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THREE NEW SPECIES OF THE ANT GENUS *TEMNOTHORAX* MAYR, 1861 (HYMENOPTERA: FORMICIDAE, MYRMICINAE) FROM NEPAL

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Summary. Three new species of the genus *Temnothorax* Mayr, 1861 are described from Nepal: *T. buddha* sp. n. based on worker and gyne from Nagarjun Forest, *T. kathmanduensis* sp. n. based on workers and gyne from Kirtipur, and *T. pathibharaensis* sp. n. based on workers from Taplejung. A key to the worker caste of all known Nepalese species of the genus is provided.

Key words: gyne, taxonomy, worker diagnosis, keys, propodeal spine, Himalaya.

И. П. Субеди, З. М. Юсупов, П. Б. Будха. Три новых вида муравьев рода *Temnothorax* Маур, 1861 (Hymenoptera: Formicidae, Myrmicinae) из Непала // Дальневосточный энтомолог. 2023. N 475. С. 6-16.

Резюме. Из Непала описаны три новых вида муравьев рода *Temnothorax* Маур, 1861: *T. buddha* sp. n. на основе рабочего и самки из леса Нагарджун, *T. kathmanduensis* sp. n. на основе рабочих и самки из Киртипура и *T. pathibharaensis* sp. n. на основе рабочих из Тапледжунга. Дана определительная таблица всех известных непальских видов рода по рабочим.

INTRODUCTION

The Myrmecine ant genus *Temnothorax* Mayr, 1861 is one of the most diverse ant genera, with 458 species and 36 subspecies found worldwide (Bolton, 2022). The genus occupies a wide array of habitats ranging from dry deserts to tropical rainforests, and at elevations from sea level to 4000 m (Guénard *et al.*, 2016; Prebus, 2015, 2017). These small ants are usually found in leaf litter, beneath stones, hollow nut shells, dead twigs and epiphyte root mats, where they build tiny nests with maximum of 200 workers (Beckers *et al.*, 1989; Prebus, 2017, 2021). The ants of the genus *Temnothorax* are commonly known as "rock ants" and "acorn ants" because their nests are commonly found in hollow nut shells or rock crevices.

The genus *Temnothorax* was described by Mayr (1861). It was treated as subgenus of *Leptothorax* (Forel, 1892 and subsequent authors), as junior synonym of *Leptothorax* (Forel,

1890 and subsequent authors) and eventually removed from synonymy (Bernard, 1967; Bolton, 2003) (see Bolton, 2022 for complete nomenclatural history). Through a detail molecular study, Prebus (2017) suggested Eocene-Oligocene transition as the origin of *Temnothorax*. The workers and gyne of *Temnothorax* can be diagnosed by the combination of following characters: clypeus with weak median emargination and median carina, maxillary stipes lacking transverse crest, 11–12 segmented strongly clavate antennae with distinct 3-segmented antennal club, frontal carinae, antennal scrobes and median isolated clypeal seta absent (Bolton, 2003).

Currently, 161 species of ants belonging to 60 genera are known from Nepal (Subedi *et al.*, 2020, 2021a,b,c, 2022a,b,c, 2023; Subedi, 2021; Williams, 2022). Fifteen species and one subspecies of the genus *Temnothorax* are known from the Himalayan region (Bharti *et al.*, 2012, 2016b; Rasheed *et al.*, 2020; Yusupov *et al.*, 2020a, b), of them the only *T. wroughtonii* (Forel, 1904) is known from Nepal (Subedi *et al.*, 2022b). In this paper, we describe three new species of *Temnothorax*. A key to the worker caste of all known Nepalese species of the genus is also given.

MATERIAL AND METHODS

The materials examined in this study were collected in 2019–2021 from Shivapuri-Nagarjun National Park, Tribhuvan University Campus, Kathmandu, and Pathibhara, Taplejung, Nepal. The specimens were collected by pitfall trapping, baiting, and hand collecting, and preserved in 95% ethanol. The point-mounted specimens were examined and measured using a stereo zoom microscope MSZ-115. The measurements were recorded in mm up to two decimal position. The type specimens were deposited at the Central Department Zoology Museum of Tribhuvan University (CDZMTU).

