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COMPETITION FOR NECTAR BETWEEN SUNBIRDS AND BUTTERFLIES

by H.D.V. Prendergast

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INTRODUCTION

Whilst nectar-feeding birds have been the subject of many recent studies on foraging behaviour, energetics, territoriality and competition, little has been written about their interaction with nectar-feeding insects.

Miller (1967, 1969) defined two mechanisms of competition. One of them, 'interference' competition, was suggested by Primack & Howe (1975) as the means by which resource partitioning occurred at the flowering shrub *Stachytarpheta jamaicensis*; they observed how a territorial Rufous-tailed Hummingbird *Amazilia tzacatl* repeatedly chased away skipper butterflies (Hesperiidae) from the middle and upper parts of the bush. On removal of the bird, the butterflies almost immediately started to forage on those parts of the shrub from which they had previously been excluded.

During a short study of nectar-feeders at Lamto, (05°02'W, 06°13'N), Ivory Coast in July-August 1981, I concluded that the other form of competition, 'exploitative', can explain the foraging patterns of sunbirds and butterflies.

MATERIALS AND METHODS

The study was carried out on a bush of *Hibiscus rosa-sinensis*, a pantropical ornamental shrub that produces abundant nectar. Its large and showy flowers open in the morning and wilt and fall to the ground during the following night. The study bush on average produced 24 flowers a day of two colours, red and pink (probably the result of a graft). The proportions of these colours changed from day to day but the overall average over three weeks was 64% red and 36% pink. I analysed nectar from flowers each colour to see if there were differences in sugar and amino-acid contents (using thin-layer and paper chromatography and the histidine method of Baker & Baker (1973) respectively).

The bush was watched from a distance of 6 m, far enough away not to scare the sunbirds and yet sufficiently close not to overlook butterfly visits. It lay within the territory of a pair of Olive-bellied Sunbirds *Nectarinia chloropygia* and was visited by a variety of butterflies of which the most frequent were *Nepheronia thalassina* and *N. pharis* (Pieridae), *Borbo sp.* (Hesperiidae) and *Papilio dardanus* and *P. fourcas* (Papilionidae).

For the sunbirds all easily-visible flowers on the bush were watched over a different five day period. In contrast to the butterflies, sunbirds approached the flowers from the rear and inserted the bill between the calyx and corolla, where nectar accumulated. Each probe for nectar constituted a visit. The sex of the bird and the numbers and colours of

the flowers it visited were noted.

For butterflies it was not possible to watch with accuracy more than 6 or 7 flowers a day. These were numbered, and observations on the times and durations of visits by the various species were noted on five full days (0800-1700 h) and one half day.

RESULTS

Sunbirds 73 red and 40 pink flowers were watched. Sunbirds made 464 visits to red and 459 visits to pink flowers, thereby showing strong preference for the latter, greater in the female ($x^2 = 62.84$; $p = < 0.001$) than in the male ($x^2 = 26.02$; $p < 0.001$) (Table 1).

Butterflies 1097 visits were made to the 29 red and 8 pink flowers that were individually marked. 1086 (99%) of these were to the red flowers and only 11 were to the pink ones. *Nepheronia thalassina* and *Borbo sp.* made 65.7% and 17.6% respectively of all butterfly visits (Table 2).

Nectar Similar proportions of fructose, glucose and sucrose sugars were found in each colour phase; sucrose levels were low. Qualitative assessments of amino-acid contents were also similar.

Table 1 Sunbird visits to *Hibiscus* flowers

	73 Red flowers		40 Pink flowers			
	No.	av./flower	No.	av./flower	x^2	p
Visits by male	282	3.9	234	5.85	26.02	<0.001
Visits by female	182	2.5	225	5.6	62.84	<0.001

Table 2 Butterfly visits to *Hibiscus* flowers

	Number of visits	
Butterfly species	29 Red flowers	8 Pink flowers
Nepheronia thalassina	714	4
Borbo sp.	191	7
Nepheronia pharis	76	0
Papilio dardanus	68	0
Papilio fourcas	16	0
Others	21	0

DISCUSSION

Why butterflies virtually ignored pink flowers is not relevant here; what is of interest is that the sunbirds significantly preferred pink to red ones. Since sugar and amino-acid levels were the same in flowers of each colour, no nutritional benefit would accrue to sunbirds eating 'pink' nectar preferentially. I hypothesise that they sought out pink blossoms because of the larger amounts of nectar that they contained. The effect of the unexplained preference by several species of butterflies for red flowers was thus to inhibit sunbirds' exploitation of 'red' nectar. This hypothesis could be tested by preventing butterflies' access to red flowers, the prediction being that the sunbirds would quickly learn to exploit 'red' and 'pink' nectar equally.

SUMMARY

Feeding by a pair of sunbirds *Nectarinia chloropygia* and by butterflies was observed on an *Hibiscus rosa-sinensis* bush having flowers of two colours. Birds preferred pink flowers, and butterflies red. It is suggested that the preference of the birds for the pink flowers was the result of competitive exploitation by the butterflies.

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