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Ant fauna of the Indian Institute of Science campus—Survey and some preliminary observations

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Abstract

On the basis of a survey of ants on the campus of the Indian Institute of Science, a checklist of species and brief descriptions of commonly seen nests is provided. Some observations, especially on diets and daily foraging patterns in a few selected species are also presented. The main objective of this study was to explore the potential of the campus ant fauna for future work in behaviour and ecology.

Keywords: Social insects, ants, *Diacamma*, *Myrmicaria*, *Leptogenys*, foraging strategies.

1. Introduction

Ants deserve a special place in the study of ecology and behavior. Their social habit, species richness and high densities and biomass make them attractive model systems for studies in behavioral ecology[1]. Their unusually high levels of ecological success and dominance make them crucial components in the study of terrestrial ecosystems[2]. However, the ant fauna of India remains relatively unexplored[3,4]. Barring a few isolated studies[5–10], very little information is available on the behavior or ecology of ants in India.

In an attempt to remedy this situation, we have conducted a pilot study of the ants of the Indian Institute of Science (IISc) campus. In addition to preparing a checklist of ants on the campus and providing brief descriptions of the commonly observed nests, we have conducted preliminary observations on three very common ants of the campus, *viz.*, *Diacamma ceylonense* and *Leptogenys processionalis* (Subfamily–Ponerinae) and *Myrmicaria* sp. (Subfamily–Myrmicinae).

2. Materials and methods

2.1. *Collection*

The campus was divided into 21 approximately equal sized zones (Fig.1). The following two methods were used to collect the different species of ants.

2.1.1 *All out search method:*

Ants were collected twice a day, each of two hours duration, (7–9 a.m. and 4–6 p.m.). One day was devoted to each zone. An attempt was made to collect representative individuals of all species seen.