The standard measurements and indices follow Yusupov *et al.* (2020a) with some changes as given below: head length (HL) = the straight line length of the head from anterior clypeal margin to the mid-point of occipital margin in full-face view; head width (HW) = the maximum width of the head just above the eyes in full-face view; scape length (SL) = the maximum straight-line length of the first antennal segment from its apex to the articulation with condylar bulb; ocular length (OL) = the maximum length of the eye; alitrunk length (AL) = the diagonal length of the mesosoma in profile-view; alitrunk height (AH) = the height of the mesosoma from the lowermost point of mesosoma to the imaginary line connecting uppermost points of promesonotum and propodeum in profile-view; pronotal width (PNW) = the maximum width of the pronotum in dorsal view; petiole length (PL) = the maximum length of the petiole in dorsal view; petiole width (PW) = the maximum width of the petiole in dorsal view; petiole height (PH) = the maximum height of petiole in profile; postpetiole length (PPL) = the maximum length of postpetiole between anterior and posterior margins in dorsal view; postpetiole width (PPW) = the maximum width of the postpetiole in dorsal view; postpetiole height (PPH) = the maximum height of the postpetiole in profile-view; propodeal spine length (ESL) = the length of propodeal spine from its tip to the center of propodeal spiracle in profile-view; cephalic index (CI) = HL/HW; scape index 1 (SI1) = SL/HL; scape index 2 (SI2) = SL/HW; ocular index 1 (OI1) = OL/HL; ocular index 2 (OI2) = OL/HW; petiolar index (PI) = PL/PH; postpetiolar index (PPI) = PPL/PPH; propodeal spine length index (ESLI) = ESL/HW; mesosomal index (AI) = AL/AH.

TAXONOMY

Temnothorax buddha Subedi, Budha et Yusupov, sp. n.

<https://zoobank.org/NomenclaturalActs/76A25F96-B2D7-4AE1-8957-2B50F5B379A9>

Figs 1A–C, 2A–C

TYPE MATERIAL. Holotype: worker (CDZMTU HymF121), **Nepal**: Bagmati Province, Shivapuri-Nagarjun National Park, Nagarjun Forest, Jamacho, 27.7452°N, 85.2667°E, 2094 m asl, bait collection, 3.V 2019, leg. I.P. Subedi. Paratype: 1 queen (CDZMTU HymF122), same data as a holotype.

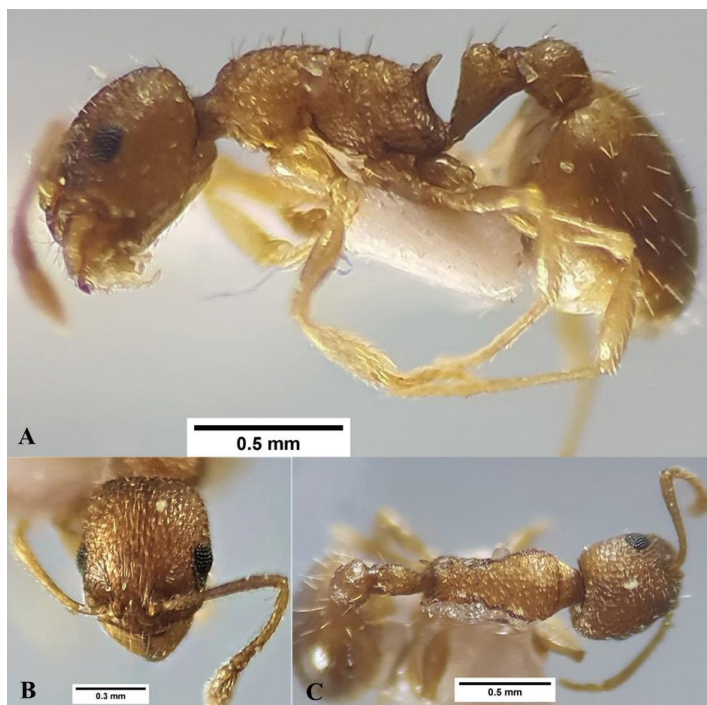


Fig. 1. *Temnothorax buddha* sp. n., worker, holotype. A – habitus, profile view; B – head, full-face view; C – habitus, dorsal view.

