

ANT (HYMENOPTERA: FORMICIDAE) DIVERSITY OF BAHONA COLLEGE CAMPUS, JORHAT, ASSAM WITH SOME NEW RECORDS FOR THE STATE

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Abstract: India is rich in ant diversity, but recent studies are limited to certain pockets of the country. In Northeast India, the study of ant fauna is poor. The present study was carried out with an objective to explore the ant species present in the Bahona College campus of Jorhat, Assam. A total of 39 species of ants was recorded during the study representing 6 subfamilies. The subfamily Formicinae included 19 species, followed by Myrmicinae (10 species), Ponarinae (5 species), Dolichoderinae (3 species), Dolyrinae (one species) and Pseudomyrmecinae (one species). The genera *Camponotus*, *Polyrhachis*, *Diacamma*, *Monomorium*, etc were found dominant, whereas the other genera contained two or one species each. Five species of ants viz *Camponotus irritans* (Smith, 1857), *Camponotus radiates* Forel, 1892, *Camponotus sericeus* (Fabricius, 1798), *Polyrhachis bicolor* Smith, 1858 and *Polyrhachis abdominalis* Smith, 1858 are recorded for the first time from Assam. Investigation covering a wider geographical area for a longer period of time will certainly bring out more information on the myrmicofauna of the North-eastern region of India.

Keywords: Ant diversity, Bahona College, Jorhat, North-east India.

INTRODUCTION:

Ants are small-sized insects belonging to Family Formicidae, Order Hymenoptera under Phylum Arthropoda. Ants are distributed almost in all terrestrial ecosystems and contribute about 15-20% of the terrestrial faunal biomass (Beattie and Hughes, 2002). There are about 12,500 identified species and subspecies of ants (Bolton *et al.*, 2006) which are concentrated mainly in the tropical region. Ants play important role in its ecosystem by maintaining species interaction (Stadler and Dixon 2005), controlling other arthropods (Fiedler *et al.*, 1996), leaf litter structure (McGlynn and Kirksey 2000), enhancing soil quality (Frouz and Jilková, 2008), and pollination (de Vega *et al.* 2009), etc. Further, they can be used as bio-indicator (Andersen *et al.* 2002), agricultural bio-control agents (Drummond and Choate, 2011) too. However, information on the diversity and distribution of ants in many regions is unknown (Fisher and Robertson 2002).

In India, there are 828 species of ants belonging to 100 genera and ten subfamilies (Bharti *et al.* 2016) but the present scenario of distribution of species is still insufficient. However, there are some regional studies on ants which contribute to the understanding of species diversity of a biogeographic region and some such studies for different Indian states are Mathew and Tiwari (2000), Rajagopal *et al.* (2005), Kumar and Mishra (2008), Gaithe and Kale (2015), Paul *et al.* (2016), Sonune and Chavan (2016), Dash *et al.* (2017), Ratnaparkhi and Kale (2018) etc. In Northeast India, which represents both Eastern Himalaya and Indo

Burma Biodiversity Hotspots (Myers *et al.* 2000), and Assam as a part of it represents the richness of different fauna and flora. But, the myrmecological studies in the entire region are still poor. Barti *et al.* (2016) listed 217 species of ant from the state of Assam based on his own collection and literature of the pre-independent period. Hazarika *et al.* (2019) reported 21 ant species from the Gauhati University campus, Guwahati. Few reports from Jorhat District conducted by Assam Agriculture University (AAU) found maximum 6 species in three separate studies (Rajkumari *et al.* 2014, Saikia *et al.*, 2019; Taye *et al.* 2017) which represent a very small fraction of ant species previously documented from the state. To reduce the gap of knowledge on myrmicofauna, the present investigation was undertaken to find out the ant species prevailing in the Bahona College campus of Jorhat, Assam.

MATERIAL AND METHODS:

Jorhat District is located in the upper-middle portion of Assam, Northeast India. The district covers an area of 2851sq km and at an average elevation of 116 m from sea level. The annual rainfall of the area is about 2000 mm. River Brahmaputra marks the north boundary whereas Sivasagar district, Golaghat district and Nagaland state cover eastern, western and southern boundaries respectively. The climate is tropical, dry during winter, humid and rainy during summer. The Bahona College is situated about 15 km north to the city of Jorhat at 26.8100° N, 94.2408° E. It has a land area of 0.03 sq km (8 acres) surrounded by the concrete walls. The nearby area is rich in bamboo vegetation as well as diverse flora. Inside the campus, there is abundant seasonal and perennial vegetation including grasses, herbs, shrubs and trees are presently providing an ideal green campus.

