

Observation of hummingbirds at bromeliads and feeders in the Ecuadorian rainforest

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1. Introduction

1.1 About Hummingbirds

Hummingbirds (Trochilidae) are small birds. Their English name is due to the sound of their flight. In Spanish they're called "pica flor" (flower pecker) and in Portuguese "beija flor" (kissing flower).

They live all over America from Alaska to Tierra del Fuego. But they do not live on the Galapagos Islands. So far 330-340 different species have been discovered. With 130 species the highest biodiversity is in Ecuador, although this is such a small country. In its neighbour countries Peru and Columbia is a high biodiversity, too.

There are some very special things about the little birds which makes them very interesting.

One of these things is their way of flying. Hummingbirds are able to hover in the air. And they are the only birds which are able to fly backwards. This is possible because of their body's structure. Their shoulder and elbow joints are quite flexible. They've got a big breastbone and big pectoral muscles. And their hands are long. The frequency of the movement from their wings is quite high. It's hard to recognise the wings of the bird while watching it hover.

Furthermore hummingbirds are famous for their iridescent colours. The colours are not (only) caused by pigmentation but by the structure of the plums. The appearance of the bird is dependent on the exposure to light. In "bad" light it might look simply black.

Hummingbirds need a lot of energy, but they're not able to store much of it. Therefore they need to regulate their energy balance. They are diurnal and can't feed during the night. Sometimes they get torpid during cold nights and lower their temperature to save energy. Torpor is most common in Andean Hummingbirds which are living in high elevation.

1.2 Hummingbirds and flowers

The main nutrition of Hummingbirds is nectar from flowers. They also feed on small insects and pollen. The nectar from "bird flowers" contains about 20% sugar. On average the sugar consists of 74% saccharose, 15% fructose and 11% glucose. Nectar also contains traces of amino acids. So the flowers provide an important source of energy and nutrients. A hummingbird of average size visits about 2000-3000 flowers per day.

Before fertilisation flowers need to get pollenised. Usually pollination is done by wind, water or animals. The animals are mostly insects, but also bats and birds. Pollinating birds are hummingbirds, sunbirds and honeyeaters. So hummingbirds are important for the reproduction of the plants which they visit.

Due to the importance of the bird for the plant and the plant for the bird both got adapted at each other. This is called co-evolution.

Quite often the plants have long, thin and colourful flowers. If the flowers themselves are light coloured, the plants frequently have colourful parts close to their flowers to attract the birds. E.g. the observed bromeliads had pink leaves and white flowers (Figure 1.1). The flowers usually don't smell to avoid the attraction of insects. They produce a lot of nectar, which contains less sugar than the one for insects. Many flowers are horizontal, because it's easier for the hummingbirds to drink.

Hummingbirds have thin and pointed beaks with variable lengths. Some have really long beaks. E.g. the beak of the sword-billed hummingbird is even longer than its body. But there are also species with short beaks like Thornbills. Some beaks are straight, others curved. The beak of Sicklebills looks like a hook. Exceptional shapes of the beak enable the bird to feed on equally exceptional flowers. Some hummingbirds also developed techniques to feed on flowers they usually wouldn't be able to feed. They open the flower at its basis and drink the nectar.

1.3 Hummingbirds and feeders

As many people like watching the nice little birds recently many feeders have been installed. You'll find them in private gardens as well as in tourist places. Unfortunately even Eco tourist facilities have them.

Feeders are plastic flasks with a red bottom. Red or yellow plastic flowers are fastened at the lower edge. In the middle of the flowers are holes in which the hummingbirds can poke their beak. The Feeders are filled with a sugar solution.

So far no studies have been done to investigate the influence of the feeders on the hummingbirds and the surrounding nature.

A problem for the birds could be wrong preparation of sugar solutions. Brown sugar contains iron which is toxic and shouldn't be used. The birds could be infected by bacteria and fungi if the feeders are not properly cleaned or the sugar solutions are not changed often enough. And the feeders do contain neither the insects nor the trace elements hummingbirds usually consume with the nectar.

Wasps and ants are getting attracted by the feeders and often drown.

The plants which need the hummingbirds for pollination might get problems if the birds prefer the feeders and visit the flowers less frequently. Some plants are adapted to one specific bird so well, that they can't reproduce without exactly this bird.

In this little project should be investigated what happens with the visitors of bromeliads if feeders are installed close to them.

