

BEHAVIOURAL CHARACTERISTICS OF THE GERMAN COCKROACH, *BLATTELLA GERMANICA* (L.)

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Abstract—Observations of the nocturnal behaviour of the German cockroach, *Blattella germanica*, were carried out using single or mixed populations of males, gravid females, ungravid females and nymphs.

The results of these studies can be summarised as follows:

1. The proportion of cockroaches present in a feeding and activity area was nearly constant in the same sex or maturity groups, irrespective of the numbers of individuals released in an adjoining "hiding" area.
2. Adult males were very active and they did not concentrate on the feeding site, but distributed widely in the activity area.
3. Under any of the experimental conditions, only a few gravid females came to the feeding site from the refuge area during the observation periods, and ungravid adult females were much more active than gravid ones.

In a separate field study of capturing cockroaches by setting adhesive traps in a restaurant, the proportion of adult males, ungravid females, and gravid females was 63%, 30%, 7%, respectively. The results also indicated differences in moving activity of these groups.

INTRODUCTION

Cockroaches are common pests in urban environments around the world. Although numerous papers have described the behaviour of cockroaches, information on their nocturnal behaviour is incomplete.

B. germanica, has diurnal rhythms of movement activity, and this activity has been reported as being affected by factors in their rearing environment, including light intensity and starvation (Barclay and Bennett, 1991).

In this report, we investigated the nocturnal behaviour of the German cockroach in relation to sex and stage of maturation in order to obtain a basic understanding of their behavioural characteristics.

MATERIALS AND METHODS

Observation of cockroaches was carried out in a container, 32 by 42 by 30cm, connected by a tube of 5cm in length and 3cm in diameter to a dark box 11 by 15 by 8cm which served as a hiding place and contained a refuge 7 by 9 by 5cm, made with white cardboard. Food and water were placed at the centre of the container and an automatic motor-driven camera was set above the centre of the observation container (see Figure 1).

Experiments were carried out in a room with a constant temperature of 25°C and 55-60% relative humidity. The photoperiod was settled at 16:8 (L:D), with complete darkness developing gradually over 30 minutes from 9.30pm and with illumination increasing in the same way from 6.30am. Cockroaches were selected from a laboratory colony reared under the same conditions.

Adult males, adult females and nymphs of nearly last-instar were used in these behavioural studies. Cockroaches were released in the small dark box and kept for a few days, for acclimation under the test conditions.

Groups of cockroaches released were single or mixed populations of adult males, adult ungravid females, gravid females (carrying an egg case) or nymphs, in varying numbers from experiment to experiment.

Under nocturnal conditions, cockroaches were photographed every fifteen or sixteen minutes and their movement was analysed. The same test was repeated three to five times in each experiment.

