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Two new species of the ant genus *Leptogenys* (Hymenoptera: Formicidae) from India, with description of a plesiomorphic ergatogyne

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ABSTRACT. Two new species of *Leptogenys* based on the worker caste are described under the names *Leptogenys lattkei* sp. nov. and *Leptogenys transitionis* sp. nov. The ergatogyne of *Leptogenys transitionis* also reported here is the first of its kind in *Leptogenys*, characterised by a highly enlarged gaster, three prominent ocelli and the absence of wing sclerites. The ergatogyne of *L. transitionis* is intermediate between that of *L. ergatogyna*, with well-developed wing-base sclerites and ocelli, and the more usual ergatoid condition characterised by degenerate ocelli.

Keywords: ergatogyne, Ponerinae, key, new species, Himalaya.

INTRODUCTION

The genus *Leptogenys* Roger currently includes 216 extant species, 31 subspecies and one fossil species, distributed pantropically (Bolton et al. 2007; Bolton 2012). It forms the most speciose genus within the subfamily Ponerinae. While *Leptogenys* awaits a global taxonomic revision, noteworthy contributions include the revisionary work of Bolton (1975) for the African region and Lattke (2011) for New World species. From Southeast Asia, important contributions include Wu & Wang (1995), Xu (2000), Zhou (2001) and Terayama (2009). In India the present study follows Bingham (1903), Donisthorpe (1943) and Mathew & Tiwari (2000).

Here we present descriptions of two new species, *Leptogenys transitionis* sp. nov. and *Leptogenys lattkei* sp. nov., collected in the foothills of the Northwest Himalayas, in the Shivalik range. Prior to this the genus *Leptogenys* was represented by 29 species/subspecies from India (Bharti 2011). The taxonomy of *Leptogenys* from India remains chaotic, although an attempt has been made here to give a summary of current understanding by providing a preliminary key. From Southeast Asia about 100 species of *Leptogenys* are reported up to now (Bolton 2012). Since most collection to date has been conducted in a small number of locations, it is likely that many more species of *Leptogenys* await discovery in the region. Considering that six ant genera (in northwest Shivalik range and the Western Ghats) and about 70 new species (from the Northwest Himalayas) have been recently discovered in India (Bharti & Wachkoo 2012a, b, c; Bharti & Akbar in prep.; Bharti et al. in prep.) and that most areas of the vast Indian territory are unexplored for ants, perhaps half of the *Leptogenys* in India are still to be discovered.

Ants of this genus generally reproduce by ergatogynes or gamergates (Ito 1997; Ito & Ohkawara 2000; Peeters 2012). Ergatogynes may or may not possess one to three ocelli, but generally show differences in petiolar width and shape and an enlarged gaster as compared with workers. The petiolar node, when seen dorsally, is generally wider than long, and the propodeal margin is more convex when observed laterally than in the worker. Some species have ergatogynes

with greatly swollen mandibles of a pale yellow colour (Lattke 2011).

The ergatogyne of *Leptogenys transitionis* reported here is the first of its kind, a novel phenotype with well developed ocelli, and an exceptionally large gaster, both of which are plesiomorphic features (Villet 1989; Lattke 2011). Other reported ergatogynes lack any trace of ocelli or, if present, they are reduced in size or in some cases have only the single median ocellus.

Wingless reproductive females are evidently a derived condition because most Hymenoptera have wings (Ito & Ohkawara 2000). Ergatogyne ponerines frequently possess ocelli or ocellar remnants, a trait typical of ponerine alates but totally absent in workers, and unlikely to reappear during evolution (Villet 1989). The queen of *L. ergatogyna* Wheeler, 1922, with well-developed wing-base sclerites and ocelli, is intermediate in thoracic morphology between the normal alate condition, as found in *L. langi* Wheeler, 1923 and *L. nigricans* Lattke, 2011. The ergatogyne of *L. transitionis*, with prominent ocelli, is in turn intermediate between *L. ergatogyna* and the more usual ergatoid condition characterised by degenerate ocelli.

