Hummingbirds of Dominica and the Concentrations of Sucrose they Prefer

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Abstract

The purpose of this experiment is to determine whether hummingbirds on Dominica demonstrate a preference for high or low concentrations of sucrose solution in hummingbird feeders. My hypothesis is that the larger of the two species will be able to compete for the highest concentration of sucrose. All species should select the highest concentration of sucrose in the absence of a competitor. The Purple-throated Carib and the Antillean Crested prefer the highest concentration of sucrose. They stayed at the highest concentration for the longest period of time. The Green-throated Carib and the Blue-headed Hummingbird were not observed. These experiments demonstrate a strong preference for higher concentration sucrose solutions and a social hierarchy among hummingbird species.

Introduction

There are four types of hummingbirds on Dominica: the Antillean Crested Hummingbird *Orthorhyncus cristatus,* Green-throated Carib *Sericotes holosericeus,* Purple-throated Carib *Eulampis jugularis,* and Blue-headed Hummingbird *Cyanophaia bicolor.* Three of these are located around Springfield Centre for Environmental Protection, Research and Education (SCEPTRE): *O. cristatus, S. holosericeus,* and *E. jugularis. O. cristatus* "is 3.5 inches. Male: Green above, the tail and underparts blackish; conspicuous crest green, or green, or green and blue, but on the Grenadines,

Grenada and Barbados distinctly violet-blue distally. Female: Green above, greyish or whitish below, with whitish tips to the tail feather; often appears crested (Bond 1993)." *S. holosericus* "is 4.75 inches. Less robust than Purple-throated Carib. Plumage predominalty green; a *violet-blue patch on breast* (rather extensive in Grenada race), bordering green gorget; abdomen blackish, glossed with green, tail violet-black. Sexes alike (Bond 1993)." *E. jugularis* "is 5 inches. A sturdy, very dark hummingbird. Plumage largely black; gorget purplish red; tail and upper tail-coverts bluish green; wings metallic green. Sexes similar. At times appears entirely black in the field, but the *green wings are usually conspicuous* (other hummingbirds have blackish wings) (Bond 1993)." The fourth hummingbird, *C. bicolor*, only lives at higher elevations of Dominica and Martinique. This hummingbird will not be considered in this study.

I set up three hummingbird feeders with concentrations of 8% sucrose, 15% sucrose and one that is greater than 32% sucrose three feet from one another and observed them at random times of the day. This was done to determine what species of hummingbirds prefer which concentrations of sucrose. My hypothesis is that the larger of the two species will be able to compete for the highest concentration of sucrose. All species should select the highest concentration of sucrose in the absence of a competitor.

Materials

three hummingbird feeders

pure cane sugar

funnel

hot kettle

refractometer

Method

I placed feeders at different locations around SCEPTRE and observed the hummingbird activity that took place. The locations that I placed the hummingbird feeders (each containing 15% sucrose) are by the remains of Mount Joy, by the Check Hall River and at the streamhouse (at SCEPTRE). I observed each location for at least two hours to decide which feeders had hummingbirds at them. I noted that the feeder at the streamhouse had the most activity, so I removed the other two feeders from their locations and placed them at the streamhouse. I placed the three different concentrations at an equal distance of three feet from one another. I observed them noted the following characteristics: species, sex, time of forging and the amount of time spent at each concentration. I chose random times to observe the hummingbirds in order to capture all different feeding aspects.

To find out the concentrations of sucrose solutions I was able to use a refractometer, Model ATAGO serial number 53385.

I plotted sugar concentration against time spent foraging for both species to look for patterns in the allocation Spearman-rank correlations for the association between time foraging and sugar concentration. In addition, I compared the time spent foraging by the male and female Antillean Crested Hummingbirds using a t-test.

Results

Antillean Crested Hummingbird (see Appendix I)

Number of Sightings	Concentrations
36	>32%
17	15
7	8

Purple-throated Carib Hummingbird (see Appendix II)

Number of Sightings	Concentrations
8	>32
2	15
0	8

Spearman Rank Correlation

Antillean Crested Hummingbird

R=.278 and P=<.00001

Purple-throated Carib Hummingbird

R=.087 and P=<.00001

Average Foraging Time

Antillean Crested Hummingbird

Males Females

12.7 sec 13.7 sec

Purple-throated Carib Hummingbird

Sexes are indistinguishable

17.24sec

Discussion

A period of accommodation to feeders was necessary before the actual study began. The hummingbirds need at least a few days to find the feeders and use them readily. The data show that both the Antillean crested hummingbird and the Purple-throated Carib heavily preferred the highest concentrations to the other sucrose concentrations (Appendix I, II). This is also true for the Purple-throated Carib.

The Spearman correlation for time spent foraging and sucrose concentration for Antillean crested hummingbird was highly significant ($r = .270$, $p < .00001$) . This shows the chance of the hummingbird going to the strongest concentration feeder is not random. The correlation for the purple-throated hummingbird was also highly significant ($r = .087$, $p < .00001$).

The Antillean crested hummingbird male averaged 12.7 seconds per feeding bout while the female averaged 13.7 seconds per feeding. These times, however, were not statistically significant. The Purple-throated Carib has indistinguishable sexes, so male and female time averages are combined. The total average feeding is 17.24 seconds per feeding.

