

Fruit Species Preference in Mountain Robins (*Turdus plebejus*)

Leah Bomberger

Department of Natural Resources; University of Nebraska-Lincoln

ABSTRACT

The Mountain Robin (*Turdus plebejus*, Turdidae) (in the Monteverde region in Costa Rica) is an opportunistic feeder and an important disperser for many plant species. This study examined fruit preference of the Mountain Robin between three species of plants: *Viburnum costaricanum*, *Chamaedorea costaricana*, and *Chamaedorea pinnatifrons*. A significant preference was found for *C. costaricana* over *C. pinnatifrons* ($P = 0.040$). These results indicate that *C. costaricana* offers a higher reward and may attract more dispersers than *C. pinnatifrons* or *V. costaricana*.

RESUMEN

El yigüirro de montaña (*Turdus plebejus*, Turdidae) (en la región de Monteverde en Costa Rica) es un comedoro oportunista y un dispersor importante para muchas especies plantas. Este estudio examinó la preferencia por la fruta del yigüirro de montaña entre tres especies de plantas: *Viburnum costaricanum*, *Chamaedorea costaricana*, y *Chamaedorea pinnatifrons*. Se encontró una preferencia significativa para *C. costaricana* por encima de *C. pinnatifrons* ($P = 0.040$). Estos resultados indican que *C. costaricana* ofrece una mayor recompensa y puede atraer más dispersores que *C. pinnatifrons* o *V. costaricana*.

INTRODUCTION

Costa Rica's numerous life zones provide a broad range of habitats for over 800 species of birds (Stiles et al. 1989). Costa Rica's diverse plant species may provide year round food resources attracting different bird guilds. Fruviguous birds play an important role as dispersers for many tropical plant species (Stiles et al. 1989). In Costa Rican wet regions, more than half of the tree species, particularly in the understory, have fruits adapted for seed dispersal by birds (Stiles et al. 1989).

Mountain Robins (*Turdus plebejus*, Turdidae) are a common species of birds in the Monteverde area and are important dispersers of cloud forest species. The Mountain Robin commonly feeds on 36 species of fruits in the Monteverde area (Wheelwright et al. 1984). Most of the observed plant species being eaten were canopy to sub-canopy species.

The preference for certain fruits over others can help in understanding dispersal strategy and effectiveness of a certain plant. Disperser effectiveness is defined by the contribution a disperser makes to the future reproduction of a plant (Shupp, 1993). This study evaluated the fruit preference of the Mountain Robin between three plant species, *Viburnum costaricanum*, *Chamaedorea costaricana*, and *Chamaedorea pinnatifrons*. *V. costaricanum* is a open area sub-canopy species. *C. costaricana* and *C. pinnatifrons* are both light gap understory species. Fruit characteristics such as size, sugar content, and pulp amount were analyzed to understand the level of reward received upon fruit consumption. It was hypothesized that the Mountain Robins would show a preference for

the *V. costaricanum* because a previous study has shown that they have been observed occasionally feeding on them with no observations of them feeding on the *Chamaedorea* species (Wheelwright et al. 1984).

METHODS

This study was conducted from July 24 to August 1, 2004 in the forest surrounding the Estación Biológica in Monteverde, Costa Rica. To catch the Mountain Robins, three mist nets were set up on the road adjacent to the Estación and opened for approximately two and a half hours at dusk and dawn every day depending on weather conditions. The birds were then held in one cubic meter net-cages, covered to darken and calm birds.

Three fruit species were collected from the forest surrounding the Estación and were continually offered to each bird; *Viburnum costaricanum*, *Chamaedorea costaricana*, and *Chamaedorea pinnatifrons*. These fruits were selected to test Mountain Robin preference based on availability and accessibility of ripe fruits. Number of fruit taken and time was recorded for each fruit selection in approximately one-hour time sets. Overnight observations were also made; a known amount of the three fruit species was left for the birds and the number of remaining fruits was counted and recorded in the morning. The birds were kept for approximately three days, if eating habits were healthy, and released in the morning or early afternoon. Pulp weight was calculated by weighing the wet fruit and then subtracting the weight of the pulp-free seeds. Wet fruit diameter was measured using calipers. Sugar content was measured by inserting the pulp of each fruit species into a syringe and squeezing the fruit juice onto a refractometer to obtain a reading. A one-way ANOVA test was used to determine if there was a statistically significant preference for certain fruit species.

