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Taxonomic studies on the ant genus *Lepisiota* Santschi 1926 (Hymenoptera: Formicidae: Formicinae) in India, with description of four new species

Anand Harshana and Debjani Dey

National Pusa Collection, Division of Entomology, ICAR-Indian Agricultural Research Institute, New Delhi, India

ABSTRACT

Taxonomic studies were carried out on the ant genus *Lepisiota* Santschi, 1926 in India, with the description of four new species, *L. binghami* **sp. nov.**, *L. pusaensis* **sp. nov.**, *L. satpuraensis* **sp. nov.**, and *L. wilsoni* **sp. nov.**, based on the worker caste. Redescription and new distribution records of five known species, *L. annandalei* (Mukerjee, 1930), *L. bipartita* (Smith, 1861), *L. integra* (Forel, 1894), *L. layla* Wachkoo, Bharti & Akbar, 2021, and *L. pulchella* (Forel, 1892), are provided. An identification key to the seventeen Indian species of *Lepisiota* based on the worker caste is presented. The male genitalia of *L. bipartita* are described in detail with the illustration of different morphological details. In addition, the DNA barcode of *L. annandalei, L. bipartita, L. pulchella*, and *L. pusaensis* **sp. nov**. is generated.

Lepisiota binghami
http://zoobank.org/urn:lsid:zoobank.org:act:8AC39CAD-C2B8-4B8C-93C5-F8E891DF1F47
Lepisiota pusaensis
http://zoobank.org/urn:lsid:zoobank.org:act:6040B8D0-E6A4-4082-AD98-A1785C33BB96
Lepisiota satpuraensis
http://zoobank.org/urn:lsid:zoobank.org:act:0CAEE697-D876-4A9D-B053-AF5FDDD54FD0
Lepisiota wilsoni
http://zoobank.org/urn:lsid:zoobank.org:act:119BCDA7-C751-413F-8F53-9980194B6477

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Taxonomy; *Lepisiota*; new species; key; male genitalia; DNA barcoding; Central India

Introduction

Lepisiota was originally described by Santschi (1926) as a subgenus of *Acantholepis* Mayr, 1861. Later, *Acantholepis* Mayr, 1861 was found to be a junior homonym of *Acantholepis* Kroyer, 1846 (Pisces), and hence *Lepisiota*, being the first available replacement name, becomes a valid genus (Bolton 1995). Genus *Lepisiota* Santschi is a diverse genus of the subfamily Formicinae, comprising 139 species and subspecies (Bolton 2021; Wachkoo et al. 2021; Jaitrong et al. 2022), mainly from Afrotropical, Indomalaya, and Palearctic regions. In India, the taxonomy of the genus

CONTACT Debjani Dey ddeyiari@hotmail.com National Pusa Collection, Division of Entomology, ICAR-Indian Agricultural Research Institute, New Delhi 110012, India

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Lepisiota was treated by Forel (1892, 1894, 1895, 1902), Bingham (1903), Mukerjee (1930), Bharti (2002). Recently taxonomic revision of the genus *Lepisiota* was published by Wachkoo et al. (2021), recognising thirteen species from India. Nonetheless, this genus remains poorly explored in many parts of India.

In the present study four new species, *L. binghami* **sp. nov**., *L. pusaensis* **sp. nov**., *L. satpuraensis* **sp. nov**., and *L. wilsoni* **sp. nov**., are described along with redescription and new distribution records of five known species. The male genitalia of *L. bipartita* is described. The DNA barcode of four *Lepisiota* species from India has also been generated and submitted to National Center for Biotechnology Information (NCBI) and The Barcode of Life Data System (BOLD). We solve uncertainty around *L. opaca* by studying its type specimens images and original description by Forel (1892).

Materials and methods

Lepisiota specimens were collected from various parts of India by direct hand collection method and preserved in 70% alcohol. The specimens were mounted on card points for morphological observations and photography. Ant specimens in the National Pusa collection (NPC), New Delhi also examined. The specimens were studied under the Leica S8AP0 stereo microscope and photographed using LEICA MC190 HD digital camera attached to the LEICA M205 C stereozoom automountage microscope. The measurements were recorded by using LEICA software LAS V4.13.0 in millimetres (mm) up to two decimals. All the studied specimens and type specimens have been deposited in the NPC, Division of Entomology, Indian Agricultural Research Institute, New Delhi, India. All new distribution records for the species are marked by an asterisk.

Institutional abbreviations

MHNG = Museum of Natural History, Geneva, Switzerland
MSNG = Natural History Museum, Genoa, Italy
NPC = National Pusa collection, IARI, New Delhi, India
IARI = Indian Agricultural Research Institute, New Delhi, India

Measurements and indices

The measurements and indices follow Sharaf et al. 2020 (except MML, TL, and REL):

EL Eye length: Maximum diameter of the compound eye measured in oblique lateral view.

HL Head length: Maximum distance from the midpoint of anterior clypeal margin to the midpoint of posterior margin of head, measured in full-face view.
HW Head width: Maximum width of the head behind eyes in full-face view.
MML Mesometanotum length: Maximum length of mesometanotum in dorsal view.
PH Petiole height: measured from petiole sternum to apex in profile view.
PRW Pronotal width: Maximum pronotal width in dorsal view.
SL Scape length: Maximum scape length excluding basal condyle and neck.
TL Total length: Roughly measured from anterior clypeal margin to tip of the gaster.
WL Weber's length: Diagonal length of mesosoma in profile view from the posteroventral margin of the propodeal lobe to anterior-most point of the pronotal slope, excluding neck.
CI Cephalic index: HW/HL × 100
OI Ocular index: EL/HW × 100
REL Relative eye length index: EL/HL × 100
SI Scape index: SL/HW × 100

Male genitalia study

The apical part of the gaster including abdominal segment nine and genitalia of *Lepisiota bipartita* was detached and cleared with 10% KOH. Genitalia was dissected and studied under a stereomicroscope (Leica S8AP0). Multi-focused montage images were created using LEICA MC190 HD digital camera attached to the LEICA M205 C stereozoom automountage microscope. Morphological terminologies from Yamada and Eguchi (2016) and Boudinot (2013) were used for description.

Molecular study

The genomic DNA of ants was extracted from the whole body of ants except gaster by using DNASure® Tissue Mini Kit (Genetix Biotech Asia Pvt. Ltd., New Delhi) with the manufacturer's protocol and preserved at −20°C. PCR amplification of the mtCOI region was done with universal primers (LCO1490: 5'-GGTCAACAAATCATAAAGATATTGG-3'; HCO2198: 5' TAAACTTCAGGGTGACCAA AAAA TCA-3') (Folmer et al. 1994) under optimised conditions for 25 µL reaction using 12.5 µL of Master mix SRL, 8.5 µL nuclease-free water, 1 µL each of forward (LCO1490) and reverse (HCO2198) primers with 2 µL of extracted DNA. The amplified PCR products were run on 1% agarose gel electrophoresis (SCIE-PLAS HU10 Mini-Plus horizontal) and visualised under AlphaImager® HP (AlphaView Version 3.2.2.0) for confirmation. The amplified PCR products

were sequenced at the commercial facilities of SciGenomePvt Ltd (Cochin, India). DNA barcode sequences were submitted to NCBI and GenBank accession numbers were obtained (Table 1). The sequences were also submitted to BOLD under the project name 'DNA Barcoding of Indian ants'.

Results and discussion

Genus *Lepisiota* Santschi, 1926

Type species: *Plagiolepis rothneyi*; Forel, 1894

Worker diagnosis

Antennae 11 segmented; propodeum armed with a pair of spines, teeth, or tubercles; the dorsal edge of petiole armed with a pair of teeth or spines but sometimes only emarginated; acidopore well-developed (Bolton 1994).

List of the Indian species of *Lepisiota* Santschi, 1926

Lepisiota annandalei (Mukerjee, 1930)
Lepisiota binghami **sp. nov.**
Lepisiota bipartita (Smith, 1861)
Lepisiota fergusoni (Forel, 1895)
Lepisiota integra (Forel, 1894)
Lepisiota layla Wachkoo, Bharti & Akbar, 2021
Lepisiota lunaris (Emery, 1893)
Lepisiota mayri Wachkoo, Bharti & Akbar, 2021
Lepisiota modesta (Forel, 1894)
Lepisiota opaca (Forel, 1892)
Lepisiota pulchella (Forel, 1892)
Lepisiota pusaensis **sp. nov.**
Lepisiota rothneyi (Forel, 1894)
Lepisiota satpuraensis **sp. nov.**
Lepisiota sericea (Forel, 1892)
Lepisiota wilsoni **sp. nov.**
Lepisiota wroughtonii (Forel, 1902)

Key to the workers of Indian species of *Lepisiota* Santschi, 1926 (based on Wachkoo et al. 2021)

1. Antennal scape long, surpassing posterior margin of head by about half of its length or more (Figs 5E, 7B) 2
–. Antennal scape short, surpassing posterior margin of head by a third of its length or less (Fig. 8C) 4

