

## Ponerine ants of Nepal (Hymenoptera: Formicidae, Ponerinae): a generic synopsis, new faunal records, and rediscovery of a rare ant, *Emeryopone franzi* (Baroni Urbani 1975)

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**ABSTRACT.** Ponerinae is the third-largest subfamily within the ant family Formicidae and makes up its own clade. The Ponerine ants are diverse and widespread across the world, including in Nepal where thirteen genera have been documented. The taxonomy, biology, and ecology of these thirteen ponerine ant genera (*Bothroponera*, *Brachyponera*, *Buniapone*, *Centromyrmex*, *Diacamma*, *Ectomomyrmex*, *Emeryopone*, *Harpegnathos*, *Hypoconera*, *Leptogenys*, *Odontomachus*, *Odontoponera*, and *Pseudoneoponera*) are provided in the form of brief generic synopsis. A list of species in each genus is also presented along with new faunal and distribution records for the country. Of all the recorded fauna, three genera, *Bothroponera*, *Ectomomyrmex* and *Hypoconera*, and 10 species, *Bothroponera tesseronoda*, *Brachyponera luteipes*, *Centromyrmex feae*, *Diacamma indicum*, *D. sikkimense*, *Ectomomyrmex annamitus*, *Ectomomyrmex* sp. NP-IPS-01 (nr. *astutus*), *E. striolatus*, *Hypoconera confinis*, and *Leptogenys* sp. NP-IPS-02 (*diminuta* species group) represent new records for Nepal. Identification keys for Nepalese ponerine ant genera based on the worker caste are provided. Representative species of each genus are illustrated by images of head in full-face and habitus in profile view. A rare endemic ant of Nepal, *Emeryopone franzi* (Baroni Urbani 1975) is rediscovered 45 years after its original description, and descriptive notes based upon recently collected materials are provided.

<b>Keywords</b>	Diversity, Himalaya, identification keys, Nepalese ants, new records, poneroid
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## INTRODUCTION

Ants (Family: Formicidae) are one of the most successful and dominant insect groups and are found in all terrestrial environments, with the greatest diversity in the world's tropical regions (Hölldobler & Wilson 1990, 2009, Guénard 2013). Ants play ecologically diverse roles such as scavengers, predators, seed dispersers, ecosystem engineers, biocontrol agents, or even household, agricultural, and forest pests (Folgarait 1998, Wetterer 2017, Anjos *et al.* 2020). There are 16 valid subfamilies, 347 genera, and over 14,089 species formally described in the world (Bolton 2022), with thousands more taxa likely yet to be identified. Nine subfamilies, 57 genera, and 153 species are currently known from Nepal (Subedi *et al.* 2020, 2021a, b, c, 2022a, b, c, Subedi 2021, Williams, 2022). The taxonomy of Nepalese ants is still in its early stages, and it is obvious that many ant species have yet to be discovered and documented in the country, owing to its unique geographical and ecological diversity.

The Ponerinae Lepeletier de Saint-Fargeau 1835 is the third-largest subfamily, with 50 genera and 1274 described species, and is distributed globally (Guénard 2013, Schmidt & Shattuck 2014, Bolton 2022). The subfamily belongs to the Poneroid clade and is the only major ant subfamily that lies outside of the Formicoid clade. In Nepal, 10 genera and 19 species of Ponerinae have been documented to date (Subedi *et al.* 2020, 2021c, 2022a, Subedi 2021). This paper adds three genera and 10 species, bringing the total number of Nepalese ponerine genera and species to 13 and 29 respectively. One rare ponerine ant species, *Emeryopone franzi* was described from Nepal by Baroni Urbani (1975) based on a single worker collected in 1971. The first author of the present paper collected four specimens of this species by pitfall trapping and hand collecting in Nagarjun Forest, 45 years after the original description. Based on these recently collected materials, descriptive notes on this endemic species of Nepal are provided in this paper.

For biologists interested in studying ants of Nepal, introductory treatments of important ant genera are desperately needed. The aim of this paper is to provide a synoptic overview of ponerine genera known from Nepal. The paper also includes

a list of species of the Nepalese Ponerinae, with new faunal and distribution records for the country, as well as simplified keys to the genera. Head in full-face and habitus in profile view images are provided to illustrate representative species of each genus. The systematic arrangements of the genera are updated from Bolton (2022).

## MATERIALS AND METHODS

### Collection, identification and data arrangement

The specimens used in this study were collected from 2006 to 2021 during ant surveys in different parts of Nepal using various methods including pitfall traps, food baits, beating lower vegetation, or hand collection. The type species, junior synonyms, and synoptic accounts with species lists are provided for each genus. The morphological examination of point-mounted specimens was done with a stereo zoom microscope (Coslab MSZ-115). Digital images were taken under the same microscope using a digital camera (Samsung SM-M625F). The specimens are deposited at the Central Department Zoology Museum of Tribhuvan University (CDZMTU). Generic and species identifications are based on available identification keys or descriptions (Baroni Urbani 1975, Eguchi *et al.* 2014, Schmidt & Shattuck 2014, Laciny *et al.* 2015, Zettel *et al.* 2016, Arimoto & Yamane 2018, Chen *et al.* 2018), comparison with type images available on AntWeb (<https://www.antweb.org>) or AntWiki (<https://www.antwiki.org>), and expert suggestions. Global species/subspecies data of ants were taken from Bolton (2022) and the total species count for Nepal was calculated by counting the species described from Nepal, the named species and morphospecies recognized from the collection of the first author, and the named species recorded in literature (Collingwood 1970, Baroni Urbani 1975, Tiwari *et al.* 1999, Thapa 2015, Guénard *et al.* 2018, Subedi *et al.* 2020, 2021c, 2022a, Subedi 2021). The genera and species within each genus are listed in alphabetical order. The preliminary species list for each genus is provided below the synopsis. Each unidentified species is assigned an author code (such as *Ectomomyrmex* sp. NP-IPS-01). For each examined species, collection localities are provided.