RESULTS

A significant difference was found in the preference of fruit species (one-way ANOVA, $P = 0.015$, $N = 17$). *C. costaricana* was preferred significantly over *C. pinnatifrons* (Fisher's PLSD, $P = 0.004$). Sugar content was found to be higher in *C. costaricana* (9.5%) than in *C. pinnatifrons* (7%). Pulp per fruit of *C. costaricana* (.245g) was over double that of *C. pinnatifrons* (.107g)(Table 1).

A difference in fruit preference between individual birds, was also found Bird (3) preferred *V. costaricanum*, while the three other birds all preferred *C. costaricana* (Fig. 2).

DISCUSSION

A significant preference of *C. costaricana* over *C. pinnatifrons* (Fig. 1) is interesting because the two fruits, both in the genus *Chamaedorea*, share many physical characteristics. They are both a fairly large fruit, which contains one large seed. *C. costaricana* is a bigger fruit than the *C. pinnatifrons* (Table 1). The significant preference for *C. costaricana* must be a result of factors other than physical appearance.

Chamaedorea costaricana was found to have higher sugar content, indicating it provided a greater reward. The *C. costaricana* also had more pulp per seed. Mountain Robins appear to be selecting *C. costaricana* as a result of it offering a greater reward.

Although Black Guans (*Chamaepetes unicolor*, Crassidae) have been observed frequently feeding on *Chamaedorea* species (Wheelwright et al. 1984), the primary dispersers of the two species observed are unknown. Though Mountain Robins have not been observed feeding on the *Chamaedorea* species used in this study in the wild it is expected that, their preference *C. costaricana* over *C. pinnatifrons* may also be true in the wild. This preference for *C. costaricana* could have negative effects for the long-term reproductive success of the very similar looking *C. pinnatifrons*. One possibility is that *C. pinnatifrons* is using a mimicry strategy to attract dispersors while using less effort to produce fruits with a lower reward than the *C. costaricana*. Further studies on this subject could include amount of fruit produced per each plant species, a higher variety of fruit species offered, a higher number of feeding repetitions, analysis of lipid and fat content in fruit species, and dispersors of the palm species.

ACKNOWLEDGMENTS

First, I must thank Ollie Hymen and Maria Jost for sacrificing many nights at La Taverna in order to get up at dawn and open the mist nets and also for their statistical and editorial wisdom. Much, much thanks, kids! I also want to thank Carlos Guindon for attending early morning and after dusk sessions, for teaching us how to untangle the stupid birds once caught and for his constant guidance with every aspect of this project. I would also like to thank Seanizzle for taking me on as his partner in berry and poo and for talking life in our second home in the lower lab. I would also like to thank Sonia for her ever sweetness and constant patience.

LITERATURE CITED

- Shupp, E. W, 1993. Quantity, quality and the effectiveness of seed dispersal by animals. *Vegetatio* 107/108:15-29.
- Stiles, G. F. and A. F. Skutch, 1989. A guide to the birds of Costa Rica. Cornell Publishing.
- Wheelwright, N. T, W. A. Haber, K. G. Murray, and C. Guindon, 1984. Tropical fruit-eating birds and their food plants: A survey of a Costa Rican Lower Montane forest. *Biotropica* 16: .