1.4 Description of project

During the first week only bromeliads without feeders were observed. Then four feeders were put on trees. Three of them close to bromeliads, the last one as a single feeder control.

The feeders were filled with a 23% sugar solution (saccharose). The solution was changed every three or four days. Every time the solutions were freshly prepared with tap water and ordinary household sugar. The concentration was checked with a refractometer and adjusted if necessary. A concentration of 23% sugar was chosen because 20-25% sugar was measured at blooming bromeliads.

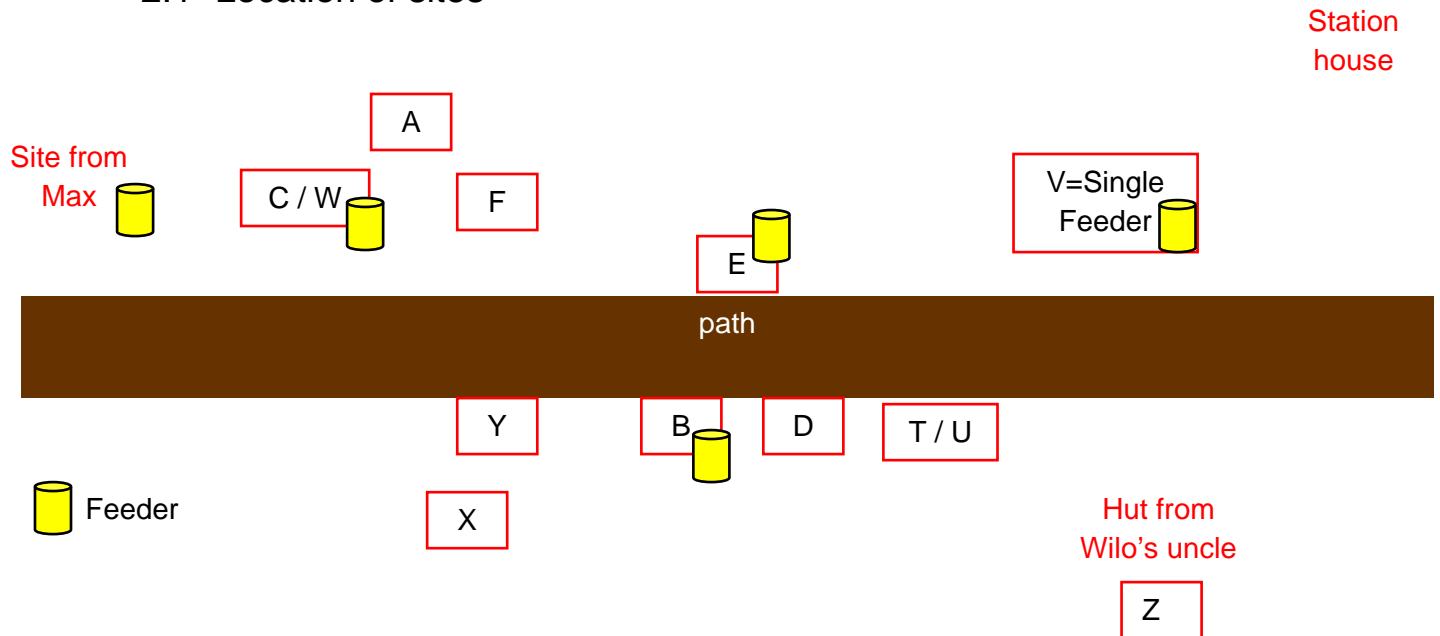
Each observation took one hour. If possible, sites were watched at different times of the day. Usually there are only visitors at the bromeliads when at least one of their flowers is open. (Figure 1.1)



Figure 1.1: open flower of bromeliad

2. Sites and plants

2.1 Location of sites



2.2 Site A

At site A were four bromeliads. Only plant 1 was observed.



Figure 2.1: Site A with bromeliads

2.3 Site B with feeder

At site B was one bromeliad and one feeder. Both were observed.



Figure 2.2: Site B with bromeliad and feeder

2.4 Site C with feeder

At site C were six bromeliads and one feeder. Plants 1, 2, 6 and the feeder were observed. Either plant 3 or plant 4 is plant W from Elisabeth Hömig. Plant W was observed from her.