The loss of winged queens is apparently effectively irreversible, and eliminates the option of colonising disjunct habitats across a hostile matrix (Peeters 2012). The species reported here were collected in canoe-shaped longitudinal valleys of the Shivalik range (arguably the most fragile ecosystem of the Himalayas) (Mittal *et al*., 2000), which separate the mountains from the plains of India. They seem especially prone to allopatric speciation due to the wingless nature of their queens and have, therefore, a limited range. Although their conservation status is yet to be ascertained, these and many other evolutionarily significant species found in Shivalik (Bharti & Wachkoo, unpublished) demand prompt attention or else the already fragmented Shivalik forests may not sustain them much longer.

MATERIALS AND METHODS

The specimens were collected by hand. The taxonomic analysis was conducted with a Nikon SMZ 1500 stereo zoom microscope. For digital images, an Evolution MP digital camera was used on the same microscope with Auto-Montage (Syncroscopy, a division of Synoptics Ltd.) software. Later, images were cleaned with Adobe Photoshop CS5. Morphological terminology for measurements (given in millimetres) and indices includes:

TL Total outstretched length of a specimen, from mandibular apex to gastral apex.
HL Maximum length of head in full-face view, measured in straight line from the anteclypeus to the midpoint of the frontovertext margin.
HW Maximum width of head in full-face view.
ML Straight-line length of a mandible in full-face view, measured from the base at the insertion into the head capsule, to the apex.
EL Maximum length of eye as measured normally in oblique view of the head to show full surface of eye.
SL Maximum length of the scape excluding the basal neck and condyle.
PW Maximum width of pronotum in dorsal view.
WL Weber's length of mesosoma, measured in lateral view from the anterior surface of the pronotum (excluding the collar) to the posterior margin of the propodeal lobes.
PL The length of the petiole from the anterior process to the posteriormost point of the tergite, where it surrounds the gastral articulation.
PDW The maximum width of the petiole in dorsal view.
PH Height of the petiole measured in lateral view from the apex of the ventral (subpetiolar) process vertically to a line intersecting the dorsalmost point of the node.
CI Cephalic index: HW/HL × 100
MI Mandibular index: ML/HW × 100
OI Ocular index: EL/HW × 100
SI Scape index: SL/HW × 100.
LPI Lateral petiole index: PH/PL × 100
DPI Dorsal petiole index: PDW/PL × 100

SPECIES ACCOUNTS

***Leptogenys lattkei* sp. nov.**
(Figs. 1–3)

MATERIAL EXAMINED

Holotype (worker) from India, Himachal Pradesh, Kangra District, Andretta, 940 m a.s.l., 32.0744°N 76.5856°E, 20 June 2010, hand picking, coll. Aijaz A. Wachkoo. Holotype deposited in Punjabi University Patiala Ant Collection (PUPAC), Patiala, India.

Paratypes: 2 workers, 11 June 2010; 2 workers, 12 June 2010, 3 workers, 13 June 2010 with same data as holotype. Paratypes deposited in Punjabi University Patiala Ant Collection (PUPAC), Patiala, India. One paratype will be deposited at BMNH, Natural History Museum, London, UK and one at California Academy of Sciences, San Francisco, USA.