2. Bicoloured species; head and gaster dark brown to black while mesosoma reddish-brown (Fig. 5D–F)..... ***L. bipartita*** (Smith)
–. Uniformly dark-brown or black-brown species..... 3
3. Dark brown species; petiolar scale with distinctly angular sides, dorsally emarginate with teeth-like apical corners (Fig. 7A)..... ***L. integra*** (Forel)
–. Black-brown species; petiolar scale with smoothly curved sides, dorsally rounded and narrow, without teeth (Wachkoo et al. 2021, Figs 35–36) ..... ***L. sericea*** (Forel)
4. Bicoloured species (Figs 1–3, 8)..... 5
–. Uniformly dark brown to black species (Figs 5A–C, 7D–F) 10
5. Body shiny to subopaque; weakly sculptured (Figs 1–3)..... 6
–. Body dull; coarsely sculptured (Fig 8) 8
6. Body with scanty pilosity; posterior margin of head with 2–3 erect setae, dorsum of pronotum with 2–4 long erect setae, mesonotum with 1–2 erect setae, metanotum lacks erect setae and propodeum with 0–1 erect setae (Fig. 1A) ..... ***L. binghami*** sp. nov.
–. Body with abundant pilosity; posterior margin of head with 4–5 erect setae or more, dorsum of pronotum with more than 10 long erect setae, mesonotum with four or more erect setae, metanotum with two or more erect setae, and propodeum with 4–6 or more erect setae (Figs 2A, 3A)..... 7
7. Smaller species (HL 0.58–0.59, WL 0.83–0.85); body with appressed pubescence (Fig. 2)..... ***L. pusaensis*** sp. nov.
–. Larger species (HL 0.80–0.83, WL 1.12–1.21); body with semi-erect pubescence (Fig. 3)..... ***L. satpuraensis*** sp. nov.
8. Head reticulate-striate; propodeal spines blunt, directed backward; petiole dorsally emarginated (Wachkoo et al. 2021, Fig. 39)..... ***L. fergusoni*** (Forel)
–. Head reticulate-punctate; propodeal spines pointed, directed upward; petiole dorsally bispinose..... 9
9. Gaster smooth and shiny (Fig. 8B)..... ***L. opaca*** (Forel)
–. Gaster microreticulate and subopaque (Fig. 8E)..... ***L. pulchella*** (Forel)
10. Propodeal spines indistinct; gastral pilosity restricted to few pairs of black setae on the posterior margin of tergites..... 11
–. Propodeal spines well-developed as two broad-based blunt tubercles, teeth or spines; whole gastral dorsum covered with abundant white to yellowish setae..... 12
11. Pronotum without setae; body sparsely pubescent, shiny (Wachkoo et al. 2021, Fig. 32)..... ***L. rothneyi*** (Forel)
–. Pronotum with few short setae; body fairly pubescent, opaque (Wachkoo et al. 2021, Fig. 38)..... ***L. wroughtonii*** (Forel)

12. Body abundantly covered with long, erect white setae (Fig. 7D–F)..... ..... ***L. layla*** Wachkoo, Bharti & Akbar
–. Body covered with usual short erect setae (Figs 4, 5A)..... 13
13. Petiole dorsally emarginated without distinct teeth or spines; scanty mesosomal setae (Fig. 5A)..... ..... ***L. annandalei*** (Mukerjee)
–. Petiole dorsally distinctly bispinose; setae present across entire mesosomal dorsum..... 14
14. Head and pronotum smooth and shiny; propodeal spines as two broad-based blunt tubercles (Wachkoo et al. 2021, Figs 22–23)..... ..... ***L. modesta*** (Forel)
–. Head and pronotum either microreticulate or microreticulate with feeble striations; propodeal spines pointed or blunt..... 15
15. Head and mesosoma microreticulate with feeble striations (Fig. 4B–C); propodeal spines blunt (Fig. 4A)..... ..... ***L. wilsoni*** sp. nov.
–. Head and mesosoma microreticulate; propodeal spines pointed..... 16
16. Antennal scape with sparse appressed to decumbent pubescence; mesosomal setae sparse; smaller species (HW 0.51–0.57)..... ..... ***L. lunaris*** (Emery)
–. Antennal scape with dense subdecumbent to suberect pubescence; mesosomal setae abundant; larger species (HW 0.60–0.69) (Wachkoo et al. 2021, Figs 19–21)..... ***L. mayri*** Wachkoo, Bharti & Akbar

Lepisiota binghami sp. nov. (Fig. 1)

Type material

Holotype worker. INDIA: Kerala: Palakkad (Nelliyampathy), 10°32′56”N 76° 41′08”E, 865 m, 27.V.2019, Coll. Anooj S.S.; *Paratype workers*. 1 worker with same data as holotype; Thrissur (Peechi), 10°31′48”N 76°20′48”E, 78 m, 7 workers, 30.V.2019, Coll. Anooj S.S. (type specimens deposited in NPC, New Delhi).

Measurements and indices

Workers (N = 5; holotype values within parentheses). EL: 0.16 (0.16); HL: 0.51–0.56 (0.56); HW: 0.45–0.50 (0.50); MML: 0.24–0.28 (0.28); PH: 0.24–0.28 (0.28); PRW: 0.32–0.35 (0.35); SL: 0.57–0.61 (0.59); TL: 2.12–2.37 (2.12); WL: 0.69–0.76 (0.76); CI: 87–90 (90); OI: 31–34 (31); REL: 28–30 (28); SI: 118–129 (118).

Description (Worker): Head

Head slightly longer than broad, sides and posterior margin weakly convex, posterolateral corners rounded and head covered with appressed

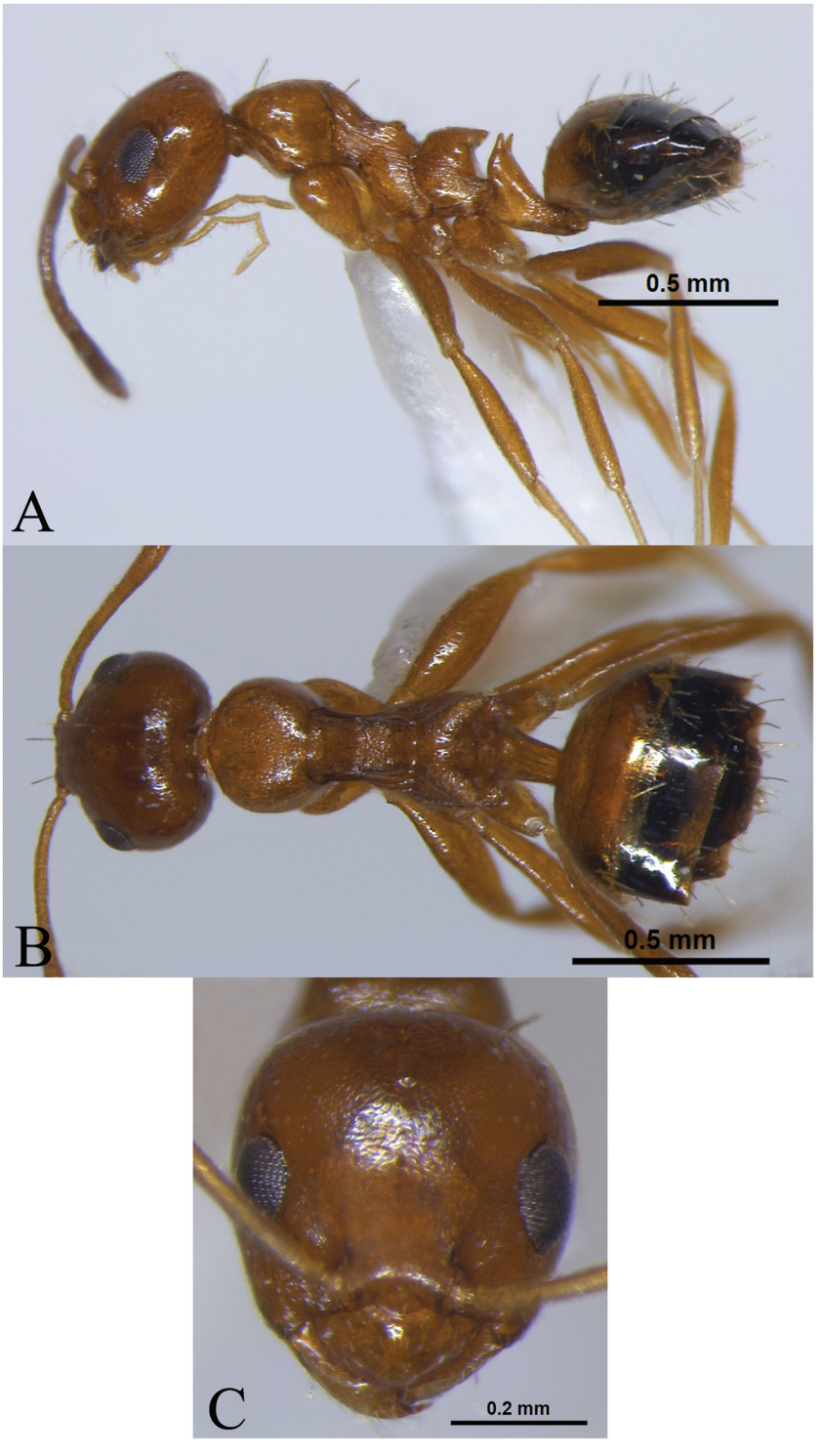

Figure 1A–C. *Lepisiota binghami* **sp. nov**. (Holotype worker). **A**, body in profile view; **B**, body in dorsal view; **C**, head in full-face view.

pubescence (Fig. 1C); posterior margin of head with 2–3 erect setae (including a pair of erect setae between lateral ocelli); palp formula 6,4 and third maxillary segment from base longest of all segments; mandible triangular with five teeth on masticatory margin, from apex third and fifth tooth are smaller than others; antennae 11 segmented, scape extending to posterior margin of head about 1/3rd of its length, third antennal segment smaller than second and fourth segment, length of second segment is about equal to combined length of third and fourth segment, antennae covered with decumbent to suberect pubescence; antennal insertions touching posterior clypeal margin; clypeus dorsally convex, subcarinate medially, anterior clypeal margin convex, posterior clypeal margin with a pair of long erect setae, anterior margin with two pairs of long erect setae with a downwardly directed long median seta; compound eyes broadly oval, positioned at about midlength of head and covering about 1/3rd of lateral cephalic margin; three ocelli present but faintly visible.

Mesosoma

Promesonotum convex in profile view, higher than metanotum but about as high as propodeum (Fig. 1A); mesometathorax constricted; propodeum armed with broad blunt spines and propodeal declivity slanting; the distal end of foretibia with pectinate spur and basitarsus with hairy notch; pronotum with 2–4 (two in most specimens) long erect yellowish setae, mesonotum with 1–2 (two in most specimens) erect yellowish setae and propodeum with 0–1 (absent in most specimens) erect yellowish setae (Fig. 1A); mesosoma having very sparse and decumbent pubescence.

Metasoma

Petiole upright, dorsally bispinose and deeply emarginate (Fig. 1A), lateral sides slightly convex; gastral segments with numerous yellowish erect setae mostly on posterior half and having very sparse, decumbent pubescence; acidopore well-developed and fringed with hairs.

Sculpture and colour

Head faintly microreticulate and shiny; region below the compound eyes feebly striate; dorsum of promesonotum microreticulate and subopaque while dorsum of metanotum and propodeal spines reticulate (Fig. 1B); mesometapleuron rugose while pleuron of propodeum subopaque; upper half of propodeal declivity longitudinally striate; mandible, clypeus, propleuron, gaster smooth and shiny; Body bicoloured; head, mesosoma, petiole, first gastral segment yellowish-brown to brown and remaining part of gaster black.

