

DIVERSITY OF ANTS (HYMENOPTERA: FORMICIDAE) IN TIRUVANNAMALAI DISTRICT OF SOUTHERN EASTERN GHATS OF TAMIL NADU, INDIA

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ABSTRACT

This study provides a wide-ranging list of ant species (Hymenoptera: Formicidae) from the Tiruvannamalai district of Tamil Nadu, located in the South-Eastern Ghats of India. The study's main goal was to assess the diversity of ant species across a range of ecosystems, including agricultural landscapes (Padavedu and Cheyyar river) and Hilly regions (Annamalai Hills, Javathu Hills, Parvathamalai Hills, Sampathgiri Hills, and Ponnur Hills). Samples have been gathered under rocks, in wooden stems, under soil, in leaf litter and in decaying logs. A total of 37 species have been identified across 19 genera and 6 subfamilies. The finding indicated that species from the subfamily Myrmicinae were the most dominant, accounting for 32% of the total species recorded, followed by Formicinae (27%), Dolichoderinae (16%), Ponerinae (11%), Pseudomyrmecinae (11%) and Amblyoponinae (3%). Exotic species such as *Anoplolepis gracillipes* (Smith, F., 1857), *Paratrechina logicornis* (Latreille, 1802), *Monomorium monomorium* Bolton, 1987, *Monomorium Pharaonis* (Linnaeus, 1758), *Monomorium subopacum* (Smith, F., 1858) and *Tetramorium bicarinatum* (Nylander, 1846) were also identified in the survey areas. The results indicate the region's ecological richness by highlighting the notable diversity of ants found there.

Keywords: Ants species, Formicidae, Dolichoderinae, Ponerinaem, *Pseudomyrmecinae*, *Anoplolepis gracillipes*.

INTRODUCTION

Ants diverged with the appearance of flowering plants, having developed from common ancestors during the Cretaceous epoch, about 140 million years ago. The huge order Hymenoptera includes a variety of insects that are helpful to humans. Ants belong to the family Formicidae, which is a suborder of the hymenoptera, which also includes capitallars, wasps, and bees. In every habitat on Earth, ants exhibit biomass dominance, variety, and abundance (Fittkau, and Klinge, 1973). They have a significant role as predators in forest (Philpott and Armbrecht, 2006) and agro-ecosystems (Mollot *et al.*, 2012). Ants are useful as bio-monitoring instruments because they are well-understood, simple to sample, and have a large biomass and variety. Compared to many other taxa, ant diversity indices are far more useful as indicators (Osborn *et al.*, 1999). This family has 17,139 species and

subspecies spread among 516 genera and 22 subfamilies worldwide 9 (antweb.org). There are 110 General and 864 Species in 10 subfamilies in India (antwiki.org). Jerdon's (1851 and 1854) and Forel's (1900a, 1900b, 1901, and 1913) investigations are early fundamental works on Indian ants. The study conducted by Bingham in 1903 is still regarded as one of the most important contributions to our knowledge of Indian ants. The pertinent checklist on Indian Ants was released by Bharti *et al.*, in 2016, and the Fauna of India Checklist: Arthropoda: Insecta: Hymenoptera was published by Rameshkumar *et al.*, in 2023.

MATERIALS AND METHODS

Ants were collected from several parts of the Tiruvannamalai district of Tamil Nadu, located in the South-Eastern Ghats of India, including Padavedu near

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Polur (12.6600°N, 79.1126°E), the Annamalai Hills in the Tiruvannamalai region (12.1800°N, 79.0400°E), Jawathu Hills spanning Chengam and Polur (12.3694°N, 78.6896°E), Parvathamalai Hills near Kalasapakkam (12.4352°N, 78.8684°E), Sampathgiri Hills in the Polur area (12°30'35"N, 79°06'58"E), Ponnur Hills near Vandavasi (12°29'52"N, 79°31'28"E), and the Cheyyar River along the Cheyyar and Vandavasi regions (12.6620°N, 79.5435°E). The ants were collected using several methods, such as pitfall traps, insect nets, Winkler extractors and hand collections. The sampling was carried out from October to December 2023, during the northeast monsoon, through February to May 2024 during the dry season and from June to September 2024, during the southwest monsoon. The samples were preserved in 70% ethyl alcohol at the Marine Biology Regional Centre of the Zoological Survey of India, Chennai, Tamil Nadu State, India.