DESCRIPTION. WORKER. *Head*. In full-face view head slightly longer than broad (CI 1.26), with little rounded occipital corners and slightly convex or nearly straight posterior margin; anterior clypeal margin convex; eyes relatively large; mandibles elongate, masticatory margins with five teeth; antennae 12-segmented; scape almost reaches the posterior margin of head in full-face view (SI1 0.65, SI2 0.83). *Mesosoma*. In profile view, mesosoma with convex dorsum; promesonotal suture visible only ventrally, not reaching up to middle, metanotal groove shallow; propodeal spines moderately long, straight, slightly widened at the base, their tips are obliquely truncate; propodeal declivity roughly concave. *Petiole and postpetiole*. In profile, petiolar node longer than high with somewhat long anterior peduncle; petiolar node with steep and almost straight anterior face and convex, massive with sharpened corners dorsum; Postpetiole shorter than petiole with rounded dorsum and almost similar in height with petiole; in dorsal view broader than petiole, more or less equal in length and width itself. *Gaster*. Smooth and shiny. *Sculpture and pilosity*. Head dorsum with regular longitudinal striations extending to the occiput, frons and genae nearly smooth and shiny, mandibles with faint striations, coarse longitudinal and reticulate rugae in mesosoma, petiole, postpetiole

and gaster with almost similar sculptures. Suberect to erect hairs covering the whole body, decumbent pubescent hairs on antennae and legs, dense in funicular segments of antennae. *Colour*. Body yellowish with little lighter legs and antennae, pilosity white.

MEASUREMENTS AND INDICES. HL 0.67, HW 0.53, SL 0.44, OL 0.14, FRS 0.13, AL 0.79, AH 0.35, PNW 0.35, HTL 0.42, PL 0.31, PW 0.17, PH 0.21, PPL 0.22, PPW 0.24, PPH 0.21, ESL 0.14, CI 1.26, SI1 0.65, SI2 0.83, OI1 0.21, OI2 0.26, PI 1.47, PPI 1.07, AI 2.28, ESLI 0.26.

QUEEN. Mostly similar with workers except usual modifications in the queen. Larger and more robust body with thick hair, mandibles almost triangular, striations as in workers, antennal scape almost reaching occipital border, large eyes, three distinct ocelli, gaster smooth and shiny with blackish yellow, body color yellowish with black tinge, legs and antennae faint yellow.

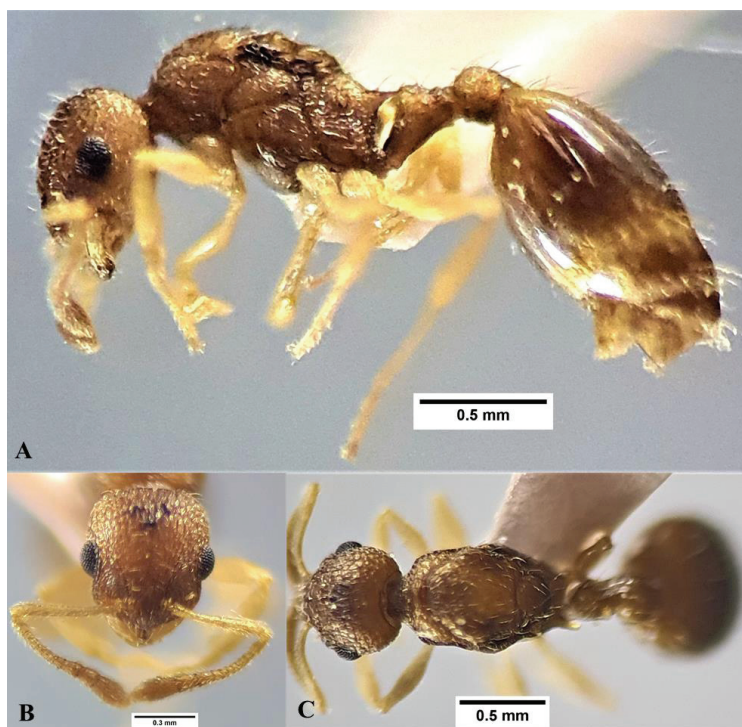


Fig. 2. *Temnothorax buddha* sp. n., queen, paratype. A – habitus, profile view; B – head, full-face view; C – habitus, dorsal view.