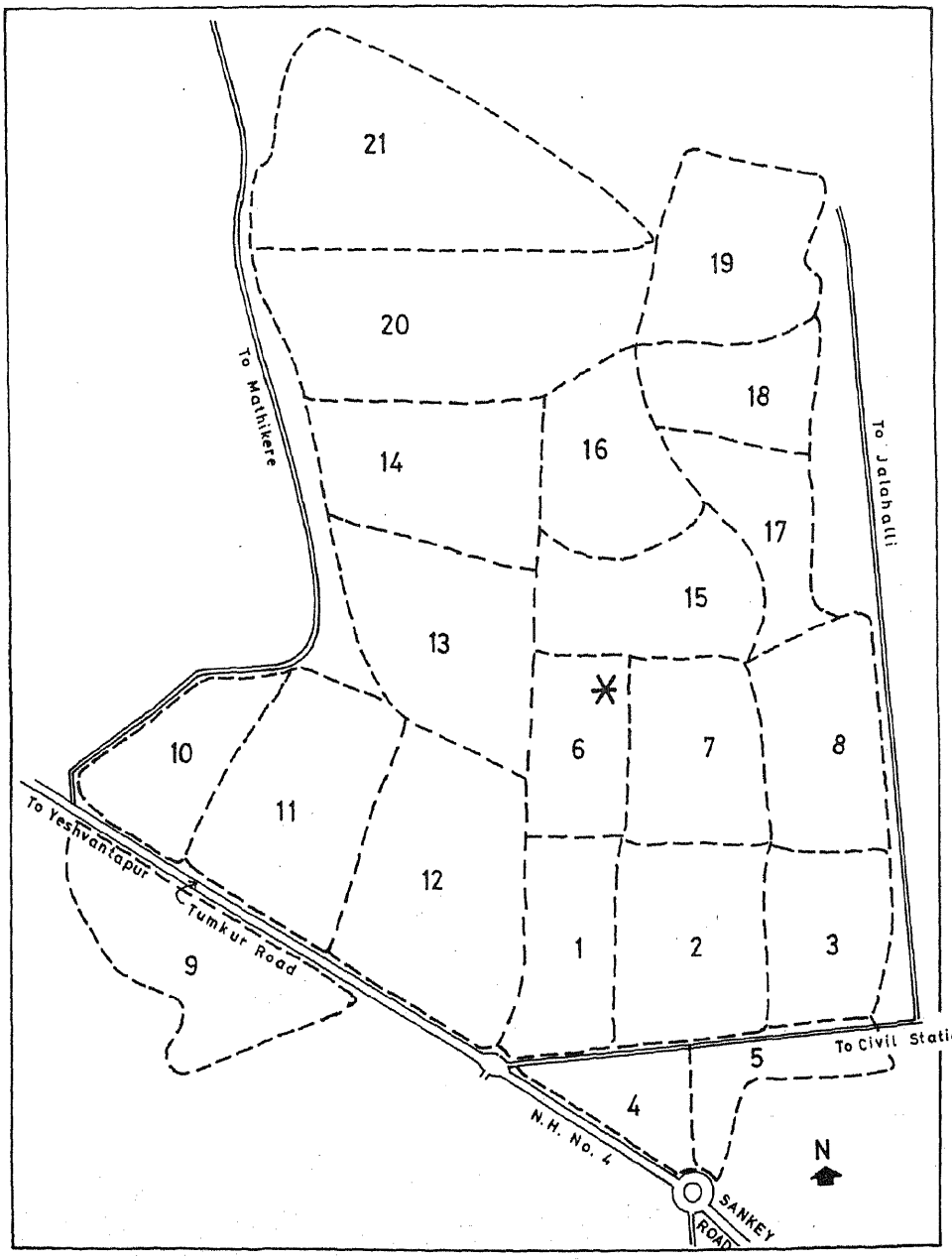

FIG. 1. Map of IISc campus showing the 21 zones surveyed for ant fauna.

Table I
Checklist of ants collected from IISc campus

Subfamily	*Genera*	*No.of species*
Ponerinae	Anochetus	3*
	Cerapachys	1**
	Brachyponera	1
	Diacamma	1
	Discothyrea?*	1*
	Harpegnathos	1
	Leptogenys	2
	Pachycondyla	2*
	8	12
Pseudomyrmecinae	Tetraponera	4
	1	4
Dorylinae	Aenictus	1**
	1	1
Myrmicinae	Aphaenogaster	1
	Cardiocondyla	3
	Cataulacus	1**
	Crematogaster	4
	Leptothorax	1
	Lophomyrmex	1
	Meranoplus	1
	Monomorium	7
	Myrmicaria	1
	Pheidole	5
	Pheidologeton	1
	Solenopsis	1
	Tetramorium	5*
	Unidentified	1*
	14	33
Dolichoderinae	Tapinoma	2*
	Technomyrmex	2
	2	4
Formicinae	Acantholepis	3
	Camponotus	5*
	Oecophylla	1
	Paratrechina	2*
	Plagiolepis	2
	Polyrhachis	3*
	6	16
6	32	70

* One species each was recorded only from pitfall traps
** Seen only in all-out search method

Table II
Ant species collected by all-out search method

Plot no.	*Subfamily*	*Genera*	*Species*
1	4	12	18
2	4	12	16
3	5	15	19
4	3	7	8
5	5	13	18
6	5	12	22
7	5	15	18
8	4	14	21
9	3	10	17
10	4	10	14
11	4	10	17
12	4	8	9
13	3	12	19
14	4	10	19
15	6	19	29
16	4	9	12
17	4	16	27
18	4	8	13
19	4	10	14
20	4	4	6
21	4	9	11

2.1.2. *Pit-fall traps*

Five pit-fall traps were randomly placed in each zone. A 2.5-l plastic jar containing 30 ml of 0.5% methyl parathion solution was buried at ground level. The traps were set up be-

tween 7 and 9 a.m. and collected after approximately 24 hours. Trapped ants were brought to the laboratory, transferred to 70% alcohol and labeled accordingly. Ants were collected by this method from 8 zones. In the remaining 13, pit-fall traps were not set up because the ground was either not suitable or it was a residential area. Classification of ants into different subfamilies and genera was done with the help of taxonomic keys provided by Bingham in *Fauna of British India series*[11] and by Bolton in *Ants* by Hölldobler and Wilson[1]. Within genera, species were given code number as we are not in a position to identify them up to the species level.

All other experiments were carried out in the field in a rectangular area (260 × 160 m) marked * in Fig. 1, during June 1993.

Daily foraging pattern: The number of foragers returning to the nest was noted for 15 min duration at hourly intervals from 600 to 1800 hours. The experiment was carried out at *Myrmicaria* and *Diacamma* nests. The nature of food brought by each returning forager was also recorded.

3. Results and discussion

3.1. *Checklist of ants found on the IISc campus*

Seventy species of ants belonging to thirty two genera and six subfamilies have been located in the present survey (Table I).

Table II indicates the number of species, genera and subfamilies found in different plots. The number of species, genera and subfamilies found in each of the 8 plots by using the pit-fall trap method alone, all-out search alone and by a combination of pit-fall trap and all-out search methods are given in Table III. Although pit-fall traps generally yielded relatively fewer species compared to all-out search method, the combination of both the methods usually yielded more species compared to any individual method (Fig. 2).

