COMMUNITY STRUCTURE OF HOUSE-INFESTING ANTS (HYMENOPTERA: FORMICIDAE) IN SOUTHERN BAHIA, BRAZIL

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ABSTRACT

The community structure of ants which infest houses in southern Bahia was studied. Of the 31 species collected, 8 are considered as characteristic of human habitat, even though some of them are also found in other conditions, such as in regional agrosystems. *Pheidole megacephala* was the dominant species and showed a negative association with most other ants, while *Tapinoma melanocephalum* was almost always found with other ant species. The notable absence of the species *L. humile* in our tests may be due to the antagonistic effects of *Ph. megacephala*.

Key Words: *Tapinoma melanocephalum*, *Pheidole megacephala*, *Linepithema humile*, Bahia, Brazil.

RESUMÉ

La structure de la communauté de fourmis qui infestent les habitations dans le sud de Bahia a été étudiée. Parmi les 31 espèces rencontrées, 8 sont considerées caractéristiques de l'habitat humain, bien qu'elles soient aussi rencontrées dans d'autres conditions, telles que dans certains agrosystèmes régionaux. Dans les communautés, *Pheidole megacephala* est dominante et montre une association négative avec la plupart des autres fourmis, alors que *Tapinoma melanocephalum* est à peu près toujours rencontrée avec d'autres espèces. L'absence notable de *Linepithema humile* de nos tests est probablement liée à son antagonisme avec *Ph. megacephala*.

Ants which infest houses have only recently received attention from entomologists in South America (Brown 1964, Fowler et al. 1992, 1993, Ketelhut et al. 1993; Bueno & Fowler 1994) in contrast to the Northern hemisphere, where ants which occur in houses and hospitals have been studied for at least two or three decades (see the reviews of Smith 1965, Edwards 1986, Eichler 1990, Thompson 1990). Compared to temperate environments, urban tropical environments may yield ideal conditions for a range of species for foraging and nesting. However, in both the temperate and tropical urban conditions of Americas, ants which occur in the human environment are regarded as destructive or detrimental to human health, food conservation and quality, wood conservation, electrical installations, and electronic equipment (Smith 1965, Fowler 1990, Thompson 1990, Vinson & McKay 1990, Fowler et al. 1993a & b).

A higher frequency of occurrence of ants in houses in tropical regions of South America compared to houses in temperate regions (Fowler et al. 1993, Bueno & Fowler 1994) is expected because of the favorable climatic conditions and the characteristics of human habitation in the tropics. To understand the community structure of house-infesting ants in tropical regions, a cooperative study was conducted in the State of Bahia, Brazil, by the Universidade Estadual de Santa Cruz (UESC) and the Myrmecology Laboratory of the Cocoa Research Center (CEPEC), at Ilheus, with the aim of describing the ant situation in houses of this region. This study is the first step toward a larger study on the interactions between ants and human health in tropical environments.

MATERIAL AND METHODS

One hundred houses were randomly sampled for ants in the region of Ilheus (14°45'S, 39°13'W), in the southern portion of the State of Bahia. Ants were caught in small glass test-tubes (length: 50 mm; diam: 7 mm) using honey as bait. In each house, three test-tubes were placed on the floor in each room: livingroom, bedroom, kitchen, and bathroom. Tubes were collected in the morning, 8 to 12 hours after initial placement. Collected test-tubes were transported to the Myrmecology Laboratory of the CEPEC where the ants were identified to species.

Data were analysed using a house or a room as the study unit. An evaluation of interrelations between the most common house-infesting ant species and their possible associations with other species were tested by chi-square analysis with Yates' correction applied (Siegel 1956). This procedure has previously been used by Room (1971) and Majer et al. (1994) to study the ant mosaic in cocoa plantations.