RESULTS AND DISCUSSION

Order: Hymenoptera Linnaeus, 1758

Superfamily: Formicoidea Latreille, 1809

Family: Formicidae Latreille, 1809

Subfamily: Amblyoponinae Forel, 1893

Genus: *Mystrium* Roger, 1862

1. *Mystrium camillae* Emery, 1889
Mystrium camillae javana Karavaiev, 1925
Mystrium oculatum Xu, 1998

Subfamily: Dolichoderinae Forel, 1878

Genus: *Chronoxenus* Santschi, 1919

2. *Chronoxenus myops* (Forel, 1895)
Liometopum minimum Zhou, 2001
3. *Chronoxenus wroughtonii* (Forel, 1895)
Chronoxenus wroughtonii formosensis (Forel, 1913)
Chronoxenus wroughtonii javanus (Forel, 1909)
Chronoxenus wroughtonii victoriae (Forel, 1895)

Genus: *Iridomyrmex* Mayr, 1862

4. *Iridomyrmex anceps* (Roger, 1863)
Iridomyrmex excisus Mayr, 1867
Prenolepis discoidalis Donisthorpe, 1947
Iridomyrmex bicknelli formosae Forel, 1912
Iridomyrmex anceps ignobilis Mann, 1921
Iridomyrmex meinerti Forel, 1901
Iridomyrmex rufoniger metallescens Emery, 1893
Iridomyrmex gracilis papuana Emery, 1897
Iridomyrmex anceps sikkimensis Forel, 1904
Iridomyrmex anceps watsonii Forel, 1895

Genus: *Tapinoma* Foerster, 1850

5. *Tapinoma melanocephalum* (Fabricius, 1793)
Formica familiaris Smith, F., 1860
Formica nana Jerdon, 1851

Myrmica pellucida Smith, F., 1857
Neoclystopenella luffae Kurian, 1955
Tapinoma melanocephalum australis Santschi, 1928
Tapinoma melanocephalum coronatum Forel, 1908
Tapinoma melanocephalum malesianum Forel, 1913

Genus: *Technomyrmex* Mayr, 1872

6. *Technomyrmex albipes* (Smith, F., 1861)
Crematogaster forticulus Walker, 1859
Formica detorquens Walker, 1859
Tapinoma albitarse Motschoulsky, 1863
Tapinoma nigrum Mayr, 1862
Technomyrmex albipes bruneipes Forel, 1895
Technomyrmex albipes wedda Forel, 1913
7. *Technomyrmex vitiensis* Mann, 1921
Technomyrmex albipes rufescens Santschi, 1928

Subfamily: Formicinae Latreille, 1809

Genus: *Anoplolepis* Santschi, 1914

8. *Anoplolepis gracillipes* (Smith, F., 1857)
Formica longipes Jerdon, 1851
Formica trifasciata Smith, F., 1858

Genus: *Camponotus* Mayr, 1861

9. *Camponotus compressus* (Fabricius, 1787)
Camponotus quadrilaterus Roger, 1863
Formica callida Smith, F., 1858
Formica indefessa Sykes, 1835
10. *Camponotus mitis* (Smith, F., 1858)
Formica ventralis Smith, F., 1858
11. *Camponotus sericeus* (Fabricius, 1798)
Formica aurulenta Latreille, 1802
Formica pyrrhocephala Motschoulsky, 1863
12. *Camponotus variegatus* (Smith, F., 1858)
Camponotus variegatus hawaiiensis Emery, 1920

