Chapter 6

Nesting and Foraging Ecology of Ants

Oecophylla smaragdina weaving a nest

Introduction

Nests are shelters that provide ants with security, defence against enemies, and an improved micro-environment (Figure 72 to Figure 84). They also provide efficient brood rearing and food storage facilities.

Ants' nests are either simple cavities or a complicated system of interconnected cavities. They might be monodomous (single entrance) e.g. *Diacamma ceylonense* or polydomous (multiple entrance) e.g. *Solenopsis geminata*.

Various types of habitats are chosen by ants for nesting. During this study, ant nests were seen in cavities of plants, crevices of tree trunks, in the ground, in foundations of buildings, branches and base of trees, pavements, playgrounds, gardens, crop field margins, mud paths, cracks in walls, kitchens, bathrooms and backyards of houses etc.

The plan of nest construction is specific to a species but sometimes the same colony may adopt very different methods of nest building at different times of the colony life cycle (Wheeler, 1910).

Terrestrial ants construct nests at the base of shrubs and trees (e.g. *Solenopsis* sp.), their nest entrances are in form of mounds made of grainy soil and small pebbles. Most of the time these nest entrances are decorated with colourful petals, leaves, twigs (Narendra and Kumar, 2006) and dead ants.

Nest entrances may be level with the ground e.g. nests of *Camponotus compressus, have* plastered walls e.g. *Camponotus sericeus* or raised chimneys e.g. *Monomorium minimum.*

Some species of ants (e.g. *Pheidole* sp.) prefer to make their nests in damp soil as this is much easier to excavate than other materials. *Lasius* sp. ants like to cut out nests under stones or against a wall, or build carton nests, which are formed by the ants chewing up pieces of wood and mixing them with honeydew and a type of syrup, very similar to the way wasps will build their nests. *Lasius* ants are one of the most skilled nest builders among the ants that can dig down a metre or more. Their nests can be very small mounds in the lawn during the summer or large mounds which are normally covered with vegetation in open areas such as meadows and fields.

Pheidole ants seem to prefer to excavate nests against a supportive structure and may also build under flat stones, or create galleries against flat objects.

Some nests are very simple in construction with only a few galleries, while others are made up of very complex chambers with flat floors and interconnecting tunnels.

Formica rufa (wood ants) build mounds around old tree stumps. The mound itself can reach a metre in height and several metres in circumference. The nest can also extend several metres into the ground beneath the mound. The microclimate within the ant nest is strictly controlled to optimise specific conditions in order that the brood develop properly. The mounds of the wood ants are dotted with ventilation holes that can be opened or closed to regulate a constant environment.

Arboreal ants like *Oecophylla smaragdina*, 'weaver ants' build exotic and complex nests by 'sewing' leaves together, using a sticky secretion that is created by their larvae. The workers form living chains of ants in order to pull the edges of two leaves together and hold them there, whilst other workers hold their larvae, touch the head of the larvae to one edge and gently pull back. A string of larval silk issues forth and the worker ant attaches this silk to the edge of the other leaf, and so bind the two leaves together. This is repeated many times, by many ants, using many leaves, until a ball of leaves all sewn together is created; and it is in this that the ants live (Cesard, 2004).

Other arboreal ants like the *Tetraponera rufonigra* and *Crematogaster* sp.live in the crevices in the barks of tree trunks of large trees like *Terminalia catappa, Tamarindus indicus, Mangifera indica,* etc.

Hölldobler and Wilson (1990) among other authors have described ant nests created by the Army ants of South America, *Eciton burchelli*, which are vast 'living nests' called bivouacs. These nests, which are only temporary, are created by the bodies of the ants themselves. They come together on a branch or some other object which is close to the ground, and grasp each others' feet to form a huge mass of ants. Other ants clamber on top to create 'ropes' and 'chains' of ants, and thereby create an impenetrable curtain of ants. Deep

inside this living nest are found the brood and queen. Some of these bivouacs contain many millions of ants. The ants can control the temperature of the bivouac by either creating gaps between the ants in order to let air in, or come closer together to keep the heat in.

Ant foraging is a collective process composed of the activities of individuals as well as behaviorally integrated groups. (Figure 72 to Figure 90).