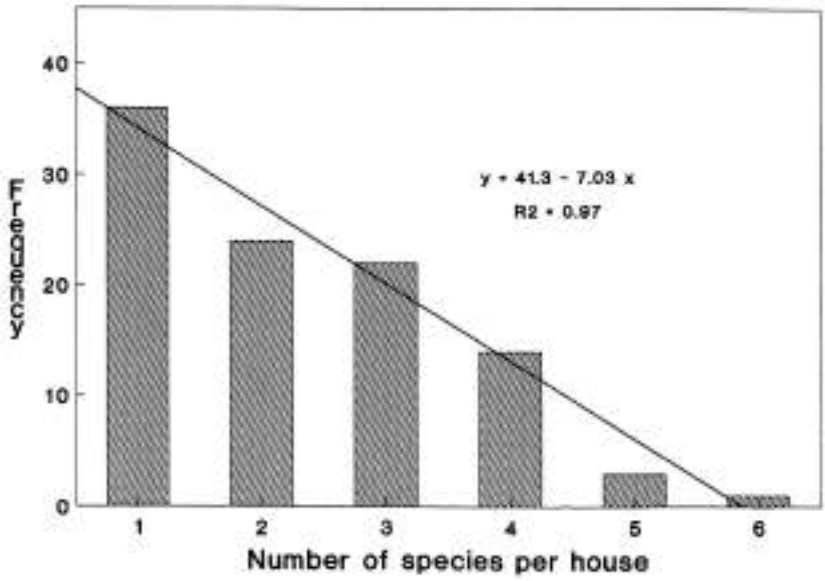

Fig. 1. Frequency of houses infested by ants as a function of the number of species found per house.

Results and Discussion

All houses sampled were occupied by at least one species of ant. A total of 31 species belonging to 14 genera and 4 subfamilies were found: Ponerinae: *Gnamptogenys* [1 sp.], *Odontomachus* [1 sp.]; Myrmicinae: *Acromyrmex* [1 sp.], *Crematogaster* [1 sp.], *Monomorium* [2 spp.], *Pheidole* [5 spp.], *Solenopsis* [4 spp.], *Tetramorium* [3 spp.], *Wasmannia* [1 sp.]; Dolichoderinae: *Dorymyrmex* [1 sp.], *Tapinoma* [1 sp.] and Formicinae: *Brachymyrmex* [1 sp.], *Camponotus* [7 spp.]), *Paratrechina* [2 spp.]. Eight exotic species (25.8%), *Monomorium floricola* (Jerdon), *M. pharaonis* (L.), *Paratrechina longicornis* (Latr.), *Pheidole megacephala* (Fabr.), *Tapinoma melanocephalum* (Fabr.), *Tetramorium bicarinatum* (Nyl.), *T. lucayanum* Wheeler and *T. simillimum* (Fr. Smith) (Delabie 1993) were responsible for 68.9% of the total number of occurrences. Most of these ants are known as "tramp ants" and have characteristics in common, such as polygyny, low intraspecific aggressivity, and the ability to change their nest site easily (Passera 1993).

One to six species were found per house, and the frequency observed for each of these six classes decreased inversely to the number of ants found (Fig. 1). The greatest number of ant occurrences (29%) and species (22) was observed in the livingroom (Fig. 2A,B). In Bahia, the livingroom is generally the largest room in the house and probably also offers more possibilities for nest sites (e.g., plant containers) to a variety of species. The other three rooms sampled (bathroom, bedroom and kitchen) showed a similar range of species number (14-16) and ant species occurrence (22-27%) (Fig. 2A,B). The kitchen was the location with the highest number of species and occurrences and the bedroom the lowest.

Among the 31 species collected, eight (Table 1) could be considered to be truly characteristic of human habitats because they were found at different sites and in all parts

TABLE 1. RELATIVE FREQUENCY OF MOST COMMON SPECIES OF HOUSE-INFESTING ANTS IN SOUTHERN BAHIA (>10 OCCURRENCES AND LIVING EVERYWHERE IN HOUSES).