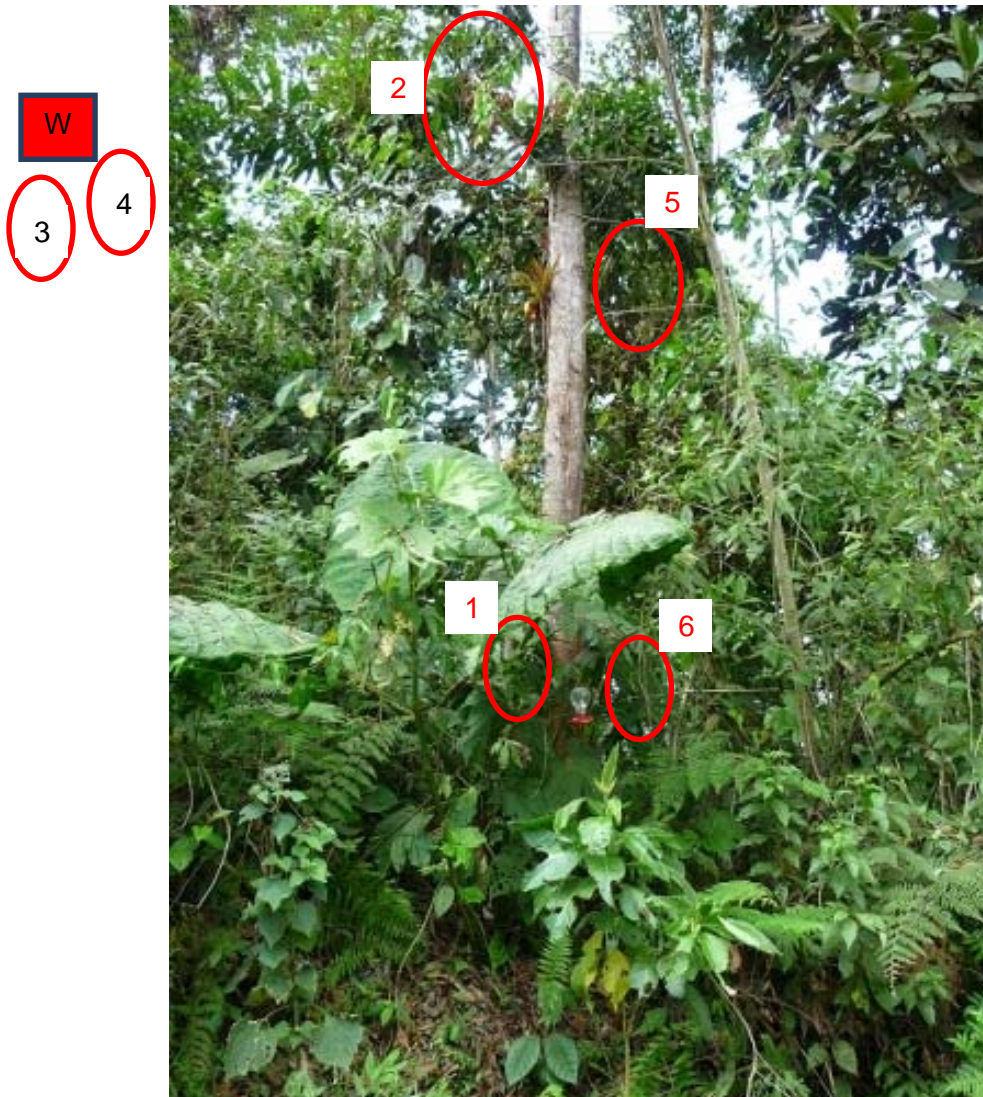


Figure 2.3: Site C with bromeliads and feeder

2.5 Site D

At site D was one bromeliad. The flowers of this plant were still closed. Nevertheless the plant was observed two times. There were no visitors.



Figure 2.4: Site D with bromeliad

2.6 Site E with feeder

At site E were two bromeliads and one feeder. Both bromeliads and the feeder were observed.



Figure 2.5: Site E with bromeliads and feeder

2.7 Site F

At site F were five bromeliads. All bromeliads were observed. But as plant 5 is deeper in the forest it might be that not all of the visitors have been noticed.