**Table 1.** Collection sites along with their site abbreviations, coordinates, and elevations

Collection Sites	Site Abbreviation	Latitude (°N)	Longitude (°E)	Elevation (m)
Nagarjun 1, SNNP	NA1	27.7444	85.2942	1400
Nagarjun 2, SNNP	NA2	27.7458	85.2856	1666
Nagarjun 3, SNNP	NA3	27.7487	85.2736	1912
Nagarjun 4, SNNP	NA4	27.7452	85.2667	2094
Shivapuri 1, SNNP	SH1	27.7911	85.3711	1650
Shivapuri 2, SNNP	SH2	27.7875	85.3939	1902
Shivapuri 3, SNNP	SH3	27.8064	85.3900	2458
Shivapuri Peak, SNNP	SHP	27.8202	85.3853	2732
Sundarikal 1, SNNP	SU1	27.7697	85.4250	1577
Sundarikal 2, SNNP	SU2	27.7753	85.4328	1808
Ranibari Community Forest	RCF	27.7294	85.3206	1310
TU Campus, Kirtipur	TUC	27.6814	85.2831	1330
Basundhara, Kathmandu	KTM	27.7408	85.3331	1320
Pokhara, Kaski	PKR	28.2136	83.9722	840
Jamune, Tanahun	THN	27.9875	84.1831	530
Bhandara, Chitwan	CHT	27.6062	84.6315	214
Ghumti, Nawalpur	NWP	72.6218	84.0565	198
Bhagbati Kalika, Baglung	BGL	28.2555	83.6136	905
Ugratara, Dadeldhura	DDH	29.3344	80.6058	1652
Jalthal, Jhapa	JHP	26.4775	87.9864	98
Banbehada, Kailali	KLI	28.8180	80.6790	204
Bet, Darchula	DRC	29.7672	80.4010	800
Sagarnath, Sarlahi	SRL	26.9942	85.6710	109

Note: SNNP (Shivapuri-Nagarjun National Park)

### Collection sites

Major study sites include Shivapuri-Nagarjun National Park (SNNP), Ranibari Community Forest (RCF), and Tribhuvan University Campus (TUC) while opportunistic collections were done from different parts of Nepal (see details in Table 1). Collection sites along with their site abbreviations, coordinates, and elevations are given in Table 1.

### Measurements and indices

All workers of *Emeryopone franzi* were measured while held in a microscope stage under a Coslab MSZ-115 stereo zoom microscope with an ocular micrometer at a magnification of  $\times 45$  for each character. The measurements are in mm and are given to the nearest two decimal places. The following definitions and abbreviations apply to measurements and indices:

**Head Length (HL).** The straight-line length of the head in full-face view (excluding mandibles).

**Head Width (HW).** The maximum width of head in full-face view (excluding eyes).

**Mandible Length (ML).** The straight-line length of mandible in full-face view.

**Petiole Height (PeH).** The maximum height of the petiole in lateral view, measured at right angle to PeL.

**Petiole Length (PeL).** The maximum length of the petiole, measured from the anteriormost margin to the posteriormost margin of the petiole, including the peduncle, in profile.

**Petiole Width (PeW).** The maximum width of petiole measured in dorsal view.

**Pronotum Width (PrW).** The maximum width of pronotum in dorsal view.

**Scape Length (SL).** The straight-line length of the antennal scape (excluding basal constriction or neck).

**Total Length (TL).** The total outstretched length of the ant from the mandibular apex to the gastral apex.

**Weber's Length or Mesosoma Length (WL).** Mesosoma length in lateral view, diagonal length from posteroventral corner of propodeum to the farthest point on anterior face of pronotum (excluding neck).

**Cephalic Index (CI).**  $HW/HL \times 100$ .

**Mandible Index (MI).**  $ML/HL \times 100$ .

**Petiole Index (PTI).**  $PeW/PeL \times 100$ .

**Scape Index (SI).**  $SL/HW \times 100$ .

## RESULTS & DISCUSSION

### Ponerinae Lepeletier de Saint-Fargeau 1835

Ponerites Lepeletier de Saint-Fargeau 1835: 185.  
Type genus: *Ponera* Latreille 1804: 179.

Thirteen genera from the subfamily Ponerinae have been recorded from Nepal to date. The synoptic list of ponerine genera along with their earliest known records for Nepal is given below in Table 2. Altogether, 29 species of ponerine ants, including 27 nominal species and two unidentified species (see below in generic synopsis), have been recorded from Nepal including all published records and the additional species documented in this paper. Three genera, *Bothroponera*, *Ectomomyrmex* and *Hypoponera*, and ten species, *Bothroponera tesseronoda* (Emery 1877), *Brachyponera luteipes* (Mayr 1862), *Centromyrmex feae* (Emery 1889), *Diacamma indicum* Santschi 1920, *D. sikkimense* Forel 1903, *Ectomomyrmex annamitus* (André 1892), *Ectomomyrmex* sp. NP-IPS-01 (nr. *astutus*), *E. striolatus* (Donisthorpe 1933), *Hypoponera confinis* (Roger 1860) and *Leptogenys* sp. NP-IPS-02 (*diminuta* species group) represent new records for Nepal documented during recent surveys. In the table and species list below, new records are indicated by asterisks (\*). Descriptive notes on the workers of *Emeryopone franzi* based upon recently collected materials are provided.

