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## Observations of territorial behavior of the Antillean Crested Hummingbird (*Orthorhyncus cristatus*) on St. Eustatius

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*Photo: J.P. Shepherdson*

## Observations of territorial behavior of the Antillean Crested Hummingbird (*Orthorhyncus cristatus*) on St. Eustatius

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**Abstract** Little information is available on territorial behavior of the Antillean Crested Hummingbird (*Orthorhyncus cristatus*). This study set out to establish a platform for future research into the territorial behavior of the Antillean Crested Hummingbird by observing the species for a total of 90 hr across three separate habitat types on the island of St. Eustatius, Caribbean Netherlands.

**Keywords** Caribbean Netherlands, conservation, hummingbirds, *Orthorhyncus cristatus*, St. Eustatius

**Resumen** Observaciones de la conducta territorial de *Orthorhyncus cristatus* en San Eustaquio—Poca información está disponible sobre la conducta territorial de *Orthorhyncus cristatus*. Este estudio pretende establecer una plataforma para las investigaciones futuras sobre la conducta territorial de esta especie mediante la observación de individuos por un total de 90 hr en tres hábitats separados de la isla de San Eustaquio, en el Caribe Neerlandés.

**Palabras clave** Caribe Neerlandés, colibríes, conservación, *Orthorhyncus cristatus*, San Eustaquio

**Résumé** Observations du comportement territorial du Colibri huppé (*Orthorhyncus cristatus*) sur Saint-Eustache—Il existe peu d'informations sur le comportement territorial du Colibri huppé (*Orthorhyncus cristatus*). La présente étude vise à établir des bases pour des recherches futures sur le comportement territorial du Colibri huppé, en observant l'espèce pendant 90 h au total dans trois types d'habitats distincts de l'île de Saint-Eustache, dans les Antilles Néerlandaises.

**Mots clés** Antilles Néerlandaises, colibri, conservation, *Orthorhyncus cristatus*, Saint-Eustache

The Antillean Crested Hummingbird (*Orthorhyncus cristatus*) is the smallest hummingbird within the Lesser Antilles and is a year-round resident throughout the Virgin Islands, Puerto Rico, and St. Eustatius (Raffaele *et al.* 2010). Although the range-wide population of Antillean Crested Hummingbird has not yet been quantified, the species was described as “common” by Stotz *et al.* (1996).

Male Antillean Crested Hummingbirds establish feeding territories and advertise their presence by singing (Schuchmann 1978). Females, however, only establish territories around nesting sites where they persistently attack intruders. Differing from the males, female Antillean Crested Hummingbirds forage along fairly regular routes, “traplining” many dispersed flowers (Collwell 1973, Schuchmann 1978). Antillean Crested Hummingbirds feed from near the ground and up to the canopy of tall trees but appear to prefer flowering plants of the understory (Ingels 1976a, 1976b). Here I report on a series of foraging and behavioral observations conducted on St. Eustatius, Caribbean Netherlands.

I observed both sexes of Antillean Crested Hummingbird consuming nectar through narrow holes at the base of the corollas of *Hibiscus* and *Allamanda* flowers. This is likely an adaptive strategy for feeding because Antillean Crested Hummingbirds have relatively short bills and would not otherwise be able to reach the deep calyces of these flowers (Ingels 1976a, 1976b). At no point during the study did I observe Antillean Crested Hummingbirds actually piercing the flowers themselves; however, they were observed visiting perforations previously made by Bananaquits (*Coereba flaveola*) and Carpenter bees (*Xylocopa mordax*). It is widely known that hummingbirds obtain the nectar of flowers by making perforations or by using holes already made by insects and birds (Lara and Ornelas 2001). Antillean Crested Hummingbirds were especially abundant in the tops of large flowering trees such as the capparis tree (*Quadrella cynophallophora*) and were observed feeding upon a total of 14 native and non-native flowering plants (Table 1).

After feeding, the observed birds almost always returned to the same resting perch. Preferred perches appeared to be bare twigs approximately 2 m off the ground situated in shaded areas; these observations concur with observations made by Ingels (1976a, 1976b) on the island of Martinique.