Genus: *Nylanderia* Emery, 1906

13. *Nylanderia bourbonica* (Forel, 1886)
Prenolepis bourbonica bengalensis Forel, 1894
Prenolepis bourbonica hawaiiensis Forel, 1899
Prenolepis bourbonica skottsbergi Wheeler, W.M., 1922

Genus: *Paratrechina* Motschoulsky, 1863

14. *Paratrechina logicornis* (Latreille, 1802)
Formica gracilescens Nylander, 1856
Formica vagans Jerdon, 1851

Paratrechina currens Motschoulsky, 1863

Prenolepis longicornis hagemanni Forel, 1901

Genus: *Polyrhachis* Smith, F., 1857

15. *Polyrhachis exercita* (Walker, 1859)
Polyrhachis clypeatus Mayr, 1862
Polyrhachis indica Mayr, 1870
16. *Polyrhachis rastellata* (Latreille, 1802)
Polyrhachis rastellata ceylonensis Donisthorpe, 1938
17. *Polyrhachis thrinax* Roger, 1863
Polyrhachis thrinax mucronis Donisthorpe, 1942

Subfamily: Myrmicinae Lepeletier de Saint-Fargeau, 1835

Genus: *Crematogaster* Lund, 1831

18. *Crematogaster biroi* Mayr, 1897
Crematogaster aitkenii Forel, 1902
Crematogaster biroi smythiesii Forel, 1902
Crematogaster urvijae Bharti, 2003
19. *Crematogaster rothneyi* Mayr, 1879
Crematogaster rothneyi civa Forel, 1902

Genus: *Monomorium* Mayr, 1855

20. *Monomorium monomorium* Bolton, 1987
Monomorium minutum Mayr, 1855
21. *Monomorium Pharaonis* (Linnaeus, 1758)
Atta minuta Jerdon, 1851
Formica antiguensis Fabricius, 1793
Myrmica contigua Smith, F., 1858
Myrmica domestica Shuckard, 1838
Myrmica fragilis Smith, F., 1858
Myrmica vastator Smith, F., 1857
22. *Monomorium subopacum* (Smith, F., 1858)
Monomorium mediterraneum Mayr, 1861
Monomorium mintiribe Collingwood & Agosti, 1996
Monomorium salomonis intermedium Santschi, 1927
Monomorium subopacum adoneum Santschi, 1936
Monomorium subopacum apuleii Santschi, 1927
Monomorium subopacum ebraicum Menozzi, 1933
Monomorium subopacum italica Baroni Urbani, 1964
Monomorium subopacum liberta Santschi, 1927
Myrmica glycipbila Smith, F., 1858
Paraphacota cabrerai Santschi, 1919
Paraphacota cabrerai obscuripes Santschi, 1921
Paraphacota surcoufi Santschi, 1919

Genus: *Pheidole* Westwood, 1839

23. *Pheidole indica* Mayr, 1879
Pheidole indica himalayana Forel, 1902
Pheidole indica rotschana Forel, 1902
Pheidole striativentris Mayr, 1879
Pheidole teneriffana Forel, 1893
Pheidole teneriffana taina Aguayo, 1932
Pheidole voeltzkowii Forel, 1894
24. *Pheidole nodus* Smith, F., 1874
Pheidole nodus flebilis Santschi, 1937
Pheidole nodus praevevata Wheeler, W.M., 1929
Pheidole rhombinoda Mayr, 1879
Pheidole rhombinoda formosensis Forel, 1913
Pheidole rhombinoda micantiventris Mayr, 1897
Pheidole rhombinoda stella Forel, 1911
Pheidole rhombinoda taprobanae Forel, 1902
Pheidole treubi Forel, 1905

Genus: *Tetramorium* Mayr, 1855

25. *Tetramorium bicarinatum* (Nylander, 1846)
Myrmica cariniceps Guérin-Ménéville, 1852
Myrmica kollari Mayr, 1853
Myrmica modesta Smith, F., 1860
Myrmica reticulata Smith, F., 1862
26. *Tetramorium tortuosum* Roger, 1863
Tetramorium tortuosum bellii Forel, 1902
Tetramorium tortuosum ethica Forel, 1911
27. *Tetramorium walshi* (Forel, 1890)
Triglyphothrix musculus Forel, 1902
Triglyphothrix walshi spuria Forel, 1912