3.2. *Checklist of nests*

Nests of 27 species were located. These belonged to 17 genera and four subfamilies. A brief description of the nests is given in Table IV.

Table III
Ant species collected by all-out search method and pit-fall trap method

	All out search			Pit-fall trap			Total		
Plot no	*Sub-family*	*Genera*	*Species*	*Sub-family*	*Genera*	*Species*	*Sub-family*	*Genera*	*Species*
7	5	15	18	3	9	12	5	17	24
8	4	14	21	2	4	6	4	14	24
14	4	10	19	4	5	13	4	10	24
15	6	19	29	4	8	11	6	22	33
17	4	16	27	4	8	13	4	16	30
18	4	8	13	3	12	18	4	13	23
19	4	10	14	4	9	14	4	13	22
20	4	4	6	4	8	11	4	9	15

Table IV
Brief description of nests of commonly found species of ants on the IISc campus

Genus/Species	*Habitat*	*Nest entrance*	*Remarks*
Ponerinae			
Diacamma	Open fields with or without grass	Nest entrances may or may not be elevated from the ground level	Both when elevated and when flush with the ground nest entrances are surrounded by twigs, bird, feathers, dead ants, caterpillar skins, etc.
Leptogenys sp. 1	Loose soil with or without grass	Nest entrance is inconspicous and at the ground level	
Pachycondyla	Hard grounds, mud tracks and unpaved foot paths	Small inconspicous entrance at the ground level	
Myrmicinae			
Aphaenogaster	Soft soil with or without grass	Entrance at the ground level	During rainy season some nests were found to have a small sloping entrance
Crematogaster sp. 1	Arboreal nests in holes of tree trunks and branches	Small entrance surrounded by patches of dark substance	
Meranoplus	Loose and hard soils	Nest entrance on ground level with a small crater surrounding it	During the rainy season nest entrances were seen on an elevated chimney
Monomorium sp. 2 and 4	Grass fields, mud tracks, hard grounds and unpaved footpaths	Small entrance on the ground level surrounded by loose soil, grass seeds and seed husk	Trails seen
Monomorium sp. 3	Soft ground and mud tracks	Small entrance on the ground level surrounded by fine excavated soil	2–3 entrances are sometimes found close together
Monomorium sp. 7	Hard ground and grass fields	Small entrance surrounded by loose soil, grass seeds and husk	This species was found to make trails with some white substance which looked as if drawn with white chalk
Myrmicaria	Under the shade of trees and canopy	Nest entrance is large in the centre of the crater	
Pheidole sp.1 and 2	Hard grounds, mud tracks and grass fields	Nest entrance is surrounded by dead ants, grass seeds and husks	Trails seen
Pheidole sp. 3	Loose soil and grass fields	Entrance is small and inconspicous	
Pheidologeton	Grass fields and loose soil	Entrance is small and inconspicous	
Solonopsis	Hard ground, loose soil and mud tracks under shade	Entrance is surrounded by loose excavated soil, grass, seeds and husks	
Dolichoderinae			
Tapinoma sp. 1	Under stones crevices near buildings and in tree holes, etc.		Trails seen
Tapinoma sp. 2	Under stones		

Genus/Species	*Habitat*	*Nest entrance*	*Remarks*
Technomyrmex sp. 1	Under stones, under pots, tree holes, under bark of trees		Trails seen
Technomyrmex sp. 2	Crevices of walls		Trails seen
Formicinae			
Camponotus sp. 1	Hard ground, crevices in walls and buildings	Nest entrance surrounded by loose soil	
Camponotus sp. 2	Under stones, open fields and hard grounds	Entrance not surrounded by loose soil	
Camponotus sp. 3	Hard grounds, under shade of trees	Entrance not surrounded by soil	
Camponotus sp. 4	Open fields and hard ground	Entrance simple, not surrounded by soil	
Oecophylla	Arboreal nest, on plants and trees with leaves woven with silk	Entrance is between the woven leaves	
Paratrechina	Under stones, crevices in walls, cemented structures, tree holes, etc.		
Polyrhachis	Arboreal nests on small plants such as Croton	Small entrance between the leaves	Nest is made of 2-3 leaves stuck together to form a ball

3.3. *Diet:*

Both *Myrmicaria* and *Diacamma* sp. were observed to be general predators. Foragers of both species brought termites, ants, caterpillars, bugs, beetles, moths, crickets and other unidentified arthropods and snails. In one instance, *Myrmicaria* foragers brought pieces of earthworms to their nest. *Diacamma* foragers generally brought intact prey to the nest, while *Myrmicaria* brought pieces of the prey, if the prey item was large. *Myrmicaria* was

