

First record of two Doryline ant genera *Cerapachys* Smith, 1857 and *Parasyscia* Emery, 1882 (Hymenoptera: Formicidae) from Nepal

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Abstract

The presence of two ant genera, *Cerapachys* Smith, 1857 and *Parasyscia* Emery, 1882 is reported for the first time in Nepal. We collected two workers of *Parasyscia wighti* (Bharti & Akbar, 2013) from Ranibari Community Forest and one worker of *Cerapachys sulcinodis* Emery, 1889 from Nagarjun forest using pitfall traps. With this discovery, the total number of Doryline ant genera of Nepal has reached to five. Synoptic account of these two genera, worker description of the species and identification keys to Nepalese genera of the subfamily Dorylinae are provided. Images of all known species representing full-face, dorsal and profile views are provided.

Keywords: Army ants, Dorylinae, Nepalese ants, new records, petiole.

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Introduction

Ants (Hymenoptera: Formicidae) are one of the world's most successful insect groups, dominating in population, geography and ecology (Hölldobler & Wilson, 1990). They can be found in almost all terrestrial environments, with the greatest diversity in tropical areas (Guénard, 2013). Ants are frequently regarded as superorganisms due to their dominance in the environment (Hölldobler & Wilson, 2009). Ants have been classified into 17 subfamilies, 338 genera, and 13,981 species (Bolton, 2021), with thousands of undescribed taxa. Nepal has eight subfamilies, 48 genera, and 133 species formally recorded (Subedi *et al.*, 2020; 2021), but given the country's unique geography and ecological diversity with large unexplored areas, this figure is far from a complete list and many ant species have yet to be identified and described.

Dorylinae includes a monophyletic group of predatory ants found in tropical, subtropical, and warm temperate regions of the world (Borowiec, 2016) with 27 valid genera

and 735 species (Bolton, 2021). Within the subfamily, these ants are highly diverse in both habits, morphology, nesting sites (subterranean or arboreal nests), and colony size, with a few dozen to millions of workers in a colony (Borowiec, 2016). Workers are either blind or have small to well-developed compound eyes, have short and long slender appendages, and coarse to shiny cuticle. Army ants are a fascinating group of organisms characterized by morphological and behavioral adaptations such as obligate collective foraging, nomadism and highly specialized queens (Brady, 2003; Brady *et al.*, 2014). Borowiec (2019) revealed through phylogenetic studies that the army ants syndrome exemplifies both long-term evolutionary stasis and a remarkable case of convergent evolution. Dorylinae includes a variety of ants in addition to true army ants, which were previously kept in the subfamilies Cerapachyinae and Leptanilloidinae before the study of Brady *et al.* (2014). Borowiec (2016)

revised the generic level classification of Doryline ants, creating a total of 28 genera, up from 19 in Brady *et al.* (2014).

Doryline ants are currently represented in Nepal by three genera: *Aenictus*, *Dorylus*, and *Ooceraea*, and four species: *A. sagei*, *D. labiatus*, *D. orientalis*, and *O. biroi* (Subedi *et al.*, 2020). The current study reports two rare ants, *Cerapachys sulcinodis* and *Parasyscia wighti*, bringing the total number of Doryline ant genera reported from Nepal to five. This paper aims to provide a synoptic account of two Doryline ant genera recorded for the first time from Nepal, *Cerapachys* Smith, 1857 and *Parasyscia* Emery, 1882. It also presents a worker description of the reported species and provides a key to the Nepalese Doryline ant genera. Photo images (full-face, dorsal, and profile views) are provided to validate these new faunal records from Nepal and to aid in their identification.

Materials and Methods

The specimens for this study were collected from Nagarjun forest, Shivapuri-Nagarjun National Park and Ranibari Community Forest (RCF) in 2019. Out of over 4000 ant specimens collected by using 160 pitfall traps, 160 bait traps at four different sites, and hand collecting along foot trails from Fulbari gate to Jamacho of Nagarjun forest in autumn and spring, and 40 pitfall traps, 40 bait traps, and hand collecting at RCF, only one specimen of *Cerapachys* and two specimens of *Parasyscia* were obtained in pitfall traps. The collected specimens were preserved in 90% alcohol before being point-mounted. A stereo zoom microscope (Coslab MSZ-115) was used to examine the morphology of the point-mounted specimens. Images were captured using a digital camera (Samsung SM-M625F), under the same microscope. The specimens are deposited at Central Department Zoology Museum of Tribhuvan University (CDZMTU). Identifications are based on available keys (Bharti & Akbar, 2013), the original description, and a comparison with images available on AntWiki (<https://www.antwiki.org>). A synoptic generic account of both genera is provided, including type species, type locality, junior synonyms, diagnostic features, distribution, and

biology, followed by worker description of Nepalese species.

