INVESTIGATING ARTHROPODS

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Abstract

During a biota survey in 2012 arthropod populations were abnormal in E.S.S.R.E. Site 3 and Site 4. It was discovered that the Isopods and Diplopods populations were unusually high given the unusually low levels found of their traditional predator the chilopods. We hypothesized that the chilopod's predator, araneae, were killing off the chilopods. After researching further on the araneae, we set up an experiment that focused on the actions of the araneae. Three pitfall traps were made and set out in both Site 3 and Site 4. We set traps each day for 24 hours for three days. Trapped arthropods were euthanized and identified each day. Our hypothesis was not supported.

Introduction

One of the common relationships in all ecosystems is that between predator and prey, and a typical example from the arthropod kingdom is that between chilopods such as centipedes and their common prey from the isopod and diplopod classes (sow bugs and millipedes). As part of this relationship, in the cycle from predator to prey, when the number of prey increases, there is normally also a corresponding increase in the number of predators (Trites, n.d). However, the 2012 E.S.S.R.E Biota Survey (E.S.S.R.E, 2012) revealed that in E.S.S.R.E Sites 3(N 39.35797; W 076.63836) and 4 (N 39.35733; W 076.63840), there were statistically higher numbers of isopods and diplopods than in E.S.S.R.E Sites 1(N 39.35794; W 076.63977) and 2(N 39.35740; W 076.63893) but not the expected corresponding statistical increase in chilopods (E.S.S.R.E, 2012). When examining the anomaly further, we realized that one of the chilopods common predators are members of the class arachnida such as spiders (Orkin, 2012).Therefore, we hypothesized that the unexpectedly low density of centipedes in these sites was due to being hunted by their predator the spider, preventing these chilopods from hunting the numerous sow bugs and millipedes found there.

Methods and Materials

Six, 32 ounce plastic food containers with the height of 13.4 cm and diameter of 11.5 cm were prepared as traps using boiled corn syrup. 300mL of corn syrup was boiled for 6-8 minutes, stirring occasionally, and then left to sit for 60 seconds to cool and thicken to make the bait solution. Once cooled, 50 mL of corn syrup was poured into each 32oz plastic food container. A paint brush was then used to paint the sides of the container with the bait solution. When all six containers were painted, the metal covering made out of the 1.3 cm^2 metal mesh, each measuring

14 sq cm by 12.5 sq cm was placed over the top of the 32oz plastic food container and folded at the corners. A rubber band was then tied around the four corners, to prevent excessive movement.

Six locations were chosen to test for arthropod density in E.S.S.R.E Site 3(N 39.35797; W 076.63836) and 4 (N 39.35733; W 076.63840). Two locations in E.S.S.R.E Site 3 were chosen based on ample plant life for shade, and previous research indicating high levels of arthropod activity in that location within the site(E.S.S.R.E, 2012). One additional location in E.S.S.R.E Site 3 was chosen with no plant life for the negative control. Two locations in E.S.S.R.E Site 4 were chosen based on ample plant life for shade, and previous research indicating high levels of arthropod activity in that location within the site(E.S.S.R.E, 2012). One additional location in E.S.S.R.E Site 4 was chosen with no plant life for the negative control.

Three holes were dug in each site, including one for negative control, with a width of 11 cm and a height of 13 cm. Then each trap was carefully placed inside the hole so that the metal covering was level with the surface of the ground. After that the dirt was patted around the trap to keep it secure and prevent it from moving. The traps were allowed to sit overnight for 24 hours before retrieval. After they had been retrieved and brought inside, 300 mL of water was added to each one. They were then mixed with a stirring rod for 60 seconds or until the bait solution had been completely dissolved into the water. Each container was filtered into 1000mL beakers using a standard coffee maker filter. When the filtering process was finished, the insects remaining in the funnel were euthanized. After the euthanization was complete, the filters were unfolded, laid on a flat surface, the arthropods were counted and identified. Traps were set and counted each day for a total of three days.

