, impunctate, and reflexed upward (Fig. 2E).



Fig. 3 A, Linear array of nest cells of *H. (Indialaeus) strenuus* with cellophane-like cell lining in bamboo trap nest. B, C, individual cells showing length of the cell and empty space between cells. D. Artificial trap-nests (Bee hotel) at bee park at College of Sericulture, Chintamani, Karnataka, India from where nests of *H. (Indialaeus) strenuus* collected



Fig. 4 Distribution map of *Hylaesus* species in south India. Blue point in the map (●) indicates location of Chintamani, Karnataka from where *Hylaesus (Indialaeus) strenuus* (Cameron, 1897) was collected. Red points (●) indicate the places where the other species of *Hylaesus* have been recorded

Table 1. Nest parameters of *H. strenuus*

Cell No.	Length of the cell (mm)	Empty space between cells (mm)
1	5.69	1.20
2	5.75	1.24
3	5.75	1.24
4	5.74	1.24
5	5.74	2 cells: 3.09; Left cell: 1.84 Right cell: 1.24
6	5.73	0.94
7	5.73	0.67
8	5.82	1.24
9	5.62	1.08
10	5.62	1.08
11	5.62	1.08
12	6.24	1.02
13	6.24	-
Mean ± STD	5.79 mm ± 0.21 (n=13)	1.11 ± 0.17 (n=12)

Coloration: Blackish. The following ivory: Both males and females have elongate lateral face marks and a small anteromedial clypeal mark (Fig. 2B–C); pronotal collar interrupted in middle (Fig. 2D); posterior part of pronotal lobe in male (Fig. 2A); an anterior spot on tegulae (Fig. 2D). Female: Only hind tibiae with ivory spot at base. Mandibles black, ferruginous at tip. Flagellum dark brown, slightly paler beneath. Wings clear, veins and stigma brown; apex of fore wings little smoky.

Nest parameters: Trap nest made of bamboo occupied by *H. strenuus* in March, 2022 was collected and stored in an emergence cage. From the nest, 4 females and one male emerged during last week of March & first week of April, 2022. In 2023, 3 females were collected from artificial trap nest (at bee hotel, Fig. 3D) during March to June. The traps had an entrance diameter of 3.8 mm and nest was 95–98 mm long. Trap nest consisted of linear series of 13 cylindrical sack like cells (Fig. 3A–C). This species constructed cells out of a clear single-layered cellophane-like transparent lining which was lightly adhered to the trap nest walls. Brood cell length varied between 5.62 – 6.24 mm with the average brood cell length of 5.79 mm \pm 0.21 (n=13) (Table 1). The length of the empty space between cells varied from 0.67 mm to 1.24 mm with the average length of 1.11 \pm 0.17 (n=12). Nest was observed only after the emergence of the adults, no vestibular and intercalary cells were differentiated. However, after the empty space of fifth cell, a short cell of 1.84 mm length was observed.

Peak activity Period: March to June

Distribution: India: Gujarat, Jharkhand, Karnataka (new record), Sikkim, and West Bengal. Elsewhere: United States (Hawaii), Singapore?

Checklist of known species of *Hylaeus* from south India:

1. *H. (Indialaeus) parmatus* Snelling, 1980

H. parmatus Snelling, 1980: 10 ♂.

Distribution: India: Tamil Nadu (Ascher and Pickering, 2023).

2. *H. (Indialaeus) peltates* Snelling, 1980

H. peltates Snelling, 1980: 12 ♂.

H. eurygnathus Snelling, 1980: 14 ♀ (syn.) according to Dathe, (2011: 257)

Distribution: India: Karnataka, Tamil Nadu (Saini *et al.*, 2021; Ascher and Pickering, 2023).

3. *H. (Indialaeus) sedens* Snelling, 1980

H. sedens Snelling, 1980: 13 ♀.

Distribution: India: Puducherry, Tamil Nadu (Saini *et al.*, 2021). Elsewhere: Sri Lanka (Karunaratne *et al.*, 2005; Ascher and Pickering, 2023).

4. *H. (Indialaeus) strenuus* (Cameron, 1897)

H. strenuus (Cameron, 1897)

Prosopis striatifrons Cameron, 1897: 89 ♀ (syn.) according to Dathe (2010: 66–67).

P. strenua Cameron, 1897: 91 ♂ (syn.) according to Dathe (2010: 66–67).

Braunsapis chandrai Gupta & Sharma in Gupta *et al.*, 2015: 373 – ♂ (syn.) according to Saini *et al.*, 2021

Distribution: India: Gujarat, Jharkhand, **Karnataka** (new record), Sikkim, West Bengal (Ascher and Pickering, 2023). Elsewhere: United States (Hawaii) (Magnacca *et al.*, 2011; 2013; Ascher and Pickering, 2023), Singapore? (Ascher *et al.*, 2022).

5. *H. (Indialaeus) thyreus* Snelling, 1980

H. thyreus Snelling, 1980: 7 ♂.

Distribution: India: Tamil Nadu (Ascher and Pickering, 2023).

6. *H. oresbius* Snelling, 1980

H. oresbius Snelling, 1980: 5 ♂.

Distribution: India: Tamil Nadu (Ascher and Pickering, 2023).

7. *H. porcatus* Snelling, 1980

H. porcatus Snelling, 1980: 7 ♂.

Distribution: India: Tamil Nadu (Ascher and Pickering, 2023).

Of the 18 species that are known from India, seven

occur in south India including a newly recorded *H. strenuus*. Most of the Indian species of *Hylaeus* are known only from the type specimens (majority from males only) or at the most, from two or three localities. Based on earlier records from India it can be assumed that *H. (Indialaeus) strenuus* is clearly a rare species and is known by only a few recent records and small extent of occurrence from most parts of its range despite many years of intensive field surveys. Little is known about the biology of this species. Therefore, the documentation of this species from south India assumes significance for taking up conservation strategies and management.

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