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A new species of the rare ant genus, *Leptanilla* Emery (Hymenoptera: Formicidae) from Eastern Himalaya, India

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ABSTRACT. *Leptanilla ujjalai* **sp. nov.** is decribed and illustrated from the Neora valley National Park, Eastern Himalaya Himalaya, India. The new species differs from the Indian congeners in having four teeth on mandibles and an extended flange on anterior clypeal margin, and from others in flagellomers and petiolar characters. Images of holotype and SEM microphotographs of a paratype are provided. An identification key to workers of the Oriental and Sino-Japanese *Leptanilla* species is provided.

Keywords Leptanillinae, Himalaya, new species, India, Neora valley National Park
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INTRODUCTION

The members of the genus *Leptanilla* Emery 1870 are small, pale yellowish ants with a more or less flat head, no eyes, antennae inserted very close to anterior margin of head and 12 segmented antenna. The genus comprises 48 species worldwide (https://www.antweb.org); it is rarely represented in the collections due to their small size, subterranean habitat or nesting in rotten wood. Studies have shown that they are predators of geophilomorph centipedes (Masuko 1990, 2007; Ogata et al. 1995). Emery (1910) placed the genus *Leptanilla* under the subfamily Dorylinae, tribe Leptanillini due to their morphological affinities to Doryline Ants. Wheeler and Wheeler (1930) separated it from Dorylinae and given the rank of subfamily, as Leptanillinae. Bolton (1990) considered it as a sister group of Ponerinae. Urbani (1977) revised the genus with description of five more species and synonimised the only Indian species *Leptomesites escheri* Kutter 1948 as *Leptanilla escheri* (Kutter). Bharati and Kumar 2012 added another species *Leptanilla lamellata* to the Indian fauna. 22 species are so far known from the Oriental Region (https://www.antwiki.org). Checklist of Ants of India (Bharti et al 2016) reports two species, *Leptanilla escheri* and *Leptanilla lamellata* from India. Here, a new species, *Leptanilla ujjalai* **sp. nov.**, is described, thereby bringing the number of species in India to three viz., *Leptanilla escheri* Kutter, *Leptanilla lamellata* Bharati and Kumar and *Leptanilla ujjalai* sp.nov. This new species is collected from the Neora valley National Park

(189.89 km^2), located in the Eastern Himalaya in the State of West Bengal, India. The park is among the oldest reserve forests of India, known for its endemic entomofaunal diversity and being located at trijunction of Indo-Malayan, Palaearctic and Sino-Japanese realms considered of ecological significance. Its pristine forests with high altitudinal variations and complex topography might help in diversification and evolution of endemic species. *Leptanilla ujjalai* sp. nov**.** was found nesting inside a fallen tree trunk, above ground; the nest occupying an area of about three inches in diameter. Its distribution seems to be restricted, as a single colony only was located within a radius of 25 km. Air temperature during collection time was 7° C at night to maximum16° C at day time.

MATERIALS AND METHODS

A Leica stereozoom microscope S8 APO was used for identification. Photographs were taken using NIKON SMZ 25 microscope with NIKON DS Ri2 camera; NIS Elements BR Analysis 5.20.00 software and SEM photographs were taken using EVO 18 microscope (Carl Zeiss, Jena, Germany), 152x to 968x magnification. The Holotype and paratypes are deposited in the National Zoological Collections of the Zoological Survey of India, Kolkata, India.

Abbreviations used (after Baroni Urbani 1977).

HW Head Width. Maximum width of head in full-face view excluding the eyes.

HL Head Length. Maximum length of head from the anterior median clypeal margin to the median posterior margin of the cephalic capsule measured along the midline as a straight line.

MaL Mandible Length. Maximum length of mandible from the anterolateral margin of clypeus at outer side of mandibular insertion to mandibular apex.

SL Scape Length. Maximum length of scape, from the proximal point of scape shaft, not including the condyle, to the distal end of scape.

