

Distribution of Hermit Crab Sizes on the Island of Dominica

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Abstract

Specimens of *Coenobita clypeatus*, the Caribbean Hermit Crab, were collected in order to investigate the anatomical structures and weight versus shell size. Hermit crabs were captured, weighed, and measured at Cabrits National Park on the island of Dominica. After completion of the experiment and extraction of data, a direct correlation was found between weight, shell size, and claw length. In addition, weight and claw length have a distribution with a high frequency of small individuals.

Introduction

Nestled in the middle of the Lesser Antilles, Dominica is a small tropical island covered in a vast variety of terrains and creatures. Also known as the “Nature Island”, Dominica is home to both dry and wet rainforests, which shelter twenty different species of crabs (Evans 1997). *Coenobita clypeatus*, the Caribbean Hermit Crab, is a common occurrence in the dry forests of Dominica, often living from zero to 400 meters above sea level. (Evans 1997). The “Commandants Quarters”, where the majority of crab specimens were collected, is at approximately 93 meters above sea level. The Caribbean Hermit Crab has many common names, the most prevalent being the Hermit Crab, although the Soldier Crab, Tree Crab, and the Purple Pincher are also used occasionally (Audrey 2006). This hardy land crustacean dines on natural debris and has become a popular pet in the United States due to its easy temperament (Wisnbofer, 2013).

This experiment’s purpose was to explore size distribution in Hermit Crabs and the correlations that exist between the anatomical size and shell size of a Hermit Crab. Relationships to be investigated included those between claw length (mm), shell width (mm), shell length

(mm), and weight (in grams). The team's goal was to verify that the size of the shell (selected by the crab itself) was directly proportional to the crab's anatomical size.

Materials and Methods

Upon arrival at Cabrits National Park, the team searched around the ruins, trees, and leaf litter surrounding the "Commandant's Quarters" for residing hermit crabs. *Coenobita clypeatus* are often found around leaf litter and in tight proximity with one another. Most crabs measured for experimentation were collected around the bases of trees, under rocks, or around the stone walls of the ruins. All crabs were carefully placed in a bucket. The crabs were then individually weighed using a plastic bag and a precision spring scale. We measured the length and width of the shell, and the length of the larger "fighting" claw using calipers. Several hands were required to complete the measuring process and special care was taken to avoid being pinched. Once all data was collected the crabs were released back into the surrounding dry forest in close proximity to where they were discovered.

Results

The 117 collected crabs varied greatly by sizes and weight. The average weight of the crabs was 42.4 grams, the heaviest weighing 140+ grams and the lightest being 0.3 grams (the exact weight of the largest crab was not calculated due to the weight limits of the spring scale). The average shell length was 32.87 millimeters, with the longest being 90.3 mm and the shortest 4.8 mm. The average shell width was 25.04 mm, with the widest being 82.7 mm and the thinnest 6.5 mm. The average claw length was 17.12 mm, with the longest being 55.4 mm and the shortest 4.2 mm. There was a direct correlation between weight, shell size, and claw length

(Graph 1). This was expected because the larger a crab gets, the bigger shell it will need and the larger its fighting claw will be.

When put into a Correlation Matrix we find that all correlations were significant at $p < 0.001$ (Table 1).

Graph 1:

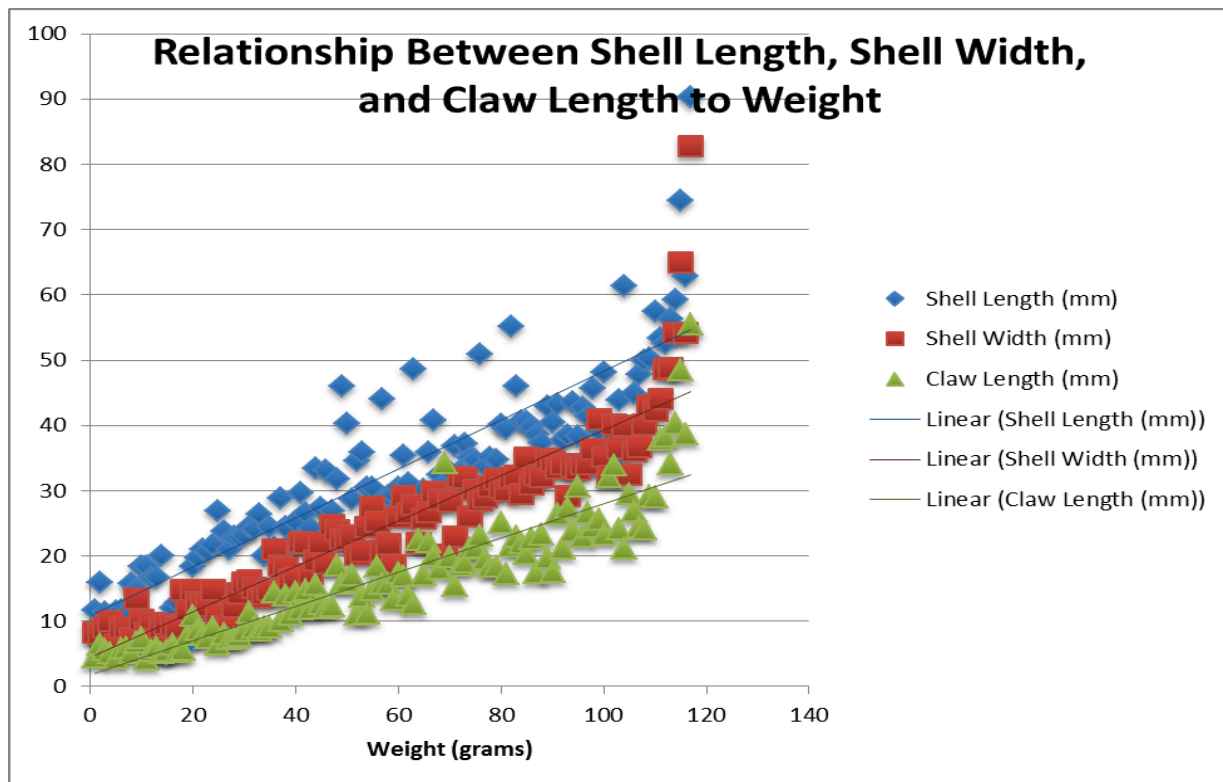
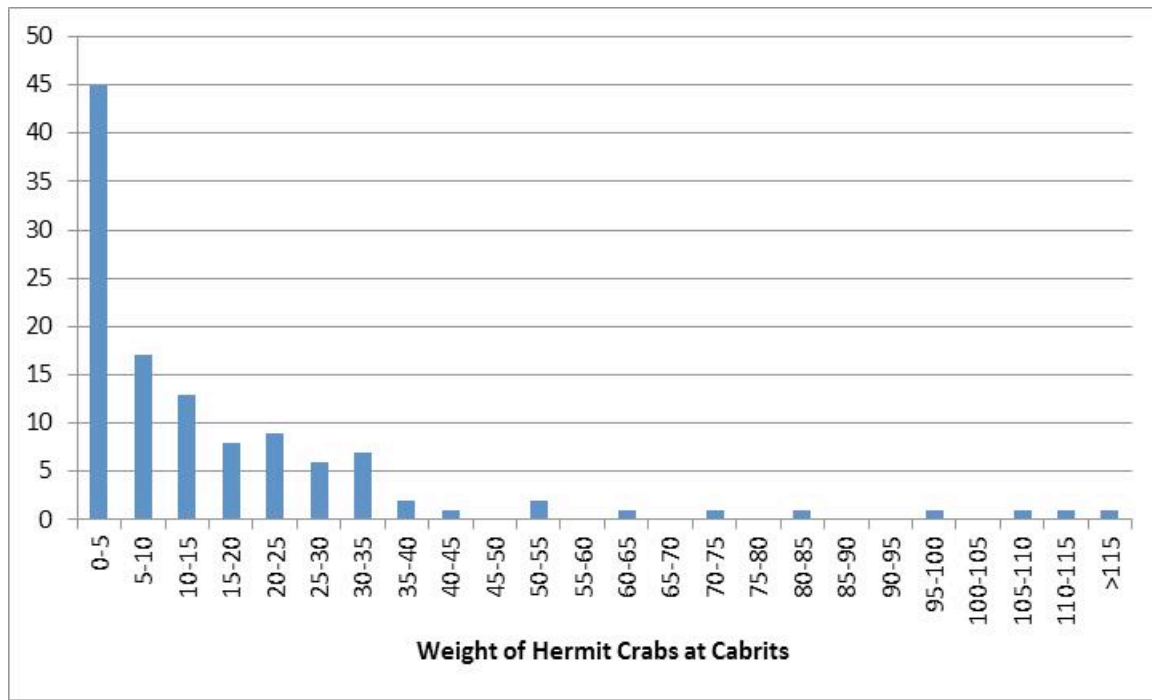


