

Froggy Time: Population Trends in *Oophaga pumilio* and
Comparison in Size Between Females and Males in Ground
Creek on Ísla Cólón, Panamá

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Abstract

Oophaga pumilio, a type of poison dart frog, was caught and measured by their snout-vent length to determine population trends through age distribution, and to investigate whether there is a size difference between females and males. A total of 112 frogs were found and measured. The results for the former were found to be inconclusive, and the results for the latter indicated that females were larger on average than males.

Introduction

Strawberry poison dart frogs, also known as *Oophaga pumilio*, are found in rainforest habitats in Costa Rica, Panama, and Nicaragua. They require a humid and rainy habitat in order to reproduce.¹ The *O. pumilio* found in the Ground Creek rainforest on Isla Colón have a distinctive green and yellow coloring with dark spots on their backs. Females and males are differentiated through a green mark on their throats.

Oophaga pumilio grow to a size of about 17-24 mm. Transformlings are the category of frogs defined by the time at which they hatch until the time at which they are greater than ten millimeters. The next category, subadults, ranges from 10 to 14.9 mm. Any frogs greater than 15 mm are considered adults.² *O. pumilio* can reproduce throughout the year, as they need a moist environment, and the rainforest on Isla Colón has these conditions for the majority of the year.

By measuring various frogs, the age distribution of the *Oophaga pumilio* population can be estimated. We hypothesized that the population is stable because the rainforest ecosystem in which they're in is balanced and generally undisturbed, as this area is protected, which means that there is nothing to cause an abnormal increase or decrease in population.

Additionally, we investigated the size difference between female and male *O. pumilio* adults. We were interested in knowing if one sex is generally larger than the other, and hypothesized that females are larger on average because they need space to store eggs.

¹ Penner, A. (2009).

² Lahanas, P. (2022).

Materials and Methods

The materials used for this study included a vernier caliper to measure the frogs, a phone or camera to take a picture, and paper and pencil to record the data.

To find the data necessary to support or refute our hypothesis, we went into the rainforest, looking around for areas where frogs are known to be found, for example the buteresses and trunks of trees. The frogs were caught by hand. When they were caught, they were held securely by one of their back legs. They were then measured with the caliper from their rear to the tip of the head. This is called snout-vent length (SVL).



A picture was also taken to mark them because every individual frog has distinct and unique patterns, as to not have accidental repeat catches, and record their sex. To figure out the sex of a poison dart frog, we looked at their throats. When a frog is male, a green mark can be found on the throat, and when female, there is no mark.



Female



Male

The frogs were then returned to their previous location. Once they were released, the sex, measurement, and location was recorded along with the photos that were taken of the specimen.

Results

The graph forms a gaussian bell curve, skewed to the right, which indicates normal distribution among adults. The size category with the largest amount of frogs is from 17 to 17.9 mm, at 33 frogs. The graph tapers off from sizes 10 to 14.9, the range at which a frog is a subadult.

