

Preliminary Inventory of Ant Fauna from the Serenity Trust Library and Botanical Garden, Ahmedabad, Gujarat, with Five New State Records

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Abstract: An ant diversity survey was conducted at The Serenity Trust Library and Botanical Garden, Ahmedabad, Gujarat, India during August 2025. A total of 23 ant species belonging to 16 genera and 5 subfamilies were recorded from the study area. The subfamily Formicinae was co-dominant with Myrmicinae, each represented by 8 species (34.78%), followed by Ponerinae with 3 species (13.04%), and Dolichoderinae and Pseudomyrmecinae with 2 species each (8.70%). Among the recorded species, five species i.e. *Camponotus parvus* Emery, 1889; *Pheidole latinoda* Roger, 1863; *Brachyponera luteipes* (Mayr, 1862); *Leptogenys diminuta* (Smith, 1857); and *Tetraponera nigra* (Jerdon, 1851) constitute new records for Gujarat state. This study contributes to the understanding of ant diversity in urban botanical gardens and expands the known distribution of these species in western India.

Keywords: Formicidae, Myrmecology, Urban biodiversity, Gujarat, New records, Botanical Garden

Introduction

Ants (family Formicidae) are among the most successful and ecologically dominant groups of organisms on Earth (HÖLLDOBLER & WILSON 1990). They occur in nearly all terrestrial ecosystems, with their greatest diversity found in tropical regions (GUÉNARD 2013). Global estimates suggest that ant species richness exceeds 20,000 species (HÖLLDOBLER & WILSON 1990). These eusocial insects exhibit remarkable abundance, with conservative estimates placing their total population at approximately 20 quadrillion individuals, representing a combined biomass of 12 megatons of dry carbon, exceeding the total biomass of all wild birds and mammals (SCHULTHEISS et al. 2022). As of 2025, 16 subfamilies, 38 tribes, 346 genera and 14,384 valid ant species have been described globally (BOLTON 2025). In India, the ant fauna comprises 887 valid species and subspecies (BHARTI et al. 2016, AntWiki 2025).

Globally, urban development has been expanding rapidly. By 2050, an estimated 70% of the world's human population is projected to reside in cities, leading to a substantial increase in urbanized areas (SETO et al. 2013). In this context, understanding the role of

urban habitats in maintaining biodiversity and identifying the species that persist in such environments is critical for future ecological research and conservation planning (LEONG 2017). Botanical gardens and managed green spaces, in particular, play a vital role in urban biodiversity conservation, serving as refugia for native flora and fauna and acting as living repositories of ecological diversity (LEE 2023).

Gujarat State, located in western India and characterized by climatic zones ranging from sub-humid to semi-arid conditions (Ministry of Environment & Forests [MoEF] 2014), remains relatively poorly surveyed for myrmecological research, with scattered records and limited systematic studies on its ant diversity. In view of this, The Serenity Trust Library and Botanical Garden, situated in Koteshwar village near Motera, Ahmedabad, was selected as a representative site to document ant diversity in an urban semi-arid landscape. The garden, occupying approximately four hectares (40,000 m²), comprised diverse microhabitats including moist gardens, lawns, a water body, a dry deciduous forest patch, butterfly and pollinator gardens, a vegetable garden, and a medicinal herb garden. The campus supported over 800 botanical species and harbored notable faunal diversity, including 178 bird species, 78 butterfly species, over 135 moth species, 23 mammal species, 27 reptile species, and 10 amphibian species (The Serenity Library 2025). Given such ecological heterogeneity and documented faunal richness, the site provided an excellent opportunity to investigate the composition and diversity of its ant fauna.

Species checklists provide essential baseline documentation for biodiversity conservation and ecological planning, facilitating the assessment of distribution patterns, taxonomic completeness, and conservation status (MAGAGULA & HAWKES 2023). The present study on the ant fauna of The Serenity Trust Library and Botanical Garden contributes valuable baseline data on ant diversity within an urban semi-arid landscape of Gujarat. It also reports five new state records, expanding the known distribution of these species in India, and underscores the conservation significance of small, well-maintained urban green spaces in sustaining insect biodiversity amidst rapid urbanization.