DESCRIPTION OF WORKER

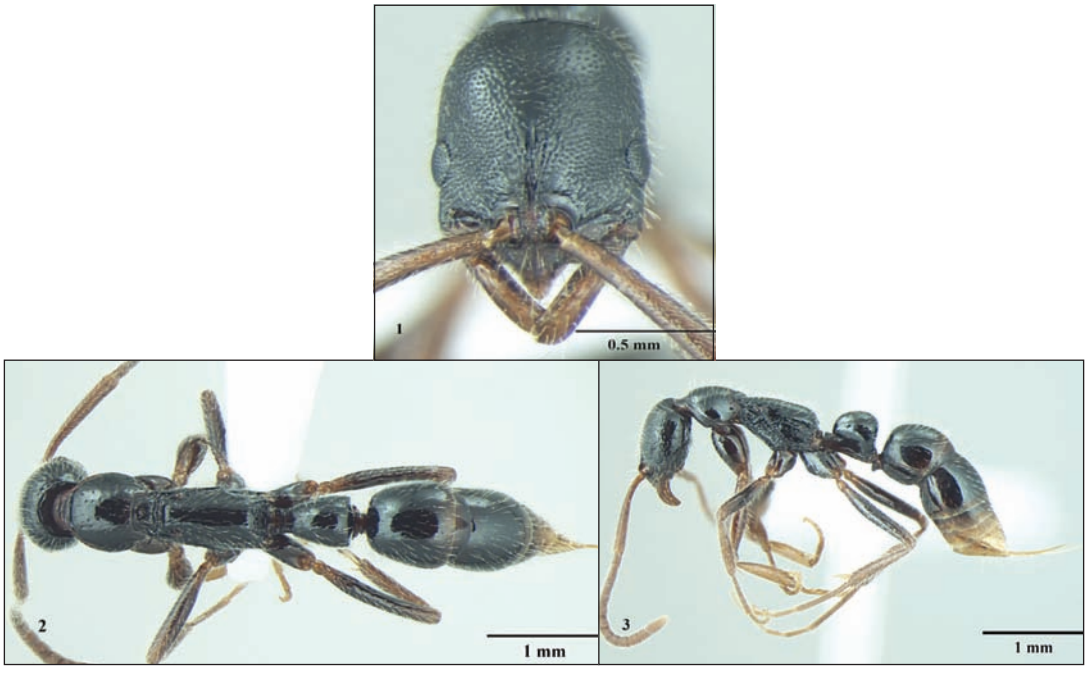
Measurements of holotype worker: TL 5.68; HL 1.14; HW 0.78; ML 0.55; EL 0.20; SL 1.07; PW 0.69; WL 1.80; PL 0.56; PDW 0.48; PH 0.68 mm. Indices: CI 68; MI 70; OI 26; SI 137; LPI 121; DPI 86;

Measurement of paratype workers: Range of seven workers: TL 5.45-5.68; HL 1.10-1.14; HW 0.77-0.78; ML 0.54-0.55; EL 0.18-0.20; SL 1.02-1.07; PW 0.64-0.70; WL 1.77-1.80; PL 0.52-0.56; PDW 0.45-0.48; PH 0.61-0.68 mm. Indices: CI 67-71; MI 70-71; OI 23-26; SI 131-139; LPI 117-121; DPI 84-87.

Head: Head subrectangular in full-face view, somewhat wider anteriorly than posteriorly, posterior and lateral margins broadly convex; anterior clypeal margin with triangular median lobe, anterior and lateral margins lamellate, apex rounded with single median seta, strongly carinate in middle; lateral lobe narrow, convex. Compound eye weakly convex, placed laterally, anterior to cephalic mid-length. Frontal groove deep, extending to posterior margin of eye. Mandible elongate, slightly arched, parallel-sided with weakly concave edentate masticatory margin, basal margin convex, basal angle with denticle. Scape surpasses posterior cephalic border by one-fifth its length; third antennal segment three-fifths as long as wide and one-quarter as long as second segment.

Mesosoma: Mesosoma with prominent metanotal groove dividing dorsal margin into large convex promesonotum and mostly flat metanotum-propodeum in lateral view; metapleural-propodeal suture effaced. Propodeal spiracle round, facing posterad; promesonotal suture distinct; mesonotum oval, much broader than long, divided in centre by a longitudinal groove. Posterolateral propodeal margins rounded; declivitous face subtriangular, wider posterially than anteriorly.