EL Eye Length. Maximum diameter of eye measured in lateral view.

TL Total Length. Maximum length of specimen measured from the tip of the mandibles to the tip of the last abdominal segment, not including sting. Due to the position of the specimen, total length was measured as the sum of head length, mesosoma length, petiole and postpetiole length and gaster length.

WL Weber's Length of Mesosoma. Maximum diagonal distance in lateral view, from base of anterior slope of pronotum to metapleural lobe.

PNW Pronotal Width. Maximum width of pronotum measured in dorsal view.

PTL Petiole Length. In dorsal view, maximum length of petiole, along the sagittal plane, and excluding the peduncle.

PTH Petiole Height. Maximum height of petiole, measured in lateral view from the highest (median) point of the node, to the ventral outline of the node.

PTW Petiole Width. Maximum width of the petiole in dorsal view.

PTNL Petiolar length: Maximum length of the node of petiole in dorsal view.

PPL Postpetiole Length. Maximum length of postpetiole, measured in dorsal view.

PPH Postpetiole Height. Maximum height of postpetiole, measured in lateral view from the highest point of the node.

PPTNL Postpetiole node length. Maximum length of the node of the post petiole in Dorsal view.

PPW Postpetiole Width. Maximum width of the postpetiole in dorsal view.

CI Cephalic Index. Calculated as: HW / HL × 100.

SI Scape Index. Calculated as: SL / HW × 100.

MaI Mandibular Index. Calculated as: MaL / HW × 100.

PI Petiolar Index. Calculated as: PTW / PTL × 100.

PPI Postpetiolar Index. Calculated as: PPTW / PPTL × 100.

PPHI Postpetiolar Height Index. Calculated as: PPTW / PPTH × 100.

F1-F11 Flagellar segments 1-11.

NZC ZSI National Zoological Collection, Zoological Survey of India.

TAXONOMY

***Leptanilla ujjalai* sp. nov.**
http://zoobank.org/1EB13968-91C8-401B-8BA5-2B4E222FE19B
(Figs. 1-3)

Measurements. Worker holotype, TL 1.71 mm; HL 0.4 mm; HW 0.31 mm; MaL 0.18 mm; SL 0.24 mm; WL 0.52 mm; PW 0.22 mm; PTL 0.12 mm; PTW 0.12 mm; PTH 0.14 mm (excluding sting); PTNL 0.14mm; PPTL 0.09 mm; PPTW 0.12 mm; PPTH 0.18 mm; PPTNL 0.12 mm; CI 79, SI 76, MaI 58, PI 93, PPI 123, PPHI 66 .

Paratypes (Worker). TL 1.58-1.71mm; HL 0.38-0.40 mm; HW 0.30-0.32 mm; MaL 0.16-0.18 mm; SL 0.24-0.25 mm; WL 0.51-0.54 mm; PW 0.21-0.22 mm; PTL 0.11-0.12 mm; PTH 0.13-0.14 mm; PTNL 0.13-0.15 mm; PTW 0.10-0.12 mm; PPTH 0.17-0.19 mm; PPTL 0.08-0.09 mm; PPTNL 0.11-0.12 mm; PPTW 0.10-0.12 mm; CI 78-80; SI 76-80; MaI 53-60; PI 91-93; PPI 125-133; PPHI 59-66. (Eight paratypes examined).