Results and Discussion

Out of 50 ant genera known from Nepal, a few individuals of the genus *Cerapachys* (one individual) and *Parasyscia* (two individuals) were collected in pitfall traps from Nagarjun and RCD respectively. The type information, distribution, and diagnostic features of newly recorded genera and species from Nepal are provided below. The identification key to Nepalese ant genera of the subfamily Dorylinae is also presented.

Cerapachys Smith, 1857

= *Ceratopachys* Schulz, 1906

= *Cysias* Emery, 1902

= *Neophyracaces* Clark, 1941

= *Phyracaces* Emery, 1902

Type species: *Cerapachys antennatus* Smith, 1857, by subsequent designation of Bingham, 1903: 28.

Type locality: Borneo (East Malaysia: Sarawak)

Cerapachys is a small genus with five known species (Bolton, 2021). Its range extends from northwest India and Tibet to southern China, Java, Borneo, and the Philippines (Borowiec, 2016). The genus has been placed in different subfamilies: Myrmicinae (Smith, 1857), Ponerinae (Dalla Torre, 1893), and Cerapachyinae (Wheeler, 1902). Based upon phylogenetic studies, Brady *et al.* (2014) confirmed it as a Doryline genus. Borowiec (2016) also placed it in Dorylinae.

These non-army ant dorylines can be diagnosed by the presence of spiracle below the propodeum's mid-height, well-developed pygidium having modified setae, a prominent pronotomesopleural suture, pronotal collar with a well-developed carina, mid and hind tibia each with a single pectinate spur and a helcium located supra axially in the upper half of the third abdominal segment (Borowiec, 2016).

Cerapachys species build their nests in rotting logs and wood fragments, under stones, leaf litter, and soil. Some species appear to be semi-nomadic, with much larger colonies than

cryptic congeners, whose colonies may not exceed one hundred (Eguchi *et al.*, 2014). The common methods for collecting these ants include breaking open twigs, sifting leaf litter, and looking for columns of raiding workers.

***Cerapachys sulcinodis* Emery, 1889**

= *Cerapachys butteli* Forel, 1913

= *Cerapachys risii* Forel, 1892

(Figs. 1, 2, 3)

Type locality: Myanmar (Tenasserim, Mt. Mooleyit).

Distribution: Nepal (New record), Himalaya, SE Asia, Philippines and Sumatra, Borneo (Brown, 1975), Myanmar, Malaya peninsula (Bingham, 1903), Vietnam (Radchenko, 1993), Thailand (Jaitrong & Nabhitabhata, 2005), China (Guenard & Dunn, 2012), India (Bharti & Akbar, 2013), Laos (Jaitrong *et al.*, 2016).

Materials examined: 1 worker, Nagarjun forest, Shivapuri-Nagarjun National Park, 27.74871N, 85.27361E, 1912 m, pitfall collection, 13-15.iv.2019, IP Subedi leg., CDZMTU.

Worker description:

Head distinctly longer than broad; posterior cephalic margin roughly straight, eyes moderately large, mandibles triangular, masticatory margin with small denticles, 12-segmented clavate antennae.

Mesosoma stout and compact, roughly rectangular, slightly rounded sides with no distinct margin, propodeal declivity concave medially, propodeal spiracle elongate. Petiole longer than broad, petiolar dorsum rounding into sides, dorsal surface of petiolar node with longitudinal grooves and smooth median area, subpetiolar processes peg like, postpetiole trapezoidal and broader than long, elongated gaster, sting exerted.

Sculpture and pilosity: Body shiny with widely scattered, indistinct punctures throughout the body except gaster. Body moderately pilose with long erect or sub-erect hairs typically prominent in head, postpetiole and gaster.

Body coloration: The workers are small, shiny black in color with brown legs and antennae.

Comments: It is very rare in Nepal, having been discovered only once in a pitfall trap in Nagarjun forest during an extensive survey using multiple sampling methods.



Figures 1-3: *Cerapachys sulcinodis*: **1.** Profile view; **2.** Head in full-face view; **3.** Dorsal view.

***Parasyscia* Emery, 1882**

Type species: *Parasyscia piochardi*, by monotypy.

Type locality: Syria

Parasyscia is represented by 51 species (Bolton, 2021) that are found throughout the old world's warm temperate and tropical regions (Borowiec, 2016) and a few species in the subtropics (Fisher & Bolton, 2016). The genus *Parasyscia* has been classified as Ponerinae (Dalla Torre, 1893) and as Dorylinae (Emery, 1895). It was described as genus by Emery (1882) and classified as a subgenus of *Cerapachys* (Forel, 1892), and as a junior synonym of *Cerapachys* (Kempf, 1972). Borowiec (2016) revived it as a valid genus of the subfamily Dorylinae after a thorough revision of the subfamily's generic-level classification.

