

**Distribution and divergence of few common Termite  
species: A study at Jnanabharathi, Bangalore University  
Bangalore, India**

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# Introduction

The termites are eusocial insects classified under the order Isoptera.

Termites classified into seven families, Termitidae being the largest family contains 14 subfamilies, 280 genera and over 2600 species (Krishna, 1970).

Feed on dead plant material for its cellulose content, generally in the form of wood, leaf litter on soil, animal dung etc.

Live in colonies which at maturity vary in no. from 100's to several million individuals. Typical colony contains nymphs (semi-mature young), workers, soldiers, winged alates (only during winter season) and reproductive individuals of both genders, sometimes containing few egg-laying queens.

their activities include soil feeding, subterranean tunneling, mound building as well as maintaining the very important macropore structures, redistributing organic matter, improve stability and quality, and improve water absorbing and storage capacity (Jones *et al.*, 2003).

They are major agents which aids in decomposition. They play an important part in nutrient cycles and carbon fluxes (Tayasu *et al.*, 1997).

They are sensitive to habitat disturbance. Landscape structure alterations affect the population dynamics and composition of concerned species or communities (Mathieu *et al.*, 2005).

Habitat loss is a known major threat to global biodiversity leading to increased extinction rate of species in most ecosystems (Brooks *et al.*, 2002).

Thus an attempt has been made to explore the diversity and distribution pattern of termites in Jnanabharathi campus Bangalore University which is an unexplored location.

# Topography - Jnana Bharalhi Campus of Bangalore University

is spread over an area of 1100 acres (4.5 sq.km) and is situated on the elevated plateau at 1000 m above sea level. The average rainfall of the campus is 900 mm. The Campus lies at the northern side of Bangalore, the capital city of Karnataka State.

is in the Arkavathi basin and the population of the campus is about 8,000 including the teaching population.

Bangalore University campus is partially inhabited. The built up area in the University campus is of about 1.21 sq.km (300 acres) and the balance area is covered by open landscape. The major part is un-inhabited.

possesses wide range of vegetation ranging from Scrubby jungle wild trees to cultivated crops. It provides shade, shelter. Agriculture activity is absent in the area.

The chief wild fauna of Bangalore University comprises of birds, rodents, reptiles, insects, and toads. There is a high population of snakes and termites in the campus.

# Materials and Method

Termites were collected at JB campus - Nov, Dec and Jan 2012, 2013 and 2014 at three different localities that is, in open field (human activity is more) Locality 1, forest edge (human activity scarce) Locality 2, and inner forest (absence of human activity) Locality 3.

The samples were collected from the same localities every year during this period to assess their nesting sites.

The method used to collect the termites were hand pick using feather light force vacuum pump aspirator (Pranesh and Harini, 2014).

The collected termite samples were brought to the laboratory in 70% alcohol, categorized, counted and identified under Leitz binocular stereo microscope attached with camera.

Based on the description given by Roonwal and Chhotani (1989) 5 species (Figure 1) were recorded.

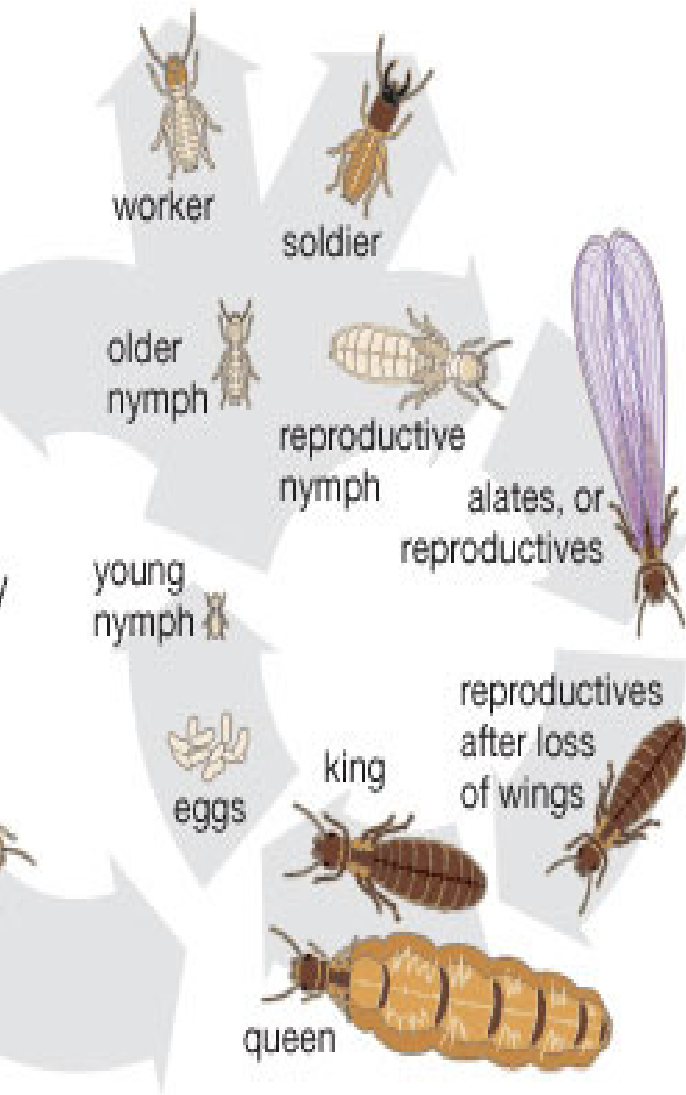








Figure 1: Five different types of species (G1- *T. biformis* (Wasmann); G2- *O. redemanni* (Wasmann); G3- *O. ramburii* (Rambur); G4- *O. horni* (Wasmann) and G5- *O. ceylonicus* (Wasmann))