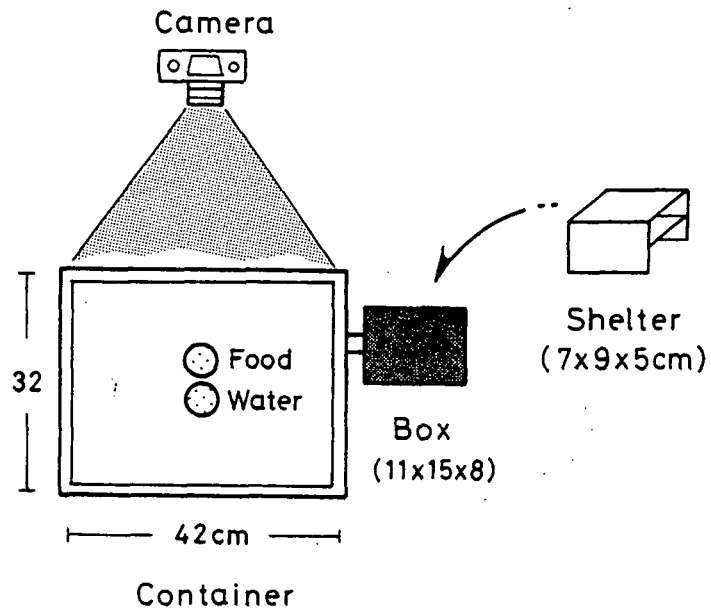


Figure 1 Experimental apparatus

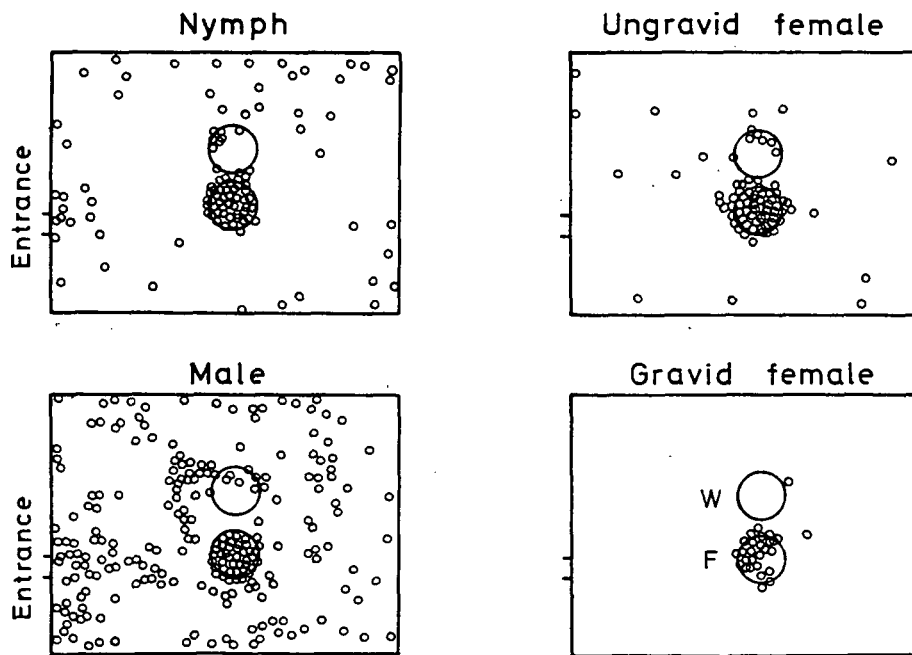


Figure 2 Distribution pattern of German cockroach in the activity area (N=50)

RESULTS AND DISCUSSION

In experiments employing single populations of male, gravid female, ungravid female or nymph cockroaches, the proportion present in the feeding area was nearly constant in repeated experiments of the same groups, irrespective of the number of released individuals.

Figure 2 shows the distribution pattern of groups of 50 cockroaches obtained by superimposing 20 photographic images taken from 11.00pm to 4.00am.

The nocturnal behaviour of adult males in a single uniform group was highly active compared to other groups and they distributed widely in the activity area. Gravid females, in contrast, were quite different in their moving pattern from males. The majority of them never came out to the activity area, and only a few individuals gathered around the feeding place. The behavioural patterns of nymphs and ungravid females were observed to be intermediate between males and gravid females, although the former group distributed itself more widely than the latter.

In experiments using mixed populations of equal numbers of male, gravid female, ungravid female and nymph cockroaches, the distribution pattern of individuals in each group was similar to that seen in uniform groups. However, ungravid females seemed to be more active in mixed populations than observed in all female groups.

The wider distribution and greater activity of adult males could be considered as a female-searching behaviour to mate, and the tendency of gravid females to remain outside the activity area appropriate to protecting their eggs.

In a field study carried out to collect wild cockroaches in a restaurant over 3 consecutive days in a week for 16 months, the total number of adult cockroaches captured in sticky traps was 9,244 and more than 99% of them were German cockroach. Of these, 62.6% were male, 30.3% ungravid females, and only 7.1% were gravid females. The fact that the majority of captured cockroaches was composed of males and ungravid females seemed to support the experimental data shown above which clearly demonstrated differences in moving activity among males, ungravid and gravid females.

REFERENCE

- Barclay SJ and Bennet, GW (1991). Influence of starvation and lighting on the movement behaviour of the German cockroach (Blattodea:Blattellidae). *J. Econ. Ent* 84: 1520-1525.