Table 1: Fruit characteristics of plant species

Species	% Sugar	Fruit Weight (g)	Wet fruit diameter (mm)
<i>C. costaricana</i>	9.5	0.245	10.68
<i>C. pinnatifrons</i>	7.0	0.107	6.67
<i>V. costaricanum</i> ^a	17	0.12	6.0

^a(Wheelwright et al. 1984)

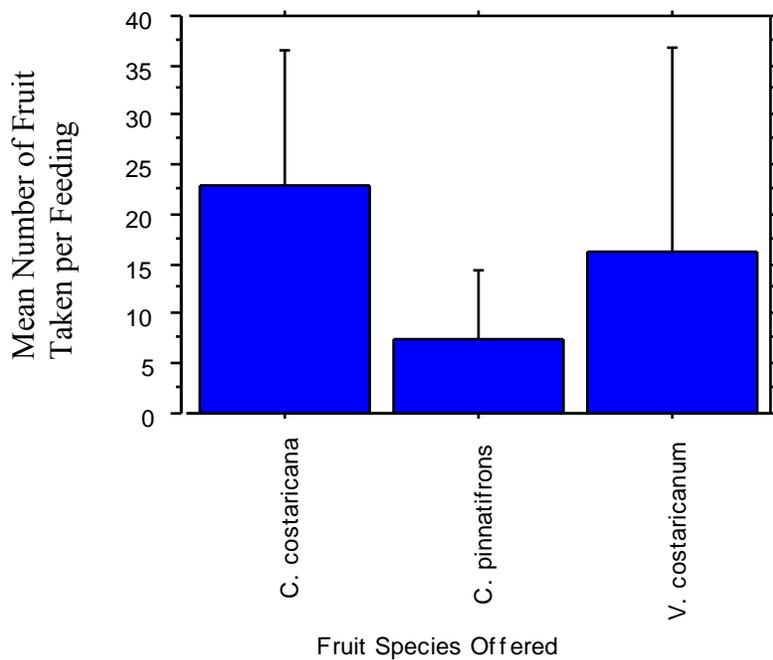


Figure 1: Comparison of mean number of fruit taken by Mountain Robin of *Viburnum costaricanum*, *Chamaedorea costaricana*, and *C. pinnatifrons* during feeding sessions of the three fruits offered using the ANOVA test. The mean of costaricana is 22.8, pinnatifrons 7.4, and costaricanum 16.2. The error bars represent the first standard deviation from the mean.

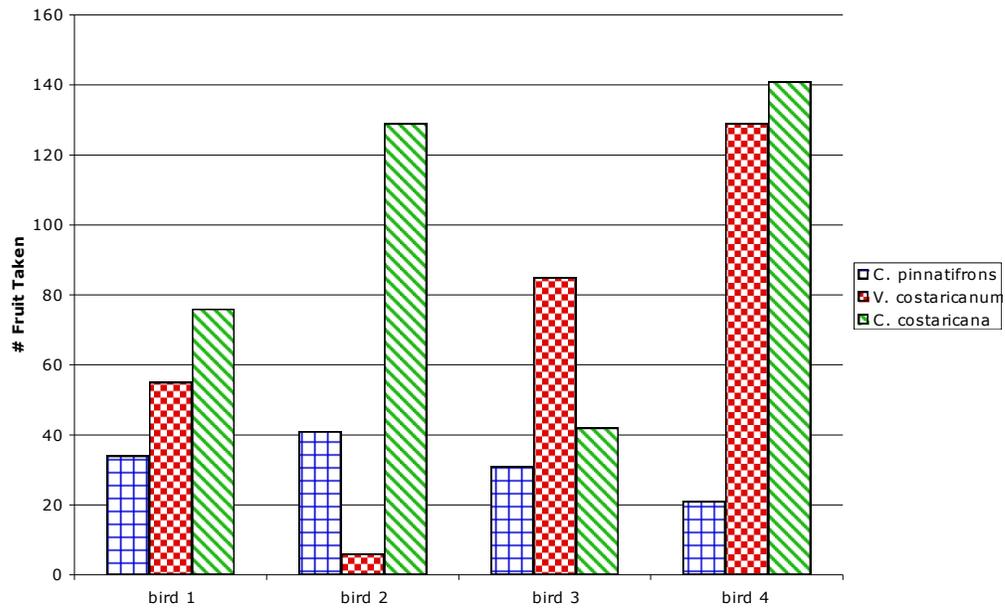


Figure 2: Individual Mountain Robin preferences of fruits from three species of plants; Note that bird 3 preferred *V. costaricanum* over the *C. costaricana*.