**Table 2.** Synoptic list and earliest known records for ponerine genera of Nepal

Ant genera	Earliest record in Nepal
* <i>Bothroponera</i> Mayr 1862	2019 (IP Subedi leg., CDZMTU)
<i>Brachyponera</i> Emery 1900	1961 (Collingwood 1970)
<i>Buniapone</i> Schmidt & Shattuck 2014	2006 (Subedi 2021)
<i>Centromyrmex</i> Mayr 1866	2015 (Adhikari <i>et al.</i> 2020)
<i>Diacamma</i> Mayr 1862	≤ 1999 (Tiwari <i>et al.</i> 1999)
* <i>Ectomomyrmex</i> Mayr 1867	2019 (IP Subedi leg., CDZMTU)
<i>Emeryopone</i> Forel 1912	1971 (Baroni Urbani 1975 as <i>Belonopelta franzi</i> )
<i>Harpegnathos</i> Jerdon 1851	2006 (Subedi <i>et al.</i> 2020)
* <i>Hypoponera</i> Santschi 1938	2021 (IP Subedi leg., CDZMTU)
<i>Leptogenys</i> Roger 1861	1954 (Collingwood 1970)
<i>Odontomachus</i> Latreille 1804	1988 (Subedi <i>et al.</i> 2020)
<i>Odontoponera</i> Mayr 1862	2001 (Subedi <i>et al.</i> 2020)
<i>Pseudoneoponera</i> Donisthorpe 1943	1961 (Collingwood 1970 as <i>Bothroponera rufipes</i> )

Note: \*New records for Nepal

### Key to Nepalese genera of the subfamily Ponerinae based on the worker caste

The key given below was modified after Eguchi *et al.* (2014) and Schmidt and Shattuck (2014). Two genera (*Anochetus*, and *Ponera*) not yet documented in Nepal but often found in neighboring countries are also included in the key for comparison.

**1.** Eyes set on prominent ocular prominences. Long and straight mandibles, in full-face view inserted medially on anterior margin of the head .....

**2.** - Eyes not set on prominent ocular prominences. Short to long, usually triangular or rarely straight mandibles, in full-face view inserted at anterolateral corners of head .....

**2.** Nuchal carina continuous without median branch extending anteriad. A pair of dark lines (apophyseal lines) absent on the posterior face of the head .....

- Nuchal carina medially with a V-shaped anterior extension. A pair of dark converging lines present on the posterior face of the head ...

**3.** Abundant stout traction setae present on dorsal surface of mesotibiae amongst background pilosity .....

- Traction setae absent on dorsal surface of mesotibiae (sometimes a few stout setae present on dorsal surface of mesotibia near tarsus but never extending along length of tibia) .....

**4.** A large pectinate spur present on the apex of metatibia ventrally, but no smaller, simple spur ..

- A large pectinate and a smaller simple spur present on the apex of metatibia ventrally .....

**5.** Elongate-triangular mandibles, with 5 long attenuated teeth. Apical tooth extremely elongated and sickle-shaped .....

- Triangular to elongate-triangular mandibles, with no long and attenuated teeth. Apical tooth not sickle-shaped .....

**6.** Anterior conspicuous round depression and paired postero-ventral teeth present on subpetiolar process .....

- Anterior conspicuous round depression and paired posteroventral teeth absent on subpetiolar process .....

**7.** Pectinate tarsal claws or the claws armed with one or two preapical teeth .....

- Tarsal claws unarmed .....

**8.** Ocelli present. Eyes extremely large and located at anterior end of head. Long, forceps-like mandibles with rows of many teeth and a large triangular flange .....

- Ocelli absent. Eyes variable in size but not extremely large, located at or near midline of head. Triangular or thin and curved mandibles without triangular flange .....

**9.** Slit-like propodeal spiracle .....

- Round or ovoid propodeal spiracle .....

**10.** Petiolar node with a pair of spines on posterodorsal margin .....

- Petiolar node simple, without spines .....

**11.** Posterodorsal margin of petiole usually with a row of small teeth or denticles .....

- Posterodorsal margin of petiole lacks a row of small teeth or denticles .....

**12.** Mesopleuron not divided by a transverse groove. Metanotal groove obsolete .....

- Mesopleuron divided by a transverse groove. Metanotal groove present .....

**13.** Mandibles subtriangular with 6-7 distinct teeth. Eyes extremely small. Clypeus with a blunt anteromedian rectangular projection .....

- Mandibles triangular. Eyes small or large. Clypeus without a blunt anteromedian rectangular projection .....

**14.** Head and body strongly striate. Dorsal margin of petiole emarginate-denticulate. Anterior clypeal margin with a series of small teeth. Mandible without a basal pit .....

- Head and body not strongly striate (light striations may occur on mesosoma). Petiole squamiform. Anterior clypeal margin without teeth. Mandible generally with a basal pit or groove .....

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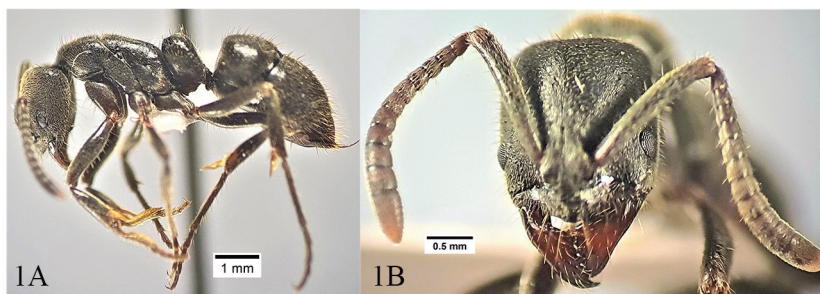
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**Fig. 1.** *Bothroponera tesseronoda* 1A. Habitus in profile view, 1B. Head in full-face view



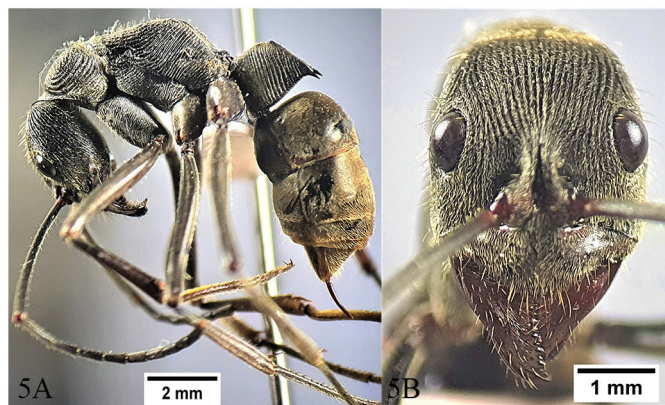
**Fig. 2.** *Brachyponera chinensis* 2A. Habitus in profile view, 2B. Head in full-face view