Etymology

The patronymic name honours entomologist Charles Thomas Bingham for his pioneering extensive work on Indian Hymenoptera including ants.

Comments

Lepisiota binghami distinctly differs from other known species of the genus *Lepisiota* from India. It differs from the bicoloured species *L. pulchella* in the sculpture of body, distribution of setae on the body, and size. *Lepisiota pulchella* workers have reticulate-punctate sculpture on the dorsum of head and mesosoma with gaster microreticulate and subopaque while the head of *L. binghami* is faintly microreticulate and shiny, most mesosoma without reticulation, gaster smooth and shiny. Mesosoma of *L. pulchella* has abundant pilosity whereas *L. binghami* has very less pilosity. *Lepisiota pulchella* is comparatively larger (HL 0.58–0.64, WL 0.83–0.91) than *L. binghami* (HL 0.51–0.56, WL 0.69–0.76) (here we are not considering measurements of Wachkoo et al. (2021) as they might have also considered specimens with less prominent characters of *L. pulchella* as discussed in personal communication).

Lepisiota binghami differs from another similar species *L. chutimae* in the sculpture of mesosoma and head, colouration of gaster, and petiole height. The dorsum of promesonotum is microreticulate and subopaque, the dorsum of metanotum and propodeal spines are reticulate in *L. binghami* whereas the dorsum of mesosoma is completely smooth in *L. chutimae*; dorsum of head is comparatively clear microreticulate with feeble striation below compound eyes in *L. binghami* whereas *L. chutimae* is about completely smooth. The first gastral segment is yellowish-brown to brown and the remaining part of the gaster is black in *L. binghami* whereas the gaster is completely dark brown in *L. chutimae*. The petiole of *L. chutimae* is higher (PH 0.33–0.35) than *L. binghami* (PH 0.24–0.28) (Jaitrong et al. 2022).

Distribution in India: Kerala.

Lepisiota pusaensis sp. nov. (Fig. 2)

Type material

Holotype worker. INDIA: Delhi: IARI (Pusa campus), 28°38′18”N 77° 09′07”E, 219 m, 13.XI.2021, Coll. A. Harshana; *Paratype workers*. 11 workers with the same data as holotype; 3 workers, 17.VII.2010, Coll. Mir Samim Akhatar. (type specimens deposited in NPC, New Delhi)

Measurements and indices

Workers (N = 5; holotype values within parentheses). EL: 0.19–0.20 (0.19); HL: 0.58–0.59 (0.58); HW: 0.54–0.55 (0.55); MML: 0.29 (0.29); PH: 0.29–

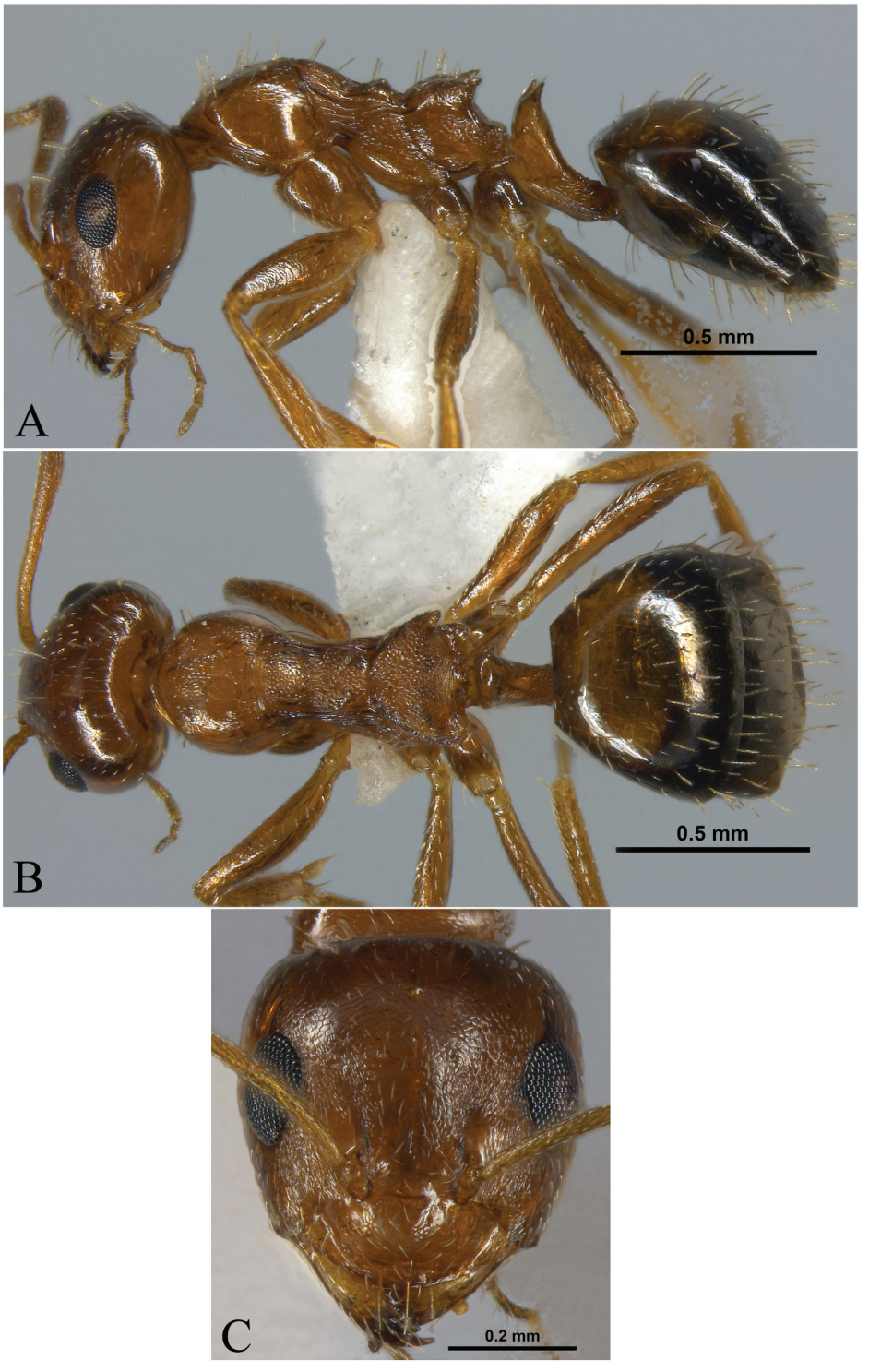

Figure 2A–C. *Lepisiota pusaensis* **sp. nov**. (Holotype worker). **A**, body in profile view; **B**, body in dorsal view; **C**, head in full-face view.

0.32 (0.32); PRW: 0.38–0.39 (0.38); SL: 0.60–0.62 (0.61); TL: 2.33–2.52 (2.52); WL: 0.83–0.85 (0.83); CI: 91–94 (94); OI: 35–37 (35); REL: 32–35 (33); SI: 111–114 (111).

Description (Worker): Head

Head slightly longer than broad, subquadrate, sides and posterior margin almost straight, posterolateral corners rounded and head sparsely covered with appressed pubescence (Fig. 2C); posterior margin of head with 4–5 erect setae (including a pair of erect setae between lateral ocelli) while three pairs on middle of head; palp formula 6,4 and third maxillary segment from base is the longest of all segments; mandible triangular with five teeth on masticatory margin and third tooth is smallest; mandible covered with decumbent to semi-erect hairs; antennae 11 segmented, scape extending to posterior margin of head about 1/3rd of its length, third antennal segment is smaller than second and fourth segment, length of second segment is about equal to combined length of third and fourth segment; antennae densely covered with appressed to decumbent pubescence; clypeus dorsally convex, subcarinate medially, anterior clypeal margin convex, posterior clypeal margin having a pair of long erect setae while anterior margin with two pair of long erect setae with a downwardly directed long median seta; clypeus covered sparsely with decumbent pubescence; compound eyes large, broadly oval, convex and positioned at about midlength of head; ocelli three in number.

Mesosoma

Promesonotum convex in profile view, higher than metanotum while almost same height as propodeum (Fig. 2A); propodeum armed with posteriorly directed, blunt spines; propodeal declivity slanting; the distal end of foretibia with pectinate spur and basitarsus with hairy notch; pronotum with more than 10 erect yellowish setae, mesonotum with two pairs of erect yellowish setae while metanotum with one pair of erect yellowish setae and propodeum with 2–3 pairs of erect yellowish setae (Fig. 2A); mesosoma having sparse, appressed pubescence.

Metasoma

Petiole upright, dorsally bispinose, sides angular with the presence of petiolar spiracles at about mid-height of the petiole (Fig. 2A); gastral segments with abundant yellowish erect setae mostly on posterior half except first gastral segment which is entirely covered with sparse yellowish erect setae; acidopore well-developed with the fringe of hairs.

Sculpture and colour

Head microreticulate and shiny, the region between compound eyes and antennal insertions feebly striate; dorsum of pronotum microreticulate

and subopaque, propleuron shiny, dorsum of mesonotum, metanotum, and propodeum reticulate (Fig. 2B); mesometapleuron rugose while pleuron of propodeum rugulose and subopaque; upper 1/3rd part of propodeal declivity having reticulate sculpture while remaining 2/3rd part transversely striate; mandible, clypeus smooth and shiny; gaster faintly microreticulate and shiny. Body bicoloured; head, mesosoma, and petiole brown while gaster black (although some specimens have most of the first gastral segment yellowish-brown).

Etymology

The species name refers to the type locality.

Comments

Lepisiota binghami differs from *L. pusaensis* based on the distribution of setae on body, size, and colouration. In *L. pusaensis*, the posterior margin of the head has 4–5 erect setae as compared to 2–3 erect setae in *L. binghami*. Mesosoma of *L. pusaensis* abundantly covered with erect setae while *L. binghami* have very less pilosity. *L. pusaensis* is a comparatively larger (HL 0.58–0.59, WL 0.83–0.85) species than *L. binghami* (HL 0.51–0.56, WL 0.69–0.76). The first gastral segment in *L. binghami* is yellowish-brown to brown while the remaining segments are black while *L. pusaensis* have completely dark gaster in most specimens. *L. pusaensis* distinctly differs from another similar species *L. pulchella* in the sculpture of the body. The head and pronotum of *L. pulchella* are reticulate-punctate whereas *L. pusaensis* has microreticulate sculpture. The gaster of *L. pulchella* is subopaque while shiny in *L. pusaensis*.