The study was carried out from February 2019 to November 2019 for 10 months. Samplings were done once in every fortnight. Ants were collected by random browsing of possible habitats (trees, flowers, grasses, wood logs, leaf litter, concrete walls, under fallen bricks, abandoned termite nest, subsurface soil, etc.) during morning and afternoon hours. Minimal numbers of specimens were taken in small sample vials using brush and forceps, brought to the laboratory for identification and preservation. Identification was done under stereo zoom binocular microscope (Model: Olympus SZX10) following Bingham (1903) and Bolton (1994). The collected ants were preserved in 90% alcohol and deposited in the Museum of Department of Zoology, Bahona College. Photographs were taken in live or preserved condition using a digital camera (model: Nikon Coolpix P900) attached with a clip-on macro lens.

RESULTS AND DISCUSSION:

The campus of Bahona College was found to be rich in ants with 39 species belonging to 18 genera under 6 Subfamilies (Table: 1). Subfamily Formicinae included the highest number of species (19 species, 49%) followed by Myrmicinae (10 species, 26%), Ponarinae (5 species, 13%), and Dolichoderinae (3 species, 8%). The subfamily Dolyrinae and Pseudomyrmecinae were represented by single species each (Fig 1). Subfamily wise composition genera and species are shown in Figure 2. The species under subfamily Formicinae were recorded under 5 genera. Genus *Camponotus* (10 species) and *Polyrhachis* (6 species) altogether comprised 16 species whereas *Anoplolepis gracilipes*, *Oecophylla smaragdina*, *Paratrechina*

longicornis were the only specie of their genus. Myrmicinae was the richest subfamily in terms of the genus (n=7) comprising *Monomorium* (3 species), *Pheidole* (2 species), and the other genus *Cataulacus*, *Crematogaster*, *Myrmicaria*, *Cerabera*, and *Solenopsis* were represented by single species. Ponerinae included two genus and 5 species. *Diacamma* was the major genus with the species *D. assamensis*, *D. rugosum sculptum*, *D. scalpratum*, and unidentified one. In contrast, only one species of *Pseudoneoponera* (*P. rufipes*) was recorded during the present study whereas *Technomyrmex albipes*, *Tapinoma melanocephalum* and an unidentified species of *Tapinoma* were recorded under subfamily Dolichoderinae which contributed about 8% of the total record of the species. Each of the subfamily Dorylinae and Pseudomyrmecinae were represented by single species *Dorylus orientalis* and *Tetraponera rufonigra* respectively. In the present investigation, *Camponotus* was found to be the most dominant genus with 10 species followed by *Polyrhachis* (6 species), *Diacamma* (4 species), *Monomorium* (3 species), *Pheidole* (2 species), *Tapinoma* (2 species) and rest of the genus viz. *Dorylus*, *Anoplolepis*, *Oecophylla*, *Paratrechina*, *Cataulacus*, *Crematogaster*, *Myrmicaria*, *Cerabera*, *Solenopsis*, *Pseudoneoponera*, *Tetraponera* were found to have single species in the study area.

Table 1: List of Ant species of Bahona College Campus

Sl. No	Name of Species	Subfamily
1	<i>Technomyrmex albipes</i> (Smith, 1861)	Dolichoderinae
2	<i>Tapinoma melanocephalum</i> (Fabricius, 1793)	Dolichoderinae
3	<i>Tapinoma sp</i>	Dolichoderinae
4	<i>Dorylus orientalis</i> Westwood, 1835	Dorylinae
5	<i>Anoplolepis gracilipes</i> (Smith, 1857)	Formicinae
6	<i>Camponotus angusticollis</i> (Jerdon, 1851)	Formicinae
7	<i>Camponotus compressus</i> (Fabricius, 1787)	Formicinae
8	<i>Camponotus irritans</i> (Smith, 1857)*	Formicinae
9	<i>Camponotus nicobarensis</i> Mayr, 1865	Formicinae
10	<i>Camponotus parius</i> Emery, 1889	Formicinae
11	<i>Camponotus radiates</i> Forel, 1892*	Formicinae
12	<i>Camponotus rufoglaucus</i> (Jerdon, 1851)	Formicinae
13	<i>Camponotus saundersi</i> Emery, 1889	Formicinae
14	<i>Camponotus sericeus</i> (Fabricius, 1798)*	Formicinae
15	<i>Camponotus sp</i>	Formicinae
16	<i>Oecophylla smaragdina</i> (Fabricius, 1775)	Formicinae
17	<i>Paratrechina longicornis</i> (Latreille, 1802)	Formicinae
18	<i>Polyrhachis bicolor</i> Smith, 1858*	Formicinae
19	<i>Polyrhachis dives</i> Smith, 1857	Formicinae
20	<i>Polyrhachis abdominalis</i> Smith, 1858*	Formicinae
21	<i>Polyrhachis armata</i> (Le Guillou, 1842)	Formicinae