**Fig. 3.** *Buniapone amblyops* 3A. Habitus in profile view, 3B. Head in full-face view



**Fig. 4.** *Centromyrmex feae* 4A. Habitus in profile view, 4B. Head in full-face view



**Fig. 5.** *Diacamma scalpratum* 5A. Habitus in profile view, 5B. Head in full-face view



**Fig. 6.** *Ectomomyrmex annamitus*. 6A. Habitus in profile view, 6B. Head in full-face view

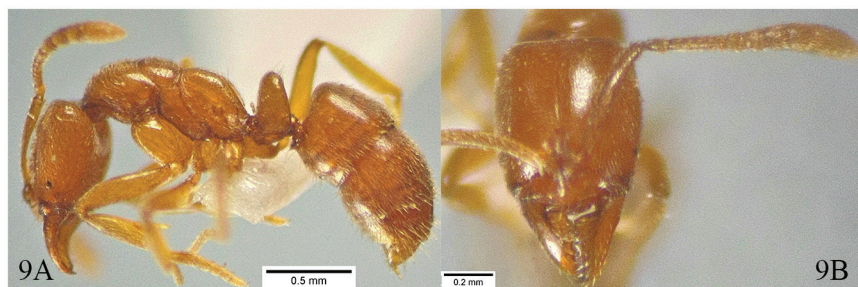


**Fig. 7.** *Emeryopone franzi* 7A. Habitus in profile view, 7B. Head in full-face view





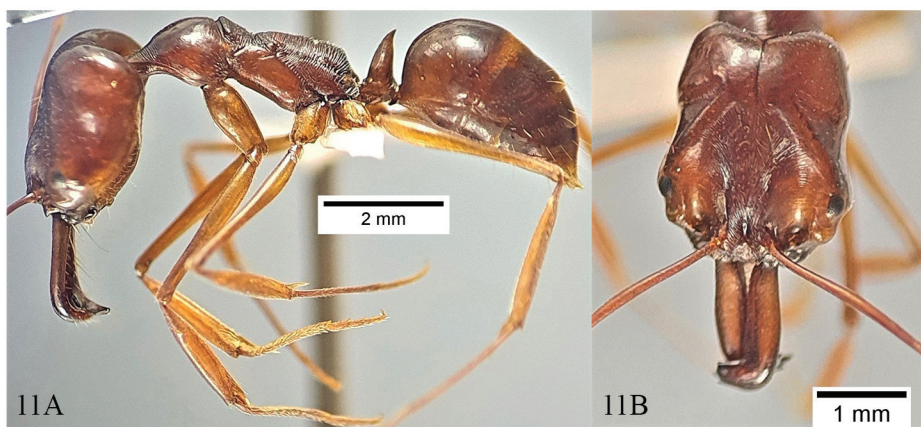
**Fig. 8.** *Harpegnathos venator* 8A. Habitus in profile view, 8B. Head in full-face view



**Fig. 9.** *Hypoponera confinis* 9A. Habitus in profile view, 9B. Head in full-face view



**Fig. 10.** *Leptogenys birmana* 10A. Habitus in profile view, 10B. Head in full-face view



**Fig. 11.** *Odontomachus monticola* 11A. Habitus in profile view, 11B. Head in full-face view





Fig. 12. *Odontoponera denticulata* 12A. Habitus in profile view, 12B. Head in full-face view



Fig. 13. *Pseudoneoponera bispinosa* 13A. Habitus in profile view, 13B. Head in full-face view

### Synopsis of Nepalese genera of the subfamily Ponerinae

#### *Bothroponera* Mayr 1862 (Figs. 1A, 1B)

*Bothroponera* Mayr 1862: 717. Type species: *Ponera pumicosa* Roger 1860: 290, by subsequent designation of Emery 1901: 42.

*Bothroponera* as subgenus of *Ponera*: Emery 1895b: 767.

*Bothroponera* as subgenus of *Pachycondyla*: Emery 1901: 42.

*Bothroponera* junior synonym of *Pachycondyla*: Snelling 1981: 389.

*Bothroponera* revived from synonymy: Schmidt & Shattuck 2014: 72.

*Bothroponera* has 43 species and three subspecies found from Sub-Saharan Africa through southern Asia to the Philippines (Schmidt & Shattuck 2014, Guénard *et al.* 2017, Bolton 2022). Nepalese *Bothroponera* workers are characterized by a narrow, convex, and medially elevated clypeus; moderately large frontal lobes; roughly triangular mandibles with six teeth; mesopleuron not divided by a transverse groove; slit-like propodeal spiracle; metanotal groove absent; nodiform petiole lacking posterodorsal spines or teeth or denticles, well-developed subpetiolar process, and weakly sculptured body with dense pubescence (see Schmidt and Shattuck 2014 for full diagnosis). In Nepal, a single species, *B. tesseronoda* represents the genus. This is possibly the most investigated *Bothroponera* species, which builds underground nests with 50–170 workers (Jessen & Maschwitz 1986). The species appears to be a generalist predator of arthropods, mostly termites, and sometimes recorded as visitors to extra-floral nectaries (Agarwal & Rastogi 2008).

**Nepalese species (1 species).** *Bothroponera tesseronoda* (Emery 1877): NA1, NA2, SH1, KLI

***Brachyponera* Emery 1900** (Figs. 2A, 2B)

*Brachyponera* Emery 1900: 315 [as subgenus of *Euponera*]. Type species: *Euponera (Brachyponera) luteipes croceicornis* Emery 1900: 315, by monotypy.

*Brachyponera* contains 18 species and five subspecies globally (Bolton 2022), which are widespread from Africa through southern and temperate Asia to Australia. These were among the most commonly observed ants in our study sites. The following combination of characters can be used to identify Nepalese *Brachyponera* workers (see also Schmidt & Shattuck 2014): mandibles with a basal pit, eyes moderate in size and located near the mandibular insertions, metanotal groove deep, propodeum at a lower elevation than the thorax and usually strongly narrowed dorsally, propodeal spiracle small and round, petiole squamiform, prora reduced and not externally visible, gaster with just a little girdling constriction, and metatibiae with two spurs. The workers are solitary epigeic generalist predators and scavengers that are small and solitary. Nests are usually constructed in decaying wood or soil.