Distribution of *O. pumilio* per Size Category

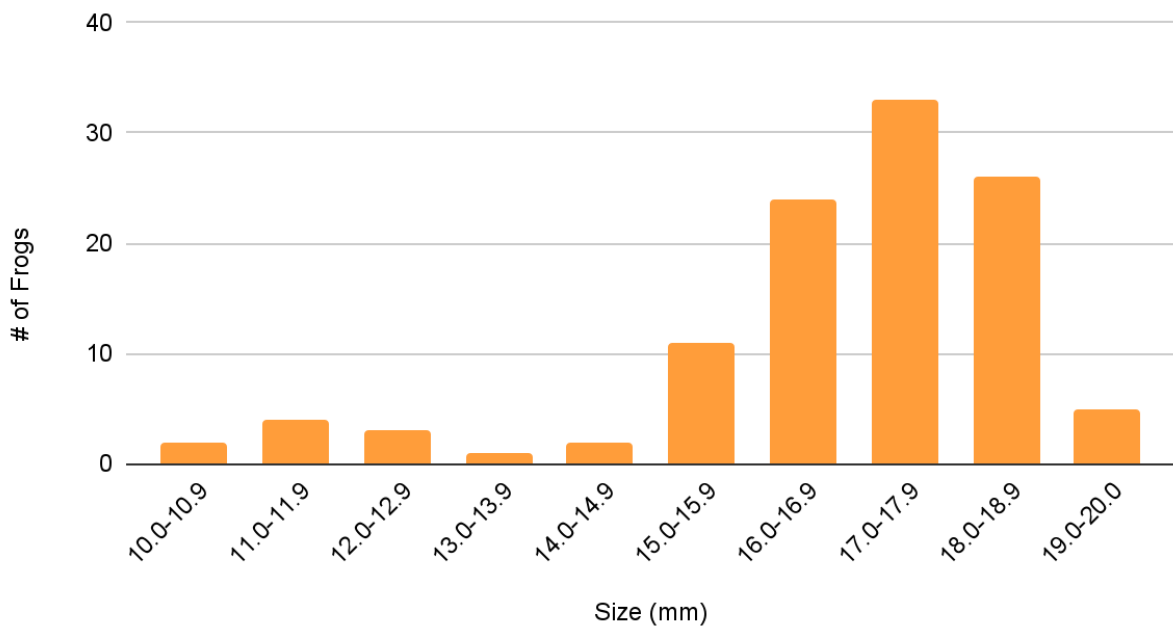


Figure 1: Number of *Oophaga pumilio* found distributed by size (mm).

Figure 2 shows that there is a substantial amount more adults than subadults and transformlings.

Population per *Oophaga pumilio* Age Category

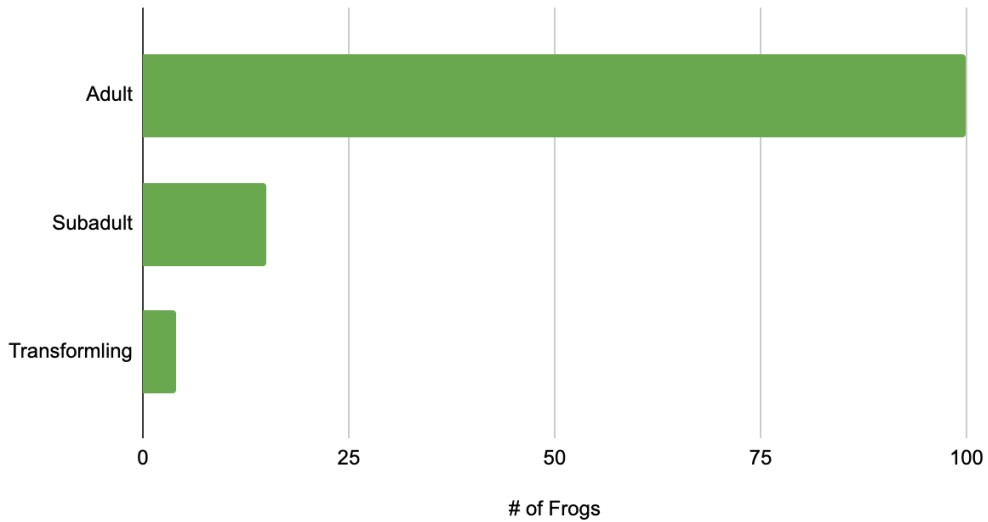


Figure 2: The number of *Oophaga pumilio* found in each age category.

In Figure 3, it can be observed that males are more commonly found between 15 and 16.9 mm, while there is a greater abundance of females between 17 and 20 mm. The trend lines created further enforce these findings.