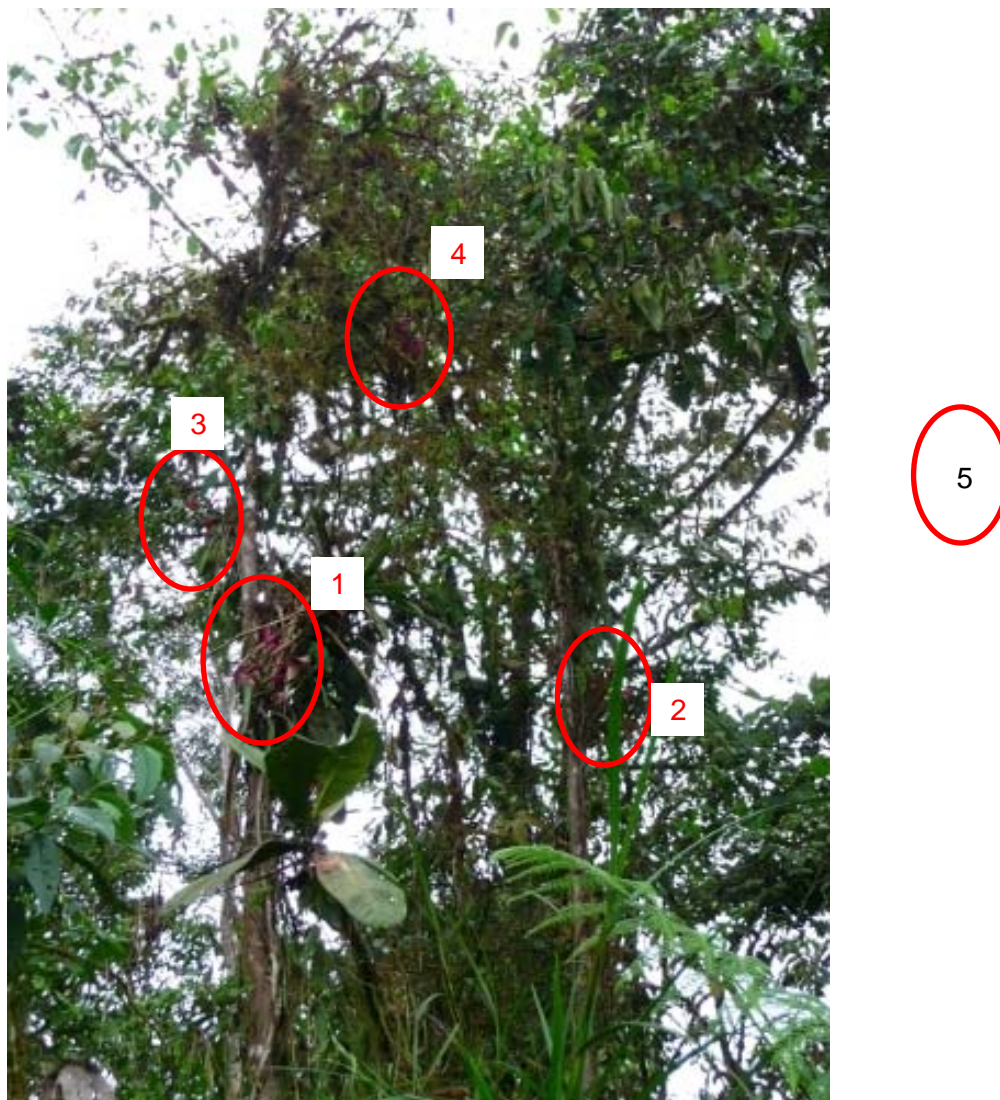
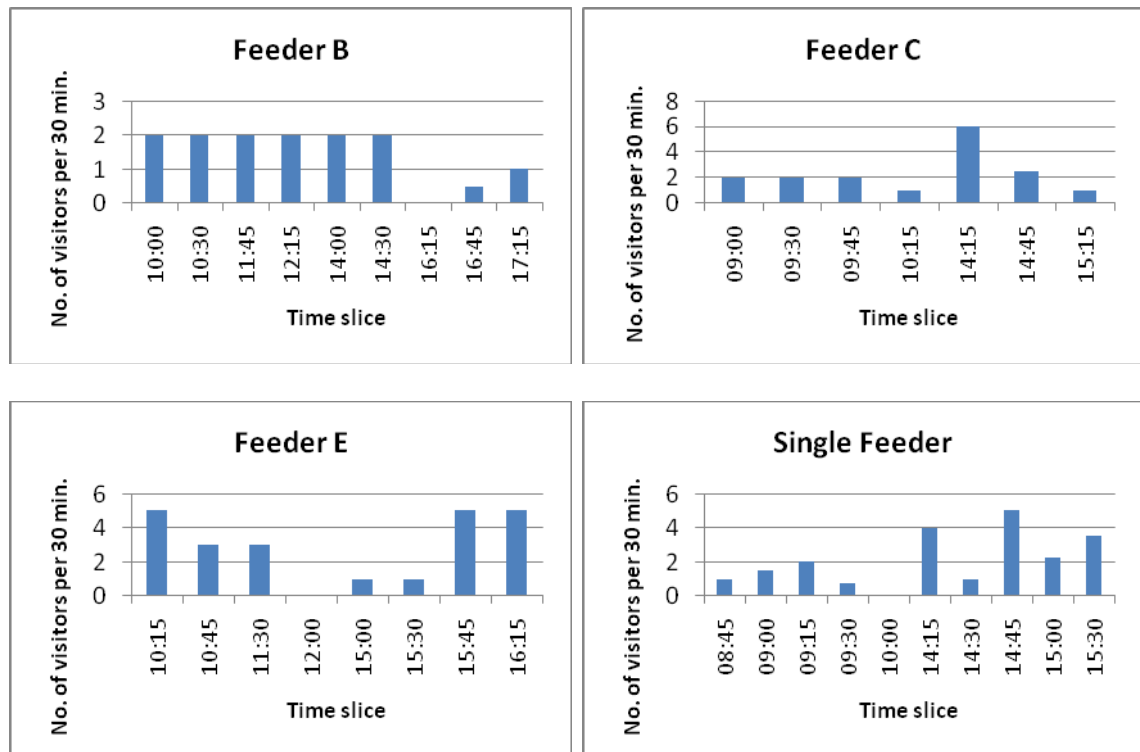