To collect data on territorial behavior of male and female

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**Table 1.** Flora that Antillean Crested Hummingbirds were observed feeding upon on St. Eustatius during 90 hr of observation from July to September 2014.

Plant Species	Feeding Visits	
	Male	Female
<i>Native Plants</i>		
<i>Quadrella cynophallophora</i>	39	4
<i>Euphorbia tithymaloides</i>	72	3
<i>Antigonon leptopus</i>	1	11
<i>Plumeria rubra</i>	0	3
<i>Jatropha multifida</i>	0	3
<i>Introduced and Ornamental Plants</i>		
<i>Crossandra infundibuliformis</i>	2	3
<i>Ixora coccinea</i>	12	1
<i>Caesalpinia pulcherrima</i>	2	87
<i>Moringa oleifera</i>	28	0
<i>Hibiscus rosa-sinensis</i>	37	31
<i>Allamanda blanchetii</i>	2	18
<i>Delonix regia</i>	1	0
<i>Hibiscus schizopetalus</i>	0	4
<i>Acacia retusa</i>	1	0

hummingbirds, I made observations between 16 July and 11 September 2014 in three distinct areas on St. Eustatius, including (1) Gilboa Hill (17°31'N, 63°00'W), (2) residential areas (17°29'N, 62°58'W), and (3) the Miriam C. Schmidt Botanical Garden (17°28'N, 62°57'W) (Fig. 1). On Gilboa Hill, preliminary observations were performed to identify plant species which were closely associated with hummingbirds and study sites were then centered around these plants.

Gilboa Hill lies within the Boven National Park (BNP) and covers 525 ha, with an altitude ranging from sea level to 300 m above sea level. BNP receives significantly less rainfall than elsewhere on St. Eustatius and has a large number of roaming livestock that graze native vegetation, subsequently resulting in a landscape dominated by *Acacia* thorn scrublands and grasslands. The study sites on Gilboa Hill were centered around two native plants: *Quadrella cynophallophora* and *Euphorbia tithymaloides*.

The residential areas of St. Eustatius have a wide range of native and ornamental flora. Study sites within the residential areas were not centered around any particular floral species; instead they were located in areas where preliminary observations identified high levels of Antillean Crested Hummingbird activity. This method of selecting study sites was also applied within the Botanical Garden.

In each of the three study areas, I recorded the sex of each observed Antillean Crested Hummingbird, along with any territorial behavior. In each of the three study locations, 30 hr of observations were recorded. Data collection began at 0800 and continued for a duration of 3 hr. Hummingbirds were observed in accordance with a slightly modified method to the one outlined by Kuban and Niell (1980). The method consisted of sitting in established locations and remaining inconspicuous while recording the sex of hummingbirds, territorial behaviors, whether

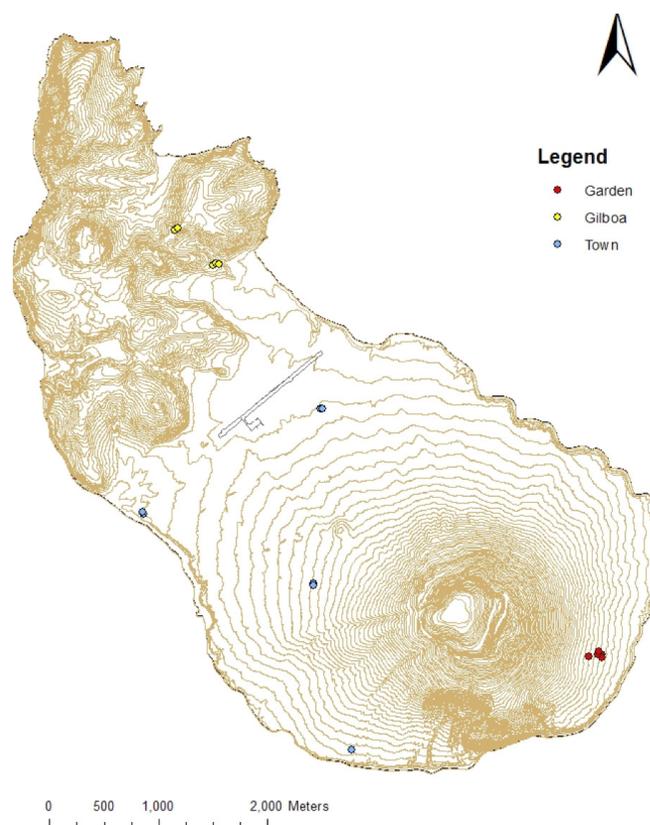
feeding took place, the species of plant fed upon, the number of flower heads visited, the wind speed and temperature, and identifying if birds returned to the same perch after feeding. When perched, I recorded the total time spent perching.