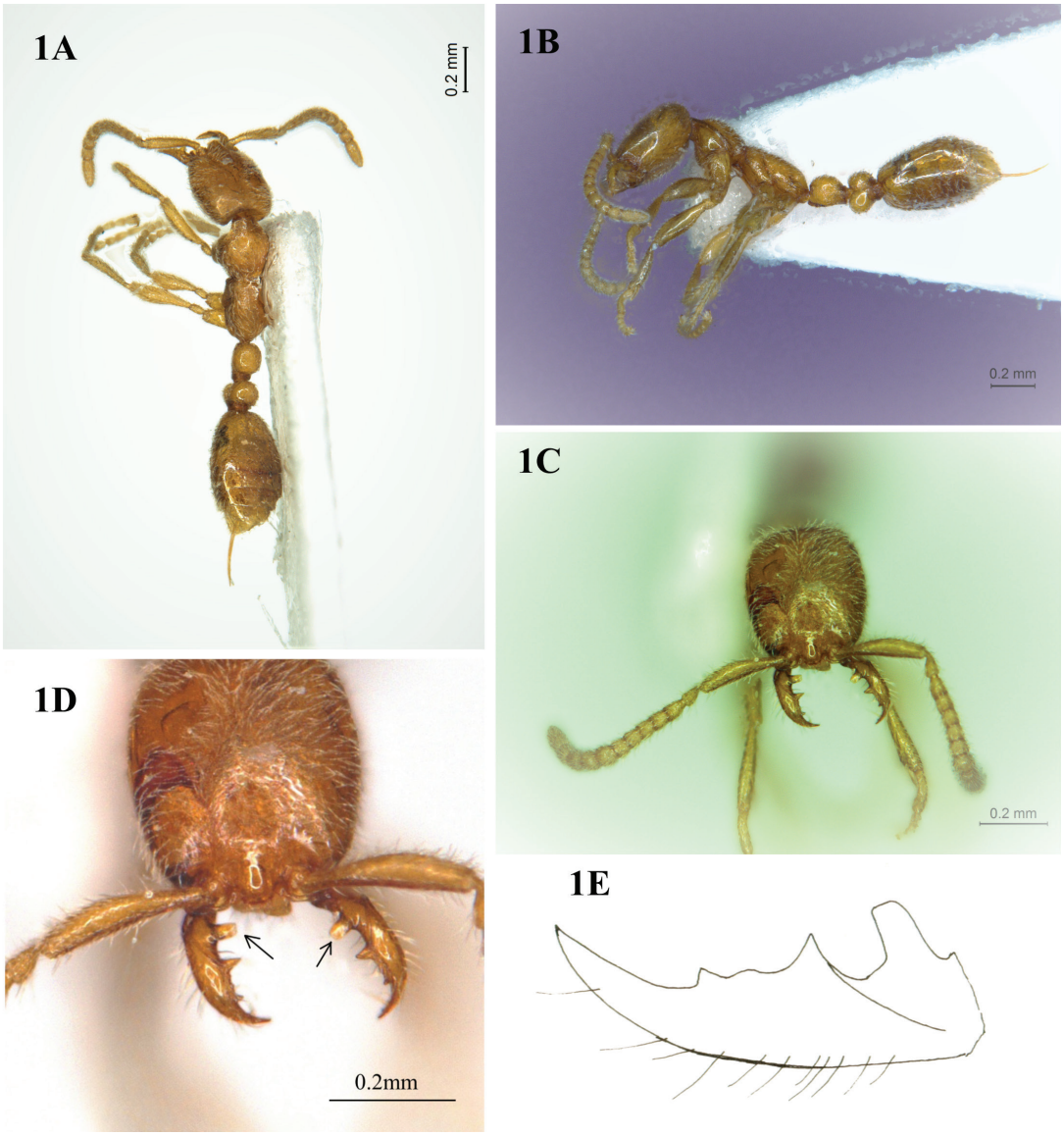

Fig. 1A–E. *Leptanilla ujjalai* sp. nov., Holotype, Worker; (A) Body dorsal view. (B) Body lateral view. (C) Head full face view showing mandibles, (D) Mandible showing the truncate tooth at basal margin, (E) Mandible; diagrammatic sketch.