Size of *O. pumilio* Based on Sex

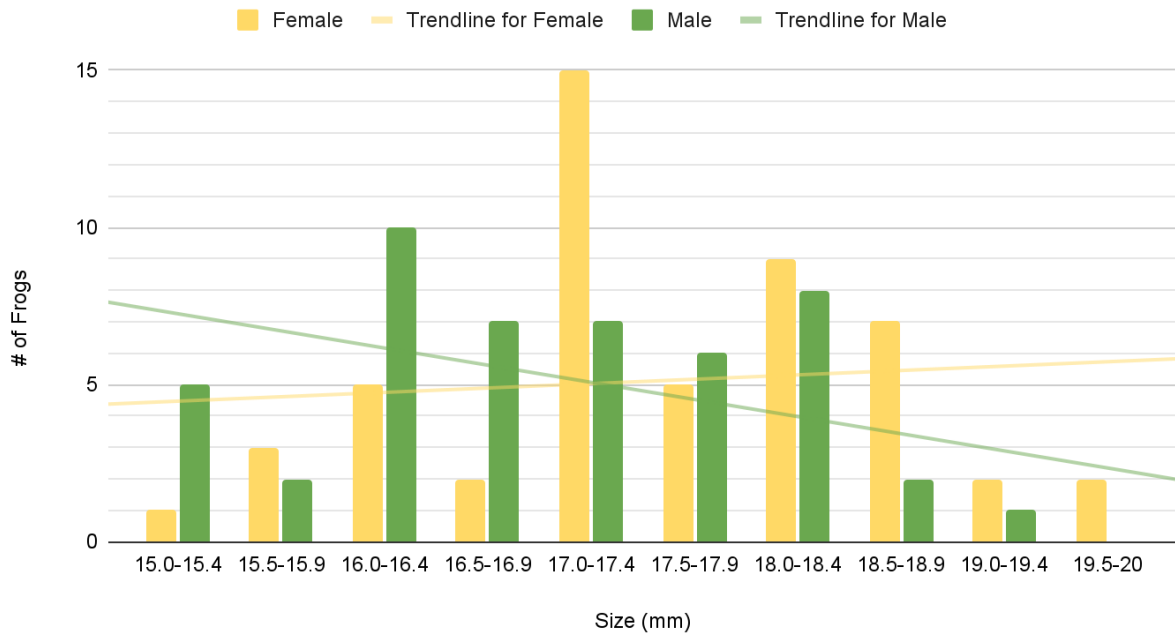


Figure 3: Comparison of size distribution between female and male *Oophaga pumilio*.

In Table 1, it can be seen that the average and median of the female *O. pumilio* is a little more than 0.5 millimeters greater than the average and median of the male *O. pumilio*. Their ranges are similar, although there were no males found above 19 centimeters. In terms of subadults their average and median is approximately in the middle of their range.

Table 1: Averages, medians, and ranges of female, male, and undefined *Oophaga pumilio*.

	Average (mm)	Median (mm)	Range (mm)
Female	17.54	17.45	15-20
Male	16.92	16.90	15-19
NA (Subadult)	12.05	11.75	10-14.1

The results found by using a t-test were that the p-value for the difference between female and male *O. pumilio* adults is 0.002. Because the result is less than 0.05, the difference is significant. This reveals that females are on average larger than males.

Discussion

As seen in Figure 1, there are more adults than subadults recorded, and no transformlings recorded. This could indicate that less frogs are being born, which in turn could mean that the population is decreasing. This is not necessarily true, due to the fact that transformlings and subadults are generally harder to find than adults, because of their smaller size. The most difficult to find were the transformlings, and the second most, the subadults. If the transformlings were found, they could not have been caught by hand, because they could be injured³. An improvement that could be made would be to develop a technique to capture transformling frogs without harming them. However, because of these uncertainties, it is not possible to know if the population is stable, increasing, or decreasing. Thus, the results are inconclusive. Though it cannot be interpreted through the data, we believe that the population is likely stable and at carrying capacity, thus restricting new transformlings from being born and growing up. We also saw more subadults than we could catch, as well as a few transformlings. Because they are so small, we could not see all of the transformlings that were near us, though there were possibly many.

The data that was collected and displayed in Figure 2 and Table 1 indicates that our hypothesis on size vs. sex was supported: females are larger than males on average. While the ranges of size were similar, the distribution of size between 15 and 20 mm showed a pattern of large females being more common in addition to small males being more

³ Lahans, P. (2022)

common, as shown through the trendlines in Figure 2. The statistics in Table 1 further support this, with the average size for females, for example, being 0.62mm larger than the average size of males. Because our sample population was so numerous, with 112 frogs in total over the course of three days, we believe that this result is reliable for the majority of the *Oophaga pumilio* population in the Ground Creek rainforest, although it is unclear whether this applies to further variations of poison dart frogs. There are multiple reasons why female frogs could be generally larger. One reason, for example, would be that females are slightly larger to accommodate the eggs they carry. A further experiment could examine the exact reasoning behind this size difference.

Conclusion

In this study, the data we gathered on age distribution among *Oophaga pumilio* was found to be inconclusive but suggestive of a stable population. Additionally, our hypothesis about female *O. pumilio*s was supported, as our data showed a highly significant difference in size between female and male frogs. Further expansion in this area of study could include studying *O. pumilio* in different locations to see if the specific environment plays a role in female and male growth. Our results can provide people with a better understanding of *Oophaga pumilio*, and how they differ between females and males.

Literature Cited:

Lahanas, P. (2022). *personal communication*.

Penner, A. (2009). *Oophaga pumilio*. Animal Diversity Web. Retrieved from https://animaldiversity.org/accounts/Oophaga_pumilio/