Genus: *Trichomyrmex* Mayr, 1865

28. *Trichomyrmex criniceps* (Mayr, 1879)
Holcomyrmex criniceps niger Forel, 1902
Holcomyrmex criniceps ruber Forel, 1903
29. *Trichomyrmex mayri* (Forel, 1902)
Monomorium gracillimum karawajewi Wheeler, W.M., 1922

Subfamily: Ponerinae Lepeletier de Saint-Fargeau, 1835

Genus: *Cryptopone* Emery, 1893

30. *Cryptopone testacea* Emery, 1893
Cryptopone emeryi Donisthorpe, 1943
Cryptopone mayri Mann, 1919
Cryptopone sarawakana Wheeler, W.M., 1933
Ponera anommata Donisthorpe, 1948

Genus: *Diacamma* Mayr, 1862

31. *Diacamma rugosum* (Le Guillou, 1842)
Diacamma bispinosum saussurei Forel, 1922

- Diacamma japensis* Donisthorpe, 1941
- Diacamma rugosum smithi* Donisthorpe, 1943
- Diacamma vagans frontalis* Stütz, 1911
- Diacamma vagans papuanum* Stütz, 1911
- Ponera sculpturata* Smith, F., 1859
- Ponera striata* Smith, F., 1860
- Ponera tortuolosa* Smith, F., 1863
- Ponera versicolor* Smith, F., 1857

Genus: Leptogenys Roger, 1861

- 32. *Leptogenys processionalis* (Jerdon, 1851)
 - Lobopelta distinguenda andrei* Emery, 1887
 - Ponera ocellifera* Roger, 1861
- 33. *Leptogenys roberti* Forel, 1900
 - Leptogenys roberti coonoorensis* Forel, 1900

Subfamily: Pseudomyrmecinae Smith, M.R., 1952

Genus: Tetraponera Smith, F., 1852

- 34. *Tetraponera allaborans* (Walker, 1859)
 - Cerapachys ceylonica* Motschoulsky, 1863
 - Cerapachys femoralis* Motschoulsky, 1863
 - Eciton minutum* Jerdon, 1851

- Eciton rufipes* Jerdon, 1851
- Sima allaborans longinoda* Forel, 1909
- Sima allaborans sumatrensis* Emery, 1900
- Sima compressa* Roger, 1863
- Sima subtilis* Emery, 1899

- 35. *Tetraponera binghami* (Forel, 1902)
 - Sima binghami lindgreeni* Forel, 1902
- 36. *Tetraponera nigra* (Jerdon, 1851)
 - Sima nigra fergusonii* Forel, 1902
 - Sima nigra insularis* Emery, 1901
 - Sima nigra krama* Forel, 1912
 - Tetraponera atrata* Smith, F., 1852
 - Tetraponera petiolata* Smith, 1877
- 37. *Tetraponera rufonigra* (Jerdon, 1851)
 - Sima rufonigra ceylonensis* Forel, 1909
 - Sima rufonigra testaceonigra* Forel, 1903
 - Sima rufonigra yeensis* Forel, 1902

Table 1. Number of species collected from selected sites.

S. No	Sites	Number of subfamilies	Number of genera	Number of species
1.	Padavedu	5	13	26
2.	Annamalai Hills	6	15	31
3.	Javathu Hills	6	17	34
4.	Parvathamalai Hills	6	19	36
5.	Sampathgiri Hills	4	10	23
6.	Ponnur Hills	6	15	30
7.	Cheyayar River	5	14	28

Table 2. Ant species collected from various locations of Tiruvannamalai district of Tamil Nadu in South-eastern Ghats of India.