22	<i>Polyrhachis thrinax</i> Roger, 1863	Formicinae
23	<i>Polyrhachis sp</i>	Formicinae
24	<i>Cataulacus latus</i> Forel, 1891	Myrmicinae
25	<i>Crematogaster sp</i>	Myrmicinae
26	<i>Monomorium floricola</i> (Jerdon, 1851)	Myrmicinae
27	<i>Monomorium indicum</i> Forel, 1902	Myrmicinae
28	<i>Monomorium pharaonis</i> (Linnaeus, 1758)	Myrmicinae
29	<i>Myrmicaria brunnea</i> Saunders, 1842	Myrmicinae
30	<i>Pheidole indica</i> Mayr, 1879	Myrmicinae
31	<i>Pheidole noda</i> Smith, 1874	Myrmicinae
32	<i>Cerabera sp</i>	Myrmicinae
33	<i>Solenopsis cf. germinate</i>	Myrmicinae
34	<i>Diacamma assamensis</i> Forel 1897	Ponerinae
35	<i>Diacamma rugosum sculptum</i> (Jerdon, 1851)	Ponerinae
36	<i>Diacamma scalpratum</i> (Smith, 1858)	Ponerinae
37	<i>Diacamma sp</i>	Ponerinae
38	<i>Pseudoneoponera rufipes</i> (Jerdon, 1851)	Ponerinae
39	<i>Tetraponera rufonigra</i> (Jerdon, 1851)	Pseudomyrmecinae

Bharti *et al.* (2016) reported nine subfamilies comprising 28 genera and 217 species for the state of Assam. As per this list, Myrmicinae with 72 species (33.18%), Formicinae with 59 species (27.19%) and Ponerinae with 45 species (20.74%) have been the dominant subfamily while 16 species of Dorylinae, 15 of Dolichoderinae, five of Pseudomyrmecinae, three of Ectatomminae, one species each of Amblyoponinae and Proceratiinae were included which together contributed to 18.89% of the myrmicofauna of the country. The rich diversity of ants belonging to Subfamilies Formicinae, Myrmicinae, Ponerinae are also reflected in the present investigation. Though, the ant fauna of Bahona College campus represents only about 18% of the state ant fauna but is significant for such a small study area. Except for the list of Bharti (2016), the only notable study on ants of Assam is the work of Hazarika *et al.* (2019) who recorded 21 species under 14 genera and 4 subfamilies from the various habitats of Gauhati University campus, Assam. In their study, Myrmicinae was found dominant with 10 species or 47.62% of the total record tailed by Formicinae (8 species, 38.09%), Ponerinae (two species, 9.52%) and Pseudomyrmecinae (one species, 4.76%) but did not record any member of subfamily Dolichoderinae and Dorylinae. *Meranoplus*, *Leptogenys*, *Myrmica* were the few genera of the report that could not be found in the present study. Three separate studies carried out by Assam Agriculture University reported a total of 10 species of ants from the university campus as well as from the district of which *Meranoplus bicolor*, *Monomorium dichroum*, *Dorylus molestus*, *Solenopsis sp*, and *Atta sp* were not encountered. Reviewing these reports from Assam, it was found that the five species viz *Camponotus irritans* (Smith, 1857), *Camponotus radiates* Forel, 1892, *Camponotus sericeus* (Fabricius, 1798), *Polyrhachis bicolor* Smith, 1858 and *Polyrhachis abdominalis* Smith, 1858 have not been recorded previously by any author and thus, this papers reports the existence of these species for the first time in Assam.