MEASUREMENTS AND INDICES. HL 0.69, HW 0.60, SL 0.53, OL 0.17, FRS 0.14, AL 1.03, AH 0.47, PNW 0.50, HTL 0.44, PL 0.33, PW 0.19, PH 0.22, PPL 0.31, PPW 0.22, PPH 0.22, ESL 0.19, CI 1.16, SI1 0.76, SI2 0.88, OI1 0.24, OI2 0.28, PI 1.50, PPI 1.38, AI 2.18, ESLI 0.33.

MALE. Unknown.

BIONOMICS. These ants were collected from the cookie baits kept at Nagarjun Forest nearby Jamacho Monastery, Shivapuri-Nagarjun National Park, Nepal.

DISTRIBUTION. It is reported only from Nagarjun forest, Shivapuri-Nagarjun National Park, Nepal.

ETYMOLOGY. The species is named after the Lord Buddha who was born in Nepal.

DIFFERENTIAL DIAGNOSIS. *Temnothorax buddha* sp. n. may be confused with Himalayan species such as *T. microreticulatus* Bharti et al., 2012, *T. pamiricus* (Ruzsky, 1902), *T. pakistanensis* Rasheed et al., 2020, and *T. himachalensis* Bharti et al., 2012, which also have unicolorous yellow body. But from the first species *T. buddha* sp. n. is distinguished by a more strongly sculptured and longer head (CI 1.26 vs max 1.17) and mesosoma, thinner propodeal spines, much rounded petiole node, shorter and broader petiolar peduncle and massive postpetiole. The new species differs from *T. pamiricus* and *T. himachalensis* in much longer propodeal spines, developed strong sculpture, petiole shape, etc. *T. buddha* sp. n. differs from *T. pakistanensis* in shorter head (CI 1.26 vs min 1.26 and max 1.32) and scape (SI1 0.65 vs min 0.72), absence of deep metanotal groove, longer propodeal spines, shape of petiole, and coarser sculpture of body.

***Temnothorax kathmanduensis* Subedi, Budha et Yusupov, sp. n.**

<https://zoobank.org/NomenclaturalActs/3EFC18AC-837E-4BE6-94A2-E58844C851FF>

Figs 3A–C, 4A–C

TYPE MATERIAL. Holotype: worker (CDZMTU HymF116), **Nepal**: Bagmati Province, Center for Nepal and Asian Studies premises, Kirtipur, Kathmandu, 27.6814°N, 85.2831°E, 1330 m asl, pitfall collection, 27–29.V 2019, leg. I.P. Subedi. Paratypes: 6 workers (CDZMTU HymF117), same data as a holotype; 2 workers (CDZMTU HymF118); **Nepal**: Bagmati Province, Kathmandu, Sundarikal Forest, SNNP, 27.7697°N, 85.4250°E, 1577 m asl, hand collection, 10.X 2020, leg. I.P. Subedi; 2 workers (CDZMTU HymF119), **Nepal**: Bagmati Province, Kirtipur, Kathmandu, coronation garden, TUC, 27.6814°N, 85.2831°E, 1330 m asl, 1.V 2016, leg. I.P. Subedi; 1 queen (CDZMTU HymF120), same data as a holotype.

DESCRIPTION. WORKER. *Head*. In full-face view head slightly longer than broad, with little rounded occipital corners and slightly emarginate posterior margin; anterior clypeal margin nearly convex; mandibles with five teeth, apical tooth longest, gradually decrease in size from apex to base; antennae 12-segmented; relatively short scape not reaching the posterior margin of head in full-face view. *Mesosoma*. Promesonotal suture visible; metanotal groove distinct; propodeal spines very short and triangular (dentate), propodeal declivity concave. *Petiole and postpetiole*. In profile, petiole with a relatively long peduncle; the anterior and posterior faces inclined, both faces tapered to form a node; subpetiolar process reduced to a small denticle. In profile, postpetiole globular and almost similar in height with petiole; in dorsal view broader than petiole, more or less equal in length and width itself. *Gaster*. Smooth and shiny. *Sculpture and pilosity*. Mandible with longitudinal striations, cephalic dorsum with fine, irregular striations, clypeus with 5–7 longitudinal rugulae. In profile view, mesosoma rugulose, fairly weak rugulosity in pronotum, petiole with very weak rugae. Mesosoma dorsum strongly rugulose, petiole weakly rugulose, postpetiole thickly granulated. Erect hair sparsely distributed throughout the body, hairs shorter in head, short suberect dense hairs on antennae, short decumbent hairs on legs, few long setae on anterior clypeal margin. *Colour*. Body dark brown, more or less uniformly colored, with a little darker head and lighter mandible, antennae and legs.