Metasoma: In lateral view, petiole subquadrate, anterior and posterior margins



Figs. 1 – 3. *Leptogenys lattkei* sp. nov. worker (1) Head, full-face view; (2) Body, dorsal view; (3) Body, lateral view.

vertical, anterior margin about as high as midpoint of the posterior node margin, node highest posterad with rounded dorsum, posterior margin inclined, with strong convexity basad; in dorsal view node trapezoidal, with the anterior margin narrower than the posterior margin, longer than wide; lateral margin broadly convex, anterior and posterior margins weakly convex. Subpetiolar process trapezoidal in lateral view. Gaster elongate, a distinct constriction with a row of short longitudinal ridges in it separates first and second gastral segments. Tibiae without setae on external face close to apex.

Sculpture: Cephalic dorsum mostly densely punctate, punctures becoming dispersed posteriorly; malar space reticulate; clypeus with longitudinal to oblique striae, which are more pronounced laterally. Antennae covered with dense piligerous punctulae. Mandible dorsal surface smooth and shiny with scattered punctures, mandible with laterobasal sulcus. Mesosoma mostly smooth and shiny, covered with a few scattered piligerous punctures; propleuron smooth and shining with sparse punctures, mesopleuron rugulose, katepisternum sulcate along mesometapleural suture; metapleuron mostly smooth and shining, propodeum rugose posteroventrally. Metanotal groove with cross-ribs; propodeal declivity transversely striate. Node and gaster polished, smooth and shiny.

Vestiture: Body with abundant suberect to erect hairs, no appressed pubescence. Scape with long abundant suberect hairs and smaller sparse subdecumbent hairs.

Colour: Body colour mostly black, with antennae, mandibles, legs, and gastral apex brown.

ETYMOLOGY

The species is named in honour of John E. Lattke, in recognition of his significant contribution to the genus *Leptogenys.*

DISTRIBUTION AND HABITAT

Andretta, the type locality of this species, falls within the Shivalik range of the Northwest Himalayas and is largely devoid of leaf litter. The surrounding habitat is mainly tea gardens and pine forests. The species was found at the roadside, nesting in soil on a stone embankment, and the foraging workers were collected during the evening.

COMPARATIVE NOTES

This new species most resembles the Chinese *Leptogenys mengzii* Xu, 2000 but can be easily separated by a shorter scape, surpassing the posterior cephalic border by one-fifth of its length (one-third in *L. mengzii*), and a mesosoma without any rugae (cf. longitudinal rugae in *L. mengzii*). Among the Indian *Leptogenys*, it to some extent resembles *L. jeanettei* Tiwari, 2000 but can be easily distinguished by the longer-than-wide petiolar node (broader-than-long in *L. jeanettei*) and smooth shiny mesosomal dorsum (densely punctate in *L. jeannettei*).