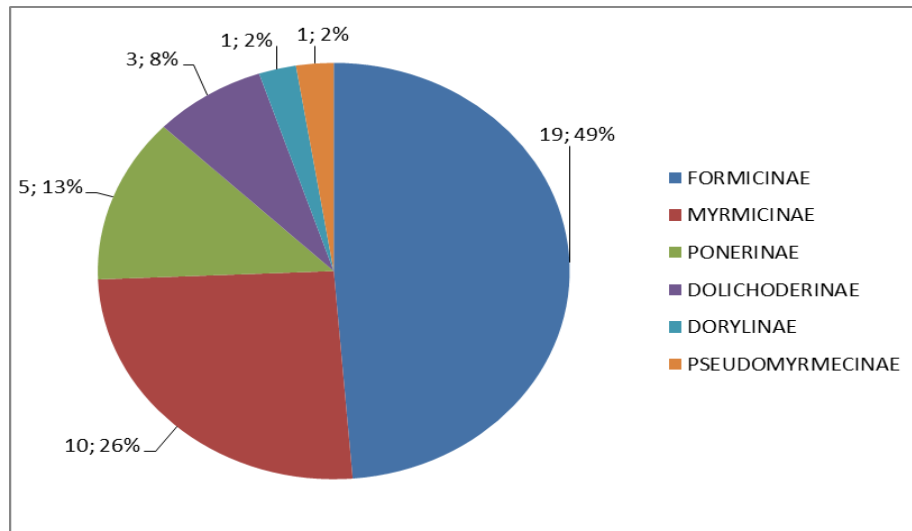


Fig 1: Percentage composition of species in different Subfamilies

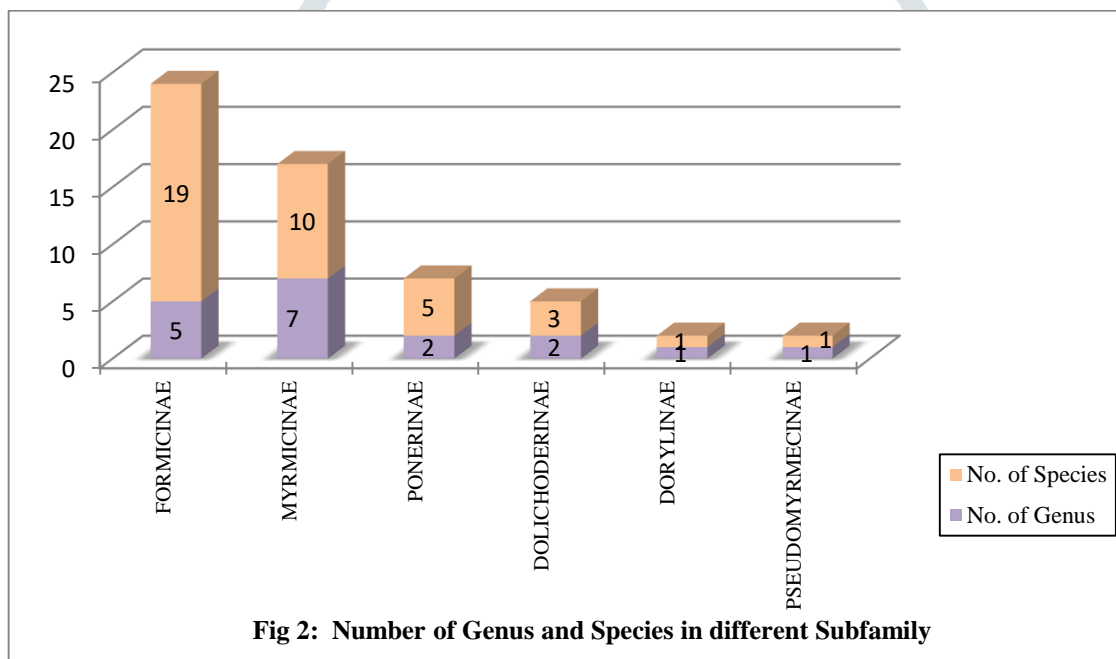


Fig 2: Number of Genus and Species in different Subfamily

In recent years, a study in Nongkhylllem Wildlife sanctuary, West Khasi Hills of nearby state Meghalaya, (Kharban and Hajong, 2013) revealed 28 species of Ants. The dominance of Myrmicinae (12 species), Formicinae (8 species), and Ponerinae (5 species) was similar to that of Bahona College Campus. But the composition of species was different in Myrmicinae and Ponerinae as the genus *Aphaenogaster*, *Cardiocondyla*, *Kartidris*, *Temnothorax*, *Tetramorium*, *Leptogenys*, *Odontomachus*, *Pachycondyla* were exclusive to that area only. Further, Cerapachyinae was the subfamily not encountered in the present study while Pseudomyrmecinae ants were not observed by the workers in Meghalaya. Such difference could be due to the vast difference in habitat type and altitude. Similarly, Tak and Kazmi (2013) reported 24 species of ant from the state Nagaland which borders the southern part of Jorhat District. The study was based on samples collected during an unspecified period, and