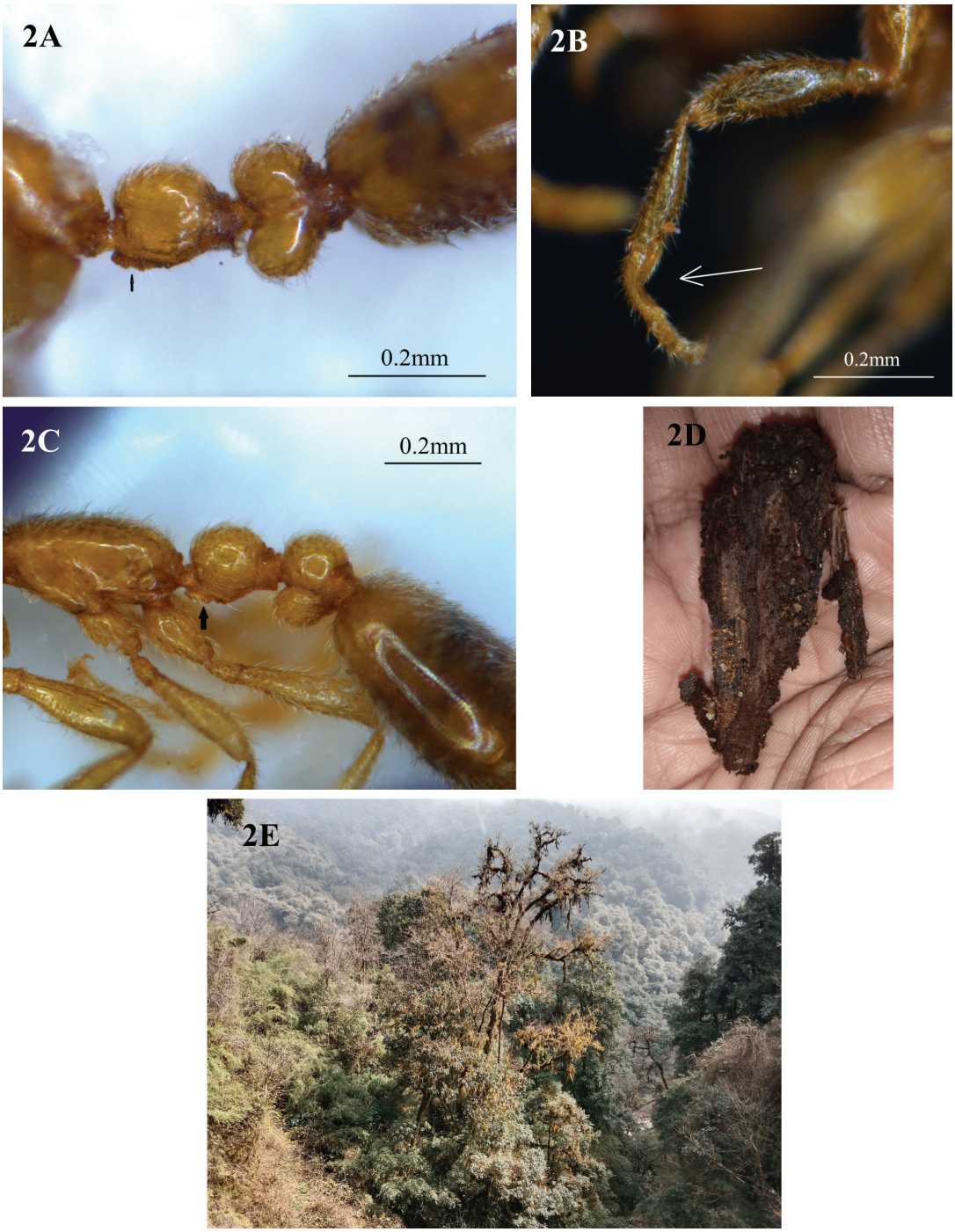

Fig. 2A–E. *Leptanilla ujjalai* sp. nov., Holotype, Paratype, Worker; (A) subpetiolar process of holotype, (B) subpetiolar process of paratype (C) Sickle shaped basi tarsus of foreleg, (D) *Leptanilla* colony inside rotten wood piece, (E) Neora Valley National Park.

