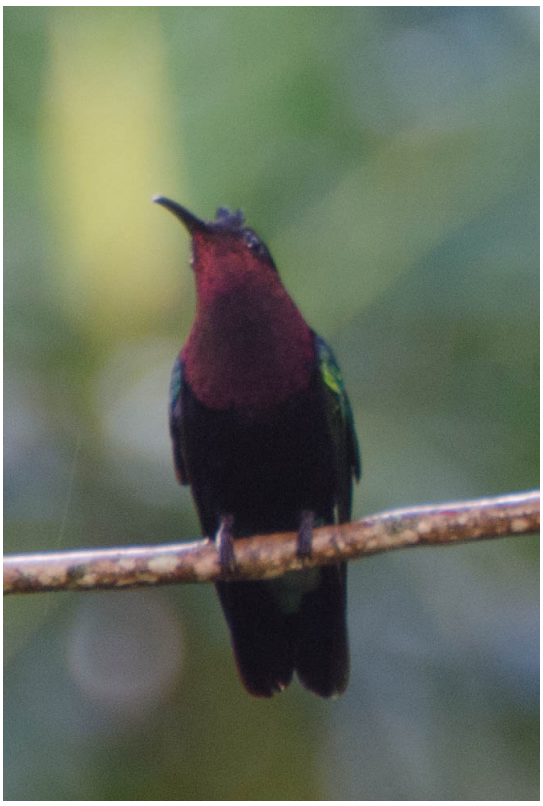
# A Study of the Sex-specific Interactions of *Eulampis jugularis* and *Heliconia* species on Dominica

By: Kristina Carter



Texas A&M University

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**Abstract**

*Eulampis jugularis* illustrates sexual dimorphism in bill morphologies and is the sole pollinator to the *Heliconia* species on the Caribbean island of Dominica. A study was done, with a photographic focus, to gather visual examples and well as observe their behavior. The females did have the more curved bills, visited the sites for longer periods of time, and flew from site to site instead of perching in a nearby area and defending a territory.

**Introduction**

The interactions between plants and their pollinators are vitality important ones, providing both dietary necessities for the animal and insuring a portion of the reproductive cycle for the plant. The island of Dominica is not lacking in this important mutualism. Located in the Lesser Antilles Chain of the Caribbean, the "Nature Island" has a plethora of varied habitats that support diverse flora and fauna (Evans 1990). One of the most unique of these important interactions found in the rain forests of Dominica is that of the Heliconia and it's sole pollinator on the island, *Eulampis jugularis* (Purple - throated Carib) (Gowda 2013). There are two species of *Heliconia* found on Dominica- *Heliconia caribaea* and *Heliconia bihai*- large plants found in tropical rain forest known for their colorful, bright bracts (Vallejo 2012). The Purple Throated Carib (one of the four hummingbird species found on Dominica) is found throughout the Lesser Antilles and its diet consists of nectar and insects (Evans 1990). The Purple Throated Carib is a large hummingbird about 12 cm in length which looks black, unless in direct sunlight when it's iridescent feathers on it's wings shine an emerald green, and its throat reveals its characteristic deep purple color (Evans 1990). This species exhibits sexual dimorphism in the curvature of the bills; the females have a curved bill while the males have a straighter bill. The male feeds solely from the *H. caribaea,* while the female feeds from both the *H. caribaea* as well as from the more curved flower from *H. bihai*. This

study was to provide more photographic evidence for the sexual dimorphism of the Purple throated Carib as well as provide more information regarding the behavior of the birds.

**Methods and Materials**

All photographs were taken using a Nikon D7000 single lens reflex digital camera with a 18mm zoom lens, and edits made through Adobe Photoshop Lightroom 4 on a Macintosh system. Any editing was minor, used only for cropping, zooming in on the bill, and bringing out the colors. All field entries for observations were recorded using a ZIG archival pen, and a paper notebook.