Technomyrmex albiceps



Tapinoma melanocephalum



Tapinoma sp



Dorylus orientalis



Anoplolepis gracilipes



Camponotus angusticollis



Camponotus compressus



Camponotus irritans



Camponotus nicobarensis



Camponotus parius



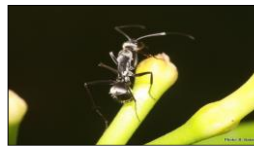
Camponotus radiatus



Camponotus rufoglaucus



Camponotus saundersi



Camponotus sericeus



Camponotus sp



Oecophylla smaragdina



Paratrechina longicornis



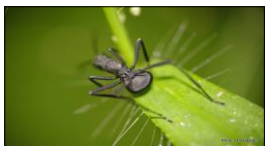
Polyrhachis bicolor



Polyrhachis dives



Polyrhachis abdominalis



Polyrhachis armata



Polyrhachis thrinax



Polyrhachis sp



Cataulacus latus



Crematogaster sp



Monomorium floricola



Monomorium indicum



Monomorium pharaonis



Myrmecaria brunnea



Pheidole indica



Pheidole noda



Cerabera sp



Solenopsis cf. germinata



Diacamma assamensis



Diacamma rugosum sculptum



Diacamma scalpratum



Diacamma sp



Pseudoneoponera rufipes



Tetraoponera rufonigra



unknown & not included in list

comprised of 11 Myrmicinae (*Solenopsis*, *Meranoplus*, *Lophomyrmex*, *Pheidologeton* (*Cerabera*), *Aphaenogaster*, *Monomorium*, *Pheidole* and *Tetramorium*), nine species of Formicinae (*Anoplolepis*, *Plagirolepis*, *Oecophylla*, *Camponotus*, *Paratrechina* and *Formica*), three of Ponerinae (all *Pachycondyla* spp.) and single species of *Tapinoma* (*T. melanocephalum*) belonging to the Dolichoderinae. Some variation can be observed in the composition of the genus in the leading subfamilies Myrmicinae and Formicinae with that of the present findings, possibly due to the differences in landscape patterns and vegetation types.

In spite of having more than 800 species of ant in the country, none of the previous individual studies recorded more than 100 species, where most of them reported below 50 species and around 25 species on average. Some of such findings are seven ant species by Gaitte and Kale (2015) from Shergaon of Maharashtra; eight species by Ratnaparkhi and Kale (2018) from Akola of Maharashtra; nine species in Manipur by Devi et. al (2000), 14 species by Chavan *et al.* (2018) in Nanded region of Maharashtra; 16 species by Purkait (2017) in South Kolkata; 17 species Sonune and Chavan (2016) around Gautala Autramghat Sanctuary of Maharashtra, 19 species by Ghosh & Sheela (2008) from Buxa Tiger Reserve of West Bengal etc. Similarly, Gakulakrishnan *et al.* (2014) reported 21 species from Thanjavur and Cuddalore Districts of Tamilnadu; Kumar and Mishra (2008) reported 22 species Vadodara District, Gujarat; Paul *et al.* (2016) listed 25 species for Trissur of Kerala; Dash *et al.* (2017) found 27 species coastal Odisha; and 29 species of ants were found by Sabu (2008) in Wayanad region of the Western Ghats. Publications for Udupi District of Karnataka (31 species), Periyanaickenpalayam village of Coimbatore district of Tamil Nadu (35 species); Punjab Shivalik range of North-West Himalaya (40 species) reported assemblage of more than 30 species (Bharti *et al.*, 2009, Chavan and Pawar, 2010, Sornapriya and Varunprasath, 2018). On the contrary, Savitha *et al.* (2008) and Narendra et al (2011) found a higher number of species for Bangalore (51 species) and Western Ghat (84 species) respectively.

Compared to many of these reports, the present study found higher number of species which can be due to regional richness, favorable humidity, and presence of diverse habitat and food resources. Introduction of ant species through the frequent import of construction materials (wood, bamboo, brick, pebbles), green vegetables and other raw food materials for the on campus girls hostel, laboratory supply packages, etc. may also occur contributing to the ant species richness of the college campus. Such passive transport of species may also occur through the large number of students gathering daily from different areas. Ants can adapt to environmental changes and exposures to new habitats (Spiesman and Cumming 2008), therefore such a possibility is not surprising. Different biotic and abiotic habitat characteristics including existing plant community, edaphic factors, human disturbance, pollution (Wang et al., 2001) also influence the assemblage pattern of ants but a longer time of research will be required to establish such relationship. Extensive study covering more geographical ranges and frequent sampling for a prolonged period will definitely bring out more information on the ant fauna of Assam.

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