*uniformis* (Wasmann) head is ovoid and protruded into rostrum at anterior and posterior head is bulged.

*obesus* (Rambur) and *O. redemanni* (Wasmann) show high level of similarity. The only difference only in the trait mandibular index. Both have convexly curved head capsule shaped head capsule with weak convergence at anterior.

*O. horni* (Wasmann) is a larger species with total body length ranging from 7.37mm to 10.05mm. These are the most prevalent species found on tree galleries. They have rectangular head with thick strong mandible.

Similarly *O. ceylonicus* (Wasmann) has strong rectangular head with strong mandible. Its total body is much smaller than *O. horni* (Wasmann) and slightly bigger than other species.

## Results and discussion

Table-1: Distribution of different species of termites in Jnanabharathi car

Termite types and No. of colonies collected	No. nest samples collected	Number of individuals collected		
		Workers	Soldiers	Total
<i>ceylonicus</i> (Wasmann)	4	1091	61	1152
<i>horni</i> (Wasmann)	13	921	645	1566
<i>obesus</i> (Rambur)	10	1462	672	2134
<i>redemanni</i> (Wasmann)	6	727	621	1348
<i>biformis</i> (Wasmann)	16	13	1233	1246

Five different species of termites were found, among which *O. holosericeus* (Wasmann) and *T. biformis* (Wasmann) species are more abundant.

A total of 7446 individuals were collected (2012 – 2014) of which, 4123 workers and 3232 soldiers.

**Table-2: The five species were subjected to Simpson's diversity and Shannon diversity indices calculation using PAST software**

<b>INDICES</b>	<b>B (Mean)</b>	<b>Lower Limit</b>	<b>Upper Limit</b>
<b>Maxa_S</b>	5	5	5
<b>Individuals</b>	7446	7446	7446
<b>Dominance_D</b>	0.2111	0.2088	0.2134
<b>Simpson_1-D</b>	0.7889	0.7866	0.7912
<b>Shannon_H</b>	1.583	1.578	1.589

The value of Simpson index (Dominance) ranges from 0.2088 to 0.2133 and its base line (B) or mean value is 0.2111. Simpson index and Simpson's D values can be interchanged.

The low value of D specifies high diversity and if the value is higher than 0.2133 specifies low diversity or single taxa domination. **Thus the lesser value specify that the diversity is very high in the locality.**

The Shannon index (entropy) is the diversity index calculated based on the number of individuals as well as the number of taxa. The value obtained ranges from 1.578 to 1.589 and the B or mean value is 1.583.

**Distribution of different species of Termites at three different localities of JB Campus, B (2013 & 2014)**

		Open field (Human activity is more)			Forest edge (human activity scarce)			Inner forest (human activity absent)		
		L1			L2			L3		
	Type of nest	2012	2013	2014	2012	2013	2014	2012	2013	2014
<i>terrestris</i> (n)	Tree galleries and land soil	1	0	2	0	0	0	2	1	0
<i>terrestris</i> (n)	Tree galleries	1	1	1	2	1	1	2	2	3
<i>terrestris</i> (n)	Mount, tree galleries and land soil	1	0	3	1	2	1	1	2	2
<i>annii</i> (n)	Mount	1	1	1	1	0	1	0	0	1
<i>terrestris</i> (n)	Land soil	2	1	0	2	3	2	1	2	2

the no. of nesting sites were higher at the L-3 sites compared to the L-2 sites and was intermediate in L-1.

The high diversity in L3 might be due to high resource availability provided by the forest area which is under the control of its ecosystem.

The termite population is less in L-1 due to the increased human activity and predators.