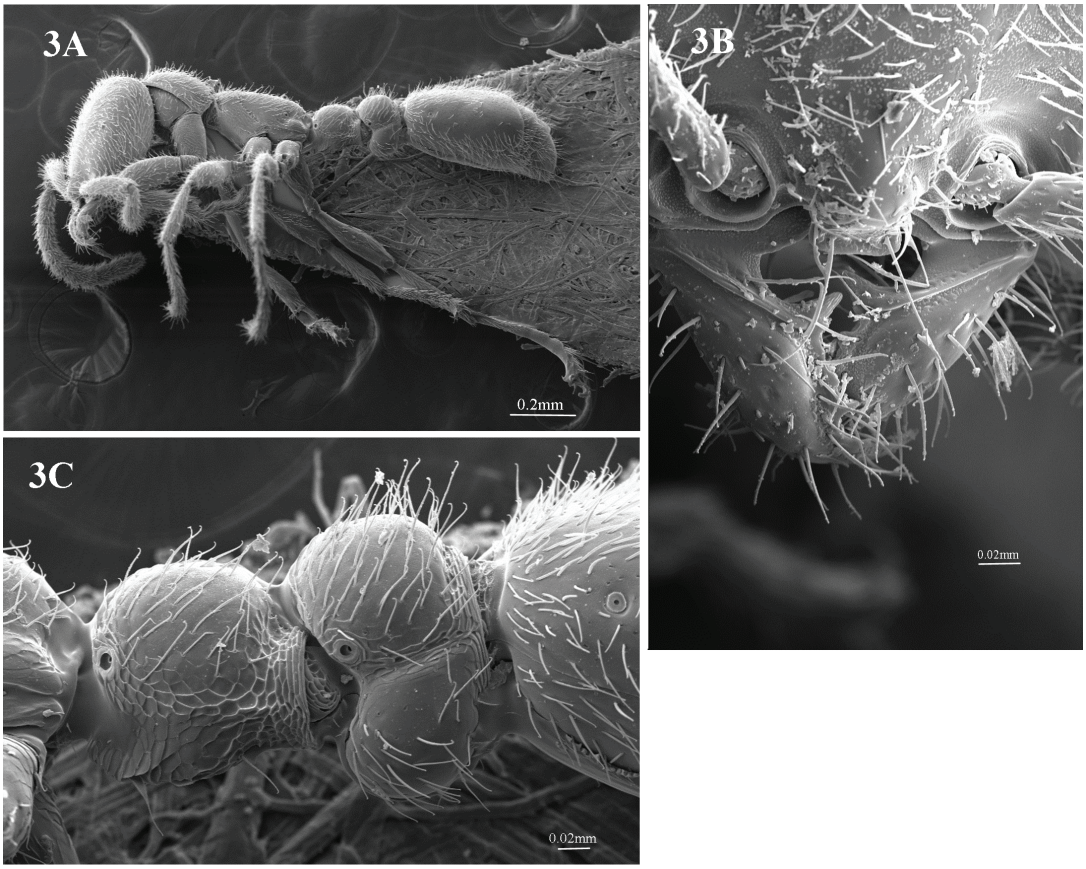

Fig. 3A–C. *Leptanilla ujjalai* sp. nov., SEM microphotographs: (A) Body lateral view . (B) Clypeus, mandible. (C) Petiole and post petiole, lateral view.

Head: Longer than wide, posterior margin widely concave in full face view, slightly broader than anterior margin, lateral margins weakly convex; postero-lateral angles smoothly curved; clypeus anteriorly produced as a distinct lobe with straight anterior margin (Fig. 3B); posterior margin of clypeus not separated by suture; mandibles with four teeth (Fig. 1C), outer margin curved ; masticatory margin long, with three unequal teeth placed at more or less equal distance; apical tooth long, curved, acute, sub-apical tooth minute but distinct, sub-basal tooth acute and larger than sub-apical one; two small denticles between sub-apical and sub-basal teeth; basal tooth large, broad and truncate apically, placed on basal margin (Figs. 1D & 1E); a small ridge from the base of sub-basal tooth diagonally run towards exterior mandibular articulation, which separates the apex of mandible from the base (Fig. 3B); palp formula 2,1; antennal furrows oval shaped with base narrow; scape reaching a little above midline of head, running short of posterior margin of head by 3/4th its length; pedicel comparatively narrow, pedicel and F2 subequal, F1 longer than F2, F3 to F9 broader, club longer than preceding two segments combined; eyes absent.