Lepisiota pusaensis was possibly misidentified as *L. opaca* in Wachkoo et al. (2021). *Lepisiota pusaensis* distinctly differs from *L. opaca* in the sculpture of the body. *Lepisiota opaca* is entirely dull with the reticulate-punctate sculpture on the head and mesosoma (Forel 1892) whereas the head of *L. pusaensis* is microreticulate and shiny; the dorsum of pronotum is microreticulate and subopaque, propleuron shiny.

Ecological and biological notes

Lepisiota pusaensis has been found at the base of the *Ficus religiosa* L. tree where they made a nest in soil with small entrance holes. The workers were slowly foraging on the tree trunk and ground around their nest. Workers are seen to be collecting dead dry insects and taking them to nest. Workers were also observed tending aphids on the grass, *Bothriochloa* sp. at IARI, New Delhi.
Distribution in India: Delhi.

Lepisiota satpuraensis sp. nov. (Fig. 3)

Type material

Holotype worker. INDIA: Madhya Pradesh: Pachmarhi, 22°28′20”N 78° 25′00”E, 1004 m, 06.IX.2020, Coll. A. Harshana; *Paratype workers*. 1 worker with same data as holotype; Pachmarhi, 22°26′56”N 78°22′15”E, 1300 m, 2 workers, 09.IX.2020, Coll. A. Harshana. (type specimens deposited in NPC, New Delhi).

Measurements and indices

Workers (N = 4; holotype values within parentheses): EL: 0.23–0.24 (0.24); HL: 0.80–0.83 (0.83); HW: 0.78–0.82 (0.82); MML: 0.43–0.46 (0.46); PH: 0.39–0.44 (0.40); PRW: 0.53–0.58 (0.54); SL: 0.81–0.87 (0.87); TL: 3.55–3.89 (3.88); WL: 1.12–1.21 (1.21); CI: 96–99 (99); OI: 29–31 (29); REL: 29–30 (29); SI: 104–112 (106).

Description (Worker): Head

Head slightly longer than broad, subquadrate, sides and posterior margin slightly convex, posterolateral corners rounded, head wider posteriorly than in front and covered with semi-erect comparatively long pubescence (Fig. 3C); four pairs of long erect setae on face of head from posterior margin of head to front of antennal insertions (including a pair of erect setae between lateral ocelli); palp formula 6,4 and third maxillary segment from base longest of all segments while sixth segment distinctly longer than fifth segment; mandible triangular with five teeth on masticatory margin, from apex third tooth smaller than second and fourth tooth; antennae 11 segmented, scape extending to posterior margin of head about 1/3rd of its length, third antennal segment is smaller than second and fourth segment, length of second segment is about equal to combined length of third and fourth segment, antennae covered with semi-erect pubescence; antennal insertions touching posterior clypeal margin; clypeus dorsally convex, subcarinate medially, having numerous semi-erect yellowish pubescent hairs along with a pair of long erect setae on posterior margin of clypeus while anterior margin with two pair of long dark erect setae with a yellowish median seta; anterior clypeal margin weakly convex; compound eyes broadly oval, positioned at about midlength of head; ocelli three in number.

Mesosoma

Promesonotum convex in profile view, higher than metanotum while about same height as of propodeum (Fig. 3A); mesometathorax constricted; propodeum armed with broad blunt spines and propodeal declivity steep; fore tibiae with a pectinate spur at the distal end and basitarsus with a hairy notch; dorsum of the whole mesosoma with

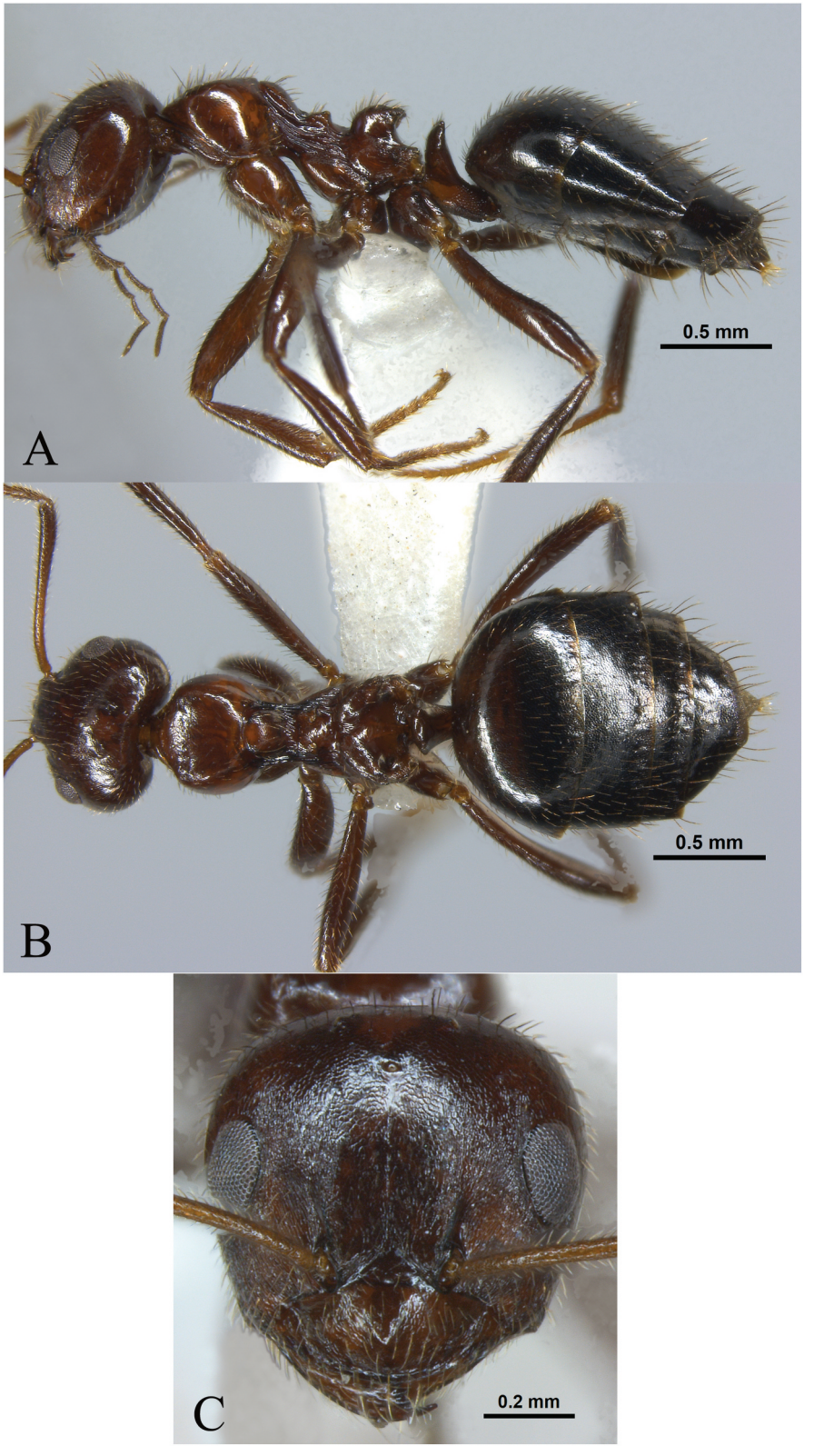

Figure 3A–C. *Lepisiota satpuraensis* **sp. nov**. (Holotype worker). **A**, body in profile view; **B**, body in dorsal view; **C**, head in full-face view.

numerous erect setae (Fig. 3A); propleuron and legs covered with semi-erect pubescence while rest of mesosoma seemingly lacking pubescence.

Metasoma

Petiole upright, dorsally bispinose and emarginated, sides with small setae; first gastral segment fully covered with numerous yellowish erect setae while remaining gastral segments mostly covered on posterior half; acidopore well-developed and fringed with hairs.

Sculpture and colour

Head microreticulate and subopaque, the region below compound eyes weakly longitudinally striate (Fig. 3C); dorsum of mesosoma microreticulate to smooth and shiny (Fig. 3B), mesometapleuron rugose; gaster faintly microreticulate and shiny. Body bicoloured; head, mesosoma, and petiole are dark brown to reddish-brown while compound eyes and gaster are completely black.

Etymology

The species name refers to the Satpura Hills in Central India, where the type locality is located.

Comments

Lepisiota satpuraensis is a unique species of Indian *Lepisiota* fauna with the following combination of characters: body with comparatively long semi-erect pubescent hairs, numerous setae on the body, body size bigger than any other species reported from India having antennal scape surpassing posterior margin of head about 1/3rd of its length.

Lepisiota satpuraensis differs from the closest species *L. fergusoni* in the structure of petiole, body size, and body colour. *Lepisiota satpuraensis* is characterised by distinct bispinose petiole while *L. fergusoni* does not possess the distinct teeth or spines on the petiole. *Lepisiota satpuraensis* is larger (HL 0.80–0.83, HW 0.78–0.82) than *L. fergusoni* (HL 0.69–0.72, HW 0.65–0.66). In *L. satpuraensis* head, mesosoma, and petiole are dark brown to reddish-brown while the gaster is completely black whereas in *L. fergusoni* head is reddish-brown, mesosoma and petiole are reddish-yellow, and the gaster is reddish-brown with a light reddish-yellow patch anteriorly on first gastral tergite (Wachkoo et al. 2021).

Distribution in India: Madhya Pradesh (Pachmarhi).

Lepisiota wilsoni sp. nov. (Fig. 4)

Type material

Holotype worker. INDIA: Madhya Pradesh: Pachmarhi, 22°28′50”N 78° 26′29”E, 1050 m, 07.IX.2020, Coll. A. Harshana; *Paratype workers*. 7 workers with the same data as holotype. (type specimens deposited in NPC, New Delhi).

Measurements and indices

Workers (N = 5; holotype values within parentheses). EL: 0.19–0.20 (0.19); HL: 0.60–0.65 (0.60); HW: 0.54–0.58 (0.54); MML: 0.27–0.29 (0.29); PH: 0.31–0.34 (0.32); PRW: 0.39–0.42 (0.39); SL: 0.64–0.69 (0.64); TL: 2.64–2.76 (2.76); WL: 0.84–0.93 (0.84); CI: 89–90 (90); OI: 33–35 (35); REL: 30–32 (32); SI: 114–121 (119).