**Nepalese species (3 species).** *Brachyponera chinensis* (Emery 1895): NA1, NA2, NA3, NA4, SH1, SH2, SH3, SU1, SU2, DDH, TUC, KTM, PKR (The Nepalese specimens have relatively thin petiole, very finely sculptured dorsal and lateral faces of pronotum and propodeum, and almost entirely smooth propodeal declivity. The correct status of the Nepalese population should be determined with DNA information.)

*B. luteipes* (Mayr 1862): NA4

*B. nigrita* (Emery 1895): NA1, NA2, SHP

***Buniapone* Schmidt & Shattuck 2014** (Figs 3A, 3B)

*Buniapone* Schmidt & Shattuck 2014: 81. Type species: *Ponera amblyops* Emery 1887: 434, by original designation.

*Buniapone* is a monotypic genus found only in South and Southeast Asia, from southern China to the islands of Indonesia, and west to India (Schmidt & Shattuck 2014). It is a rare ant in Nepal which was collected only once from the dung in Kaski by the first author. It is very distinct morphologically and has the following diagnostic features (see also Schmidt & Shattuck 2014): long and narrow toothed mandibles, antennal scape surpassing cephalic border in full-face view, blunt medial clypeal projection, much reduced eyes, obsolete metanotal groove, ovoid propodeal spiracles, complex metapleural gland opening, squamiform petiole, and scattered erect hairs and fine dense golden pubescence on the body. Except for the fact that *Buniapone* is hypogeic, little is known about their behavior in Nepal. Although their prey preferences are not known, they are most likely predators.

**Nepalese species (1 species).** *Buniapone amblyops* (Emery 1887): PKR

***Centromyrmex* Mayr 1866** (Figs 4A, 4B)

*Centromyrmex* Mayr 1866: 894. Type species: *Centromyrmex bohemanii* (junior synonym of *Ponera brachycola*), by monotypy.

*Glyphopone* Forel 1913: 308. Type species: *Glyphopone bequaerti*, by monotypy.

*Leptopone* Arnold 1916: 163 [as subgenus of *Glyphopone*]. Type species: *Glyphopone (Leptopone) rufigaster* (junior synonym of *Glyphopone bequaerti*), by original designation.

*Spalacomyrmex* Emery 1889: 489. Type species: *Spalacomyrmex feae*, by monotypy.

*Typhloteras* Karavaiev 1925: 128. Type species: *Typhloteras hamulatum*, by monotypy.

*Centromyrmex* is an easily recognizable genus with 15 species and two subspecies occurring in tropics worldwide; however, the majority of them are found in Afrotropics (Bolton & Fisher 2008, Bolton 2022). The Nepalese *Centromyrmex* workers can be diagnosed by the following features (see also Bolton & Fisher 2008, Schmidt & Shattuck

2014): mandible triangular to elongate-triangular, eyes absent, antennal scape strongly dorsoventrally flattened, propodeum unarmed, helcium relatively high, mesotibiae and meso/metabasitarsi with peg-like setae. They are adapted to a hypogeic and subterranean life with the adaptational features as in other fossorial ants such as relatively smooth cuticle, flattened scapes, no eyes, and traction setae on the legs (Bolton & Fisher 2008, Schmidt & Shattuck 2014). Workers are specialized predators feeding solely on termites, occurring in and around termitaries, under leaf litter, soil upper layers, or decaying logs (Bolton & Fisher 2008).

**Nepalese species (1 species).** *Centromyrmex feae* (Emery 1889): PKR

***Diacamma* Mayr 1862** (Figs. 5A, 5B)

*Diacamma* Mayr 1862: 718. Type species: *Ponera rugosa* Le Guillou 1842: 318, by subsequent designation of Bingham 1903: 75.

*Diacamma* is a well-defined genus occurring from India to Australia and comprising over 44 valid species and 23 subspecies (Bolton 2022). It is well recognized for its unusual reproductive biology. Colonies are typically medium in size, with a few hundred monomorphic workers, and are completely devoid of queens. Instead, mated workers, often known as “gamergates,” carry out reproduction (Peeters & Higashi 1989). The characteristic deep striate sculpturing covering the head, mesosoma and petiole, deep pits (“gemmal pits”) on the edges of the mesosoma, a bispinose petiole, prominent arolia, and lateral metapleural gland opening with a posterior U-shaped cuticular lip are useful to diagnose *Diacamma* workers (see also Schmidt & Shattuck 2014). Ground-dwelling or arboreal, these large black ants build their nests in soil, rotten logs, or even trees. The workers are generalist predators and forage individually on the ground and on low vegetation (Eguchi *et al.* 2014).

**Nepalese species (5 species).** \**Diacamma indicum* Santschi 1920: PKR

*D. rugosum* (Le Guillou 1842): CHT, SRL

*D. scalpratum* (Smith 1858): JHP

\**D. sikkimense* Forel 1903: NWP

*D. vagans* (Smith 1860): Not examined. The existence of *D. vagans* in Nepal has to be further validated despite being cited in the literature since there are no specimen records and no information on the precise location where it was collected.

***Ectomomyrmex* Mayr 1867** (Figs. 6A, 6B)

*Ectomomyrmex* Mayr 1867: 83. Type species: *Ectomomyrmex javanus* Mayr 1867: 84, by subsequent designation of Bingham 1903: 85.

*Ectomomyrmex* as subgenus of *Pachycondyla*: Emery 1901: 42.

*Ectomomyrmex* as genus: Mayr 1867: 83.

*Ectomomyrmex* as subgenus of *Pachycondyla*: Snelling 1981: 389.

*Ectomomyrmex* revived from synonymy: Schmidt & Shattuck 2014: 191.