Materials and methods

The survey was conducted in August 2025 at The Serenity Trust Library and Botanical Garden (23.111825°N, 72.623190°E) in Koteshwar village near Motera, Sabarmati, Ahmedabad District, Gujarat (Fig. 1). The garden comprises diverse native and exotic vegetation, including mixed tree canopies, shrub layers, and open areas that provide heterogeneous microhabitats for ant communities. Sampling was carried out during the post-monsoon period using hand-picking and aspirator methods. In the hand-picking method, ants were actively collected from ground surfaces, leaf litter, under stones, logs, and vegetation using soft forceps, while the aspirator was employed to collect small or fast-moving species from bark crevices and foliage. Specimens were preserved in 70% ethanol, sorted, cleaned, and card-mounted for examination. Morphological analysis was performed using a Nikon SMZ 1500 stereo zoom microscope (max. magnification 112.5×), and standard morphometric parameters were recorded. Species identification was based on standard taxonomic keys which includes BINGHAM 1903, BOLTON 1994 and comparison with reference collections, and distributional data were verified using BHARTI et al. 2016 and AntWiki, 2025. Photographs of newly recorded species were captured using a Nikon D5600 DSLR camera with a Laowa 25 mm ultra-macro lens; multiple focal-plane images were focus-stacked to enhance depth of field and highlight diagnostic characters.

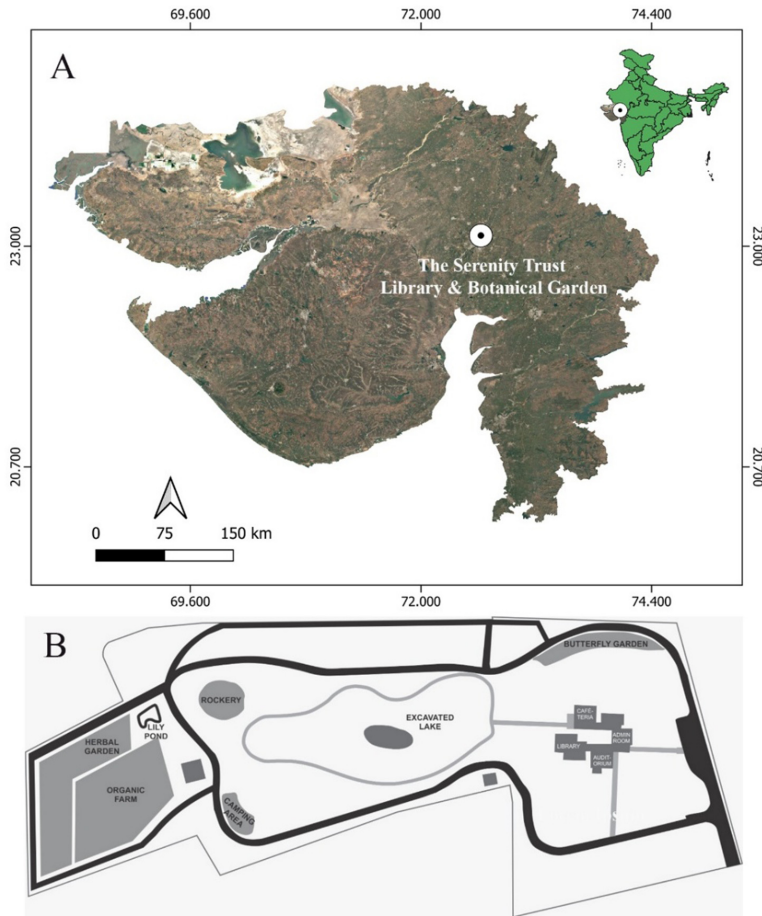


Fig. 1: Location of The Serenity Trust Library and Botanical Garden, Ahmedabad, Gujarat, India. (A) Regional position within Gujarat and India; (B) Detailed site lay out.