Description (Worker): Head

Head little longer than broad, sides weakly convex, posterior margin almost straight, posterolateral corners rounded and head covered with appressed pubescence (Fig. 4C); posterior margin of head with 4–5 erect setae (including a pair of erect setae between lateral ocelli); palp formula 6,4 and third maxillary segment from base longest of all segments, sixth segment distinctly longer than fifth segment; mandible with five teeth on masticatory margin, third tooth from apex smaller than fourth tooth, mandibular surface with fine long setae; antennae 11 segmented, scape extending to posterior margin of head about 1/3rd of its length, antennal insertions touching posterior clypeal margin; antennae with decumbent to semi-erect pubescence; clypeus dorsally convex, subcarinate at middle, having appressed pubescence, posterior margin of clypeus with a pair of long erect setae while anterior margin with two pairs of long erect setae with a median seta; anterior clypeal margin convex; compound eyes broadly oval, placed at about mid-length of head; three ocelli present.

Mesosoma

Promesonotum convex in profile view, higher than metanotum and as high as propodeum (Fig. 4A); mesometathorax constricted; propodeal spines short, broad at the base and blunt at apex; propodeal declivity slanting; fore tibiae with a pectinate spur at the distal end and basitarsus with a hairy notch at the proximal end; pronotum with 5–9 erect yellowish setae, mesonotum with two pairs of erect yellowish setae, metanotum with a pair of erect yellowish setae and propodeum with 3–4 erect yellowish setae (Fig. 4A); mesosoma with very sparse appressed pubescence.

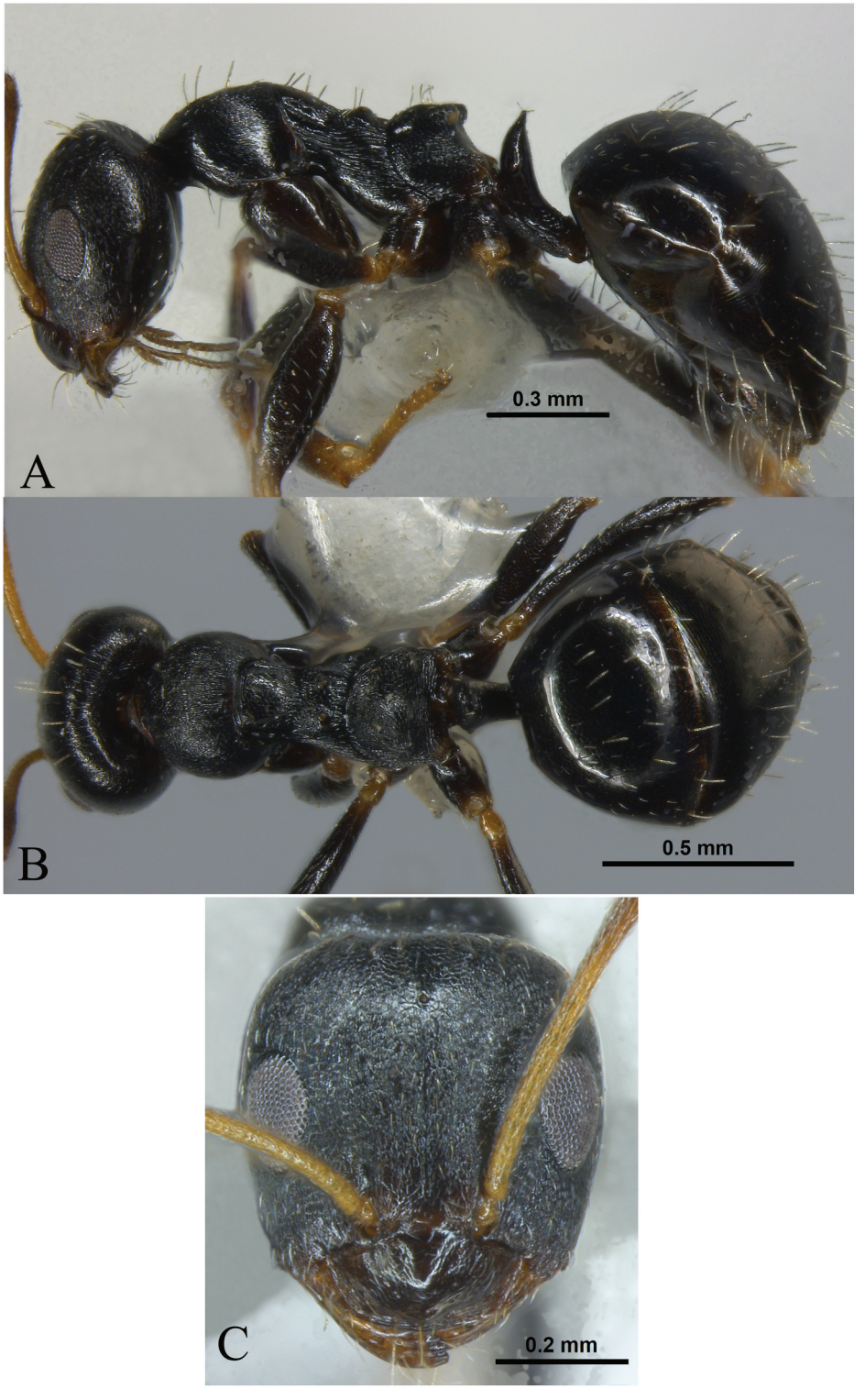

Figure 4A–C. *Lepisiota wilsoni* **sp. nov.** (Holotype worker). **A**, body in profile view; **B**, body in dorsal view; **C**, head in full-face view.

Metasoma

Petiole dorsally bispinose, each spine with a single small erect seta; gaster covered with sparse yellowish erect setae and appressed pubescence; acidopore well-developed and fringed with hairs.

Sculpture and colour

Head and pronotum microreticulate with feeble striations, subopaque; dorsum of mesonotum microreticulate; dorsum of metanotum and propodeum reticulate; mesometapleuron rugose; mesometanotal suture cross-ribbed; mandible, most of the clypeus smooth and shiny; propodeal declivity transversely striate; gaster faintly microreticulate and shiny. Body uniformly black; proximal 2/3rd part of antennal scape, trochanter, the proximal end of tibiae, and tarsi of legs yellowish-brown; palps, mandible, distal part of scape and funicles of antennae brown.

Etymology

The patronymic name honours Prof. Edward O. Wilson for his extensive contribution to myrmecology.

Comments

Lepisiota wilsoni differs from the closest species *L. lunaris* in terms of sculpture of body and structure of the propodeal spine. The head, dorsum of pronotum, and propleuron of *L. wilsoni* are microreticulate with feeble striations and subopaque, whereas the head and dorsum of pronotum in *L. lunaris* are microreticulate without striations and propleuron is shiny. Propodeal spines are pointed in *L. lunaris* (Emery 1893a, Fig. 12; Syntype worker images, AntWeb: Casent0905157 photographed by Zach Lieberman) while blunt in *L. wilsoni*.

Distribution in India: Madhya Pradesh (Pachmarhi).

Lepisiota annandalei (Mukerjee, 1930) (Fig. 5A–C)

Acantholepis annandalei Mukerjee 1930: 156, fig. 4 (Worker). Syntype workers, Shimla [Simla], Himachal Pradesh, India.

Lepisiota annandalei (Mukerjee), Bolton 1995: 226. Combination in *Lepisiota*.

Material examined

INDIA: Madhya Pradesh: Gwalior, 26°14′06”N 78°13′16”E, 196 m, 4 workers, 7.VIII.2020, coll. A. Harshana. Delhi: IARI, 28°38′28”N 77°10′12”E, 7 workers, IX.2021, Coll. A. Harshana; 7 workers, VII.2010, Coll. Mir Samim Akhatar, NPC.

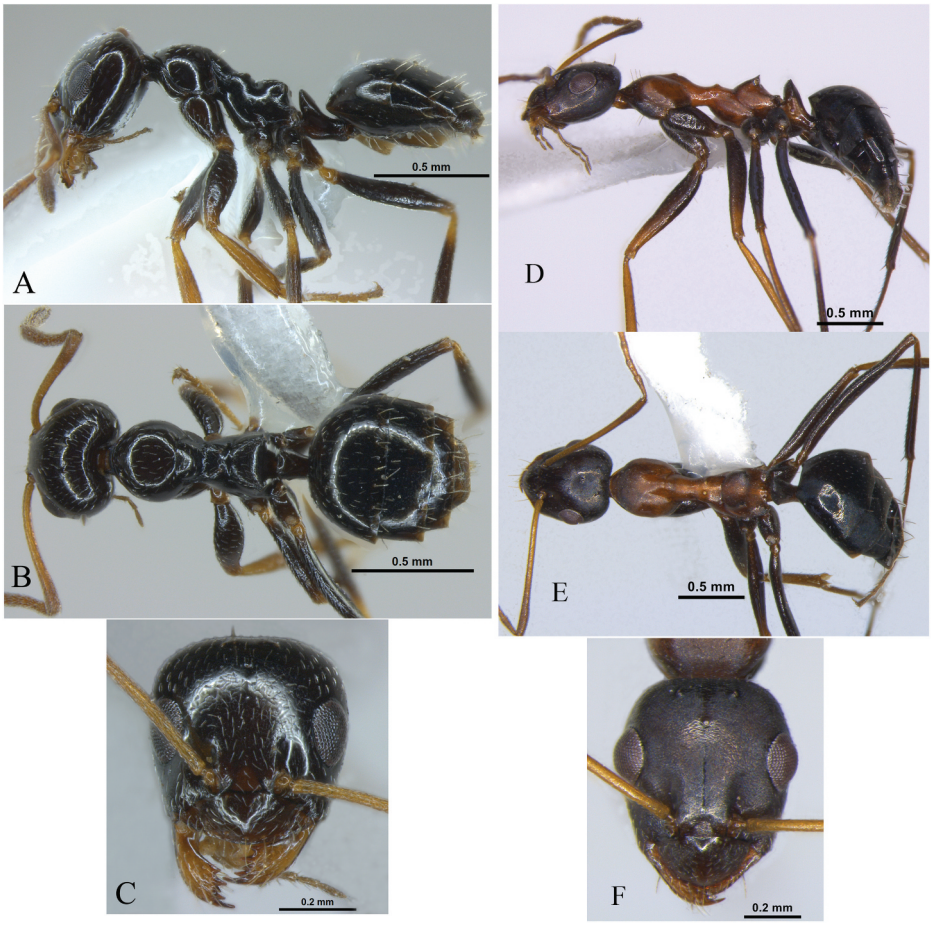

Figure 5A–F. Workers of *Lepisiota annandalei* (A–C), *Lepisiota bipartita* (D–F). **A, D**, body in profile view; **B, E**, body in dorsal view; **C, F**, head in full-face view.