Observations and photographs were all taken from three sites: 1) Site A-near Checkhall creek (N 15 20.735' W061 22.142) 2) Site B- on Mt. Joy, (15 20.890' W 061 21.981') and 3) Site C –on Mt. Joy (N 15 20.877' W 061 21.966). Site B excluded *H. bihai* in order to determine if there would be different behavior of the birds. Each site was watched for approximately one hour, within the hours of 10-2 or 4-6, over four non-consecutive days. At each site the following was recorded: time of feeding, sex of bird, duration of time within stand, and which *Heliconia* plant the birds feed from. Duration was general and marked in 5-second increments. For the actual process of observation I sat a few feet away and waited for activity. When a bird flew near enough to feed, I took as many pictures as I could, trying to focus on the bill. After the bird left, I recorded the aforementioned data.

**Results**

Male feeding on a *H. caribaea (*Picture 1)  Female feeding on a *H. bahai* (Picture 2)

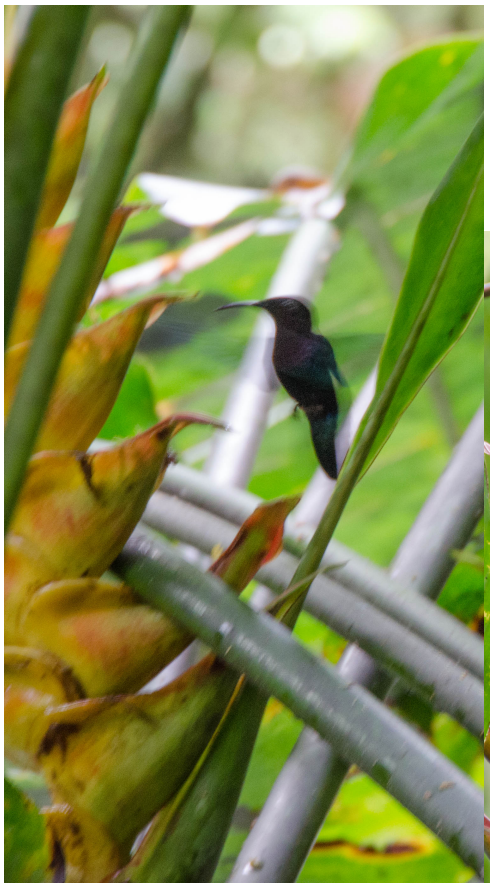

Table 1

| Date | Location | Time | Sex | Duration | Feeding Location | *Species* |
|---|---|---|---|---|---|---|
| May 29th 2013 | Site A | 4:45 | male | 10 sec | back yellow | *H. caribaea* |
| May 29th 2013 | Site A | 5:45 | female | 10-20 sec | back red and side yellows | *Both* |
| May 29th 2013 | Site A | 5:57 | male | 10 sec | side yellow | *H. caribaea* |
| May 30th 2013 | Site A | 9:09 | male | 15 sec | side yellow | *H. caribaea* |
| May 30th 2013 | Site A | 9:16 | female | 45 sec | back red and back yellow | *Both* |
| May 30th 2013 | Site A | 9:19 | female | 45 sec | back red and back yellow | *Both* |
| May 30th 2013 | Site A | 9:23 | male | 30 sec | side yellow | *H. caribaea* |
| May 30th 2013 | Site A | 9:27 | male | 10 sec | side yellows | *H. caribaea* |
| May 30th 2013 | Site B | 1:45 | Male | 15 sec | lower left yellow | *H. caribaea* |
| May 30th 2013 | Site B | 2:05 | male | 30-45 sec | right back yellow | *H. caribaea* |
| May 30th 2013 | Site C | 3:11 | male | 30 sec | front yellow | *H. caribaea* |
| May 30th 2013 | Site C | 3:34 | female | 30 sec | front yellow | *H. caribaea* |
| May 30th 2013 | Site C | 3:44 | unknown | 15 sec | back yellow | *H. caribaea* |
| May 31st 2013 | Site A | 10:08 | Male | 20 sec | Side Yellow | *H. caribaea* |
| May 31st 2013 | Site A | 10:13 | Male | 10 sce | Side Yellow | *H. caribaea* |
| May 31st 2013 | Site A | 10:25 | male | 5 sec | back yellow | *H. caribaea* |
| May 31st 2013 | Site A | 10:30 | male | 20 sec | front yellow | *H. caribaea* |
| May 31st 2013 | Site A | 10:34 | unknown | 45 sec | front yellow | *H. caribaea* |
| May 31st 2013 | Site A | 10:41 | male | 30 sec | side yellow | *H. caribaea* |
| May 31st 2013 | Site A | 10:46 | female | 15sec | side and back yellows | *H. caribaea* |
| May 31st 2013 | Site A | 10:50 | male | 10 sec | front yellows | *Both* |
| May 31st 2013 | Site A | 11:14 | female | 45 sec | front red, front and back yellow | *Both* |
| May 31st 2013 | Site A | 11:19 | female | 45 sec | front red | *H. bihai* |
| May 31st 2013 | Site A | 11:21 | female | 20 sec | front red | *H. bihai* |
| May 31st | Site A | 11:39 | female | 45 sec | far back yellow, front reds | *Both* |