Morphological terminology and standard measurements followed BHARTI & WACHKOO (2014), BAIDWAN et al. 2024

Head length (HL): Maximum length of head in full-face view, measured in straight line from the anteriormost point of the median clypeal margin to the midpoint of a line drawn across the posterior margin of head.

Head width (HW): Maximum width of head in full-face view (excluding the portion of eyes that extends past the lateral margins of the head).

Eye length (EL): Maximum length of eye as measured normally in oblique view of the head to show full surface of eye.

Eye width (EW): In lateral view maximum width of eye.

Scape length (SL): Maximum length of the scape, excluding the basal neck and condyle.

Pronotal width (PnW): Maximum width of the pronotum in dorsal view.

Mesosoma length (ML): Mesosomal length in profile, from the anteriormost border of the pronotum, excluding the neck to the posterior basal angle of the metapleuron.

Postpetiole length (PPTL): Maximum length of the postpetiole in profile, from the anterior and posterior extensions of the postpetiolar node, excluding the anterior and posterior condyles.

Gaster length (GL): The length of the gaster in profile from the anteriormost point of the first gastral segment to the posteriormost point (excluding sting).

Total length (TL): Total outstretched length of a specimen, excluding mandibles.

The following ratios were calculated from the preceding measurements and multiplied by 100 are denominated as indices:

Cephalic index (CI): $HW/HL \times 100$.

Scape index (SI): $SL/HW \times 100$.

Repository

PUAC = “Punjabi University Patiala Ant Collection” at Department of Zoology and Environmental Sciences, Punjabi University, Patiala, Punjab, India

Results

A total of 23 ant species belonging to 16 genera and 5 subfamilies were recorded from The Serenity Trust Library and Botanical Garden during the survey period (Table 1). The recorded fauna represents a diverse assemblage with representation from major ant sub-families occurring in the Indian subcontinent.

Table 1: List of ant species recorded from The Serenity Trust Library and Botanical Garden, Ahmedabad, Gujarat

S. No.	Species	Subfamily
1.	<i>Tapinoma melanocephalum</i> (Fabricius, 1793)	Dolichoderinae
2.	<i>Technomyrmex albipes</i> (Smith, 1861)	Dolichoderinae
3.	<i>Camponotus compressus</i> (Fabricius, 1787)	Formicinae
4.	<i>Camponotus irritans</i> (Smith, 1857)	Formicinae
5.	<i>Camponotus parius</i> Emery, 1889	Formicinae
6.	<i>Lepisiota bipartita</i> (Smith, 1861)	Formicinae
7.	<i>Paratrechina longicornis</i> (Latreille, 1802)	Formicinae
8.	<i>Plagiolepis jerdonii</i> Forel, 1894	Formicinae
9.	<i>Polyrhachis exercita</i> (Walker, 1859)	Formicinae
10.	<i>Polyrhachis lacteipennis</i> Smith, 1858	Formicinae
11.	<i>Crematogaster rothneyi</i> Mayr, 1879	Myrmicinae
12.	<i>Crematogaster subnuda</i> Mayr, 1879	Myrmicinae
13.	<i>Meranoplus bicolor</i> (Guérin-Méneville, 1844)	Myrmicinae
14.	<i>Monomorium indicum</i> Forel, 1902	Myrmicinae
15.	<i>Monomorium pharaonis</i> (Linnaeus, 1758) (I)	Myrmicinae
16.	<i>Pheidole latinoda</i> Roger, 1863	Myrmicinae
17.	<i>Pheidole sulcaticeps</i> Roger, 1863	Myrmicinae
18.	<i>Trichomyrmex destructor</i> (Jerdon, 1851)	Myrmicinae
19.	<i>Anochetus sedilloti</i> Emery, 1884	Ponerinae
20.	<i>Brachyponera luteipes</i> (Mayr, 1862)	Ponerinae
21.	<i>Leptogenys diminuta</i> (Smith, 1857)	Ponerinae
22.	<i>Tetraponera nigra</i> (Jerdon, 1851)	Pseudomyrmecinae
23.	<i>Tetraponera rufonigra</i> (Jerdon, 1851)	Pseudomyrmecinae