Measurements and indices

Workers (N = 4). EL: 0.17–0.18; HL: 0.54–0.57; HW: 0.49–0.51; MML: 0.22–0.24; PH: 0.23–0.24; PRW: 0.34–0.36; SL: 0.55–0.56; TL: 2.19–2.34; WL: 0.69–0.74; CI: 89–94; OI: 35; REL: 31–33; SI: 108–114.

Description (Worker): Head

Head little longer than broad, sides slightly convex, posterior margin about straight, posterolateral corners rounded and head covered with sparse appressed pubescence (Fig. 5C); palp formula 6,4 and third maxillary segment from base longest of all segments; mandible with five teeth on masticatory margin, third and fourth tooth from apex smaller than other teeth; antennae 11 segmented, scape extending to posterior margin of head not more than 1/3rd of its length; antennal insertions touching posterior clypeal margin and a pair of erect setae present little behind the antennal insertions;

clypeus dorsally convex, having sparsely distributed appressed pubescence, posterior margin having a pair of long yellowish erect setae while anterior margin with two pairs of long yellowish erect setae with a downwardly directed long median seta, anterior clypeal margin weakly convex; eyes broadly oval, placed at about mid-length of head and covering about 1/3rd lateral margin of head; three ocelli present with a pair of erect setae in between the lateral ocelli.

Mesosoma

Promesonotum in profile view dome-shaped and convex, metanotum at a lower than promesonotum (Fig. 5A); pronotum with 2–5 erect setae and mesonotum with a pair of erect setae; propodeum with pointed tubercles and propodeal declivity steep; mesosoma with sparse appressed pubescence.

Metasoma

Petiole upright, without distinct teeth, emarginated dorsally while its sides are convex; gaster with sparsely distributed erect setae; metasoma covered with sparse appressed pubescence; acidopore well-developed with the fringe of hairs.

Sculpture and colour

Head, mesosoma, and metasoma are smooth and shining except for rugulose mesopleuron. Body uniformly black; mandible, antennae, trochanters, tarsi, fore tibiae, the distal and proximal end of mid and hind tibiae yellowish-brown to brown.

Comments

Lepisiota annandalei has smaller-sized workers, which we have found dwelling on different plants or flowers. It is the smallest among all the *Lepisiota* species in our collection from Central India and it is not so frequent in collections.

Distribution in India: Delhi*, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh*, Punjab, Sikkim, Uttarakhand, West Bengal.

***Lepisiota bipartita* (Smith, 1861)** (Figs 5D–F & 6)

Formica bipartita Smith 1861: 33. Syntype workers, Lebanon and Israel (Holy Land).

Acantholepis bipartita (Smith), Roger 1863: 11. Combination in *Acantholepis.*

Acantholepis bipartita (Smith), Mayr 1863: 394. As junior synonym of *Acantholepis frauenfeldi.*

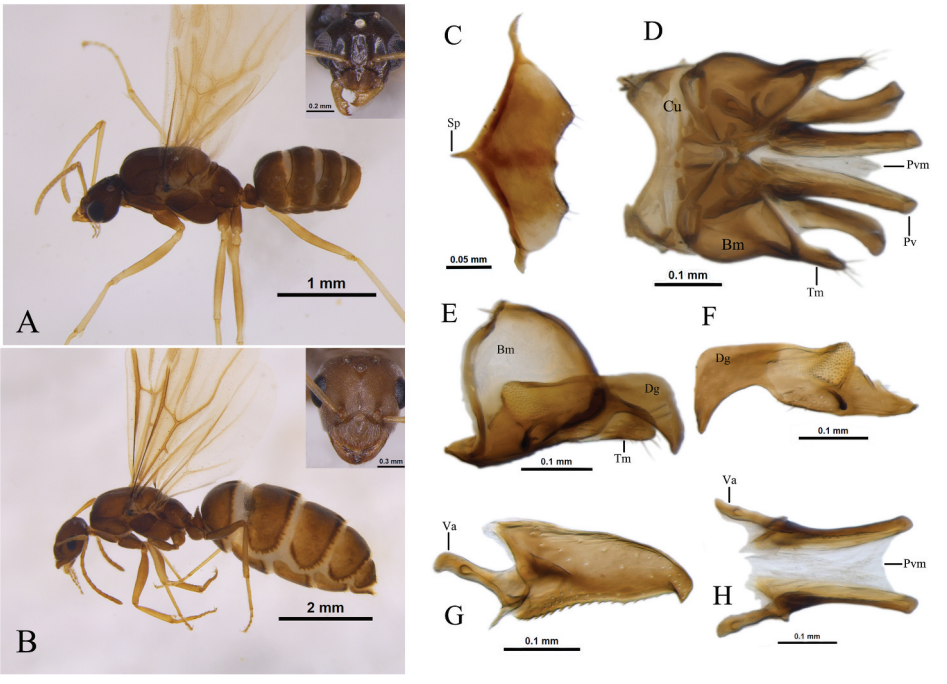

Figure 6A–H. *Lepisiota bipartita*. **A**, male (Voucher male specimen after detaching apical part of gaster for genitalia study); **B**, female (Profile view in 70% alcohol); **C–H**: male genitalia; **C**, abdominal sternum IX, ventral view; **D**, genital capsule, dorsal view; **E**, paramere and volsella, right side, inner view; **F**, volsella separated from paramere, left side, inner view; **G**, penisvalva, left side, outer view; **H**, pair of penisvalvae, dorsal view. **Bm** basimere; **Cu** cupula; **Dg** digitus; **Pv** penisvalva; **Pvm** penisvalva membrane; **Sp** speculum; **Tm** telomere; **Va** valvura.

Acantholepis frauenfeldi var. *bipartita* (Smith), André 1882: 211. Queen described and revived from synonymy as a variety of *A. frauenfeldi.*

Acantholepis frauenfeldi bipartita (Smith), Emery 1891: 16; Emery 1898: 126; Forel 1902a: 155; Ruzsky 1905: 463; Santschi 1917: 47. As variety/subspecies of *A. frauenfeldi.*

Acantholepis frauenfeldi var. *bipartita* (Smith); Karavaiev 1911: 44. Male described.

Lepisiota frauenfeldi subsp. *bipartita* (Smith); Baroni Urbani et al. 1992: 303. Combination in *Lepisiota.*

Lepisiota bipartita (Smith), Collingwood & Agosti 1996: 365. Status as species.

Material examined

INDIA: Madhya Pradesh: Gwalior (Tapovan), 26°10′20”N 78°10′16”E, 236 m, 5 workers, 7.VIII.2020, Coll. A. Harshana; Gwalior (C.P. Colony), 26°14′06”N 78°13′17”E, 196 m, 2&4 workers, 14.IV.2019 & 20.VII.2020, Coll. A. Harshana; Jabalpur (JNKVV), 23°12′46”N 79°57′33”E, 394 m, 2

workers, 12.IX.2020, Coll. A. Harshana; Gwalior (Ramaua village), 26° 09′17”N 78°13′34”E, 219 m, 4 workers, 08.VI.2019, Coll. A. Harshana; Narsinghpur (Kalyanpur), 22°51′07”N 78°54′55”E, 352 m, 5 workers, V.2020, Coll. M. Patel; Pachmarhi, 22°28′50”N 78°26′29”E, 1050 m, 5 workers, 07.IX.2020, Coll. A. Harshana. Delhi: IARI, 28°37′51”N 77°09′55”E, 7 workers, 4 ♂ & 2 ♀, VII.2019, Coll. A. Harshana; Delhi, 5 workers, 1 ♂ & 1 ♀, 25.V.1938, Coll. K.B. Lal, NPC.

Measurements and indices

Workers (N = 6). EL: 0.22–0.24; HL: 0.71–0.77; HW: 0.56–0.62; MML: 0.42–0.46; PH: 0.33–0.37; PRW: 0.44–0.49; SL: 1.04–1.12; TL: 3.48–3.60; WL: 1.21–1.27, CI: 77–80; OI: 38–42; REL: 31–33; SI: 180–194. Males (N = 2). EL: 0.28–0.30; HL: 0.57–0.58; HW: 0.53; SL: 0.66–0.72; CI: 91–93; OI: 52–56; REL: 49–51; SI: 124–134. Female (N = 1). EL: 0.38; HL: 1.042; HW: 0.976; SL: 1.324; CI: 94; OI: 39; REL: 36; SI: 136.

Description (Worker): Head

Head longer than broad, sides slightly convex, posterior margin almost straight, posterolateral corners rounded (Fig. 5F) and head covered with sparse appressed pubescence; palp formula 6,4 and third maxillary segment from base longest of all segments, fifth maxillary segment distinctly smaller than sixth segment; mandible with five teeth on masticatory margin, third tooth from apex is smallest while second tooth smaller than fourth tooth, mandibular surface having fine setae; antennae 11 segmented, scape extending to posterior margin of head about half its length, antennal insertions touching the posterior margin of clypeus; a pair of erect setae present little behind the antennal insertions, and a pair at about mid-length of head; clypeus dorsally convex, subcarinate medially, anterior clypeal margin convex, clypeus with appressed pubescence, posterior margin of clypeus with a pair of long erect setae while anterior margin with two pair of long erect setae along with a downwardly directed median seta; compound eyes broadly oval, convex and placed little behind mid-length of head; three ocelli present with a pair of erect setae in between lateral ocelli.

Mesosoma

Pronotum and about half of the mesonotum forming an arch in profile view (Fig. 5D); pronotum with 2–4 standing setae; mesometanotum strongly constricted (Fig. 5E) and lower than rest of mesosoma; propodeum armed with a pair of short spines and propodeal declivity slanting.

Metasoma

Petiole upright, dorsally emarginated, and apical corners with very short teeth, sides angular; gastral segments with erect setae on their distal margin

and basal part of the first gastral sternum with 2–4 erect setae; acidopore well-developed with the fringe of hairs.