Observations show that there is a form of social hierarchy between the Trembler *Cinclocerthia ruticauda*, Bananaquit *Coereba flaveola*, Purple-throated Carib, Antillean Crested male, and Antillean Crested female. An Antillean Crested Male would chase off an Antillean Crested female. Then a Purple-throated Carib would come and chase the Antillean Crested male, and finally Tremblers were able to dominate all other species at

the feeder. The beak of the Trembler is too large to fit in the feeder so apparently this species is extremely territorial.

The last thing that was very noticeable was that the Bananaquit would stay and guard the strongest concentration of sucrose for certain time frame and would make sure it was the only one on the feeder. This is the only species that exhibited this kind of behavior.

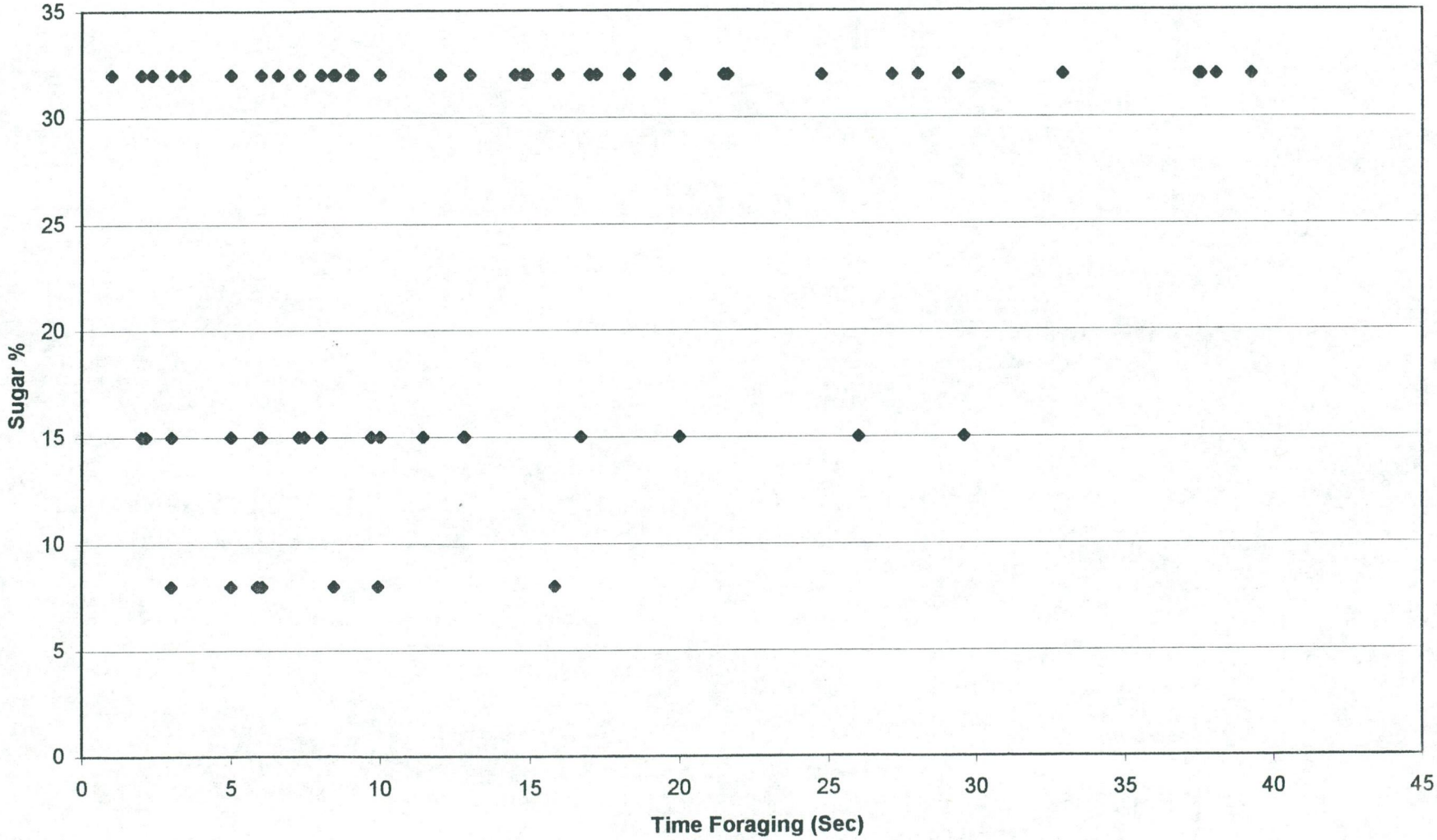
Conclusion

There is a significant correlation between the sucrose concentration and the amount of time spent at a certain feeder for both species of hummingbird. The feeder with the highest concentration of sucrose attracts more hummingbirds for a longer amount of time. One thing that could be done for future studies is to find a way to include the Green-throated Carib, to see which sucrose concentration they would prefer. One other thing that could be done is to go to higher elevations and see how the Blue-headed Hummingbirds would interact with the feeders.

Reference

Bond James. 1993. *Birds of the West Indies*. Houghton Mifflin Company, Boston. pp. 133-139.

Antillean-crested Foraging
Appendix I



Purple-throated Carib
Appendix II