The subfamily-level analysis revealed co-dominance of Formicinae and Myrmicinae, each represented by eight species (34.78% each). Ponerinae was represented by three species (13.04%), while Dolichoderinae and Pseudomyrmecinae each contributed two species (8.70%) (Fig. 2). This composition reflects a typical pattern in tropical and sub-tropical ant assemblages, where Formicinae and Myrmicinae collectively account for the majority of species richness. A total of sixteen genera were recorded from the study area. The genus *Camponotus* was the most species-rich with three species, followed by *Polyrhachis*, *Crematogaster*, *Monomorium*, *Pheidole*, and *Tetraponera*, each represented by two species. The remaining genera – *Tapinoma*, *Technomyrmex*, *Lepisiota*, *Paratrechina*, *Plagiolepis*, *Trichomyrmex*, *Meranoplus*, *Anochetus*, *Brachyponera*, and *Leptogenys* – were each represented by a single species.

Five species collected during this survey represent first records for Gujarat state, significantly expanding the known distribution of these taxa in western India. Detailed accounts of these species are provided below.

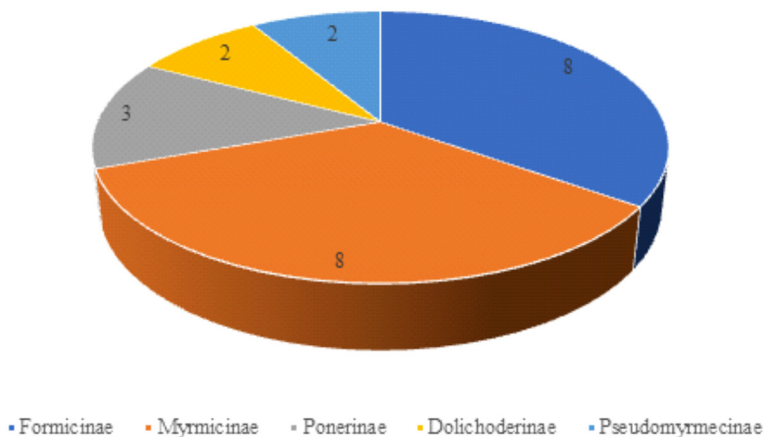


Fig. 2: Proportion of ant species across different subfamilies in the study area

New State Records for Gujarat

Camponotus parius Emery, 1889 (Fig. 3)

Camponotus micans r. *paria* Emery, 1889: 513 (w.) Myanmar. Indomalaya.

Material examined: India, Gujarat, The Serenity Trust Library and Botanical Garden, 23.111389 N 72.623611 E, 84m, Hand picking, 22-08-2025, 12w, Rakeshwar Kapoor leg. (PUAC).

Worker measurements: HL 2.41-2.82; HW 2.17-2.58; EL 0.49-0.53; EW 0.41-0.43; SL 2.09-2.17; PnW 1.41-1.45; ML 2.78-3.15; PL 0.65-0.69; GL 2.82-3.64; TL 8.66-10.30mm. Indices: CI 90.41-90.48; SI 84.10-96.31. (n=7).

Diagnostic characteristics: In full-face view, the head is subtriangular in shape with length approximately equal to width, the posterior margin of the head is straight to slightly concave, while the lateral margins are convex. Head lateral and ventral setae absent to short, and never abundant, clypeus lobe is anterolaterally rounded and medially emarginated; in lateral view, the mesosomal profile forms a smooth, continuous arch that is not interrupted by the propodeum; the petiolar node is relatively broad and compressed, with silky pilosity that is dense and evenly distributed; gaster is completely covered with sericeous yellow pubescence.



Fig. 3: *Camponotus parius* Emery, 1889: Profile view of the worker

Distribution: Previously recorded from Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Goa, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Maharashtra, Meghalaya, Nagaland, Orissa, Punjab, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand and, West Bengal. This represents the first record from Gujarat and extends the known distribution to western India.