Figure 2.6: Site F with bromeliads

3. Results

3.1 Number of visitors at different times of the day

Due to the low number of visitors at the bromeliads only the data of the feeders is considered. In the charts below you'll find all time slices in which the feeders have been observed. It does not look like there is a relation between the time of the day and the number of visitors at the feeders.



3.2 Number of visitors per hour

The bromeliads turned out to be hardly visited by hummingbirds. Very often there wasn't any hummingbird visiting the plant during the hour of observation. The highest number of visitors per hour was three individuals at plant F-1. (Tables 3.1, 3.2 and Figure 3.1)

The feeders were more popular. Up to 10 hummingbirds per hour have been observed. (Table 3.3 and Figure 3.2)

The average number of visitors at the feeders is higher than at the bromeliads. (Figure 3.3)

Plant	A-1	B	C-1	C-2	C-6	E-1	E-2	F-1	F-2	F-3	F-4	F-5
Observation 1	1	2	0	0	0	0	1	1	0	0	0	1
Observation 2	0	0	0	0	0	0	0	0	0	0	0	0
Observation 3	1	0	0	0	0	0	0	3	0	1	2	0
Observation 4	1	0	0	0	0	0	0	0	0	0	0	0
Observation 5	0	1	0	1	0	0		0	1	0	0	0
Observation 6	2	0	1	1	1			0	0	0	0	0
Observation 7		2						0	0	0	0	0
Observation 8		0						1	1	0	0	0
Observation 9		0										
Observation 10		0										
Average	0,8	0,5	0,2	0,3	0,2	0,0	0,3	0,6	0,3	0,1	0,3	0,1
Std Dev	0,7	0,8	0,4	0,5	0,4	0,0	0,4	1,0	0,4	0,3	0,7	0,3

Table 3.1: Number of visitors per hour at the bromeliads, sites A, B, C, E and F

Plant	T	U	W	X	Y	Z
Observation 1	2	1	0	0	0	0
Observation 2				1	1	0
Observation 3				2	2	
Observation 4				0	0	
Observation 5				2	0	
Observation 6				0	0	
Observation 7				0	0	
Observation 8						
Observation 9						
Observation 10						
Average	2,0	1,0	0,0	0,7	0,4	0,0
Std Dev	0,0	0,0	0,0	0,9	0,7	0,0

Table 3.2: Number of visitors per hour at the bromeliads, sites T, U, W, X, Y and Z

