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Short Communication

Foraging range of subtropical bees, *Megachile flavipes*, *Megachile nana* (Hymenoptera: Megachilidae) and *Apis florea* (Hymenoptera: Apidae)

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Abstract

The foraging range of *Megachile flavipes* Spinola, *M. nana* Bingh and *Apis florea* Fab. was determined as 250, 150 and 150 m respectively. Weight and size decreased in the order: *M. flavipes* > *M nana* > *A. florea*.

Key words: Foraging range, *Megachile flavipes*, *M. nana*, *Apis florea*.

1. Introduction

Foraging range of pollinators provides information regarding their intrinsic capabilities and limitations in gathering nectar and pollen resources[1–6]. The distances up to which maximum number of bees can orient from their domiciles and effect pollination is of utmost significance. The foraging range of bees depends largely upon their body size and energy needs[7–8], yet determined also by the quantity of reserve fuel carried when in flight. The smaller bees with relatively low-energy requirements and little reserve fuel may hardly risk foraging long distances[9]. Therefore, orienting range of bees from their domiciles makes an important component for investigation. *Megachile flavipes*, *M. nana* and *A. florea* are acknowledged pollinators of several crops[6–8,10]. The present paper reports on the foraging range of these bees.

2. Materials and methods

The study was completed at Hisar, India (lat. 28°N; long. 76°E). *Megachile flavipes* and *M. nana* data were examined over two seasons: October–November 1983 and April–May 1984. The bees were collected from the experimental station of the

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Department of Zoology, Haryana Agricultural University, Hisar, where they are maintained for alfalfa pollination. Twenty individuals of each bee species were marked and released at different distances from the domiciles. The first release was at 50 m and were at intervals of 50 m up to 800 m. Nests of the released bees were examined hourly between 1200 and 1600 h to determine whether the marked bees had returned to their nests.

Bee counts per m^2 were made at random in five plots of each 1×1 m size in an experimental area of one hectare of *Medicago sativa*. All bees were counted per observation time. The mean of the five plot counts per hour were taken to represent the single hourly count. The bees were counted during 1200–1400 h, the peak period of their activity. During September–October 1983, data were not recorded due to irregular flower and low bee density.

A colony of *Apis florea* was identified during November–December 1984 near the oilseed farm of Haryana Agricultural University, Hisar, where *Brassica campestris* var Toria is grown for seed production. The bees were marked following the method of Dhaliwal and Sharma[11]. The marked bees were counted on m^2 of the crop by the method of Linsley *et al*[12], during 1000–1100 h and 1400–1500 h.

The size and weight of the bees was also recorded. The weight was determined nearest to 0·01 mg accuracy by single pan analytical balance. Wing length and breadth of bees were measured nearest to 0·1 cm arranging the cut wings on a centimeter graph. Wing hooks were also counted from the temporary mounts of hind wings.

3. Results and discussion

The percentage of *M. flavipes* and *M. nana* that returned to their domiciles when displaced at variable distances varied (fig. 1). During April–May 1984 all individuals of *M. flavipes* returned to their nesting sites from 250 m. The percentage gradually decreased with increasing distances. A similar trend was observed in both the seasons.

It was also observed that some individuals returned immediately to their domiciles during the first hour of observation, while others returned at differing time intervals.

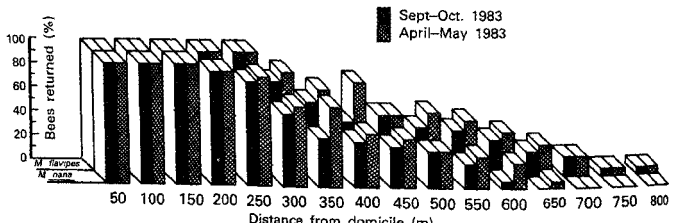

FIG 1 Histogram exhibiting percentage of foragers returning to their domiciles from variable distances.

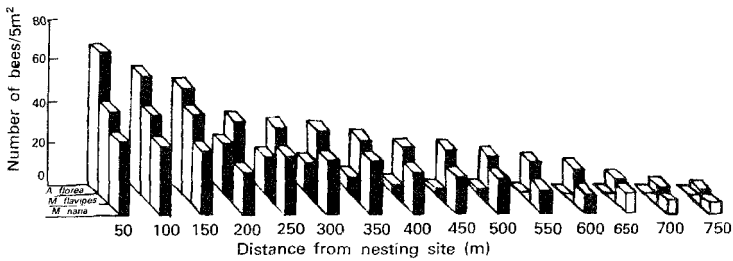

FIG 2. Abundance of *Megachile flavipes*, *M. nana* and *Apis florea* at variable distances from domiciles foraging on *M. sativa*. Each bar represents mean of 25 observations.

Density studies of *M. flavipes* and *M. nana* on *Medicago sativa* growing near nesting sites during April–May 1984 revealed maximum abundances up to 250 and 150 m, respectively (fig. 2). Bee abundance decreased with increase in distance from nesting sites for both *Megachile* species. Counts of marked *A. florea* bees were considerably higher up to 150 m from the nesting site but thereafter the numbers declined gradually, none being observed at more than 500 m.

The three bee species differed in weight and size. *M. flavipes* was larger in weight (43·72 ± 4·30 mg, $n = 90$) than *M. nana* (27·17 ± 3·84 mg, $n = 90$) and *A. florea* (23·19 ± 3·20 mg, $n = 90$) and possessed higher number of wing hooks than the latter two species ($P < 0{\cdot}01$) (Table I).

These bees generally preferred to forage near their domiciles. Decreases in return from increased distances from the domiciles may be related to the partial familiarity with an area. Kapyla[5] reported that females of *Chelostoma maxillosum* returned efficiently from 150 m, while the male could not do so from beyond 60 m. Bacon *et al*[13] found that *Megachile rotundata* F. in California confined their visits within 30 m of their domiciles

Table I
Body weight, wing-length, breadth and number of wing-hooks of *Megachile flavipes*, *M. nana* and *A. florea* (females)

Bee species	Body weight (mg)	Dimensions of wing (cm)		
		Length	Breadth	Wing-hooks
Megachile flavipes	43·72 ± 4·30	0·70 ± 0·04	0·210 ± 0·004	13·70 ± 2·20
M. nana	27·17 ± 3·84	0·49 ± 0·02	0·180 ± 0.01	8·50 ± 1·85
A. florea	23·19 ± 3·20	0·45 ± 0·058	0·125 ± 0·004	10·50 ± 0·83

Values are mean ± S.D. of 90 observations.

but extended their foraging range when the flowers became sparse. Tasei[14] found th bees pollinated more flowers at 20 m than at other distance. Evidently, the reasonab flight range of bees may be somewhat less than the values reported in literature

Hocking[9] reported that foraging range is species-specific and increases with increase i size of the bee. This is related to the energy requirement of different bee species. Since pollinator with bigger body size and hence high energy demanding must be able to utilis wide variety of resources, different pollinators having differing body sizes have differen foraging ranges. Thus it is reasonable to suggest that because *M. flavipes* is comparatively larger than *M. nana* and *A. florea* its flying range is higher.

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