S. No	Species	padavedu	Annamalai Hills	Javathu Hills	Parvathamalai Hills	Sampathgiri Hills	Ponnur Hills	Cheyayar river
1.	<i>Mystrium camillae</i> Emery, 1889	*	*	*	*	-	*	-
2.	<i>Chronoxenus myops</i> (Forel, 1895)	*	*	*	*	*	-	*
3.	<i>Chronoxenus wroughtonii</i> (Forel, 1895)	*	*	*	*	*	-	*
4.	<i>Iridomyrmex anceps</i> (Roger, 1863)	-	-	*	*	*	*	*
5.	<i>Tapinoma melanocephalum</i> (Fabricius, 1793)	-	*	*	*	-	*	-
6.	<i>Technomyrmex albipes</i> (Smith, F., 1861)	-	*	*	-	-	*	*
7.	<i>Technomyrmex vitiensis</i> Mann, 1921	*	*	-	*	-	*	*
8.	<i>Anoplolepis gracillipes</i> (Smith, F., 1857)	*	-	-	*	-	*	*
9.	<i>Camponotus compressus</i> (Fabricius, 1787)	*	*	*	*	*	*	-
10.	<i>Camponotus mitis</i> (Smith, F., 1858)	*	*	*	*	*	*	*

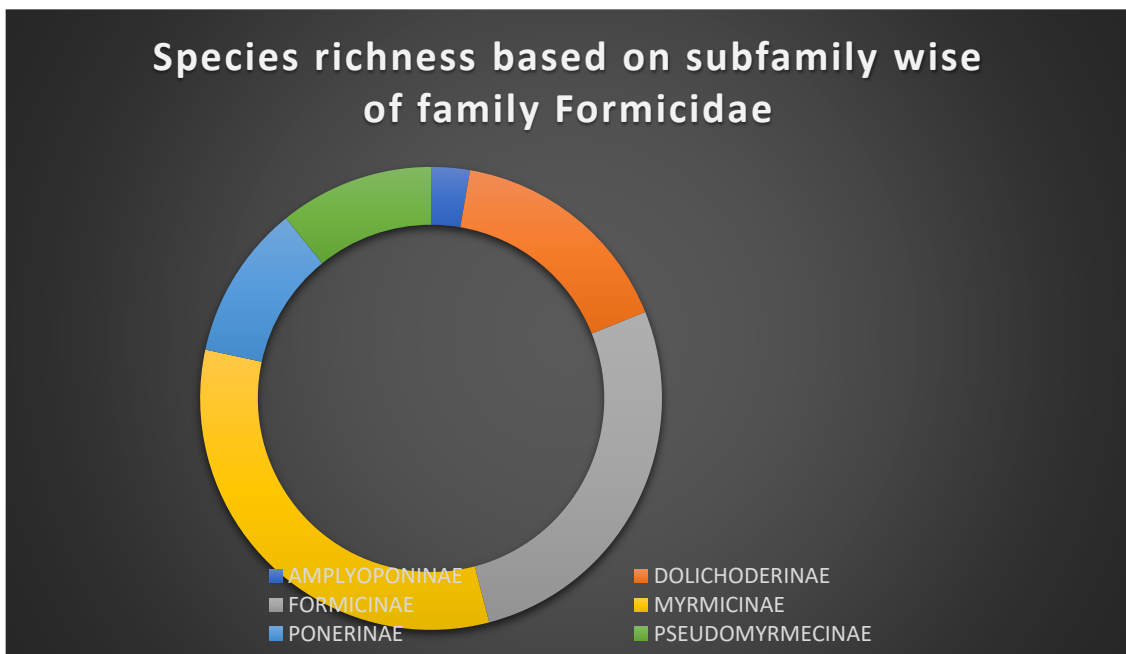
11.	<i>Camponotus sericeus</i> (Fabricius, 1798)	*	*	*	*	*	*	*
12.	<i>Camponotus variegatus</i> (Smith, F., 1858)	*	*	*	*	*	*	*
13.	<i>Nylanderia bourbonica</i> (Forel, 1886)	*	*	*	*	-	-	-
14.	<i>Paratrechina logicornis</i> (Latreille, 1802)	*	-	*	*	*	-	-
15.	<i>Polyrhachis exercita</i> (Walker, 1859)	*	*	*	*	*	*	-
16.	<i>Polyrhachis rastellata</i> (Latreille, 1802)	*	*	*	*	-	*	-
17.	<i>Polyrhachis thrinax</i> Roger, 1863	-	*	*	*	*	*	*