Sculpture and colour

The body is not smooth, with effaced sculpture and subopaque. Body bicoloured; head and gaster dark brown to black, mesosoma reddish-brown; antennae, mandible, distal segments of legs brownish.

Description (Male): Head

Head little longer than broad, sides mostly covered by compound eyes, posterior margin about straight, posterolateral corners rounded (Fig. 6A); palp formula 6,4 and third maxillary segment from base longest of all segments, fifth maxillary segment distinctly smaller than fourth and sixth segment; mandible with five teeth on masticatory margin, third tooth from apex is than fourth tooth, mandible with a pit at its base; antennae 12 segmented, scape extending to posterior margin of head about half its length, third antennal segment is about same length of second and fourth segment; antennal insertions touching the posterior margin of clypeus; clypeus dorsally convex, anterior clypeal margin weakly convex, posterior margin of clypeus with a pair of long erect setae while anterior margin with two pairs of long erect setae along with a downwardly directed median seta; compound eyes large, broadly oval, convex and covering more than half of sides of head; three large ocelli present with a pair of erect setae in between lateral ocelli.

Mesosoma

Pronotum strap-like, anteroventral, and hidden by mesoscutum dorsally; mesoscutum well developed, dorsally flat, and anterior margin rounded; mesoscutellum subtriangular in dorsal view and about the same height as mesoscutum; metanotum strip-like; propodeum lower, slightly convex in profile view; propodeal spiracles well developed, anterolateral in position, and its diameter about equal to the length of metanotum; fore tibiae with a pectinate spur at the distal end and basitarsus with a notch at the proximal end.

Metasoma

The petiole is short, without teeth, dorsally emarginated, and apical corners seemingly rounded; gastral segments with erect setae on their distal margin.

Sculpture and colour

Overall body microreticulate and shiny. Body colour brown to dark brown.

Description of the male genitalia (Fig. 6C–H)

Abdominal sternum nine wider than long, outline somewhat bat-shaped dorsally, spiculum (anterior apophysis of the sternum nine) long, anterior margins meeting basal to the spiculum at an obtuse angle, lateral margins sloping inwardly, posterior margin concave with weakly bulging medially, anterolateral corners well-produced and posterolateral corners with long setae (Fig. 6C). Genital capsule is longer than broad, cupula broader than long, and dorsally anterior margin of cupula concave (Fig. 6D). Basimere broad with outer surface convex; telomere attached ventrally and the inner side of basimere. In the lateral view, the telomere is a little longer than broad and posterior part with long setae (Fig. 6E). Volsella with setae on the ventral ridge. Digitus is broad and hooked ventrally in the lateral view (Fig. 6F). The lateral view shows penisvalva having more than 15 denticles on the ventral margin, posterior apex hooked ventrally, and foveae sparsely present on the surface (Fig. 6G). Valvura directed dorsoanterolaterally.

Description (Female)

Head little longer than broad, sides weakly convex, posterior margin about straight, and posterolateral corners rounded (Fig. 6B); palp formula 6,4; the third maxillary segment from base longest of all segments, and fifth maxillary segment distinctly smaller than the sixth segment; mandible with five teeth on masticatory margin; antennae 11 segmented, scape extending to posterior margin of head about half its length; antennal insertions touching the posterior margin of clypeus; clypeus dorsally convex, anterior clypeal margin weakly convex, posterior margin of clypeus with a pair of long erect setae while anterior margin with two pairs of long erect setae along with a downwardly directed median seta; compound eyes large, broadly oval, convex and covering more than 1/3rd of sides of the head; three large ocelli present with a pair of erect setae in between lateral ocelli.

Mesosoma

Pronotum strap-like, anteroventral in position; mesoscutum well developed, dorsally flat, and anterior margin rounded; mesoscutellum subtriangular in dorsal view and about the same height as mesoscutum; metanotum strip-like; propodeum lower, slightly convex in profile view; propodeal spiracles well developed, anterolateral in position; fore tibiae with a pectinate spur at the distal end and basitarsus with a notch at the proximal end.

Metasoma

Petiole upright, squamiform, with teeth on the apical corners; gastral segments with erect setae on the posterior margin except for first gastral

sternum which has erect setae on the middle part; acidopore well developed and fringed with hairs.

Sculpture and colour

Body sculpture is rough and subopaque. Body colour brown.

Comments

This species is widely distributed in India and adapted well in urban localities. It is frequently encountered and therefore collected easily.

Distribution in India: Andhra Pradesh, Delhi*, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Punjab, Rajasthan, Uttarakhand, West Bengal.

***Lepisiota integra* (Forel, 1894)** (Fig. 7A–C)

Acantholepis frauenfeldi var. *integra* Forel 1894: 411. Syntype workers, Dharamshala, Himachal Pradesh, India.

Acantholepis frauenfeldi integra Forel; Forel 1906: 86; Santschi 1917: 44; race/stirps of *A. frauenfeldi.*

Lepisiota frauenfeldi var. *integra* (Forel); Bolton 1995: 227. Combination in *Lepisiota*.

Lepisiota integra (Forel), Wachkoo *et al.* 2021: 231. Status as species.

Material examined

INDIA: Madhya Pradesh: Pachmarhi, 22°28′50”N 78°26′29”E, 1050 m, 2 workers, 07.IX.2020, Coll. A. Harshana. Delhi: IARI, 1 worker, VIII.2021, Coll. Suby S.B.

Measurements and indices

Workers (N = 2). EL: 0.21–0.22; HL: 0.69–0.70; HW: 0.53–0.59; MML: 0.39; PH: 0.32–0.36; PRW: 0.42–0.46; SL: 0.85–0.95; TL: 3.04–3.08; WL: 1.08–1.15; CI: 76–86; OI: 37–40; REL: 30–32; SI: 144–178.

Description (Worker): Head

Head longer than broad, sides are slightly convex, posterior margin almost straight with rounded posterolateral corners, head covered with sparse appressed pubescence (Fig. 7C); palp formula 6,4 and the third segment of maxillary palp from base longest of all, fifth segment smaller than the sixth segment; mandible with five teeth on masticatory margin, the third tooth is smallest; antennae 11 segmented, scape extending to posterior margin of head about half its length, antennal insertions touching the posterior margin of clypeus; a pair of erect setae present little behind antennal insertions, and

Figure 7A–F. Workers of *Lepisiota integra* (A–C), *Lepisiota layla* (D–F). **A, D**, body in profile view; **B, E**, body in dorsal view; **C, F**, head in full-face view.

a pair at about mid-length of the head; clypeus dorsally convex, anterior clypeal margin convex with two pair of erect setae with a downwardly directed median seta, posterior margin with a pair of erect setae; compound eyes broadly oval, convex and placed at about mid-length of the head; three ocelli present with a pair of erect setae between lateral ocelli.

Mesosoma

Pronotum and about half of the mesonotum forming an arch in profile view (Fig. 7A); pronotum with two standing setae; mesometanotum strongly constricted (Fig. 7B) and lower than rest of mesosoma; propodeum armed with a pair of short spines; propodeal declivity slanting.

Metasoma

Petiole upright, dorsally with teeth-like apical corners (Fig. 7A) and emarginated, sides angular; gastral segment with erect setae on their distal margin and basal part of first gastral sternite with 2 erect setae; acidopore well-developed with the fringe of hairs.

Sculpture and colour

Body sculpture microreticulate to effaced and subopaque; mandible smooth and shiny. Body about uniformly dark brown; mandible, antennae, and tarsi brown.

Comments

This species is comparatively less shiny than *L. bipartita* and about uniformly dark brown while *L. bipartita* is bicoloured. *Lepisiota integra* was first time collected in Central India by Forel (1894) from Pachmarhi, and after 126 years we also collected this species in the same locality but not from any other place which we explored in Central India.

Distribution in India: Delhi*, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Meghalaya, Punjab, Uttarakhand.

Lepisiota layla Wachkoo, Bharti and Akbar, 2021 (Fig. 7D–F)

Lepisiota layla Wachkoo, Bharti and Akbar 2021: 232. Type workers, Kotla, Himachal Pradesh, India.

Material examined

INDIA: Madhya Pradesh: Pachmarhi, 22°28′50”N 78°26′29”E, 1050 m, 3 workers, 07.IX.2020, Coll. A. Harshana.

Measurements and indices

Workers (N = 2). EL: 0.19; HL: 0.59–0.61; HW: 0.57–0.60; MML: 0.32; PH: 0.26–0.27; PRW: 0.41–0.42; SL: 0.62–0.65; TL: 2.76–2.81; WL: 0.87–0.89; CI: 97–98; OI: 33–32; REL: 31–32; SI: 108–109.

Description (Worker): Head

Head slightly longer than broad, subquadrate, sides weakly convex, posterior margin almost straight, posterolateral corners rounded (Fig. 7F); palp formula 6,4 and third maxillary segment from base longest of all segments while sixth segment distinctly longer than the fifth segment; mandible with five teeth on masticatory margin, third tooth from apex smaller than the fourth tooth; antennae 11 segmented, antennal scape extending to posterior margin of head not more than 1/3rd of its length, antennal insertions touching posterior clypeal margin; clypeus dorsally convex, subcarinate at the middle, having sub-erect comparatively long pubescent hairs, posterior margin with a pair of long erect setae, anterior margin with two pairs of long erect setae with a median seta, anterior clypeal margin weakly convex; eyes broadly oval, weakly convex, placed little behind mid-length of the head; three ocelli present.

Mesosoma

Promesonotum convex, higher than remaining mesosoma in profile view (Fig. 7D); propodeum with broad, thick, posteriorly diverging spines and propodeal declivity steep; fore tibiae having pectinate spur at the distal end, basitarsus having a hairy notch at the proximal end.

Metasoma

Petiole dorsally with angular sides, without distinct teeth or spines, shallowly emarginated, and sides slightly convex; acidopore well-developed and fringed with hairs.

Head, mesosoma, and metasoma covered with abundant whitish long erect setae (Fig. 7D–F); legs with sub-erect to erect comparatively short whitish setae; antennal scape with sub-erect to erect setae while funicular segments with sub-erect to decumbent pubescence; mandibular surfaces with fine setae.