Thorax: Mesosoma (Figs 1A, 3A) narrower and subequal to gaster; pronotum convex, wider than rest of mesosoma in dorsal view, sides weakly convex, posteriorly constricted; pro-meso-notum weakly convex above; pro-meso-notal suture distinct; meso-meta-notal suture absent; dorsum of propodeum descending to apex with a smooth curve, without distinct separation of declivity from dorsal face; meso-metanotum more or less flat and capsule like in dorsal view; coxae, femora and tibiae swollen; fore-basi-tarsus sickle shaped (Fig. 2B) ; hind tibial spur thick.

Gaster: Petiole as long as braod and distinctly longer than postpetiole, sides nearly parallel; anterior margin straight; petiole with a very thin , narrow subpetiolar lamella at anterior half, subpetiolar process lamellate and denticulate (Fig. 2A), four setae arranged in a row on it; postpetiole distinctly broader than long, sides curved; sternal portion of postpetiole separated from tergal part by a distinct groove and anterior margin making a deep concavity at this groove; tergal height of postpetiole less than that of sternum; spiracles of petiole and postpetiole situated on anterior margin, petolar spiracle wider than post petiolar spiracle (Fig. 3C). Metasoma flat, oval, antero-lateral margins smoothly round and narrowly attached to post petiole; first tergite covers more than half of dorsum; sting exserted.

Sculpture and colour: Whole body smooth and shining with dense, long and short, suberect and decumbent pilosity all over. Fine punctation visible on antennae, anterior neck of pronotum, legs and ventral part of petiole and post petiole. Uniform yellowish with head, gaster and joints slightly darker.

HOLOTYPE: Worker, INDIA: West Bengal, Kalimpong district, Neora valley National Park, 27°03′572″N, 088°46′100″E, 2014m alt., 22.x.2019, S. Bhattacharya (NZC, ZSI, Kolkata; Reg. no.24034/H3). **PARATYPES**: Eight workers. with same data as that of the holotype (Deposited in NZC, ZSI, Kolkata; Reg. nos. 24035/H3-24042/H3).

Remarks: Paratypes share the characters same as that of holotypes with some variations: denticles between teeth on mandible vary from one to two and sometimes not visible in some specimens. In some specimens sub petiolar lamella clearly visible with sharp spiniform teeth (Fig. 2B) with ventral setae ; postpetiolar sternal height also varies in that some times tergum higher than sternum, equal to sternum or lower than sternum.

Etymology: The species is named after Sri. Ujjal Ghosh, Chief Coservator of Forests, Wildlife North, West Bengal, recognising his conservation efforts in the type locality.