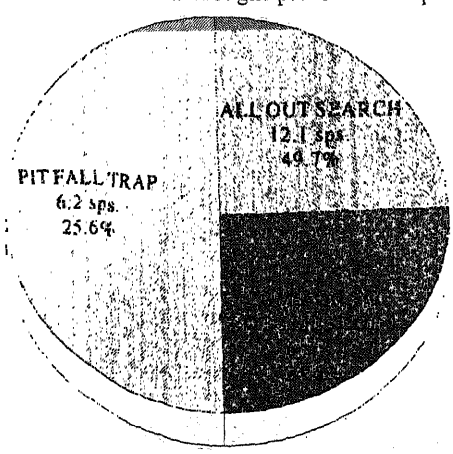

FIG. 2. Numbers of species of ants obtained by all-out search method alone, pit-fall trap alone and species common to both the methods.

also observed tending Homopterans. In 73 out of 144 observations of food being brought to the nest, *Diacamma* foragers brought termites. However, we observed *Myrmicaria* sp. foragers bring termites significantly more often (483 instances) than they brought back nontermite items (274 instances) (binomial test, $p < 0.001$).

3.4. *Daily foraging pattern*

There was a clear-cut difference in the foraging pattern of *Myrmicaria* sp. and *Diacamma* sp. (Fig. 3). In *Myrmicaria* sp. foraging was maximum in the morning and gradually decreased through the day. *Diacamma* sp. showed high foraging activity during mornings and evenings and very much reduced activity at midday. When the proportion of successful foragers returning to the nest at different times of the day was compared, it was found that *Myrmicaria* sp. shows a bell-shaped curve with a peak of foraging success at midday, while in *Diacamma* sp. it exhibits the same bimodal pattern (Fig. 4). Thus, in *Myrmicaria* sp., large number of foragers return empty (without solid food) in the early morning. One explanation of this could be that the colony is sending out large number of scouts in the morning to search for suitable foraging areas. In *Diacamma* sp. foragers are solitary, and recruitment does not occur at all. Such scouting may not be required and this may account for the fact that the total foraging activity and the foraging success follow a similar pattern at different times of the day. An alternate explanation could be that large number of foragers of *Myrmicaria* who are returning without solid food are actually loaded with nectar or honey dew. Since *Myrmicaria* foragers have been observed tending Homopterans and visiting flowering plants, they may be returning with honey dew/nectar, at certain times of the day.

It appears from this pilot study that the ant fauna of the Indian Institute of Science campus is quite rich and provides an excellent opportunity for several kinds of studies in behaviour and ecology.

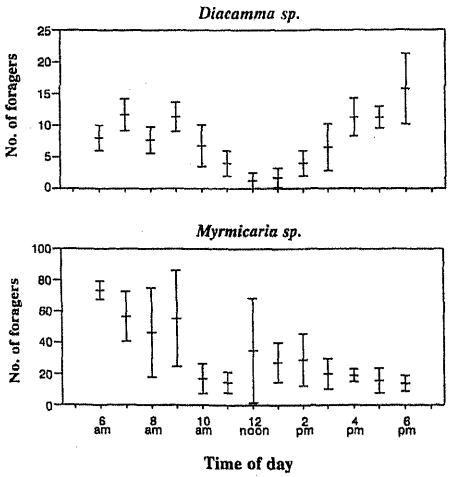

FIG. 3. Daily foraging patterns of *Diacamma* sp. and *Myrmicaria* sp. at different times of day.

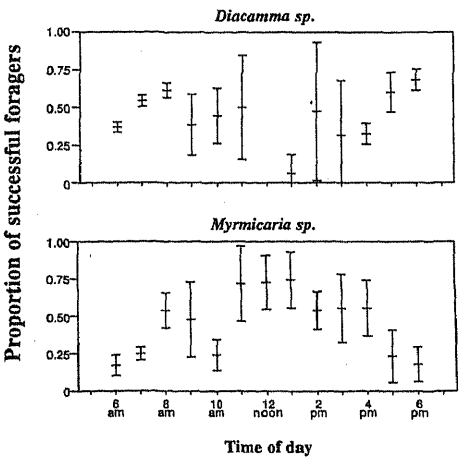

FIG. 4. Proportion of successful foragers of *Diacamma* sp. and *Myrmicaria* sp. returning at different times of day.

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