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| 2013 | | | | | | |
| May 31st 2013 | Site A | 11:50 | female | 45 sec | front yellows | *H. caribaea* |
| May 31st 2013 | Site A | 11:50 | female | 45 sec | front yellows | *H. caribaea* |
| May 31st 2013 | Site C | 2:39 | Male | 20 sec | center yellow | *H. caribaea* |
| May 31st 2013 | Site C | 2:39 | female | 5 sec | center yellow | *H. caribaea* |
| May 31st 2013 | Site B | 4:31 | male | 20 sec | front right | *H. caribaea* |
| June 2nd 2013 | Site B | 11:54 | male | 30 sec | side yellow | *H. caribaea* |
| June 2nd 2013 | Site B | 11:57 | male | 20 sec | side yellow | *H. caribaea* |
| June 2nd 2013 | Site B | 12:03 | male | 15 sec | side yellow | *H. caribaea* |
| June 2nd 2013 | Site B | 12:13 | male | 10-15 sec | side yellow | *H. caribaea* |
| June 2nd 2013 | Site B | 12:22 | male | 20-25 sec | side yellow | *H. caribaea* |
| June 2nd 2013 | Site B | 12:34 | male | 30 sec | back red, side yellow | *Both* |
| June 2nd 2013 | Site C | 5:44 | female | 5sec | left red | *H. bihai* |
| June 2nd 2013 | Site C | 6:03 | male | 5-10 sec | side yellows | *H. caribaea* |
| June 2nd 2013 | Site C | 12:18 | female | 15 sec | back red and yellows | *Both* |
| June 2nd 2013 | Site C | 12:36 | female | 20-30 sec | back red, side yellow | *Both* |
| May 31st 2013 | Site A | 10:25 | male | 5 sec | back yellow | *H. caribaea* |
| May 31st 2013 | Site A | 10:30 | male | 20 sec | front yellow | *H. caribaea* |
| May 31st 2013 | Site A | 10:41 | male | 30 sec | side yellow | *H. caribaea* |
| May 31st 2013 | Site A | 10:46 | female | 15sec | side and back yellows | *H. caribaea* |
| May 31st 2013 | Site A | 10:50 | male | 10 sec | front yellows | *H. caribaea* |
| May 31st 2013 | Site A | 11:14 | female | 45 sec | front red, front and back yellow | *Both* |
| May 31st 2013 | Site A | 11:19 | female | 45 sec | front red | *H. bihai* |
| May 31st 2013 | Site A | 11:21 | female | 20 sec | front red | *H. bihai* |
| May 31st 2013 | Site A | 11:39 | female | 45 sec | far back yellow, front reds | *Both* |
| May 31st 2013 | Site A | 11:50 | female | 45 sec | front yellows | *H. caribaea* |
| May 31st | Site A | 11:50 | female | 45 sec | front yellows | *H. caribaea* |