Diagnosis: Workers of the new species have unique combination of characters from other species of the genera in having the mandible subtriangular (linear in most of the species) with four teeth. First three teeth on masticatory margin and the largest truncate tooth on basal margin; anterior clypeal margin with a truncate apical lobe, subpetiolar process lamellate and denticulate; petiolar spiracle larger than post petiolar spiracle; 3rd abdominal tergum weakly narrow in its anterior part and post petiole with equal width at anterior and posterior margin. It differs from other two Indian species, in having four distinct teeth on masticatory margins (Figs 1C, 3B) against three teeth in *L. escheri* and *L. lamellata*.; anterior clypeal margin transverse (anterior clypeal margin concave and bilobed in *L. escheri* and *L. lamellata*), subpetiolar process lamellate and denticulate (subpetiolar process not denticulate in *L. escheri* and *L. lamellata*). *L. ujjalai* comes close to *L. tanakai* Urbani from Japan in that abdominal tergite anteriorly constricted, mandibles with four teeth and the basal mandibular teeth distinct; but it differs from *L. tanakai* in postpetiole width equal in anterior and posterior margin, (post petiole trapezium shaped in *L. tanakai*) post petiole not truncated posteriorly, dorsal face of post petiole smoothly passing to posterior face without any edge in *ujjalai* (post petiole posteriorly truncated, posterior margin of post petiole delimited by an edge between dorsal and posterior face in *tanakai*). *Leptanilla ujjalai* resembles *L. japonica* Urbani described from Japan, in the number of mandibular teeth; rectilinear dorsal profile, dorsum of propodeum descending to apex with a smooth curve without a difined declivity, hair and colour pattern, but differs in the subtriangular mandibles (Figs. 1D, 1E), F3 to F9 transverse, anteriorly straight petiole and post petiole, the post petiole width equal on anterior and posterior sides (Fig. 1A) and anterior margin of first gastral tergite narrowly attached to post petiole (in *japonica*, mandibles nearly linear, F3 transverse, F4 to club, gradually increasing length, anterior margins of petiole and post petiole concave, the post petiole broader posteriorly than anteriorly and first gastral tergite broadly attached to post petiole). *L. ujjalai* shows affinities to *L. hypodracos* Wong and Guénard from Singapore in presence of basal tooth on mandibles and anterior margin of clypeus straight (concave to straight in *hypodracos*). But it differs

from *hypodracos* in presence of four teeth on mandible (only three teeth in *hypodracos*), basal tooth truncate (basl tooth sharp in *hypodracos*); petiole as long as wide and post petiole wider than long (petiole twice its width and post petiole longer than wide in *hypodracos*).

Key to Oriental Leptanillinae based on workers (Modified from Leong *et al* 2018)

1) Masticatory margin of mandible with 2 teeth.. 2
- Masticatory margin of mandible with 3 or more teeth.....3

2) Anterolateral lobes of clypeus present. 3rd antennal segment with a distinct basal peduncle; dorsal view of petiolar node with arched anterior margin; promesonotal suture narrow (Indonesia) .....*L. kebunraya* Yamane & Ito
- Anterolateral lobes of clypeus absent. 3rd antennal segment without distinct basal peduncle; dorsal view of petiolar node rectangular; promesonotal suture wide (Malaysia).....*L. butteli* Forel

3) Masticatory margin of mandible with 4 teeth.. 4
- Masticatory margin of mandible with 3 teeth.... 6

4) In full face view 3rd abdominal tergum strongly narrow in its anterior part; basal tooth of masticatory margin of mandible distinct.....5
- In full face view 3rd abdominal tergum weakly narrow in its anterior part; basal tooth of masticatory margin of mandible very small and difficult to distinguish (Japan) ....*L. japonica* Baroni Urbani

5) Post petiole trapezium shaped and posteriorly truncated (Japan).....*L. tanakai* Baroni Urbani
- post petiole with equal width at anterior and posterior margin; posteriorly not truncate (India) ....*L. ujjalai* sp. nov.

6) Metanotal groove present 7
- Metanotal groove absent.....8

7) In full-face view head approximately rectangular; clypeus not protruding, with anterior margin roundly convex; in profile, dorsum of petiole almost straight; in dorsal view post petiolar node much wider than petiolar node. Smaller species; HW: ca. 0.180 mm (China)..... .....*L. hunanensis* Tang, Li & Chen
- In full-face view head distinctly narrowed anteriorly; clypeus protruding, with anterior margin concave; in profile, dorsum of petiole roundly convex; in dorsal view post petiolar node as wide as petiolar node. Larger species; HW: ca. 0.370 mm (China) .....*L. kunmingensis* Xu & Zhang