Results

Averages of Site 3 and Site 4

Arthropods	Site 3	Site 4	Site 3 control	Site 4 control
Formlcdae	181	111.1667	37.66666667	0
Araneae	0.166667	4.333333	1	0
Geophilomorpha	0	0.5	0	0
Gryllidae	2.333333	2	5	0
Coleptera	0	0	0	0
Isoptera	0	0	0.333333333	0
Acarl	0.666667	0	0	0
Armadillidildae	0	0	0.666666667	2.333333333
Lumbricina	0	0	0	0.333333333
Culicidae	0.166667	0.166667	0	0
Orthoptera	0	0.5	0	0
Lepidoptera	0.166667	0	0	0

Figure 1 (Above): This table shows the averages in site 3 and site 4 and their controls

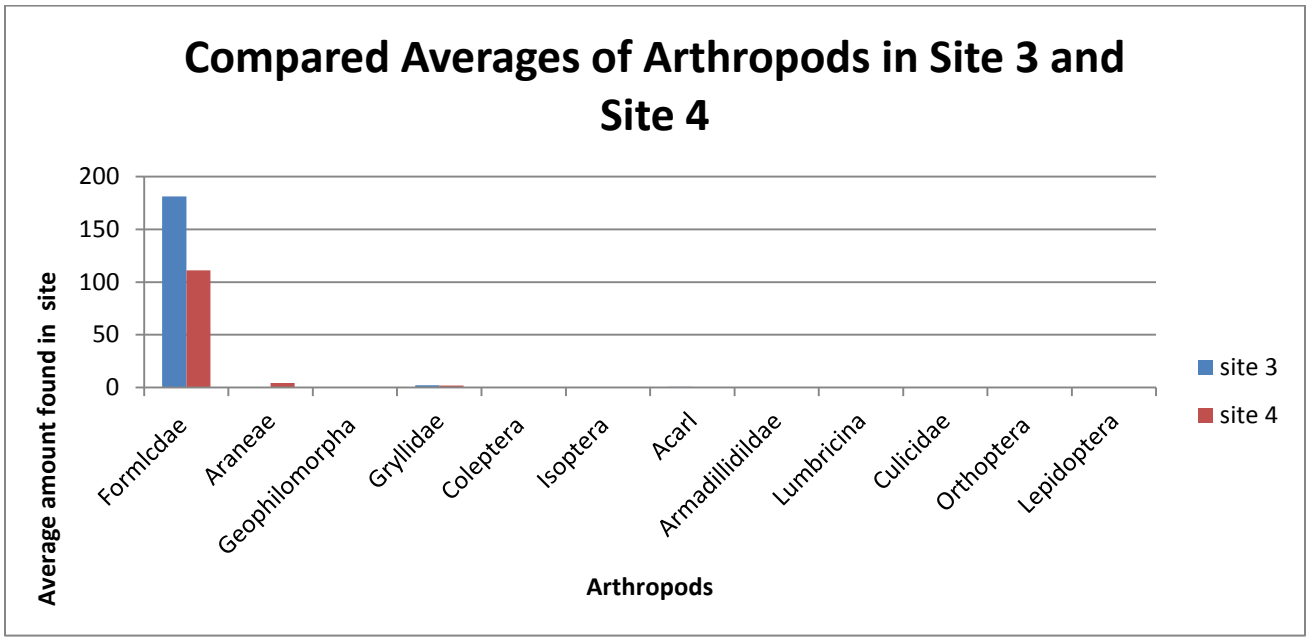

Figure 2 (Above): This graph compares the average of each arthropod in E.S.S.R.E Site 3 control and Site 4 control. The averages go from greatest to least, starting with Formlcdae (the class of ants) and ending with Lepidoptera (the class of butterflies and moths). It shows that there are no Araneae (the class of spiders) in the control so of site 3. It also shows that on site 3 there are more ants than in site 4.This graph contributes to the process of confirming of denying the hypothesis of this experiment.