Borowiec (2016) recognized the following characteristics to diagnose *Parasyscia* workers: Propodeal spiracle positioned low on the sclerite, propodeal lobes present. Constriction between III and IV abdominal segments but no constrictions between IV, V, and VI segments. Petiole dorsolaterally not marginate. Pronotomesopleural suture fused. Helcium axial. Middle tibiae with a single pectinate spur, pretarsal claws unarmed, and abdominal segment III anterodorsally often marginate.

The genus includes small, cryptic ants found in rotting logs, under stones (Brown, 1975), arboreal nests (Sarnat & Economo, 2012), and urban environments (Borowiec, 2016). Their colonies appear to have a small number of individuals (Borowiec, 2016).

***Parasyscia wighti* (Bharti & Akbar, 2013)**

(Figs. 4, 5, 6)

Type locality: India (Silent Valley National Park, Kerala).

Distribution: Nepal (New record), India (Bharti & Akbar, 2013).

Materials examined: 2 workers, RCF, Kathmandu, 27.729444N, 85.3205555E, 1310 m, pitfall collection, 13-15.x.2019, IP Subedi leg., CDZMTU.

Worker description

Head rectangular, longer than broad; slightly rounded posterior lateral corners, posterior cephalic margin transverse, prominent parafrontal ridges, eyes reduced, mandibles subtriangular, masticatory margin with no denticles, 12-segmented clavate antenna with short scape.

Mesosoma compact, rectangular in dorsal view, slightly convex dorsal surface, slightly rounded sides with no distinct margin, propodeal declivity smooth and margined. Petiole longer than broad, subpetiolar processes with hook like ventral margin, sub trapezoidal postpetiole slightly wider behind, elongated gaster.

Sculpture and pilosity: Large and crowded punctures on the head dorsum, with diameters equal to greater than the average distance between them. Mesosoma, petiole, and postpetiole with similar sculpture, smaller punctures on gaster. Body moderately pilose with decumbent or subdecumbent hairs typically prominent in postpetiole and gaster. Standing hairs on the apical funicular segments and legs.

Body coloration: The body is mostly dark reddish brown in color, with slightly lighter mandibles, antennae, and legs.

Comments: It is extremely rare in Nepal, having been discovered only once in a pitfall trap during an extensive survey using multiple sampling methods and it is most likely cryptic in nature.

Key to Nepalese Dorylinae ant genera based on worker caste

The following key to Nepalese ant Doryline ant genera is mainly based upon Borowiec (2016). The numbers in parentheses refer to the previous couplet in the sequence. The genus *Syscia* has not yet been documented in Nepal, but it is included in the key for comparison purposes.



Figures 4-6: *Parasyscia wighti*: **4.** Profile view; **5.** Head in full-face; **6.** Dorsal view.

1. Pygidium, not armed with numerous modified setae, at most with only one or two pairs of thick setae or cuticular projections. Propodeal lobes short or absent. Propodeal spiracle positioned high on the propodeum 2
- Pygidium armed with numerous specialized, peg-like or spiniform setae much thicker than surrounding fine hairs; setae more than four in number, often more numerous. If pygidium is small or with few specialized setae, then propodeal lobes are conspicuous. Propodeal spiracle positioned low or mid-height on the propodeum.....3
2. (1) Antennae with 8–10 segments. Binodal waist. Pygidium small, reduced to narrow strip, without impressed medial field and simple, not armed with cuticular spines or modified setae. *Aenictus*
- Antennae with 8–12 segments. Uninodal waist. Pygidium large and impressed at apex, armed with one or two cuticular teeth or spines on each side.....*Dorylus*
3. (1) The pronotomesopleural suture is either fully or partly fused in lateral view, and there is never a curving incision in the cuticular surface that approaches the dorsolateral borders of the promesonotum..... *Parasyscia*
- Pronotomesopleural suture appears as a deep incision in the cuticle in lateral view, typically curled below the dorsolateral borders of the mesosoma.....4
4. (3) Helcium circumference is enormous in comparison to abdominal segment II (petiole) and is located above the segment's midheight, resulting in a low, undifferentiated rear face of the petiole and a low anterior face of abdominal segment III.....*Cerapachys*
- Helcium circumference is modest in comparison to abdominal segment II (petiole), which is positioned at around the midpoint of the segment, resulting in a distinct rear face to abdominal segment II and a prominent anterior face to abdominal segment III.....5
5. (4) Abdominal segment III is relatively narrow in dorsal view and similar in size to the petiole. In lateral view, abdominal tergite IV not folding over sternite and the anterior portion of the sternite visible. Hind

basitarsi not dilating distally, circular in cross-section.....*Ooceraea*

- Abdominal segment III is relatively wide in dorsal view and larger than the petiole. In lateral view, abdominal tergite IV folding over sternite and the anterior portion of sternite at least partly obscured. Hind basitarsi swollen at about two thirds of their length, oval in cross-section.....*Syscia*

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