8) Anterior margin of clypeus more or less straight or weakly to strongly convex.....9
- Anterior margin of clypeus medially incised, bilobed.....15

9) Clypeus not protruding anteriorly, and with straight or weakly convex anterior clypeal lobe 10
- Clypeus slightly or strongly protruding anteriorly, and with distinctly convex anterior clypeal lobe.....13

10) Ventral margin of petiolar sternite in lateral view without well developed projection (Japan) . .....*L. kubotai* Baroni Urbani
- Ventral margin of petiolar sternite in lateral view with well developed and convex projection..... 11

11) Petiolar node distinctly wider than long (PI ≥ 138) 12
- Petiolar node distinctly longer than wide (PI ≤ ca. 81) (Japan).....*L. morimotoi* Yasumatsu

12) Post petiolar node wider than long (PPI = 163–171). Larger species; HW: ca. 0.235 mm (China) .....*L. yunnanensis* Xu
- Post petiolar node almost as long as wide (PPI = 88). Smaller species; HW: ca. 0.140 mm (Japan) *L. okinawensis* Terayama

13) Larger species, with petiole longer than 0.13 mm (Sri Lanka).....*L. besucheti* Baroni Urbani
- Smaller species, with petiole shorter than 0.10 mm 14

14) Ventral margin of petiolar sternite with triangular projection. Subpetiolar process absent. PPI = 122–138; CI ≥ 82; PI = 111–125 (Nepal) ....*L. buddhista* Baroni Urbani
- Ventral margin of petiolar sternite with sub-circular projection. Subpetiolar process present as a small and hook like spine. PPI = 80–86; CI ≤ 74; PI = 117–124 (China)..... .....*L. macauensis* Leong, Yamane and Guénard

15) Petiole in dorsal view with sharp and protruding anterolateral corners, with well concave anterior margin.....16
- Petiole in dorsal view with blunt and non-protruding anterolateral corners, with slightly concave to convex anterior margin 17

16) Petiolar node almost twice as long as wide (PI = 60); post petiolar node almost as wide as long (PPI = 90); propodeal dorsum and declivity in lateral view meeting at an angular corner; masticatory margin of mandibles with a long and well-defined basal tooth (Singapore) ....*L. hypodracos* Wong & Guénard
- Petiolar node almost as long as wide (PI = 82–100); post petiolar node distinctly wider than long (PPI = 133–137); propodeal dorsum and declivity in lateral view meeting at a rather rounded corner; masticatory margin of mandibles without a long and well-defined basal tooth (Indonesia) ....*L. clypeata* Yamane & Ito

17) Anterior margin of clypeal disc almost touching the lower level of antennal insertion, with shallowly notched anterior lobe (Taiwan) ....*L. taiwanensis* Ogata, Terayama & Masuko
- Anterior margin of clypeal disc exceeding the lower level of antennal insertion with distinctly bilobed anterior lobe 18

18) Posterior margin of head deeply concave in full-face view 19
- Posterior margin of head almost straight in full-face view 20

19) Petiolar node rectangular with slightly concave anterior margin in dorsal view; anterior distinctly shorter than posterior margin. Smaller species; HW: ca. 0.155 mm (Japan) .... *L. oceanica* Baroni Urbani
- Petiolar node square with straight anterior margin in dorsal view; anterior margin as long as posterior margin. Larger species; HW: ca. 0.29 mm. (India)..... *L. lamellata* Bharti & Kumar

20) Petiole sternite in lateral view distinctly protruding, with ventral margin bluntly angulate..... 21
- Petiole sternite in lateral view indistinctly protruding, with ventral margin almost straight (Thailand) ..... *L. thai* Baroni Urbani

21) Anterolateral corners of petiole roundly convex in dorsal view HW: ca. 0.245 mm (Singapore).... .....*L. havilandi* Forel
- Anterolateral corners of petiole forming a small and sharp angle in dorsal view HW: ca. 0.280 mm (India)..... .....*L. escheri* (Kutter)

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