Traniello (1989) has described foraging behaviour as a process in which a forager leaves the nest entrance in either a random or a consistent direction. A travel phase ensues, during which the worker maintains a constant compass bearing and moves directly away from the nest. At some point during the travel phase the forager shows a high frequency of turning, marking the beginning of search. During search, food resources are encountered and selected based upon a forager's physical caste, age, and prior experience, the trip distance, thermal stress, resource quality, and the colony's current nutritional status. Depending on the ant species and the size, density, or quality of the food, the forager may communicate information to nest mates about its location and recruit additional foragers.

Foraging can be an individual or a social process. Diffuse foraging is when foragers leave the colony singly and retrieve food solitarily. This occurs in the Ponerinae and Myrmicinae. However, Traniello (1989) suggests that "individual foraging" is a misleading term because the behaviour of a forager is probably never completely independent of the activities of other foragers and the state of the colony as a whole.

Group foraging is seen in many species of Formicinae .Here communication mediates cooperation among foragers during search and resource retrieval and serves as a control mechanism of colony-level foraging responses.

Strategies of nest building and foraging influence the scale at which these ants affect the ecosystems. It is therefore necessary to study their foraging and nest building capacities in order to understand the functioning of ecosystems.

The aim of this chapter is to describe the nest type and foraging strategies of ant species reported in this study, purely based on observations (Table 15).

Results

Table 15. Nest type and Foraging pattern of Ant species

Species Number	Name of Species	Nest type	Foraging pattern
1	*Tapinoma melanocephalum*	monodomous, nest in or under bark of trees, collection of loose soil around the entrance	foraging trail seen
2	*Dorylus labiatus*	not known	solitary
3	*Camponotus compressus*	polydomous , mostly nests at the base of large trees and hollow stems	solitary, sometimes in trails
4	*Camponotus irritans*	polydomous , mostly nests at the base of large trees and hollow stems	solitary
5	*Camponotus sericeus*	polydomous , mostly nests in soil	always solitary
6	*Formica rufa*	polydomous, in crevices, holes made in paved floors	foraging trail seen
7	*Lasius sp.*	polydomous, in crevices, garden soil, mud tracks	foraging trail seen
8	*Oecophylla smaragdina*	polydomous, mostly on mango trees, nests constructed from leaves attached to each other by silk extracted from larva	solitary
9	*Paratrechina longicornis*	polydomous, nests in leaf litter and crevices in houses	solitary
10	*Polyrhachis lacteipennis*	monodomous ,nests in soil	solitary

Species Number	Name of Species	Nest type	Foraging pattern
11	*Prenolepis sp.*	polydomous, nests in houses, gardens, crevices in buildings	foraging trails seen
12	*Crematogaster soror*	monodomous, nests in soil, inside thorns and galls, crevices in walls and tree trunks	foraging trails seen
13	*Crematogaster subnuda*	monodomous, nests in soil, crevices in walls and tree trunks	foraging trails seen
14	*Meranoplus bicolor*	monodomous, nests have elevated chimney like entrance during rainy season	solitary, very slow forager
15	*Monomorium minimum*	monodomous, small mounds seen in grass fields, seeds and husk seen around entrance	foraging trails seen
16	*Monomorium pharaonis*	monodomous, small mounds seen in grass fields, in homes ,cracks of buildings, unpaved footpaths	foraging trails seen
17	*Pheidole megacephala*	polydomous, nest entrances decorated with dead remains of ants of other species, leaves and dry twigs	solitary, sometimes minor workers seen foraging in groups
18	*Pheidole watsoni*	polydomous, nests under stones, logs or flower pots	solitary, sometimes minor workers seen foraging in groups
19	*Pheidole sp.1*	not known	solitary
20	*Pheidole sp.2*	polydomous, nests in soil in fields	solitary, sometimes minor workers seen foraging in groups