***Leptogenys transitionis* sp. nov.**
(Figs. 4-9)

MATERIAL EXAMINED

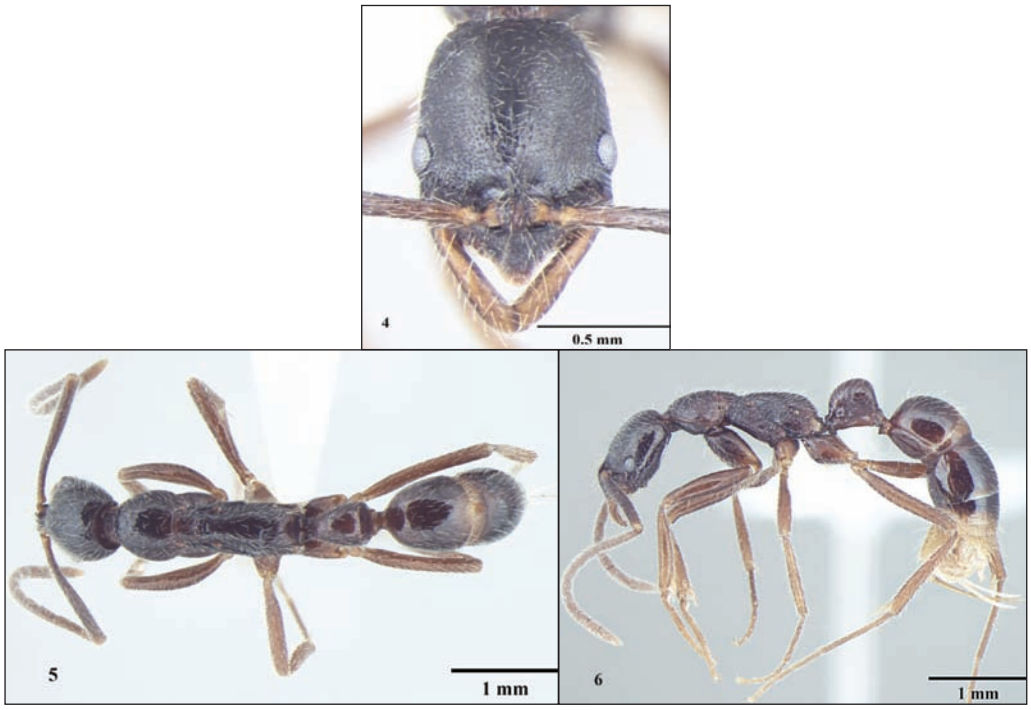
Holotype (worker) from India, Himachal Pradesh, Sirmaur District, Lwasa, 1200 m a.s.l., 30.7394°N 77.1528°E, 13 October 2008, hand picking, coll. Aijaz A. Wachkoo. Holotype deposited in Punjabi University Patiala Ant Collection (PUPAC), Patiala, India.

Paratypes: 9 workers and 1 ergatogyne queen, with same data as holotype. Paratypes deposited in Punjabi University Patiala Ant Collection (PUPAC), Patiala, India. One paratype will be deposited at BMNH, Natural History Museum, London, UK and one at California Academy of Sciences, San Francisco, USA.