*Ectomomyrmex* is with 27 species and four subspecies (Bolton 2022) occurring in most of the Indo-Australian and Australasian regions, from India to Japan and Korea, and from southern China to northern Australia eastward (Brown 1963). The following characteristics distinguish *Ectomomyrmex* workers (see also Schmidt & Shattuck 2014): highly sculptured head, mesosoma, and petiole, head generally prismatic posteriorly, mesopleuron separated into upper and lower portions by a transverse groove, and petiole with a sweeping posterior face. *Ectomomyrmex* species are typically found in well-developed forests and other forested settings and build their nests in rotting logs and wood fragments, as well as under stones and in the soil (Eguchi *et al.* 2014). Very little is known about their habits in Nepal. They appear to be generalist arthropod predators, with feeding patterns that fall somewhere between epigeic and hypogeic (Wilson 1958). The workers appear to act dead when disturbed (Wilson 1958).



**Nepalese species (3 species).** *Ectomomyrmex anamitus* (André 1892): PKR

*E. striolatus* (Donisthorpe 1933): NA1, NA2, JAM

*E. sp.* NP-IPS-01 [nr. *E. astutus* (Smith 1858)]: SU1

***Emeryopone* Forel 1912** (Figs. 7A, 7B)

*Emeryopone* Forel 1912: 761, Type species: *Emeryopone buttelreepeni* Forel 1912: 318, by monotypy.

*Emeryopone* as junior synonym of *Belonopelta*: Baroni Urbani 1975: 296.

*Emeryopone* as genus: Brown 1994: 164.

*Emeryopone* contains five known species recorded from Israel, India, Nepal, Thailand, southern China, Indonesia, and Malaysia (Baroni Urbani 1975, Xu 1998, Varghese 2006, Khachonpisitsak *et al.* 2020), however rare collections likely underestimate its true range. The workers can be distinguished from other ponerines by their long, curved mandibles having five long teeth with the greatly attenuated apical tooth, medium-sized frontal lobes separated anteriorly by a posterior extension of the clypeus that is very short, very small eyes, head and mesosoma foveolate, with very dense punctures on cephalic dorsum while punctures are gradually few on mesosoma, and petiole (see also Schmidt & Shattuck 2014). Almost nothing is known about their habits, although their unique mandibles suggest a specialized diet. *Emeryopone* is very rare in Nepal with only four *E. franzi* specimens collected in pitfall traps from Nagarjun forest during recent surveys. It is worth mentioning that this endemic ant of Nepal was documented almost after 45 years of its previous record [original description]. They are almost certainly cryptobiotic, based on their morphological traits and collecting data, and the rarity with which they are collected (Baroni Urbani 1975, Xu 1998, Varghese 2006).

**Nepalese species (1 species).** *Emeryopone franzi* (Baroni Urbani 1975): NA1, NA3

***Harpegnathos* Jerdon 1851** (Figs. 8A, 8B)

*Harpegnathos* Jerdon 1851: 116. Type species: *Harpegnathos saltator* Smith 1858: 117, by monotypy.

*Drepanognathus* Smith 1858: 81. Type species: *Harpegnathos saltator*, by subsequent designation of Bingham 1903: 49. [Unnecessary replacement name for *Harpegnathos*.]

*Harpegnathos* has nine species and four subspecies found in India, the Philippines, southern China, Nepal, Thailand, Borneo, Sumatra and Java (Donisthorpe 1937, Guenard *et al.* 2017, Bolton 2022). Workers have pliers-like mandibles and large anteriorly positioned eyes, making them one of the most morphologically distinct of the ponerines. Ocelli, an obsolete metanotal groove, a laterally opening metapleural gland orifice, toothed tarsal claws, prominent arolium, a long nodiform petiole, a short rounded anterior face of A3, and a strong girdling constriction between pre- and postsclerites of A4 are other diagnostic characters (see also Schmidt & Shattuck 2014). The morphological features, jumping abilities, foraging patterns, complex nest design, peculiar reproductive habits and unique social system of these ants are all noteworthy (Schmidt & Shattuck 2014, Aupanun *et al.* 2022). These large ants are usually found on the ground and most likely occur in forest edges and sparsely forested areas (Eguchi *et al.* 2014). They can be collected by leaf litter sifting, general search and pitfall trap methods.

**Nepalese species (1 species).** *Harpegnathos venator* (Smith 1858): TNH

***Hypoponera* Santschi 1938** (Figs. 9A, 9B)

*Hypoponera* Santschi 1938: 79 [as subgenus of *Ponera*]. Type species: *Ponera abeillei* André 1881: 61 (obsolete combination of *Hypoponera abeillei*), by original designation.

*Hypoponera* as subgenus of *Ponera*: Santschi 1938: 79.

*Hypoponera* as genus: Taylor 1967: 9.

*Hypoponera* has 154 species and 22 subspecies (Bolton 2022) and the most cosmopolitan ponerine genus occurring in all continents except in Antarctica (Schmidt & Shattuck 2014). Nepalese *Hypoconera* workers have the following characteristics (see also Schmidt & Shattuck 2014): triangular mandible, 12-segmented antenna with distinct antennal club, very small eyes, promesonotal suture separating pronotum from mesonotum, metanotal groove distinct dorsally, unarmed propodeum narrowed dorsally, petiole squamiform, subpetiolar process a rounded lobe lacking anterior fenestra and posterior teeth, single spur on hind tibia. The genus includes small cryptic species inhabiting forested habitats [some species occur in sparse forests and even grassland] and make small colonies in soil, rotten wood and leaf litter (General & Alpert 2012, Eguchi *et al.* 2014). These ants can be obtained by litter sifting, pitfall trapping and soil core sampling techniques.

**Nepalese species (1 species).** \**Hypoconera confinis* (Roger 1860): SH2

***Leptogenys* Roger 1861** (Figs. 10A, 10B)

*Leptogenys* Roger 1861: 41. Type species: *Leptogenys falcigera* Roger 1861: 42, by subsequent designation of Bingham 1903: 52.

*Dorylozelus* Forel 1915: 24 Type species: *Dorylozelus mjobergi*, by monotypy.

*Lobopelta* Mayr 1862: 714 (diagnosis in key), 733. Type species: *Ponera diminuta*, by subsequent designation of Bingham 1903: 54.