Species Number	Name of Species	Nest type	Foraging pattern
21	*Solenopsis geminata*	polydomous, large mounds of loose soil, the walls of the opening sometimes high raised high	foraging trails
22	*Solenopsis invicta*	polydomous, nests in soil	foraging trails
23	*Solenopsis sp2*	polydomous, nests in soil	foraging trails
24	*Diacamma ceylonense*	monodomous, mound entrance decorated with bird features and dead ants	solitary
25	*Diacamma rugosum*	not known	solitary
26	*Leptogenys chinensis*	monodomous, nests in loose soil	solitary
27	*Tetraponera allaborans*	arboreal, nests in modified cavities (domatia) of living plants, or cavities in dead and living wood	solitary
28	*Tetraponera rufonigra*	arboreal, nests in crevices in barks of large trees	solitary

Figure72. Monodomous nest of *Camponotus sericeus* with plastered walls

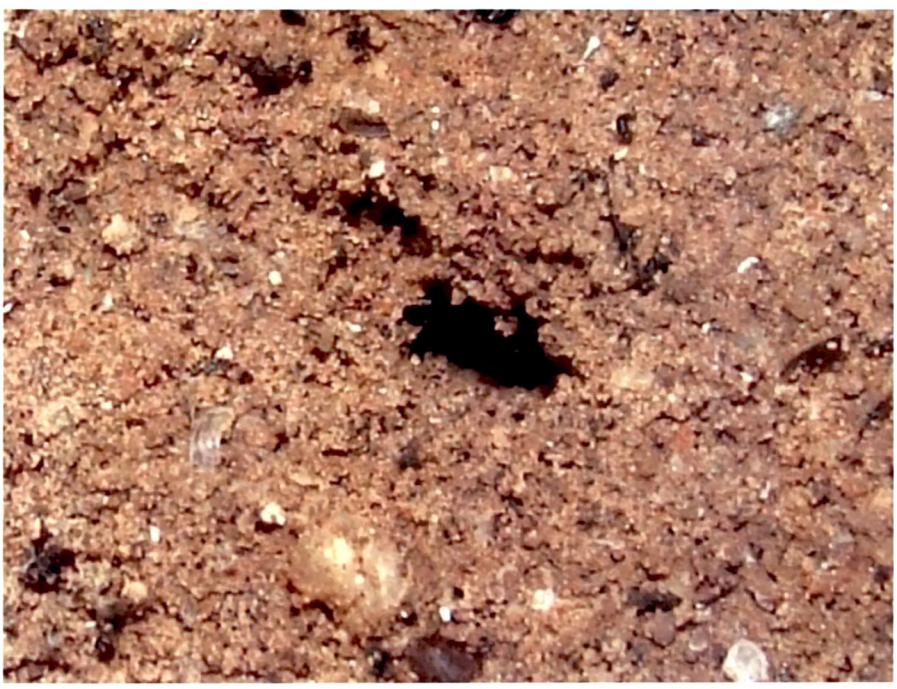

Figure73. Monodomous nest of *Leptogenys chinenses* in loose soil

Figure74. Monodomous nest of *Camponotus compressus* in hard soil

Figure75. Monodomous nest of *Camponotus* sp. in field periphery.

Figure76. Polydomous nest of Pheidole sp. in field periphery.

Figure77. Polydomous nest of *Monomorioum sp.* along joggers path

Figure 78.
Nest of *Crematogaster soror* at the base of *Aegle marmelos*

Figure 79.
Polydomous nest of *Pheidole watsoni* in a flower pot

Figure 80. Mud nests of *Camponotus compressus* on trunk of Banyan

Figure 81. *Oecophylla smaragdina* nest of leaves of *Mangifera indica*

Figure 82. Balconies built by *Solenopsis invicta* in the field periphery

Figure 83. Nest of *Monomorium minimum* with raised chimney like entrance

Figure 84. Nest entrance of *Monomorium minimum* with a twig roof

Figure 85.
Ant trail of *Monomorium* sp.