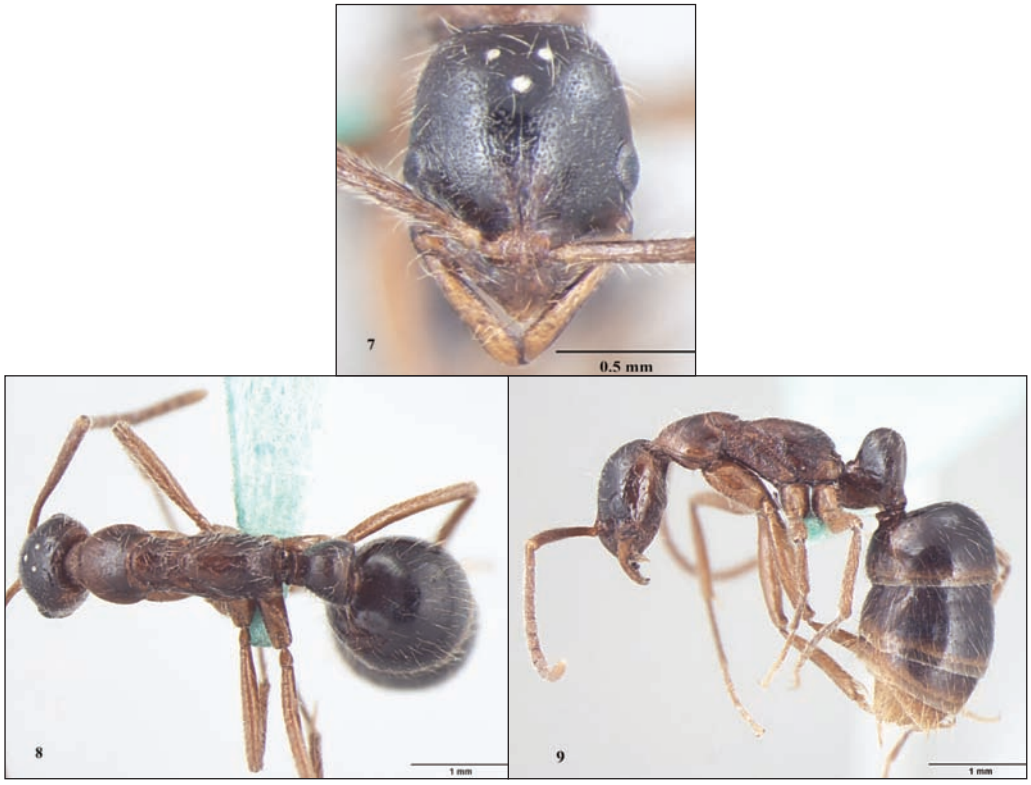
DESCRIPTION OF WORKER

Measurements of holotype worker: TL 6.68; HL 1.36; HW 0.92; ML 0.68; EL 0.23; SL 1.41; PW 0.74; WL 2.20; PL 0.61; PDW 0.46; PH 0.69 mm. Indices: CI 68; MI 74; OI 25; SI 153; LPI 113; DPI 75.

Measurement of paratype workers: Range of nine workers: TL 6.38-6.69; HL 1.29-1.36; HW 0.88-0.92; ML0.64-0.67; EL 0.21-0.23; SL 1.36-1.41;



Figs. 4–6. *Leptogenys transitionis* sp. nov. worker 4) Head, full-face view; 5) Body, dorsal view; 6) Body, lateral view.



Figs. 7 – 9. *Leptogenys transitionis* sp. nov. ergatogyne (7) Head, full-face view; (8) Body, dorsal view; (9) Body, lateral view.

PW 0.71-0.74; WL 2.05-2.20; PL 0.57-0.61; PDW 0.43-0.46; PH 0.65-0.69 mm. Indices: CI 66-68; MI 72-73; OI 24-25; SI 151-158; LPI 113-114; DPI 73-77

Head: Head subrectangular in full-face view, slightly wider anteriorly than posterially, posterior and lateral margins broadly convex; median clypeal lobe broad, apex bluntly rounded with single median seta, strongly carinate in middle, its anterior margin thin and translucent. Compound eye broadly convex, flattened, placed laterally, anterior to cephalic mid-length. Frontal groove shallow, reaching posterior margin of eye level; mandible elongate, basal margin convex, basal tooth reduced; masticatory margin edentate, concave; basal sulcus well developed. Scape surpasses posterior cephalic border by two-fifths of its length; third antennal segment two-thirds longer than wide, and one-third longer than second segment.

Mesosoma: Mesosoma with promesonotum forming a single broad convexity in lateral view, metanotal groove deeply impressed, dorsal propodeal margin broadly convex, twice as long as declivitous margin. Propodeal spiracle round, facing posteriorly. Promesonotal suture distinct; mesonotum subquadrate, slightly wider than long, divided in centre by a longitudinal sulcus, which is very shallow (almost absent in one specimen). Propodeal declivity subtriangular, wider posteriorly than anteriorly; posterolateral propodeal margins rounded.

Metasoma: Petiole subrectangular in lateral view, anterodorsal margin convex, curvature weak anterobasally but becoming stronger towards apex; node highest posteriorly with rounded apex, posterior margin inclined, with strong convexity basally; node broadly trapezoidal in dorsal view, longer than wide; lateral margin convex, anterior margin convex, posterior margin nearly straight or weakly convex. Subpetiolar process subquadrate, directed backwards in lateral view. Gaster elongate; a distinct constriction, with a row of short longitudinal ridges in it, separates first and second gastral segments. Tibiae without setae on external face close to apex.