***Brachyponera luteipes* (Mayr, 1862) (Fig. 4)**

Ponera luteipes Mayr, 1862: 722 (w.q.) India (Nicobar Is). Indomalaya.

Material examined: India, Gujarat, The Serenity Trust Library and Botanical Garden, 23.112778 N 72.624167 E, 80m, Aspirator, 24-08-2025, 7w, Rakeshwar Kapoor leg. (PUAC).

Worker Measurements: HL 1.01-1.07; HW 0.92-0.98; EL 0.17-0.19; EW 0.12-0.16; SL 0.93-0.98; PnW 0.58-0.64; ML 1.31-1.39-3; PL 0.26-0.29; GL 1.32-1.78; TL 3.87-4.56mm. Indices: CI 89.08-92.98; SI 99.01-102.75. (n=5).

Diagnostic characteristics: Head longer than wide, finely punctate, posteriorly slightly emarginate, with broadly rounded depression at posterior margin, Mandible finely punctured and triangular with nine teeth; clypeus anteriorly with a broad medial lobe; antennae 12-segmented with scape exceeding posterolateral corner, flagellar segments first and second as long as broad, or wider than long. pronotum and mesonotum dorsum rough; lateral mesosoma smooth and shiny; petiolar node and gaster finely punctate. Body black; mandible, antennae flagellum, tibiae, tarsus, and end of gaster reddish brown.

Distribution: Previously recorded from Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Sikkim, Tamil Nadu, Tripura, Uttarakhand and West Bengal. Not previously reported from Gujarat.



Fig. 4: *Brachyponera luteipes* (Mayr, 1862): Profile view of the worker

***Leptogenys diminuta* (Smith, F., 1857) (Fig. 5)**

Ponera diminuta Smith, 1857a: 69 (w.) Borneo (East Malaysia: Sarawak). Indomalaya.

Material examined: India, Gujarat, The Serenity Trust Library and Botanical Garden, 23.110000 N 72.622778 E, 82m, Hand picking, 23-08-2025, 5w, Parvinder Singh Baidwan leg. (PUAC).



Fig. 5: *Leptogenys diminuta* (Smith, 1857): Profile view of the worker

Worker measurements: HL 1.39-1.47; HW 1.14-1.23; EL 0.28-0.36; EW 0.17-0.24; SL 1.59-1.64; PnW 0.86-0.90; ML 2.17-2.50; PL 0.57-0.62; GL 2.50-2.70; TL 6.63-7.29mm. Indices: CI 82.01-83.67; SI 133.33-139.47. (n=4).

Diagnostic characteristics: Head longitudinally striated anterior to eyes and transversely striated posterior to eyes; median clypeal lobe triangular, apex bluntly rounded with two setae, strongly carinate in middle; pronotum smooth without striation laterally, mesonotum and metanotum rugose; propodeal declivity transversally striated; petiole nodiform, anterior and posterior petiolar margins straight, inclined not forming continuous convexity in profile, dorsal margin convex; node in dorsal view longer than wide; sub-petiolar process absent; gaster cylindrical, curved posteriorly, dorsal convex; body covered with sparse suberect hairs, no appressed pubescence; head, mesosoma, node and most of gaster black; antennae, mandibles, clypeus, legs and apex of gaster brown; coxae black.

Distribution: Previously recorded from Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Goa, Jammu & Kashmir, Karnataka, Kerala, Maharashtra, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tamil Nadu and, West Bengal.

***Pheidole latinoda* Roger, 1863 (Fig. 6)**

Pheidole latinoda Roger, 1863a: 195 (s.) Sri Lanka? Indomalaya.

Material examined: India, Gujarat, The Serenity Trust Library and Botanical Garden, 23.112778 N 72.623333 E, 79m, Hand picking, 23-08-2025, 12w, Himender Bharti leg. (PUAC).