*Machaerogenys* Emery 1911: 100 [as subgenus of *Leptogenys*]. Type species: *Leptogenys truncatirostris*, by original designation.

*Microbolbos* Donisthorpe 1948: 170. Type species: *Microbolbos testaceus*, by original designation.

*Odontopelta* Emery 1911: 101 [as subgenus of *Leptogenys*]. Type species: *Leptogenys turneri*, by monotypy.

*Prionogenys* Emery 1895a: 348. Type species: *Prionogenys podenzanai*, by monotypy.

*Leptogenys* is the most speciose ponerine ant genus distributed mostly in tropical and subtropical regions and comprises over 316 species and 14 subspecies (Bolton 2022) with over a hundred undescribed taxa (AntWeb 2022). The workers of *Leptogenys* can be diagnosed by the presence of pectinate claws on legs and carinate median clypeal lobe (Bolton 1975, Rakotonirina & Fisher 2014). Another useful feature for distinguishing this genus from other ponerines is the absence of a basal protarsal comb which is present in most Ponerini (Lattke 2011). These ants have ergatoid queens, prey on a variety of small animals including earthworms and show an army ant-like lifestyle (Schmidt & Shattuck 2014). The genus includes large-eyed epigaeic species to small-eyed cryptobiotic species nesting on diverse habitats, including leaf litter, rotten wood, logs, soil, under stones, and even in vegetation (Bolton 1975, Rakotonirina & Fisher 2014). Sifting leaf litter, turning rocks, pitfall trapping, and looking for raiding columns are the common methods to collect these ants. One of the *Leptogenys* species (NP-IPS-02) in the *diminuta* species group found in Nepal is most likely a new species that is yet to be described.

**Nepalese species (7 species).** *Leptogenys birmana* Forel 1900: NA1

*Leptogenys chinensis* (Mayr 1870): RCF

*Leptogenys dentilobis* Forel 1900: NA1, TUC

*Leptogenys diminuta* (Smith 1857): JAM, NA3, NWP

*Leptogenys* sp. NP-IPS-02 [*diminuta* species group]: RCF

*Leptogenys kitteli* (Mayr 1870): NA1, BGL, PKR, CHT

*Leptogenys laeviceps* (Smith 1857): NA4, SU2, RCF, TUC, THN, PKR

***Odontomachus* Latreille 1804** (Figs. 11A, 11B)

*Odontomachus* Latreille 1804: 179. Type species: *Formica haematoda* Linnaeus 1758: 582 (Obsolete combination of *Odontomachus haematodus*), by monotypy.

*Champsomyrmex* Emery 1892: 558 (footnote). Type species: *Odontomachus coquereli*, by monotypy.

*Myrtoteris* Matsumura 1912: 191 Type species: *Myrtoteris kuroiwae*, by monotypy.

*Pedetes* Bernstein 1861: 7. Type species: *Pedetes macrorhynchus*, by monotypy.

*Odontomachus* is a relatively large genus with 73 species (Bolton 2022) and is widely distributed across the world's tropics and subtropics, whereas some extending to temperate regions, with the highest diversity in the Neotropics and Malesia (Brown 1976). *Odontomachus* and *Anochetus* workers may be distinguished from any other genera by the presence of remarkable trap mandibles and associated behaviors (Schmidt 2013, Larabee *et al.* 2016). The presence of a median V-shaped extension of the nuchal carina and a pair of dark converging apophyseal lines on the posterior surface of the head distinguish *Odontomachus* from *Anochetus* (Schmidt & Shattuck 2014). The trap mandibles' rapid closing is among the fastest movements ever recorded in animals (Larabee & Saurez 2014), and is often used for escaping from enemies by jumping. Their nests are generally found in soil or rotting wood, while some species nest in abandoned termite nests or arboreal habitats or rock crevices, and are collected by tuna bait, beating of low vegetation, pitfall trapping, and hand collecting (General & Alpert 2012). They are mainly the generalist predators of arthropods, but some species partially specialize in specific prey such as termites. Workers are monomorphic and epigaeic foragers, with some species being partially arboreal (Longino 2013).

**Nepalese species (1 species).** *Odontomachus monticola* Emery 1892: NA1, NA2, SH1, SH2, SU1, KTM

***Odontoponera* Mayr 1862** (Figs. 12A, 12B)

*Odontoponera* Mayr 1862: 713 (diagnosis in key). Type species: *Ponera denticulata* Smith 1858: 90 (obsolete combination of *Odontoponera denticulata*), by monotypy.

*Odontoponera* contains only two species and two subspecies (Bolton 2022). These moderately large, hard-bodied species are found only in Southeast and South Asian countries, frequently observed from the Philippines, Vietnam, Thailand, southern China, Peninsular Malaysia, Java, Sumatra and Borneo (Schmidt & Shattuck 2014). These ants were also commonly seen by the author during his surveys of Nepalese ants. Workers of *Odontoponera* have a denticulate anterior clypeal margin, toothed pronotal margins, prominent striate sculpturing, denticulate-emarginate petiolar scale, and a small, ventrally directed tooth at the apex of the hypopygium, which distinguishes them from other ponerines (see Schmidt & Shattuck 2014). Workers of the genus are primarily epigeic foragers who are generalist predators and scavengers (Pfeiffer *et al.* 2006, Zhou *et al.* 2007) and generally occur in primary and secondary forests, forest edges and disturbed areas (Yamane 2009, Eguchi *et al.* 2014). They nest under the soil, hunt singly, and can be collected by leaf litter sifting, pitfall trapping, and hand collecting (General & Alpert 2012).

**Nepalese species (2 species).** *Odontoponera denticulata* (Smith 1858): PKR, THN, CHT, DRG

*O. transversa* (Smith 1857): SEM images (ANTWEB1008558) examined (AntWeb 2022). This species has been mainly found in the Sundaland region, old records have confused the two species, all treated as *O. transversa* (Yamane 2009). All records before 2009 have been omitted.