MEASUREMENTS AND INDICES. Ordered as holotype (paratype, n=6): HL 0.78 (0.78–0.92), HW 0.71 (0.64–0.78), SL 0.64 (0.58–0.75), OL 0.19 (0.18–0.21), FRS 0.28 (0.22–0.28), AL 1.03 (0.97–1.11), AH 0.39 (0.36–0.43), PNW 0.49 (0.46–0.53), HTL 0.64

(0.56–0.64), PL 0.31 (0.25–0.39), PW 0.19 (0.17–0.19), PH 0.22 (0.21–0.25), PPL 0.25 (0.24–0.31), PPW 0.21 (0.22–0.26), CI 1.10 (1.10–1.35), SI1 0.82 (0.67–0.87), SI2 0.90 (0.79–1.17), OI1 0.25 (0.21–0.25), OI2 0.27 (0.26–0.28), PI 1.38 (1.20–1.69), PPI 1.20 (1.12–1.38), AI 2.64 (2.45–3.00).

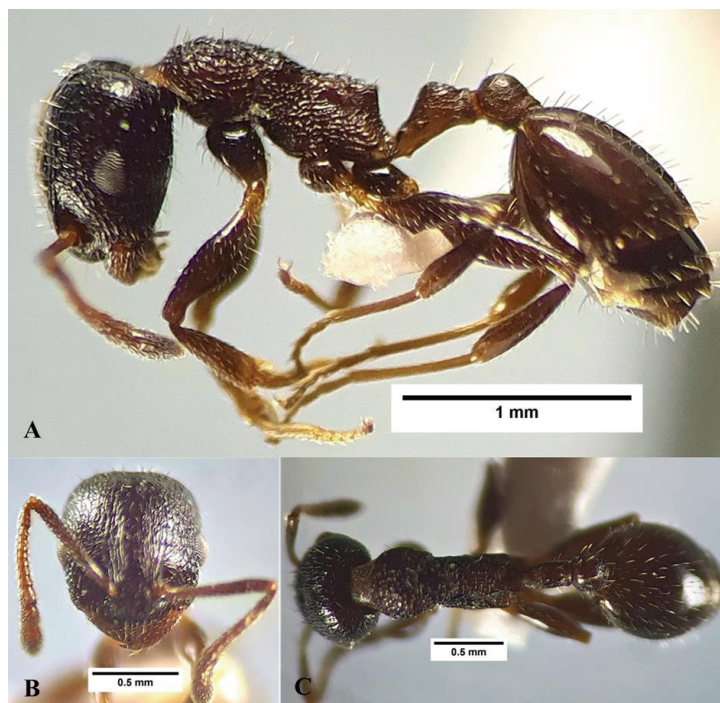


Fig. 3. *Temnothorax kathmanduensis* sp. n., worker, holotype. A – habitus, profile view; B – head, full-face view; C – habitus, dorsal view.

QUEEN. Head almost like that in workers, but slightly wider, with three distinct ocelli. Scape not reaching posterior cephalic border as in worker. Eyes as large as in workers. Mesosoma relatively longer and much taller. Propodeal spines absent. Petiole and postpetiole as long as that of workers, but little wider. Pronotal dorsum with parallelly arranged longitudinal striations with a smooth and shiny surface between fine ridges, fine striations in mesosoma in profile view. Sculpture in petiole and postpetiole similar to that in workers. Body shiny and color almost like that of workers.