Worker measurements: HL 1.8-1.88; HW 1.92-1.98; EL 0.28-0.32; EW 0.24-0.30; SL 1.32-1.38; PnW 0.9-1.0; ML 1.84-1.92; PL 0.41-0.45; PPTL 0.45-0.49; GL 2.20-2.32; TL 6.70-6.94mm. Indices: CI 105.31-106.66; SI 68.75-69.69. (n=4).



Fig. 6: *Pheidole latinoda* Roger, 1863: Profile view of the worker

Diagnostic characteristics: Head anteriorly longitudinally striate, posterior and laterally reticulate, the head is noticeably broader at the posterior end compared to the anterior of the head and vertex bears a broad, well-defined transverse impression; clypeus anterior margin medially biangular; antennae 12 segmented, terminal three flagellar segments forming a distinct club; mesometanotal suture distinct, mesosoma anteriorly transversely striate, metanotal spines erect and stout; petiole with a projection and appendix beneath, petiole without emargination above; abdomen only striate at base rest smooth and shiny; body with light chestnut-red colour and covered with abundant soft, erect, reddish hairs.

Distribution: Previously known from Arunachal Pradesh, Assam, Bihar, Delhi, Himachal Pradesh, Jharkhand, Maharashtra, Manipur, Mizoram, Nagaland, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, and West Bengal. It has not been listed from Gujarat previously. The present record extends its known distribution to western India.

***Tetraponera nigra* (Jerdon, 1851) (Fig. 7)**

Eciton nigrum Jerdon, 1851: 112 (w.q.) India (Karnataka/Kerala). Indomalaya.

Material examined: India, Gujarat, The Serenity Trust Library and Botanical Garden, 23.113333 N 72.624444 E, 77m, Hand picking, 25-08-2025, 6w, Parvinder Singh Baidwan leg. (PUAC).

Worker measurements: HL 1.23-1.27; HW 1.10-1.16; EL 0.41-0.43; EW 0.30-0.34; SL 0.69-0.75; PnW 0.69-0.78; ML 1.87-1.96; PL 0.84-0.90; PPTL 0.60-0.68; GL 2.08-2.20; TL 6.62-7.01. Indices: CI 89.43-91.33; SI 56.09-59.05. (n=4).

Diagnostic characteristics: The head exhibits relatively sparse punctation with noticeably shiny interspaces between the punctures; head without or very rarely with two or



Fig. 7: *Tetraponera nigra* (Jerdon, 1851): Profile view of the worker

three faint ocelli; compound eyes large size; mandible robust, with four teeth on the masticatory margin; petiole long and slender; body black colour with most of the pilosity standing in profile on mesosoma, petiole, postpetiole mesosternum devoid of pubescence, the fourth abdominal tergite is characteristically covered with dense pubescence.

Distribution: Previously recorded from Andhra Pradesh, Arunachal Pradesh, Assam, Delhi, Goa, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Nagaland, Odisha, Punjab, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand, and West Bengal. The present record from Gujarat represents a significant range extension of the species.

Discussion

The Serenity Trust Library and Botanical Garden in Ahmedabad supports notable ant diversity despite its small size and urban setting, with 23 species representing five sub-families. The co-dominance of Formicinae and Myrmicinae reflects typical tropical community patterns, as reported from other regions of the Indian subcontinent (DAD et al. 2019, SUBEDI et al. 2021). The presence of Ponerinae and Pseudomyrmecinae indicates habitat heterogeneity, suggesting availability of varied nesting and foraging sites. Five new state records: *Camponotus parius*, *Pheidole latinoda*, *Brachyponera luteipes*, *Leptogenys diminuta*, and *Tetraponera nigra* extend the known distribution of these species into western India, revealing that Gujarat's urban green spaces remain underexplored. Well-maintained urban gardens can maintain ecological complexity and function as refugia and stepping stones for biodiversity (GIBB & HOCHULI 2002). This study highlights the ecological significance of conserving even small urban habitats and emphasizes the need for continued, systematic surveys to document and protect urban ant diversity.

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