The social dominance of an individual hummingbird, both interspecifically and intraspecifically, may affect its patterns of habitat use (Stiles and Wolf 1970, Kuban and Niell 1980). I evaluated dominance by noting each time a hummingbird succeeded in chasing another individual bird of the same or different species from the study site. Individuals were not marked; most territories were small and thus advantageously allowed for the resident male to be followed at all times.

Territory-holders approached invading birds and encounters were brief, rarely lasting more than 5 s. The primary aggressors for territorial activities were males ( $n = 70$ ); females were rarely observed instigating territorial interactions ( $n = 13$ ) (Table 2). Males exhibited 84% of territorial behaviors recorded, whereas females were only involved in 16% of territorial interactions. This difference was statistically significant ( $\chi^2 = 33.98$ ,  $df = 1$ ,  $p < 0.001$ ).

A comparison of the average time spent perching by each of the sexes was not normally distributed (Shapiro-Wilk test,  $W = 0.82$ ,  $p < 0.05$ ,  $n = 105$  observations; Shapiro and Wilk 1965) so a Mann-Whitney U test was used to identify that females spent significantly more time perching than males ( $U = 104$ ,  $p < 0.001$ ,  $n = 105$  observations; Fig. 2).

It appears likely that males are more territorial than females, based on their higher percentage of time performing territorial activities and lower percentage of time spent perching in com-



**Fig. 1.** Study sites on St. Eustatius.

**Table 2.** Number of observed territorial behaviors in relation to the total number of observations recorded during 90 hr of observation.

	Total Number of Observations	Territorial Behavior
Male	215	70
Female	172	13

parison to females. Various other studies that investigated territoriality in hummingbirds have also found males to be more territorial (i.e., Stiles and Wolf 1970, Miller and Inouye 1983). Additionally, territories appeared to be centered around food resources, coinciding with similar observations made by Temeles *et al.* (2009). Although it is widely accepted that some hummingbird species feed upon insects, this was not observed in Antillean Crested Hummingbirds at any point in this study. This study should form a basis upon which to build a better understanding of the behavior and ecology of this iconic Caribbean species.

### Acknowledgments

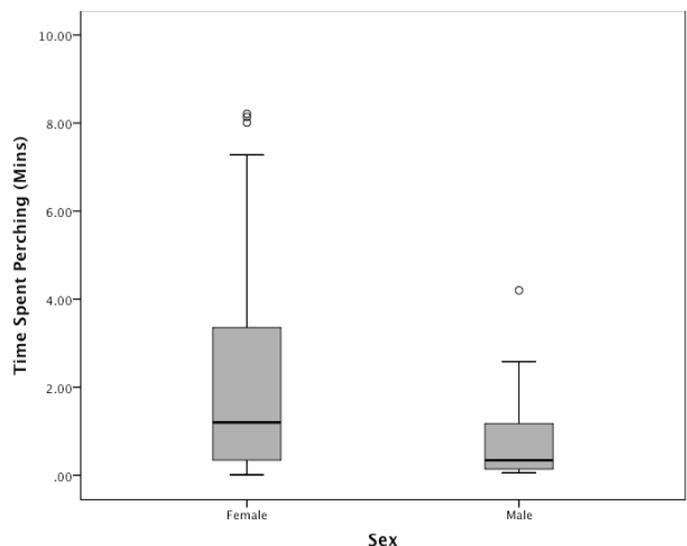
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**Fig. 2.** Female Antillean Crested Hummingbirds spent significantly more time perching than males ( $n = 105$  perching observations). Data not corrected for repeated measures. See text for statistics.

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