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|---|---|---|---|---|---|---|
| 2013 | | | | | | |
| May 31st 2013 | Site C | 2:39 | Male | 20 sec | center yellow | *H. caribaea* |
| May 31st 2013 | Site C | 2:39 | female | 5 sec | center yellow | *H. caribaea* |
| May 31st 2013 | Site B | 4:31 | male | 20 sec | front right | *H. caribaea* |
| June 2nd 2013 | Site B | 11:54 | male | 30 sec | side yellow | *H. caribaea* |
| June 2nd 2013 | Site B | 11:57 | male | 20 sec | side yellow | *H. caribaea* |
| June 2nd 2013 | Site B | 12:03 | male | 15 sec | side yellow | *H. caribaea* |
| June 2nd 2013 | Site B | 12:13 | male | 10-15 sec | side yellow | *H. caribaea* |
| June 2nd 2013 | Site B | 12:22 | male | 20-25 sec | side yellow | *H. caribaea* |
| June 2nd 2013 | Site B | 12:28 | unknown | 10-15 sec | side yellow | *H. caribaea* |
| June 2nd 2013 | Site B | 12:34 | male | 30 sec | back red, side yellow | *Both* |
| June 2nd 2013 | Site C | 5:44 | female | 5sec | left red | *H. bihai* |
| June 2nd 2013 | Site C | 6:03 | male | 5-10 sec | side yellows | *H. caribaea* |
| June 2nd 2013 | Site C | 12:18 | female | 15 sec | back red and yellows | Both |
| June 2nd 2013 | Site C | 12:36 | female | 20-30 sec | back red, side yellow | Both |

Table 2

| Species | Number of Male Visits to Species | Number of Female Visits Species | Total Number of Visits |
|---|---|---|---|
| *H. caribaea* | 37 | 9 | 46 |
| *H. bihai* | 0 | 5 | 5 |
| Both | 0 | 13 | 13 |
| Total | 37 | 27 | |

The observations also show differences regarding the behavior of each sex. Table 2 is a summary table of how many times a male or female fed from a species. The

females spent much more time in the *Heliconia* stands then the males did. The average duration time for females is 29 seconds while the average duration time for the males was 18 seconds. The males would stay in one area and defend a territory only if there were *H. caribaea* solely located there, while the females would feed in locations almost solely were both species were, and move out of sight after feeding.

**Discussion**

The purpose of this study was to provide visual representation of the sexual dimorphism in Purple Throated Carib, which the photographs show the female has a curved bill that fits to the *H. bihai* flowers, and the male bill is much straighter fitting only to the *H. carbide.* This is a prime example of plant-pollinator interaction. The females not only have a curved bill, but also exhibit different behavior than the males. This could potentially be explained because of the different uses of resources between the sexes. The male must use his energy to secure a territory and find a mate. The female must use her resources for the high cost of reproduction for birds: making and laying eggs, and caring for that young. The female doesn't waste energy on fighting for the nectar guarded by the males, but instead spends her time flying from stand to stand that contains both species (the lesser guarded ones) to achieve maximum net energy gain. This is parallel to the conclusion that Temeles et al (2013) came to. The male guards his territory and receives his nutrition from the flowers within his territory.

It is noteworthy to mention that out of the two color morphs of *H. caribaea*, pink and yellow, the pink was never fed upon by the hummingbirds. However, other birds like *Cinclocerthia ruficauda (*Brown Trembler), *Loxigilla noctis (*Lesser Antillean Bullfinch) and *Coereba flaveola* (Bananaquit) all used the pink morph more than once for water or

attempted food purpose.

The project was also affected by several factors. One, this was the wettest May in Dominica which prevented earlier data collection, collecting over more days, and damped hummingbirds activity. Also, I am inexperienced in the sexing of birds, so human error is a factor. In addition, more data would strengthen the results. In the future if would be interesting to see the relationship the pink morphs have with other birds of the area.

**Acknowledgments**

I wish to thank Dr. Woolley for the photography lessons, Dr. Lacher for all the articles, my family for the financial support, and all my classmates for their help, company during data collection, and helping making this trip as amazing as it was.

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