MEASUREMENTS AND INDICES. HL 0.92, HW 0.81, SL 0.61, OL 0.19, FRS 0.25, AL 1.42, AH 0.83, PNW 0.75, HTL 0.58, PL 0.36, PW 0.22, PH 0.28, PPL 0.31, PPW 0.28, PPH 0.28, CI 1.14, SI1 0.67, SI2 0.76, OI1 0.21, OI2 0.24, PI 1.30, PPI 1.10, AI 1.70.

MALE. Unknown

BIONOMICS. These ants were collected from the planted forest at Tribhuvan University Campus area, Kirtipur in 2016 by hand collection and in 2019 by pitfall trapping along with a queen. They were also hand collected from Sundarijal forest, SNNP in 2020.

DISTRIBUTION. Tribhuvan University Campus area, Kirtipur, Kathmandu, Nepal. Sundarijal forest, Shivapuri-Nagarjun National Park, Nepal.

ETYMOLOGY. The species is named after the type locality Kathmandu, a capital city of Nepal.

DIFFERENTIAL DIAGNOSIS. The new species is more closely related with *Temnothorax wroughtonii* but former can be distinguished from the later by dentate propodeum, distinctly sculptured head and mesosoma. The new species is also comparable with *T. inermis* (Forel, 1902), but differ from the later in having dentate propodeum, differently sculptured head and mesosoma, shallow pronoto-mesonotal suture, and shape of the petiolar node.



Fig. 4. *Temnothorax kathmanduensis* sp. n., queen, paratype. A – habitus, profile view; B – head, full-face view; C – habitus, dorsal view.

***Temnothorax pathibharaensis* Subedi, Budha et Yusupov, sp. n.**

<https://zoobank.org/NomenclaturalActs/E1D5D92D-0087-4580-ADD8-444BB1560C93>

Figs 5A–C

TYPE MATERIAL. Holotype: worker (CDZMTU HymF114), **Nepal**: Koshi Province, Taplejung District, Pathibhara, Furrabhu, 27.4215°N, 87.7629°E, 3413 m asl, fir forest (*Abies* sp.), 9.X 2020, leg. B.R. Shrestha & T. Sherpa. Paratype: 1 worker (CDZMTU HymF115), same data as a holotype.

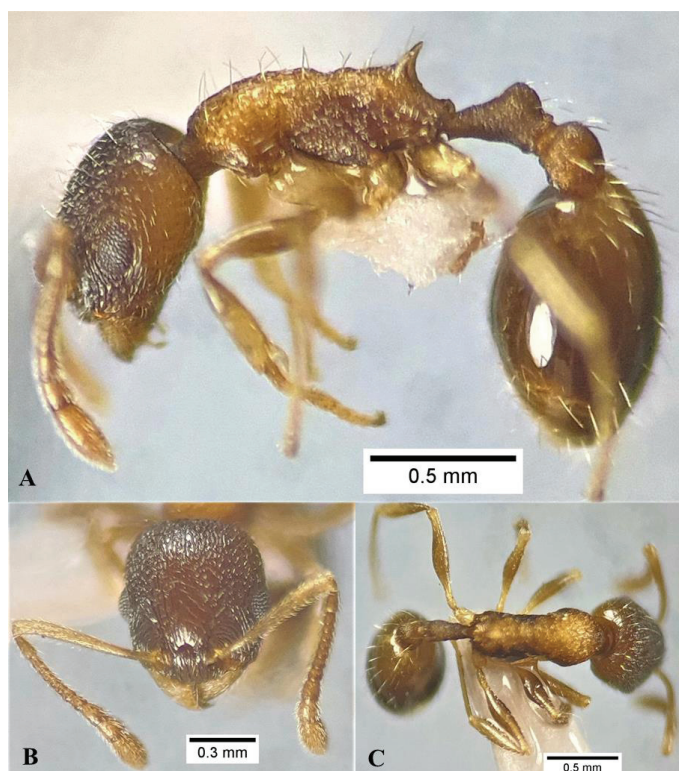


Fig. 5. *Temnothorax pathibharaensis* sp. n., worker, holotype. A – habitus, profile view; B – head, full-face view; C – habitus, dorsal view.