Feeder	B	C	E	Control
Observation 1	4	10	8	9
Observation 2	4	2	3	3
Observation 3	0	4	2	0
Observation 4	2	3	10	2
Observation 5	4			7
Observation 6				3
Average	2,8	4,8	5,8	4,0
Std Dev	1,6	3,1	3,3	3,1

Table 3.3: Number of visitors per hour at the feeders

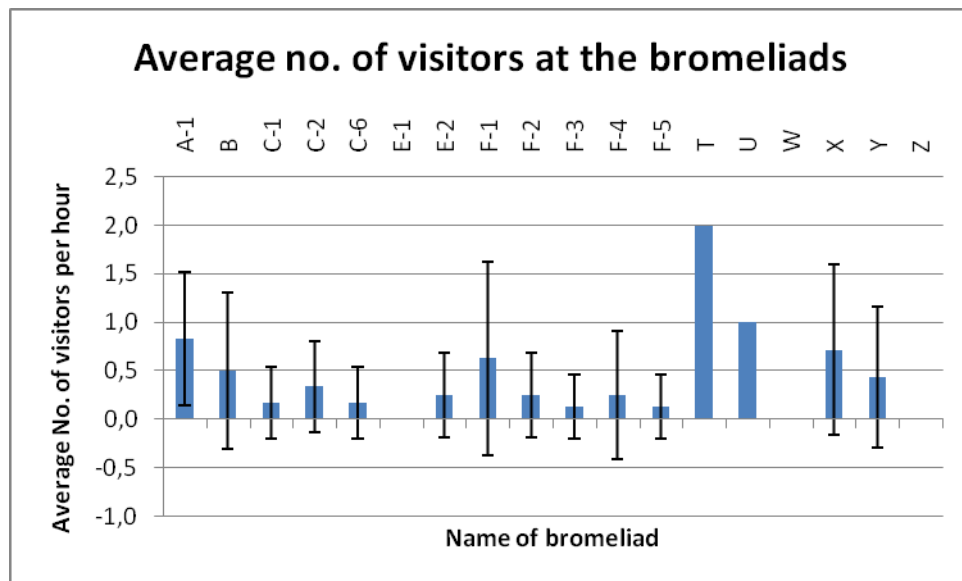


Figure 3.1: Average number of visitors per hour at the bromeliads

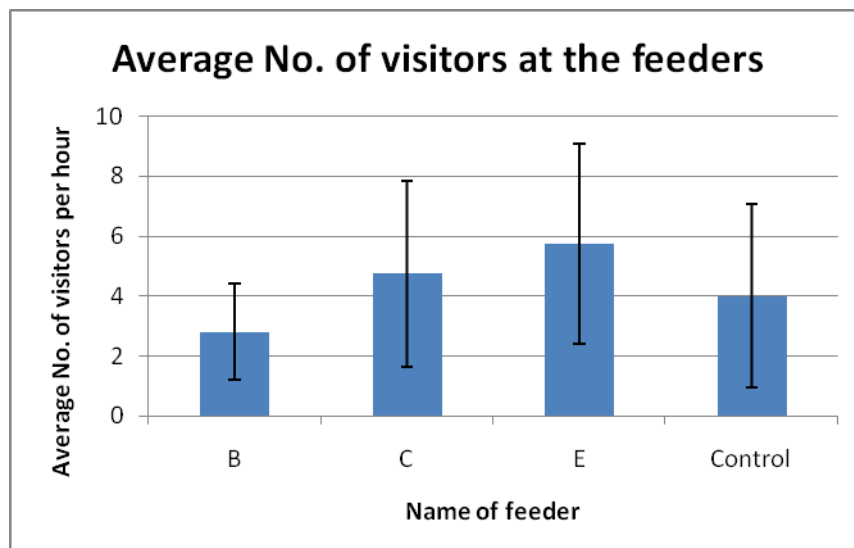


Figure 3.2: Average number of visitors per hour at the feeders

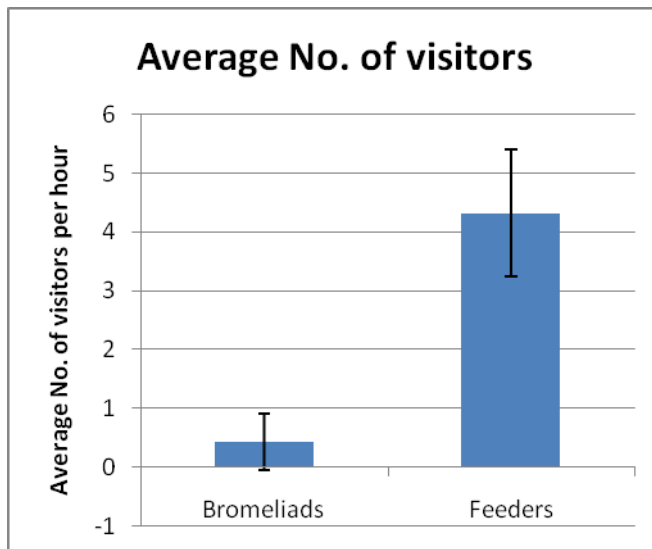


Figure 3.3: Average number of visitors per hour at all bromeliads and all feeders

3.3 Observed species

Five different species have been identified at the bromeliads, five to six at the feeders (Figures 3.4 and 3.5). At the bromeliads many hummingbirds could not be identified. Often the drinking hummingbirds were very well hidden behind the bromeliad itself or behind leaves. Sometimes the birds were simply too quick.

White-whiskered Hermits (Figure 3.6) and juvenile Green-crowned Brilliants were common at the bromeliads. Both species did not visit the feeders.

Nearly half of the visitors at the feeders were Green-crowned Woodnymphs (Figure 3.7). They did not visit the bromeliads. Wedge-billed Hummingbirds (Figure 3.8), Rufous-tailed Hummingbirds (Figure 3.9) and Green-crowned Brilliants (Figure 3.10) were common at the feeders, too. Seldom were they observed at the bromeliads.