18.	<i>Crematogaster biroi</i> Mayr, 1897	*	*	*	*	-	*	*
19.	<i>Crematogaster rothneyi</i> Mayr, 1879	*	*	*	*	-	*	*
20.	<i>Monomorium monomorium</i> Bolton, 1987	*	*	*	*	*	*	*
21.	<i>Monomorium Pharaonis</i> (Linnaeus, 1758)	*	*	*	*	*	*	-
22.	<i>Monomorium subopacum</i> (Smith, F., 1858)	*	*	*	*	*	*	*
23.	<i>Pheidole indica</i> Mayr, 1879	-	*	*	*	*	-	*
24.	<i>Pheidole nodus</i> Smith, F., 1874	-	*	*	*	*	-	*
25.	<i>Tetramorium bicarinatum</i> (Nylander, 1846)	*	*	*	*	*	*	*
26.	<i>Tetramorium tortuosum</i> Roger, 1863	-	*	*	*	*	*	*
27.	<i>Tetramorium walshi</i> (Forel, 1890)	*	*	*	*	*	*	*
28.	<i>Trichomyrmex criniceps</i> (Mayr, 1879)	*	-	*	*	*	*	*
29.	<i>Trichomyrmex mayri</i> (Forel, 1902)	*	-	*	*	*	*	*
30.	<i>Cryptopone testacea</i> Emery, 1893	-	*	*	*	-	*	-
31.	<i>Diacamma rugosum</i> (Le Guillou, 1842)	-	*	-	*	-	*	*
32.	<i>Leptogenys processionalis</i> (Jerdon, 1851)	-	*	*	*	-	*	*
33.	<i>Leptogenys roberti</i> Forel, 1900	-	*	*	*	-	*	*
34.	<i>Tetraponera allaborans</i> (Walker, 1859)	*	-	*	*	*	*	*
35.	<i>Tetraponera binghami</i> (Forel, 1902)	*	*	*	*	-	-	*
36.	<i>Tetraponera nigra</i> (Jerdon, 1851)	*	*	*	*	*	*	*
37.	<i>Tetraponera rufonigra</i> (Jerdon, 1851)	*	*	*	*	*	*	*