Ant species	% of Houses	% of Occurrences
Pheidole megacephala	47.0	31.7
Tapinoma melanocephalum	48.0	22.9
Solenopsis saevissima	23.0	9.3
Paratrechina longicornis	18.0	7.9
Wasmannia auropunctata	12.0	5.5
Camponotus (Tanaemyrmex) sp	13.0	4.8
Pheidole sp4	13.0	3.8
Tetramorium simillimum	9.0	2.9

of the house. These eight species were responsible for 88.9% of the total number of occurrences. In Bahia, these ants are not found exclusively in houses, but are also commonly found in gardens, secondary vegetation, and crops. Their distribution tends to be different at higher latitudes where few species are limited exclusively to human dwellings, e.g., *M. pharaonis* (Eichler, 1990). This difference is probably related to the year-round thermal stability in this region, which allows these ants to live both in and out of human habitats.

The most abundant ant species were *Ph. megacephala* (47% of infested houses and 31.7% of occurrences) and *T. melanocephalum* (48% of infested houses and 22.9% of occurrences).

The community structure at the room level (Fig. 3) showed that *Ph. megacephala* was the only species that was truly dominant (see Majer et al. 1994). This ant was negatively associated with the species *P. longicornis*, *Solenopsis saevissima* (Fab.), *T. melanocephalum* and the little fire ant *Wasmannia auropunctata* (Roger). *Ph. megacephala* was frequently the only species in a room or a house, with all potential competitors being excluded (Fig. 4). In contrast, the second most common species, *T. melanocephalum*, usually occurred with other ants (Fig. 4). However, it seems that

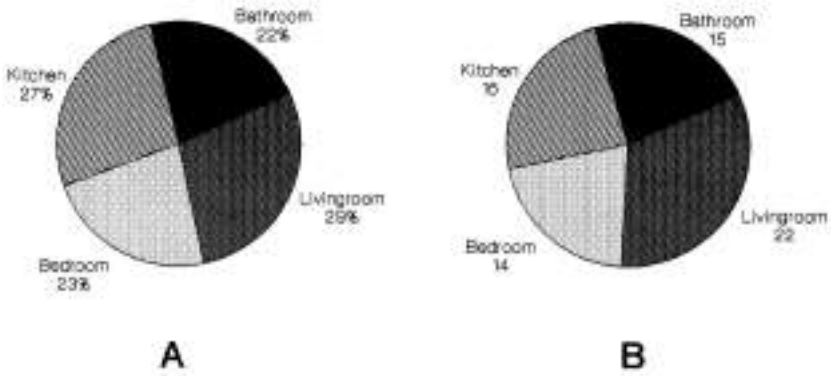

Fig. 2. Percent of ant occurrences (A) and number of species (B) in sampled rooms.

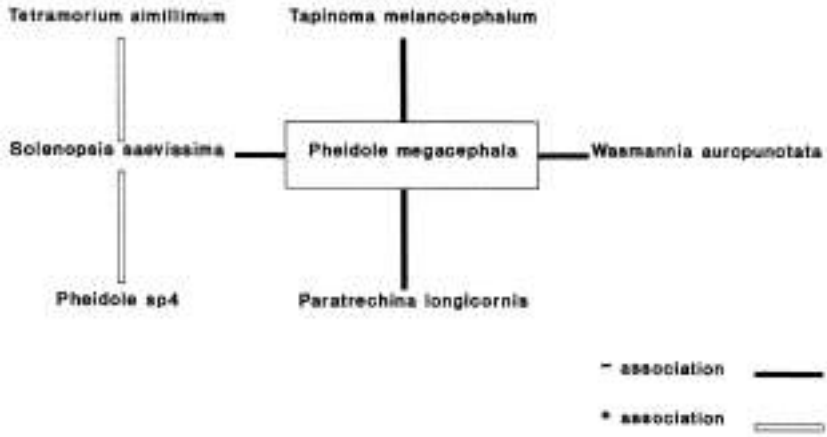

Fig. 3. Community structure of house-infesting ants of Bahia.

this species can act as a rapid colonizer, because it was the only species found when houses were new.

The study of size classes shows a bimodal distribution (Fig. 5) in which the smaller ants (< 5mm) were more common. Most of the larger ants were species of the *Camponotus* genus which are generally more active at night in Bahia (see, for example, Delabie et al. 1991). Establishment of these large ant species in the house environment may relate to their nocturnal behavior which does not interfere with the human activity and removes them from competition with diurnal species.