Sculpture and colour

Head, mesosoma, and metasoma are smooth and shining except for rugose mesometapleuron. Body uniformly black; antennal scape (except the distal end), tarsi of legs yellowish-brown; mandible, the distal end of antennal scape, funicular segments of antennae brown.

Comments

Lepisiota layla seems to be a rare species. It shows similarities with the South African species, *Lepisiota capensis junodi* (Forel, 1916), in having numerous whitish erect setae all over the body but it differs by lack of bispinose petiole. **Distribution in India**: Himachal Pradesh, Madhya Pradesh*.

***Lepisiota opaca* (Forel, 1892)** (Fig. 8A–C)

Acantholepis opaca Forel 1892:6. Syntype workers, Kanara, Karnataka, India. [Images of CASENT0909893, CASENT0905158]

Acantholepis opaca Forel; Bingham 1903: 318.

Lepisiota opaca (Forel); Xu 1994: 235. Combination in *Lepisiota*.

Material examined (Images of type-specimens)

CASENT0909893 (MHNG). INDIA: Karnataka: Kanara, worker, 1891, Coll. Aitken. CASENT0905158 (MSNG). INDIA: Karnataka: Kanara, worker.

Forel (1892) *(Description of worker)*

Head subquadrate with somewhat convex sides (Fig. 8C). Mandibles narrow. Clypeus convex at middle and subcarinate. Antennal scape barely protruding 1/3rd of their length to the posterior margin of the head.

Compound eyes are located at the midlength of the head. Ocelli is very small but distinct. The dorsum of the pronotum is almost flat and sub-shouldered at its anterior angles. Strongly imprinted, shiny promesonotal suture. Mesonotum narrow. Metanotum short, propodeum with two elongated lateral protuberances, shaped like large triangular teeth. Petiole thicker than *L. capensis*, surmounted by two long spines. Body entirely dull, densely reticulate-punctate, except shiny gaster (Fig. 8A–C). Body colour ferruginous red while gaster reddish-brown colour. Short, sparse, yellowish erect setae on the body except on legs and antennae. Pubescence very sparse. TL–2.20 mm.

Comments

Lepisiota opaca distinctly differs from *L. pusaensis* (which has been possibly misidentified as *L. opaca* in Wachkoo et al. 2021) in the sculpture of the head and mesosoma. Head of *L. pusaensis* bears microreticulate sculpture and is shiny while *L. opaca* has reticulate-punctate sculpture on the head and its overall appearance is dull. Dorsum of pronotum is microreticulate in *L. pusaensis*, while *L. opaca* has reticulate-punctate sculpture (Forel 1892).

***Lepisiota pulchella* (Forel, 1892)** (Fig. 8D–F)

Acantholepis opaca r. *pulchella* Forel 1892: 43. Syntype workers, Pune [Poona], Maharashtra, India.

Acantholepis pulchella Forel; Dalla Torre 1893: 172; Bingham 1903: 318; Wu & Wang 1995: 129; Zhou 2001: 168; status as species.

Acantholepis opaca subsp. *pulchella* Forel; Emery 1893b: 172; Forel 1894: 414; Forel 1895: 458; Emery 1925: 27; Chapman & Capco 1951: 210; Bolton 1995: 228; Guénard & Dunn 2012: 34; Bharti et al. 2016: 28; Bharti et al. 2017: 42; subspecies of *opaca*.

Lepisiota opaca subsp. *pulchella* (Forel); Bolton 1995: 228; combination in *Lepisiota*.

Lepisiota pulchella (Forel), Wachkoo et al. 2021: 238; status as species.

Material examined

INDIA: Madhya Pradesh: Pachmarhi, 22°28′20”N 78°25′00”E, 1004 m, 11 workers, 06.IX.2020, Coll. A. Harshana; Jabalpur (JNKVV), 23°12′46”N 79° 57′33”E, 394 m, 7 workers, 12.IX.2020, Coll. A. Harshana.

Measurements and indices

Workers (N = 6). EL: 0.17–0.19; HL: 0.58–0.64; HW: 0.52–0.59; MML: 0.27–0.29; PH: 0.31–0.36; PRW: 0.39–0.43; SL: 0.62–0.67; TL: 2.60–2.80; WL: 0.83–0.91; CI: 89–92; OI: 31–33; REL: 27–30; SI: 114–118.

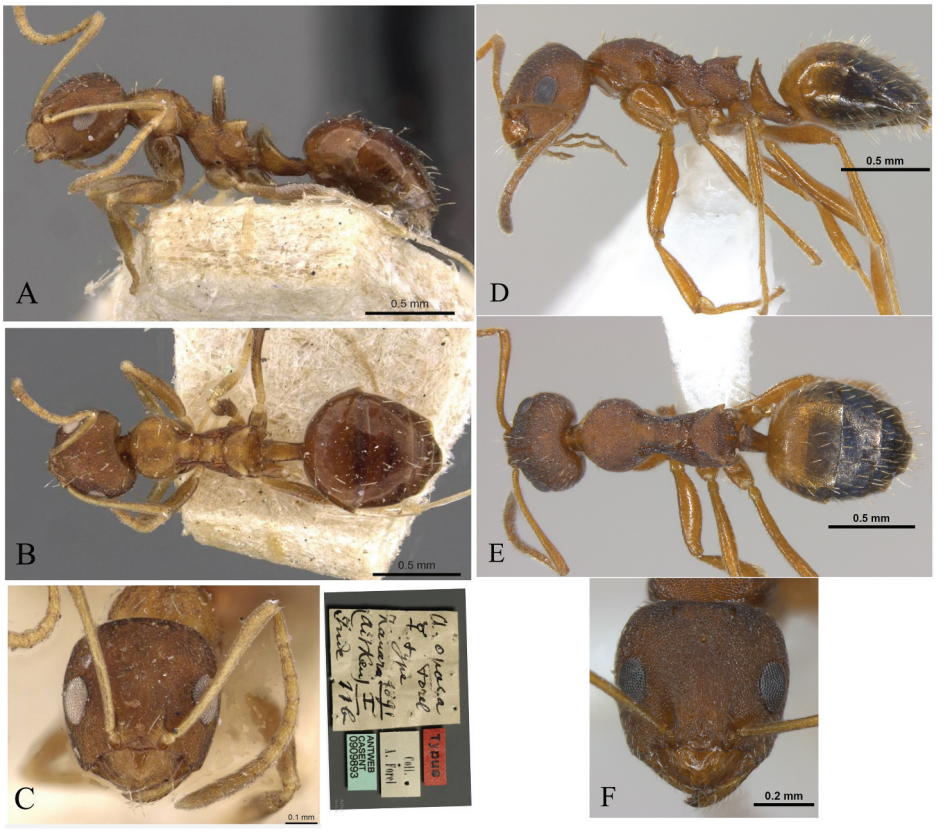

Figure 8A–F. Syntype worker (AntWeb: CASENT0909893, photographed by Zach Lieberman) of *Lepisiota opaca* (A–C), worker of *Lepisiota pulchella* (D–F). **A, D**, body in profile view; **B, E**, body in dorsal view; **C, F**, head in full-face view.

Description (Workers): Head

Head slightly longer than broad, subquadrate, sides of head weakly convex, posterior margin straight with posterolateral corners rounded (Fig. 8F) and head covered with appressed pubescence; posterior margin of head with 4–5 erect setae (including a pair of erect setae between lateral ocelli), three pairs of setae at middle of head; palp formula 6,4 and third maxillary segment from base longest of all segments, sixth maxillary segment distinctly longer than fifth segment; mandible with five teeth on masticatory margin, third tooth from apex smaller than fourth tooth; antennae 11 segmented with scape extending to posterior margin of head not more than 1/3rd of its length; antennal insertions touching posterior clypeal margin; antennae covered with appressed to decumbent pubescence; clypeus dorsally convex, subcarinate at middle, having decumbent pubescence, posterior margin having a pair of long yellowish erect setae while anterior

margin with two pairs of long yellowish erect setae with a downwardly directed long median seta; anterior clypeal margin convex; compound eyes broadly oval and positioned at about mid-length of head; three ocelli present.

Mesosoma

Promesonotum convex in profile view, metanotum little lower than promesonotum (Fig. 8D); propodeal spine broad at the base and blunt at apex, propodeal declivity steep; fore tibiae with a pectinate spur at the distal end and basitarsus with a notch at the proximal end; dorsum of pronotum with more than 10 erect yellowish setae, mesonotum with two pairs of erect yellowish setae, metanotum with a pair of erect yellowish setae and propodeum with three pairs of erect yellowish setae; mesosoma with very sparse appressed to decumbent pubescence.

Metasoma

Petiole upright, dorsally bispinose, and deeply emarginate (Fig. 8D), lateral sides of petiole weakly convex in frontal view with a pair of long setae little above petiolar spiracles; gastral segments sparsely covered with yellowish erect setae mostly on posterior half except first gastral segment which is almost completely covered with erect setae; gaster with sparse decumbent pubescence; acidopore well-developed and fringed with hairs.

Sculpture and colour

Dorsum of head and mesosoma reticulate-punctate (Fig. 8E–F); mesopleuron rugose; mandible, clypeus smooth and shiny; gaster microreticulate and subopaque. Body bicoloured; head brown to dark brown; antennal scape yellowish-brown while antennal funicles brown; mesosoma, and petiole golden brown to dark brown, first gastral segment golden brown to brown while remaining gaster black in most studied specimens. The first gastral segment was golden brown in the Pachmarhi population with the remaining segments being black while from the Jabalpur population four specimens had complete black gaster.

Comments

Lepisiota pulchella differs from *L. opaca* in the sculpture of gaster, which is microreticulate and subopaque in the former while smooth and shiny in the latter.

Distribution in India: Karnataka, Kerala, Madhya Pradesh*, Maharashtra.

Table 1. List of *Lepisiota* species with DNA barcode's GenBank accession numbers and BOLD process IDs.

Species	Collection Locality	GenBank accession numbers	BOLD Process IDs
Lepisiota annandalei	India: Delhi	OK287917	AHDD001-22
Lepisiota bipartita	India: Madhya Pradesh	OK350690	AHDD002-22
Lepisiota pulchella	India: Madhya Pradesh	OK353881	AHDD003-22
Lepisiota pusaensis **sp. nov.**	India: Delhi	OL827570	AHDD004-22

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ORCID

Anand Harshana http://orcid.org/0000-0001-7266-4912
Debjani Dey http://orcid.org/0000-0002-6956-239X

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