Table 3. Diversity indices for various locations of Tiruvannamalai district of Tamil Nadu in South-eastern Ghats of India.

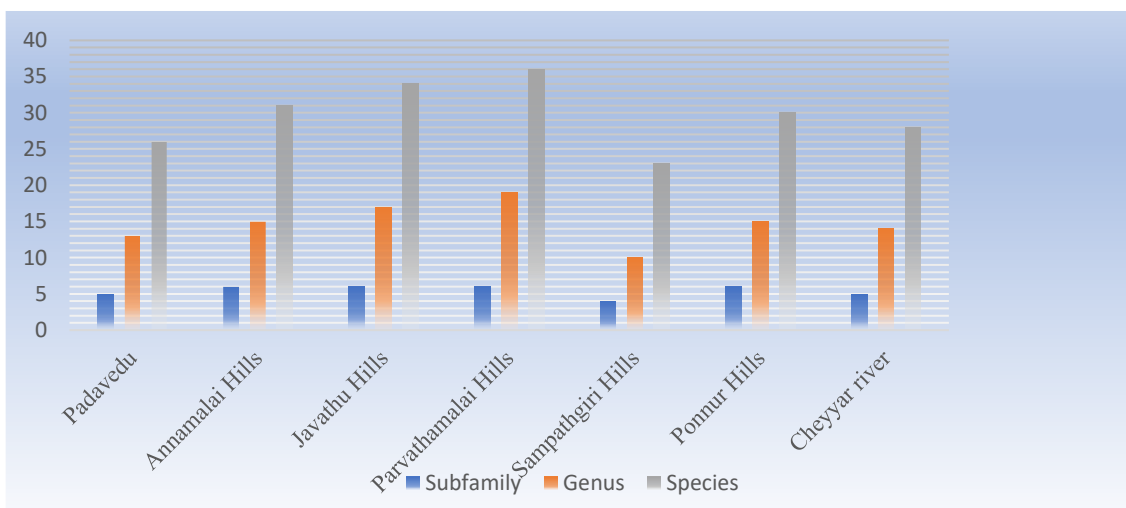
S. No	Locations	padavedu	Annamalai Hills	Javathu Hills	Parvathamalai Hills	Sampathgiri Hills	Ponnur Hills	Cheyvar river
1.	Taxa_S	26	31	34	36	23	30	28
2.	Individuals	192	178	206	306	151	171	193
3.	Dominance_D	0.05322	0.04236	0.04081	0.04691	0.07188	0.05126	0.04669
4.	Simpson_1-D	0.9468	0.9576	0.9592	0.9531	0.9281	0.9487	0.9533
5.	Shannon_H	3.072	3.277	3.347	3.304	2.834	3.136	3.173
6.	venness_e^H/S	0.8301	0.855	0.8355	0.7559	0.74	0.7673	0.8529
7.	Brillouin	2.842	2.997	3.076	3.098	2.597	2.866	2.929
8.	Menhinick	1.876	2.324	2.369	2.058	1.872	2.294	2.015
9.	Margalef	4.755	5.79	6.194	6.115	4.385	5.64	5.13
10.	Equitability_J	0.9429	0.9544	0.949	0.9219	0.904	0.9221	0.9523
11.	Fisher_alpha	8.111	10.85	11.6	10.6	7.557	10.54	9
12.	Berger-Parker	0.09896	0.08989	0.08252	0.1242	0.1457	0.1053	0.0829
13.	Chao-1	26	32	34	36.2	25	32	28

Table 4. List of exotic Ant species in Tiruvannamalai district of Tamil Nadu in South-eastern Ghats of India.

S. No	Subfamily	Genus	Species
1.	Formicinae	<i>Anoplolepis</i>	<i>Anoplolepis gracillipes</i> (Smith, F., 1857)
2.		<i>Paratrechina</i>	<i>Paratrechina logicornis</i> (Latreille, 1802)
3.	Myrmicinae	<i>Monomorium</i>	<i>Monomorium monomorium</i> Bolton, 1987
4.		<i>Monomorium</i>	<i>Monomorium Pharaonis</i> (Linnaeus, 1758)
5.		<i>Monomorium</i>	<i>Monomorium subopacum</i> (Smith, F., 1858)
6.		<i>Tetramorium</i>	<i>Tetramorium bicarinatum</i> (Nylander, 1846)



Graph 1. Species richness based on subfamily wise of Family Formicidae.



Graph 2. Comparison of Diversity of Family Formicidae in various ecosystem of Tiruvannamalai district of Tamil Nadu in South-eastern Ghats of India.

Ant species distribution across subfamilies showed that Myrmicinae, with five genera and twelve species, clearly dominated the field. Formicinae, with five genera and ten species, Dolichoderinae, with four genera and six species, Ponerinae, with three genera and four species, and Pseudomyrmecinae, with one genus and four species, followed. Furthermore, there was just one species and one genus representing Amplyoponinae. The Parvathamalai Hills were the most species-rich habitat among those surveyed, with *Tetraoponera* and *Camponotus* being especially prevalent. In contrast, the Sampathgiri Hills ecosystem exhibited the lowest diversity, indicating a more limited ant community in that region. According to the results, the ant community in the Tiruvannamalai district may be complicated and diversified. However, further study is necessary to completely understand the scope and ecological importance of this variety. The goal of future research should be to examine the ecological roles of the entire range of ant species found in the region.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest

ETHICS APPROVAL

Not applicable

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