DESCRIPTION. WORKER. *Head*. In full-face view, head slightly longer than broad; broadly rounded occipital corners and straight, posterior head margin; eyes placed roughly at the middle of the head laterally; eyes bulging, anterior clypeal margin broadly convex; mandibles subtriangular, armed with 5 teeth in its masticatory margin, apical tooth longest; antennae 12-segmented with the distinct 3-segmented club, scape moderately long (SI1 0.84–0.87, SI2 1.02–1.08), just surpasses the posterior head margin. *Mesosoma*. Mesosoma dorsum fairly convex anteriorly and roughly straight posteriorly; metanotal groove distinct; propodeal spines moderately long. *Petiole and postpetiole*. Petiole longer than high with long anterior peduncle; in profile petiolar node with inclined and roughly straight anterior face, convex posterior face and very roughly rounded, thicker dorsum; postpetiolar node taller than petiolar node, with the nearly rounded dorsum. *Gaster*. Gaster roughly oval, smooth and shiny. *Sculpture and pilosity*. Head with dense longitudinal striations; mandibles with faint longitudinal striations; mesosoma with longitudinal rugae; petiole and postpetiole finely rugulose; gaster smooth and shiny; suberect to erect hairs scattered over the whole body, hair sparse in mesosoma and denser in gaster; decumbent to subdecumbent pubescent hairs on antennae; decumbent pubescent hairs on legs. *Colour*. Head, lower half of mesosoma, petiole, postpetiole and gaster dark brown to blackish in colour, antennae, mandible, upper half of mesosoma, legs yellowish-brown, pilosity white.

MEASUREMENTS AND INDICES. Ordered as holotype (paratype): HL 0.74 (0.69), HW 0.63 (0.54), SL 0.64 (0.58), OL 0.18 (0.13), FRS 0.15 (0.14), AL 0.89 (0.81), AH 0.33 (0.28), PNW 0.36 (0.33), HTL 0.49 (0.50), PL 0.31 (0.28), PW 0.15 (0.14), PH 0.21 (0.18), PPL 0.24 (0.19), PPW 0.19 (0.17), ESL 0.13 (0.13), CI 1.18 (1.28), SI1 0.87 (0.84), SI2 1.02 (1.08), OI1 0.25 (0.18), OI2 0.29 (0.23), PI 1.47 (1.54), PPI 1.21 (1.17), AI 2.67 (2.90), ESLI 0.20 (0.23).

QUEEN AND MALE. Unknown.

BIONOMICS. Specimens were collected from the east Himalayan *Abies* Forest in Pathibhara, Taplejung, Eastern Nepal.

DISTRIBUTION. Pathibhara, Furrabhu, Taplejung, Nepal.

ETYMOLOGY. The species is named after the type locality Pathibhara located in Nepal.

DIFFERENTIAL DIAGNOSIS. The new species, *Temnothorax pathibharaensis* sp. n. is closely related to *T. rothneyi* (Forel, 1902) and *T. simlensis* (Forel, 1904). However, it differs from both species in a much longer scape, which reaches (or even slightly exceeds) the occipital margin of the head, while in *T. rothneyi* and *T. simlensis* the scape does not reach the occipital margin of the head. In addition, *T. pathibharaensis* sp. nov. is also distinguished by its longer and lower petiole and the shape of the propodeal spines etc.

Key to Nepalese species of *Temnothorax* based on worker caste

1. Propodeum without denticles or with very short blunt denticles, color uniformly brown to dark brown 2
- Propodeum with spines of variable length, color from uniformly yellow or bicolor with brown head and gaster 3
2. Part of the head, as well as areas on the mesosoma largely smooth and shiny *T. wroughtonii*
- Entire surface of head and mesosoma strongly rugulose *T. kathmanduensis* sp. n.
3. Body uniformly yellow, scape short (SI1 0.65), propodeal spines straight and thin, weakly widened at base, directed upwards (ESLI 0.26) *T. buddha* sp. n.
- Body bicolor, at least head and gaster distinctly darker than mesosoma, scape long (SI1 0.84–0.87), propodeal spines curved and widened at base (ESLI 0.20–0.23) *T. pathibharaensis* sp. n.

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