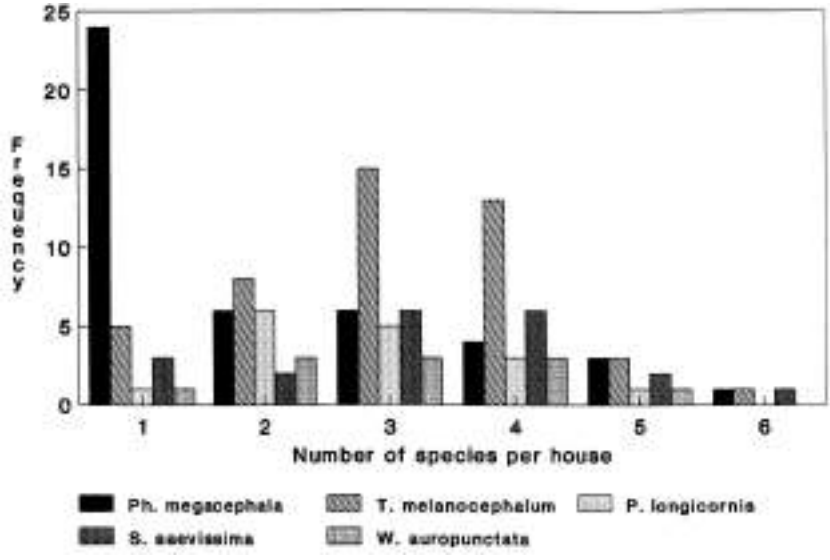

Fig. 4. Relative abundance of the 5 commonest ant species in Bahia houses.

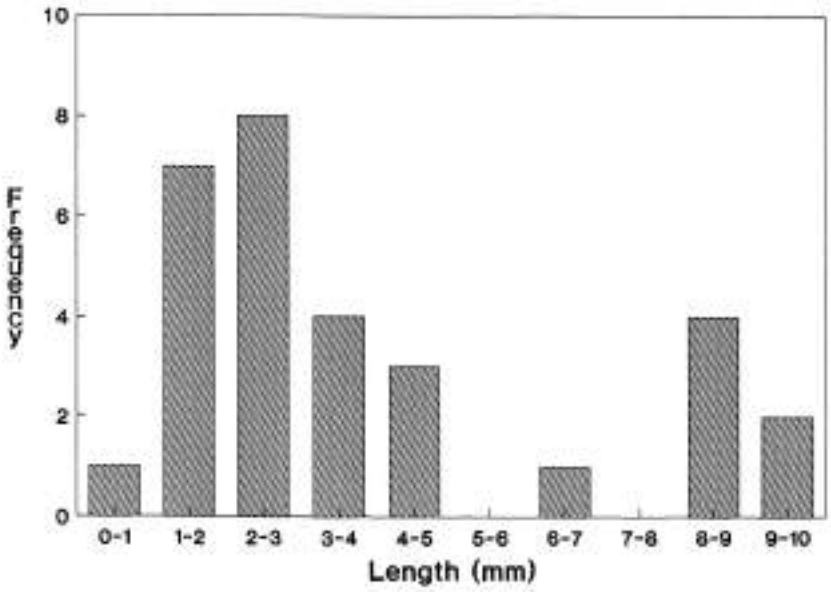

Fig. 5. Distribution of house-infesting ants as a function of body length.

Linepithema humile (Mayr) was completely absent from our house samples. This absence has been confirmed in all of south Bahia and confirmed by other extensive experiments over the region (J. H. C. D., unpublished data). However, the same species was commonly found forming discrete societies in cocoa plantations within the same region. It seems that *L. humile* avoids human settings in Bahia and this may be due to an antagonism with *Ph. megacephala* which is dominant in houses and other strongly human anthropized habitats. The antagonism between these two species has been documented in other situations (Haskins & Haskins 1965, Crowell 1968). Thus, the main difference between house-infesting ant communities in Bahia and other parts of Brazil is that *L. humile* can be found everywhere in the urban environment (Brown 1964, Fowler et al. 1993), while it seems restricted to only a few agricultural situations in Bahia.

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