Sculpture: Mandible with dorsal surface smooth, punctate laterally. Cephalic dorsum with dense punctures, which become dispersed posteriorly; clypeus smooth, laterally with some longitudinal to oblique striae. Scape with piligerous punctulae which become dense apically; funiculus densely punctulate. Mesosoma mostly smooth and shining, with sparse piligerous punctures; propleuron smooth and shining, mesopleuron with rugae on anepisternum and posteroventrally, weakly colliculate medially; metapleuron with rugulae, medially mostly smooth and shiny. Metanotal groove with cross ribs; propodeal declivity transversely striate. Node and gaster polished, smooth and shining.

Vestiture: Body with abundant suberect hairs, no appressed pubescence. Scape covered with abundant, subequal and suberect hairs.

Colour: Mandible, funiculus, apex of median clypeal lobe, legs, and apical gastral segments ferruginous brown; rest of body dark brown.

DESCRIPTION OF ERGATOGYNE

Measurement of paratype: TL 6.82; HL 1.39; HW 1.01; ML 0.75; EL 0.26; SL 1.39; PW 0.77; WL 2.13; PL 0.51; PDW 0.60; PH 0.85 mm. Indices: CI 73; MI 74; OI 26; SI 138; LPI 167; DPI 118

Ergatogyne with the usual differences from the workers including larger eyes, 3 well developed ocelli and enlarged gaster, more than twice as wide as petiole in dorsal view. The ergatogyne is less sculptured and lighter-coloured than her worker, with a more ferruginous tint. Mandible not swollen but paler.

ETYMOLOGY

The species epithet refers to the intermediate phenotype of the ergatogyne.

DISTRIBUTION AND HABITAT

The species was collected in an isolated pine-forest patch with some litter, under a large stone almost a foot deep covering moist and loose soil.

COMPARATIVE NOTES

Leptogenys transitionis most resembles the Chinese *Leptogenys laozii* Xu, 2000 but can

be easily separated from it by the absence of pubescence on the body (extensive in *L. laozii*) and larger body size (TL 6.38-6.69; HW 0.88-0.92, cf. TL 4.50-5.00; HW 0.63-0.70 in *L. laozii*). Among the Indian *Leptogenys* it somewhat resembles *Leptogenys jeanettei* Tiwari, 2000 but can be easily distinguished by the longer-than-wide petiolar node (broader-than-long in *L. jeanettei*), and smooth shiny mesosomal dorsum (densely punctate in *jeanettei*).