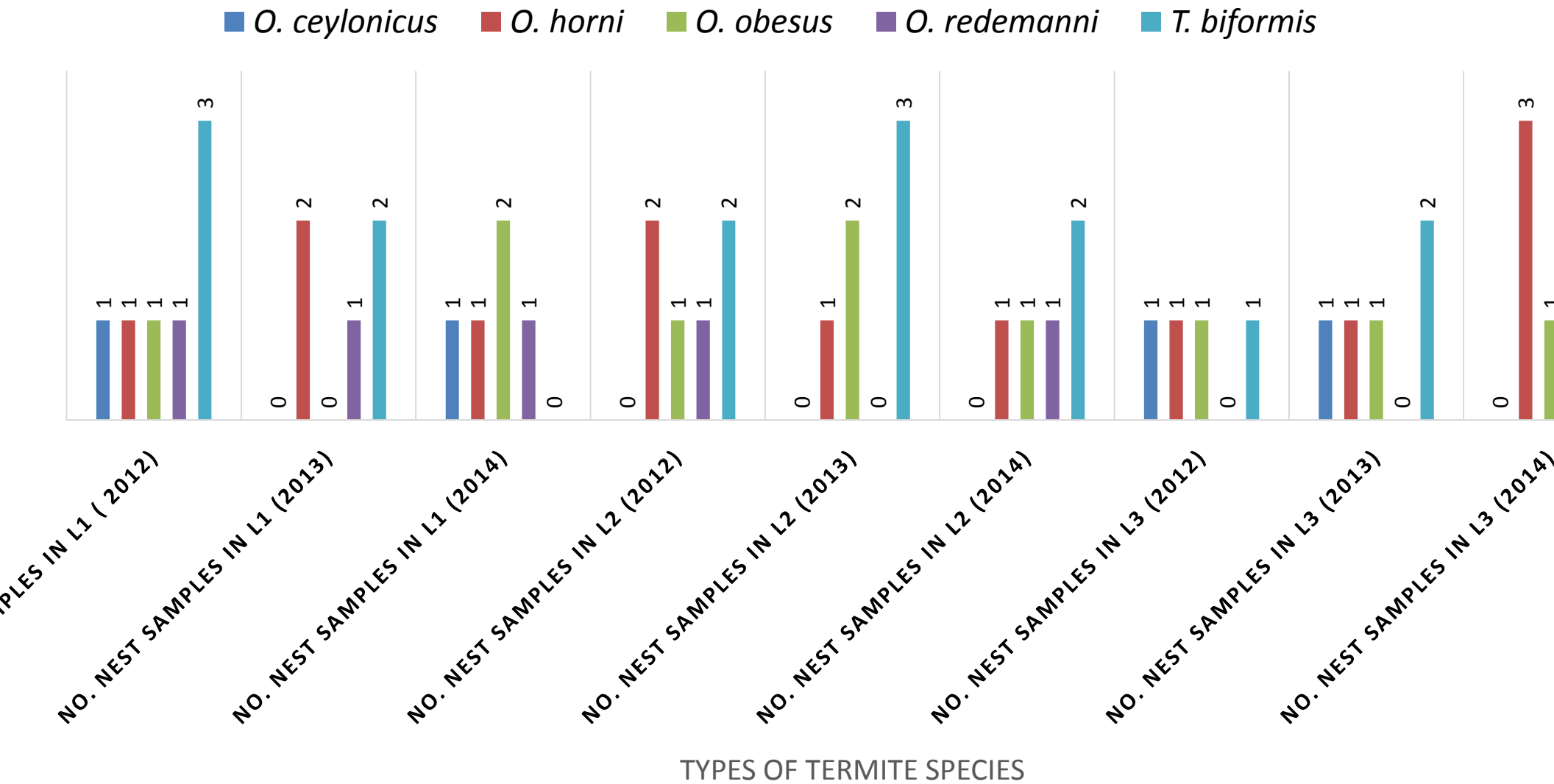


Figure-2: Number of Termite species at different localities (L1 = Open field; L2 = Forest edge; L3 = Forest interior) of JB Campus.

*O. ceylonicus* is sparsely distributed, while *O. horni* and *T. biformis* are widely distributed in the three localities.

Though *O. obesus* nest number is almost equal to that of *O. horni*, the abundance is comparatively less but they are equal competitors in number for *O. horni*. The reason is that *O. obesus* colonies are found in wide varieties of nesting sites like mounds, tree galleries, and logs, man-made structures, land soil and so on.

On the other hand *T. biformis* could be found only in underground nests and it was found that they were active during night times for collecting plant litters. Thus the number of nesting sites for *T. biformis* were found to be more compared to other species in this study.

*Termitomyces redemanni* were found only from termite mounds which are fairly distributed all over the campus.

Among all the five species collected *O. ceylonicus* was found in less number and less quantity. They were found only in L1 and L3 localities. The number of soldiers were also less compared to the number of workers. During collection a nest possessed only one soldier with at least 200 workers.

Interestingly, very few numbers of soldiers belonging to *O. ceylonicus* (Wasmann) was found in all the above assessed months in L-1 locality.

Similarly very fewer number of workers belonging to *T. biformis* (Wasmann) was found in all the above assessed localities which specifies that soldiers protected their colony aggressively during sample collection.

This data implies that *O. obesus* (Wasmann), *T. biformis* (Wasmann) and *T. ornata* (Wasmann) are more capable of adapting to the changing environment, whereas *O. ceylonicus* (Wasmann) is more sensitive which might be due to human interference or its natural predators.

The study opines, diversity and distribution of the termites have been affected enormously where human habitat is frequently sensed

In addition to physical and biotic factors, the topography and season also affect the animal distribution.

Thus the presence or absence of a species in an ecological niche, and its richness or abundance in that area is an indicator of both biological and ecological diversity of that ecosystem.

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