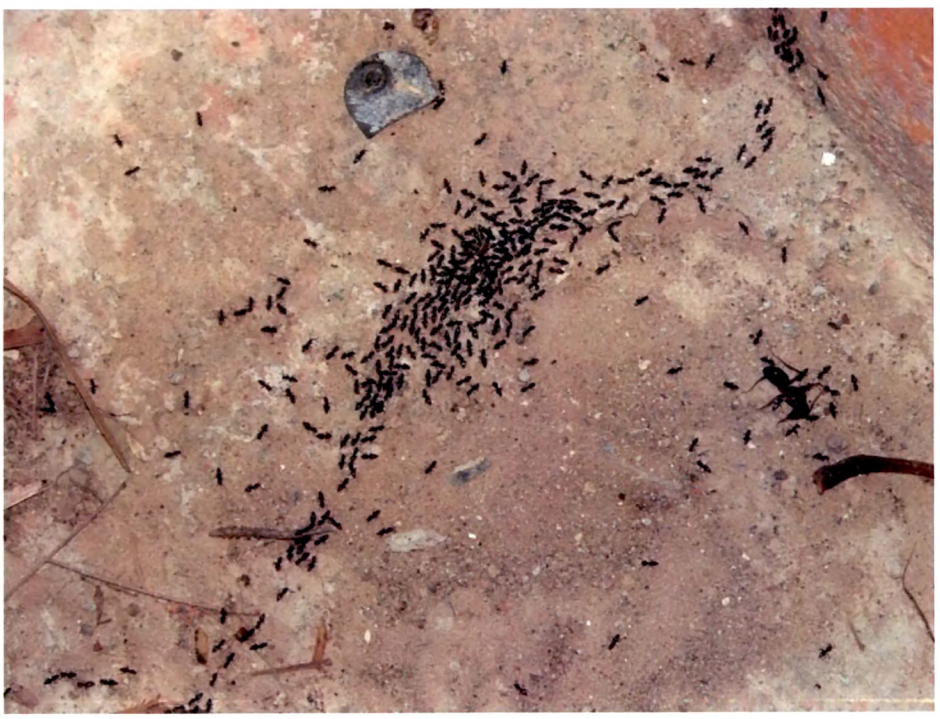

Figure 86.
Crematogaster soror foraging in a trail

Figure 87. Solitary foraging *Camponotus compressus* carrying stale bread

Figure 88. *Crematogaster sp.* around a drop of tea

Figure 89. *Pheidole megacephala* workers (major and minor)

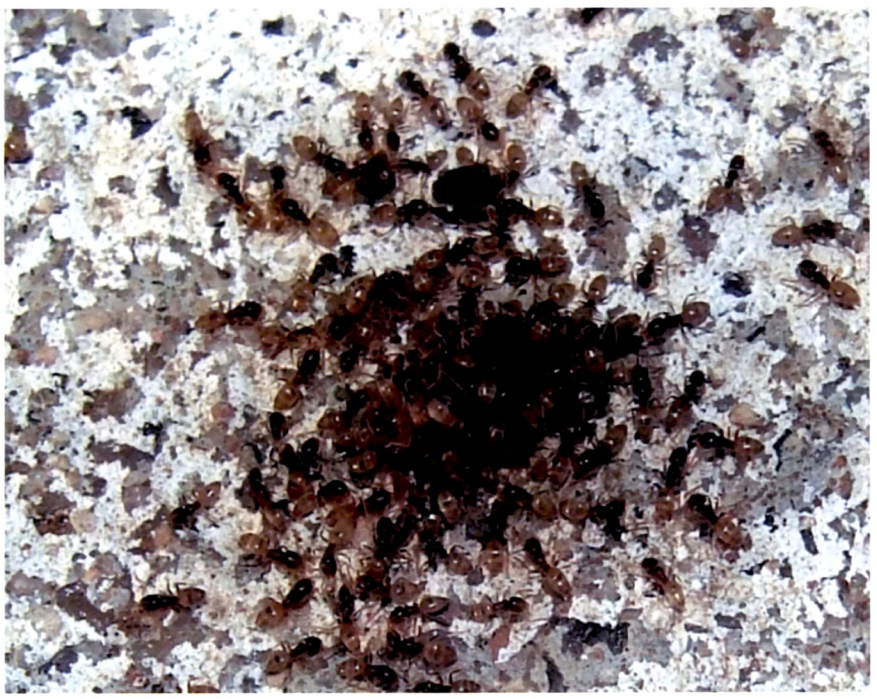

Figure 90. *Tapinoma melanocephalum* feasting on a dead roach