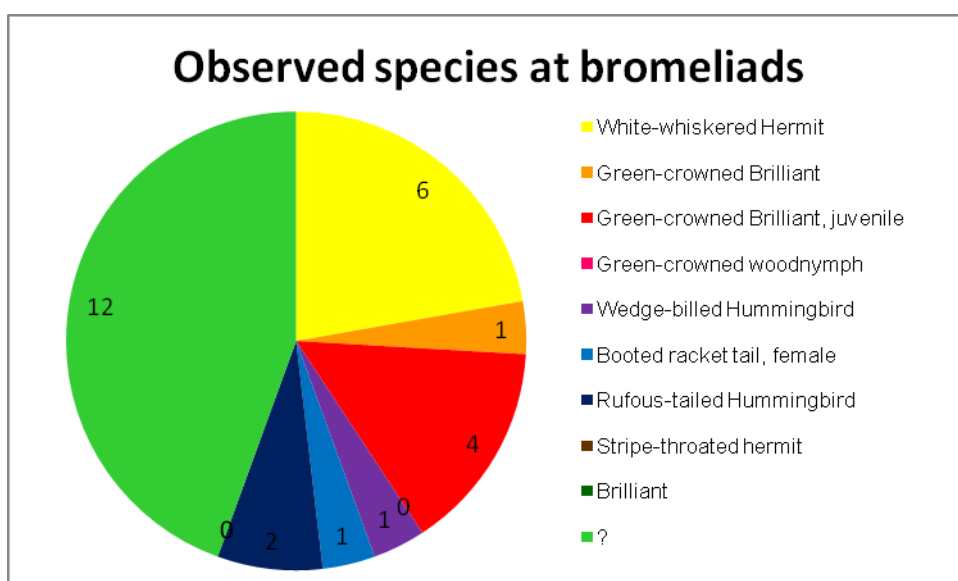


Figure 3.4: Species visiting the bromeliads

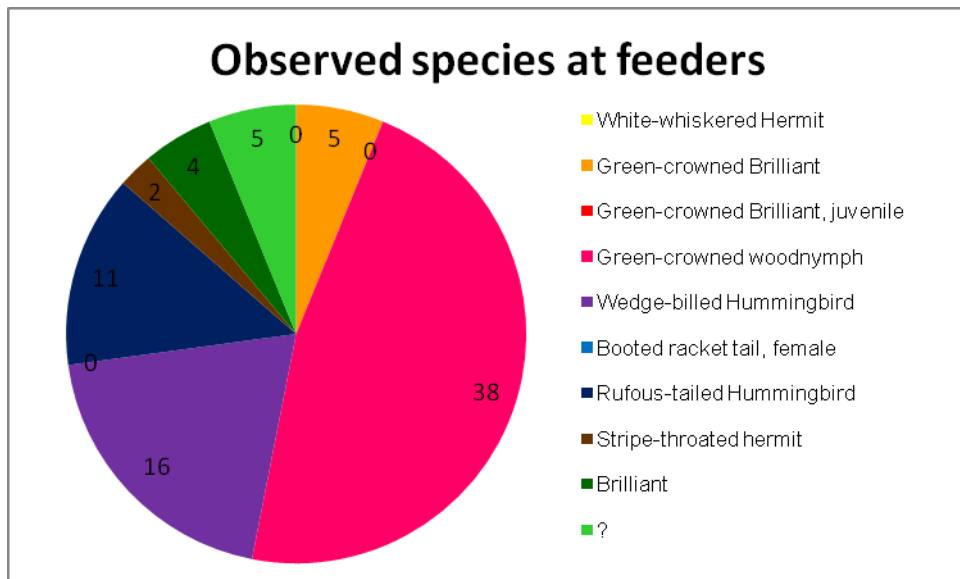


Figure 3.5: Species visiting the feeders. Probably all four Brilliants and three of the unidentified hummingbirds were Green-crowned Brilliants.



Figure 3.6: White-whiskered Hermit



Figure 3.7: Green-crowned Woodnymph, male



Figure 3.8: Wedge-billed hummingbird, female



Figure 3.9: Rufous-tailed hummingbird, male



Figure 3.10: Green-crowned Brilliant, female



Figure 3.11: Stripe-throated Hermit visiting one of the feeders

4. Discussion

Due to the low number of visitors at the observed bromeliads it's very hard to make any statements about that species of plant. To get reliable results it might be necessary to do more observations.

4.1 Possible reasons for hardly visited bromeliads

One possible reason for such low numbers of visiting hummingbirds could be the shape of the flower. The calyx is relatively long compared to that of other flowers, e.g. Rubiaceae. That isn't a problem for birds like the White-whiskered Hermit with its long, curved beak. But hummingbirds with a short beak would have difficulties in feeding at the bromeliad.

Furthermore there might be an attractive food supply with a lot of other flowers producing more tasty nectar.

Another possibility is the low number of flowers per plant. At the bromeliads one to three open flowers have been observed, mostly only one. Other plants like the Rubiaceae have heaps of flowers at one plant. Although they might deliver less energy per single flower, they probably deliver a lot more energy per plant than the bromeliad. So the hummingbird might save some energy for flying between the plants, because it does have to visit fewer places.

Last but not least some visiting hummingbirds might have been missed. Especially the bromeliads deeper in the forest were not completely visible.

4.2 Influence of feeders