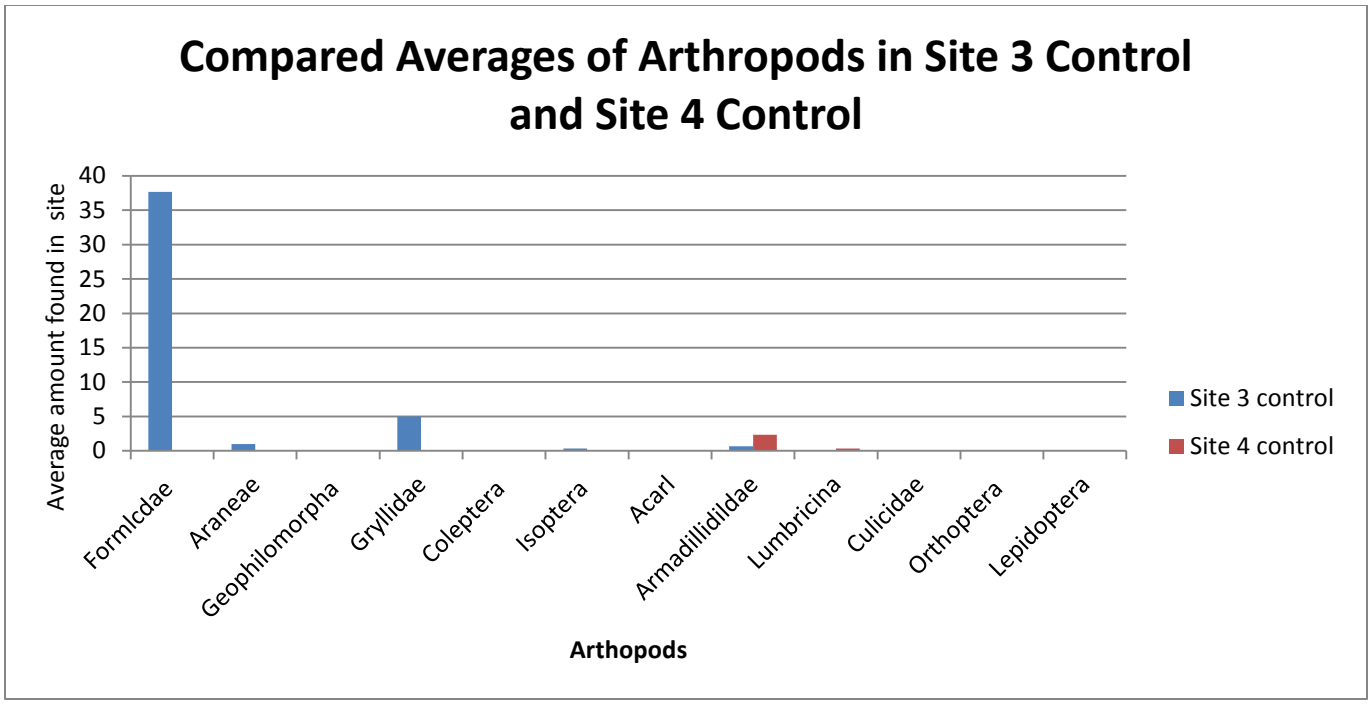

Figure 3 (Above): This graph compares the averages of the arthropods in E.S.S.R.E Site 3 control and Site 4 control. In this graph, the class of ants (Formlcdae) is the arthropod with the highest average, but only in site 3.There are no ants in site 4's control shown on this graph. This graph has the information needed to confirm or deny this experiments hypothesis.

Discussion

We had originally hypothesized araneida were the reason for the low levels of chilopods found in E.S.S.R.E S Sites 3 and 4. But as figures 1 and 2 clearly indicate, almost no araneida were found in these sites either in the test plots or the controls. Hence, our hypothesis remains unsupported. However, there was a very large statistical difference between the average amount of formlcdae and the other eleven arthropods groups that were found in E.S.S.R.E Sites 3 and 4. Our findings suggest that the reason for low levels of chilopods may be due to the high levels of formlcdae in each site. The formlcdae is a predator of the centipede, and they are known for their aggressive nature (Modlmeier, 2010). Hence, it would make sense to test for formlcdae in the future as they are very territorial and may be the more probable cause of the low levels of chilopods in sites 3 and 4.

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Acknowledgements

We would like to thank the following sponsors for making this research possible; Human Capital Development, Inc.; Larry & Kathy Jennings; Dr. Holliday Cross Heine.