

Comparative Activity Patterns of Some Neotropical Bees in a Suburban Area in Trinidad, West Indies

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ABSTRACT

Flower visitation rates of five common bees to *Antigonon leptopus* are compared during an early morning and a late morning period in Trinidad, West Indies. Throughout the day three highly social bees (*Apis mellifera*, *Partamona nigrrior* and *Trigona nigra*) were more abundant, overall, at flowers than two solitary bees (*Ceratina* sp. and *Pereirapis* sp.). As predicted, there was a significant proportional shift from the social to the solitary species between the early and late morning. In contrast, there was a significant shift from smaller to larger bees between the early and late morning, which is contrary to the prediction. This however, is considered inconclusive, as the large bees comprised a single highly social species.

Key words: *Antigonon leptopus*, *Apis mellifera*, *Ceratina*, *Partamona nigrrior*, *Pereirapis*, *Trigona nigra*.

INTRODUCTION

Bees predominate among animals that visit flowering plants to collect pollen and nectar, which form the mainstay of their diet. Bees also account for the majority of flowering-plant pollination, which is key to the relationship from the plants' point of view. Most plants make their pollen and/or nectar available in the daytime, so that most bees are diurnal and stop foraging during rain. Competition among bees is evidently intense, but as a strong general rule this is scramble, or pre-emptive competition, rather than interference, or aggressive competition (Roubik 1989).

Pollen and nectar from a given plant species are not uniformly available during all daylight hours. This poses for the bees the strategic question of how best to allocate foraging effort for maximum return, in view of how plants schedule the availability of resources and the activities of other bee species. Roubik (1989: Figs. 2.35-2.39) shows the daily pattern of 17 tropical bee species. For the most part, these show foraging throughout the day, with a peak in the early or mid-morning. The emerging general pattern (Roubik 1989 and references therein) is of a shift in proportions throughout the day a) from social bees capable of nestmate recruitment to solitary and other bees, and b) from larger to smaller bees. This is thought to be due to social and/or larger bees successfully monopolising floral resources in the early period.

Here we examine whether bee visits to one common tropical plant conform to this pattern.

METHODOLOGY

Observations were made in suburban St Augustine, Trinidad and Tobago, during October-November 1999. Preliminary observations identified three plants as broadly attractive to bees in this habitat: the wayside herbaceous plants *Antigonon leptopus* (Polygonaceae) and *Tagetes* sp. (Compositae) and the ornamental palm *Adonidia merrillii*

(Palmae). Further observations showed that the first of these was most reliable in attracting various bees, so that it became the main focus.

Preliminary observations also showed five bee species as most abundant at these plants: a) *Ceratina* sp. (Apidae: Xylocopinae), solitary, body length <5mm, b) *Pereirapis* sp. (Halictidae), solitary, body length <5mm, c) *Partamona nigrrior* (Apidae: Meliponini), highly social, body length about 5mm, d) *Trigona nigra* (Apidae: Meliponini), highly social, length about 5mm, and e) the introduced honey bee *Apis mellifera* (Apidae: Apini), highly social, body length about 11mm. Two *Ceratina* species are known from Trinidad, *C. chloris* and *C. minima* (Starr and Hook 2003), and our records may represent a mixture of the two. The *Pereirapis* sp. is presumably *P. semiaurata*, the only species recorded from Trinidad (Starr and Hook 2003).

We tabulated bee visits to the three plants during two periods: 07:00-09:00 (early, on three days) and 11:00-13:00 (late, on four days) when there was no significant rain. It is assumed that all visiting bees were female. Attention to *Antigonon* consisted of watching a particular patch about 20-30 cm wide for 15 min, then switching to a different patch for 15 min. Table 1 shows the data for *Antigonon*. Most of our records from *Adonidia* and *Tagetes* are of a single species, *A. mellifera*, and thus much less informative.

RESULTS and DISCUSSION

Whilst 57% of recorded social-bee visits to *Antigonon* flowers were during the early period, this was the case for only 14% of solitary-bee visits, a highly significant difference (χ^2 test with Yates's correction for continuity, $p < 0.01$). The data corroborate the predicted proportional shift from social to solitary bees over the course of the day.

If we divide the bee species into large (*A. mellifera*) and small (all others), we find that 38% of large-bee visits

Table 1. Visits by five bee species to flowers of *Antigonon leptopus* in St Augustine, Trinidad and Tobago during three (early period) and four (late period) days, October-November 1999. Further explanation in text.

Period	Species					Total
	<i>Ceratina</i> sp.	<i>Pereirapis</i> sp.	<i>Partamona nigrior</i>	<i>Trigona nigra</i>	<i>Apis mellifera</i>	
early	0	7	214	3	21	245
late	18	25	143	2	34	222
Total	18	32	357	5	55	467

were during the early period, versus 54% of small-bee visits. This significant difference ($p < 0.05$) is contrary to the expected proportional shift from larger to smaller bees. However, because the large-bee category in our results comprised a single, highly social species, this result must be regarded as tentative.

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