At the feeders were more hummingbirds than at the bromeliads. On average a little more than 4 visitors per hour came to the feeders, while there came only 0,5 visitors per hour to the bromeliads.

The distribution of different species of hummingbirds looks quite different for bromeliads and for feeders.

The main visitors of the bromeliads, the White-whiskered Hermits and juvenile Green-crowned Brilliants, did not visit the feeders. So for this plant it does not look like the feeders are able to entice the hummingbirds away.

Interestingly the adults of the Green-crowned Brilliants hardly visited the bromeliads, whereas the juvenile ones were often seen. At the feeders it was just the other way round: the adults came, but not the juveniles.

Actually there were only a few different species visiting the feeders. It might be very interesting to observe the plants, which are visited by these hummingbirds. Most common at the feeders were Green-crowned Woodnymphs, Wedge-billed Hummingbirds and Rufous-tailed Hummingbirds.

5. Conclusion

In the Ecuadorian rainforest Hummingbirds at bromeliads with and without feeders have been observed. With about 0,5 hummingbirds per hour the bromeliads were hardly visited. At the feeders were more visitors (on average 4 per hour).

White-whiskered Hermits and juvenile Green-crowned Brilliants were most common at the bromeliads, whereas Green-crowned Woodnymphs, Wedge-billed Hummingbirds and Rufous-tailed Hummingbirds were most common at the feeders.

It does not seem like the feeders had an influence on the visiting hummingbirds at the bromeliads. But for reliable results with more data further observations need to be done.

There could be an influence on other plants. It might be worthwhile to observe the nectar sources of the hummingbirds which were common at the feeders. Nearly half of the visitors at the feeders were Green-crowned Woodnymphs. Their plants could be interesting.

6. Acknowledgements

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7. Literature

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