***Pseudoneoponera* Donisthorpe 1943** (Figs. 13A, 13B)

*Pseudoneoponera* Donisthorpe 1943: 439. Type species: *Pseudoneoponera vercundae* Donisthorpe 1943: 439, by original designation.

*Pseudoneoponera* as junior synonym of *Bothroponera*: Wilson 1958: 361.

*Pseudoneoponera* as junior synonym of *Pachycondyla*: Brown 1973: 184.

*Pseudoneoponera* revived from synonymy: Schmidt & Shattuck 2014: 131.

*Pseudoneoponera* is a relatively small genus with 19 species and 10 subspecies (Bolton 2022) that ranges from India to Australia, where it has the highest diversity of species. The genus is known for its peculiar foamy protective secretions, small colonies, and strange social structures, including the frequent occurrence of gamergates (Schmidt & Shattuck 2014). Workers can be diagnosed from other ponerines by their robust build, coarse sculpturing, shaggy pilosity, obsolete metanotal groove, nodiform petiole which is semicircular in dorsal view and often has a denticulate posterodorsal margin, usually longitudinally striate tergite of A3, and strong gastral constriction between A3 and A4 (see Schmidt & Shattuck 2014). Like many ponerines, they have tiny colonies of 10 to 20 workers and are generalist predators and scavengers. They generally occur in wooded habitats. *Pseudoneoponera* species are closely related with *Bothroponera* and *Ectomomyrmex*, but the latter two genera lack a row of tiny denticles in the posterodorsal border of the petiolar node and longitudinal striations on tergite of A3 (Eguchi *et al.* 2014).

**Nepalese species (2 species).** *Pseudoneoponera bispinosa* (Smith 1858): THN, PKR, KLI

*P. rufipes* (Jerdon, 1851): THN, PKR, KTM

***Emeryopone franzi* (Baroni Urbani 1975)** (Figs. 7A, 7B)

*Belonopelta franzi* Baroni Urbani 1975: 305, figs. 4, 6 (w.). Type locality: Nepal. Combination in *Emeryopone*: Bolton 1995: 187.

**Materials examined:** 2 workers (CDZMTU HymF 124, CDZMTU), Nagarjun forest, SNNP, 27.74444 N, 85.29417 E, 1400 m, pitfall collection, 22–24.x.2019, I.P. Subedi, K. Chaudhary and A. Pandey leg.; 1 worker, *ibid.*, 1–3.v.2019, I.P. Subedi and R.P. Pokhrel leg.; 1 worker, Nagarjun forest, 27.74871 N, 85.27361 E, 1912 m, hand collection, 1.v.2019, I.P. Subedi leg.

#### Descriptive notes on worker:

**Measurements and indices** (n=4): TL 4.88–5.88, WL 1.50–1.56, HL 1.00–1.06, HW 0.78–0.88, SL 0.78–0.81, PeL 0.39–0.42, PeH 0.56–0.63, PeW 0.44–0.50, PrW 0.59–0.63, ML 0.56–0.75, CI 78.13–87.50, MI 56.25–75.00, SI 89.29–104.00, PTI 116.67–145.45

**Head:** Head distinctly longer than broad (HL 1.00–1.06 mm, HW 0.78–0.88), with slightly convex lateral margins and weakly concave posterior margin. Clypeus broadly convex, having a median longitudinal lumpy pointed protrusion. Mandibles elongate-triangular, roughly as long as head, with a strongly curved outer margin and a masticatory margin containing 5 powerful teeth including a very long apical tooth, a slightly smaller subapical tooth and three relatively shorter teeth. Eyes very small, located laterally towards the anterior corner of head, near to mandibular base. Frontal lobes medium-sized, separated anteriorly by posterior clypeal extension. Frontal carina short and slightly visible, distinct median longitudinal furrow present. Antenna 12-segmented, with long scape (SL 0.78–0.81) just surpassing the posterior cephalic border, 3-segmented antennal club.

**Mesosoma:** Pronotum in dorsal view rounded anteriorly and convex laterally. Mesosoma in profile with dorsal outline that continuously forms a weakly convex curve. Promesonotal suture distinct. Metanotal groove obsolete, meso-metanotal suture well-marked on the pleura. Propodeum in profile with dorsum very weakly convex, nearly straight. Propodeal declivity obliquely truncate, shorter than dorsum. Propodeal spiracle round.

**Metasoma:** Petiolar node thick, roughly triangular in profile view, slightly convex anteriorly and nearly straight posteriorly; in dorsal view wider than long (PeW 0.44–0.50, PeL 0.39–0.42), with a well-developed subpetiolar process without window. Gaster elongate, with a moderate girdling constriction between abdominal segments A3 and A4. Tergite of the fourth abdominal segment moderately arched, making the gaster mildly curved downward. Sting long and strong. Midtibia with a single simple spur, hind tibiae with pectinate spur.

**Sculpture:** Head and body foveolate, with very dense punctures on cephalic dorsum and gradually fewer punctures on mesosoma, petiole, and third abdominal segment. Distance between punctures shorter than puncture diameter. Pronotal dorsum and petiolar node finely and densely punctate. Lateral sides of mesosoma with sparse large punctures and feeble striation. Fourth abdominal segment, antennae, and legs with very thin and sub-lucid knurls. Mandibles smooth and shiny.

**Pilosity:** Integument with abundant appressed pubescence all over the body. Dorsal part of head, antennae and legs without long hairs. Dorsa of vertex, mesosoma, and abdomen with suberect long hairs. Long bristles present on the anterior clypeal margin. A few short erect hairs on the mandible.

**Color:** Ferruginous or dark reddish-brown body with lighter legs, antennae and mandibles.

**Discussions:** The holotype of *Emeryopone franzi* has more strongly convex head margins in comparison to recently collected Nepalese specimens of *Emeryopone*. These specimens differ from holotype in having shiny, sparse and smaller foveae in the head and a little shorter petiole. We consider these differences as usual variations within a species and determine them as *E. franzi*. *Emeryopone franzi* is most closely related to *E. buttelreepeni* but differs from the latter by relatively larger size, longer antennal scape surpassing the posterior margin of the head, and subpetiolar process without anterior fenestra.

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