Key to species of *Leptogenys* of India based on worker caste

1. Petiolar node squamiform, compressed longitudinally, its dorsal margin narrow.....2
   — Petiolar node nodiform, not compressed longitudinally, dorsum broader, sub-rectangular 4
2. Clypeus armed with 3 teeth anteriorly……
   …….....……*L. dentilobis* Forel
   — Clypeus unarmed anteriorly.....3
3. Head subquadrate, CI > 95; scapes shorter, SI < 85…….....….*L. birmana* Forel
   — Head rectangular, CI < 92; scapes longer, SI > 90.....*L. processionalis* (Jerdon)
4. Head more-or-less striate 5
   — Head either punctured or smooth and shining, never striate.....12
5. Head entirely striate 6
   — Head without striation posterior to eyes 9
6. Head uniformly longitudinally striate including the vertex; entire mesosoma regularly striate 8
   — Head mostly longitudinally striate, vertex distinctly transversely striate; pronotum and mesonotum only rugose, with no regular striation; propodeal dorsum smooth, with a few scattered shallow punctures 7
7. Head subrectangular, lateral margins parallel .....*L. diminuta* (Smith, F.)
   — Head oval, lateral margins strongly convex .....*L. diminuta deceptrix* Forel
8. Larger species; HW > 1.55 ....*L. kitteli* (Mayr)
   — Smaller species; HW < 1.55 ....*L. kitteli minor* Forel
9. Body yellowish or reddish brown; head oval .....*L. diminuta woodmasoni* (Forel)
   — Body black; head subrectangular 10
10. Clypeus acutely carinate medially 11
    — Clypeus not carinate medially ....*L. diminuta palliseri* Forel
11. Vertex smooth and shiny without any striation .....*L. diminuta laeviceps* (Smith, F.)
    — Vertex with feeble transverse striation .....*L. diminuta diminutolaeviceps* Forel
12. First gastral segment opaque, scrobiculate ... .13
    — First gastral segment mostly smooth with only widely spaced sparse piligerous punctulae 15
13. Larger species; HW > 1.45 mm ....*L. binghamii* Forel
    — Smaller species; HW < 0.95 mm 14
14. Metanotal groove distinct; petiolar node broader than long in dorsal view, DPI > 110. .....*L. hysterica* Forel
    — Metanotal groove obsolete; petiolar node longer than broad, DPI < 90 ....*L. punctiventris* (Mayr)
15. Petiolar node broader than long or about as broad as long in dorsal view; petiolar dorsum broadly rounded in lateral view 16
    — Petiolar node longer than broad in dorsal view; petiolar dorsum sloping anteriorly in lateral view 21
16. Cephalic dorsum smooth and shining, at most with sparse piligerous punctulae 17
    — Cephalic dorsum opaque or shining but distinctly punctate 18
17. Pronotum smooth; second antennal segment (first funicular segment after scape) two-fifths longer than the third .....*L. lucidula* Emery
    — Pronotum scrobiculate; second and third antennal segments subequal ....*L. emiliae* Forel
18. Basal mandibular margin toothed 19
    — Basal mandibular margin not toothed 20
19. Head rectangular; head and mesosoma opaque, closely punctured, with a blue metallic tint .....*L. moelleri* (Bingham)
    — Head subquadrate; head and mesosoma shiny, moderately punctured, with no metallic tint .....*L. dalyi* Forel

20. Gaster lighter in colour than head and mesosoma; third antennal segment distinctly longer than second segment ....*L. roberti* Forel
— Gaster unicolorous with head and mesosoma; second and third antennal segment subequal ....*L. roberti coonoorensis* Forel
21. Cephalic dorsum coarsely punctate 22
— Cephalic dorsum smooth and shining without punctures 24
22. HW > 0.95 mm; petiolar node broader than long; mesosomal dorsum densely punctate ... .*L. jeanettei* Tiwari
— HW < 0.95 mm; petiolar node longer than broad; mesosomal dorsum smooth and shiny 23
23. Body black; mesonotum almost twice as wide as long; HW < 0.8 mm; scapes shorter SI < 140 .....*L. lattkei* sp. nov.
— Body brown; mesonotum subequal, as wide as long; HW > 0.8 mm; scapes longer SI > 150 .....*L. transitionis* sp. nov.
24. Body brown; third antennal segment almost 3x length of second .....*L. assamensis* Forel
— Body black; third antennal segment ≤ 2x length of second 25
25. Anterior clypeal margin laterally sinusoid, with apex transverse and dentate ....*L. chinensis* (Mayr)
— Anterior clypeal margin laterally straight, with apex bluntly rounded and edentate ...26
26. Head subrectangular in full-face view with lateral margins distinctly diverging anteriorly; scape short, surpasses posterior cephalic border by about one-third its length .....*L. minchinii* Forel
— Head subquadrate in full-face view with subparallel lateral margins; scape long, surpasses posterior cephalic border by about half its length .....*L. peuqueti* (André)

[*Leptogenys stenocheilos* (Jerdon, 1851) could not be placed in this key due to the inadequate description and unavailability of the material. *Leptogenys iridipennis* (Smith, F., 1858), *L. carinata* Donisthorpe, 1943 and *L. longiscapa* Donisthorpe, 1943, all described based on the male caste only, are also excluded.]

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