Table 1: Correlation Matrix

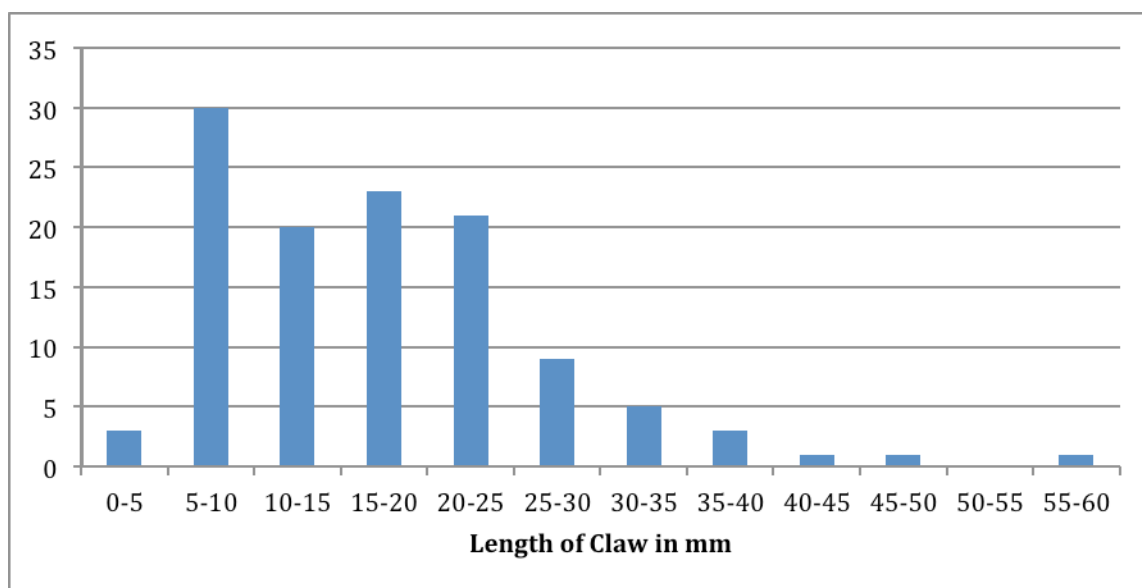
	Weight	Shell Length	Shell Width	Claw Length
Weight	1	0.83	0.90	0.88
Shell Length		1	0.93	0.87
Shell Width			1	0.93
Claw Length				1

In addition, the size-class distribution of the crabs was highly skewed, with high frequencies of very small individuals by weight (Graph 1) and a similar distribution for claw length (Graph 3) excluding the very smallest size category.

Graph 2:



Graph 3:



Discussion

Significant correlations were found between all measured variables. As one variable increased, be it claw length, shell length, shell width, or weight, the other factors almost always increased. This finding supports the prediction that as hermit crabs grow in size and weight, they will find an appropriately larger shell to house them. No hermit crabs without shells were found, which suggests efficient survival instincts in these animals. For possible future projects, surveying crabs on multiple locations across the island could prove enlightening. Does the elevation, environment, or distance from the sea affect the size of the crabs? Would the distribution of size be wider, or more closely knit?

While graph 2 shows the distribution of hermit crab weights, graph 3 shows the distribution of claw length. Graphs 2 and 3 show that there is a very high percentage of small individuals, suggesting high mortality for small individuals. Because of the large numbers of small sized crabs represented in both graphs, small hermit crabs may be more easily targeted by predators or possibly there are health problems associated with small size that can lead to mortality.

Another interesting factor to investigate could be the geographical distribution of crabs itself within a selective radius. Given the predominance of crabs gathered around trees as opposed to random distribution among the leaf litter, this might prove to be an enlightening study.

Possible room for error includes the loss of limb during the capture of crabs. Over one hundred hermit crabs were placed within the same bucket for an extended period of time, and afterward a small number of hermit crab legs were discovered. This almost definitely lessened

the weight of some hermit crabs, thus skewing results slightly. Other possible errors that may have occurred could be the replacement of an already measured crab, and therefore the occurrence of a double measurement. Careful experimental procedures, however, make this unlikely.

References

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