WHICH ECOSYTEM SUPPORTS THE LARGEST POPULATION OF DRAGONFLIES? OBSERVATIONS IN NATIONAL AREA LAB TEACHING PARK

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April 16, 2016

**Abstract**

Dragonflies choose their home ranges based on prey availability and basking opportunities. Dragonflies can be normally found around wetland areas because of high prey availability, mosquitoes. Why, then, are they observed in terrestrial ecosystems, such as forests and grasslands, and which ecosystem will adult dragonflies prefer? Our hypothesis was that if food and basking are driving factors of the population densities of adult dragonflies are measured across a grassland, wetland, and forest, then we will find larger aggregations within grasslands. The grassland should have a large prey density as well as a prime opportunity for basking. We observed/ counted adult dragonflies on three separate experimentation days, in three different transects, one located in each of the three ecosystems, for every day. We collected the smaller insects in a modified fly trap (without an attractant) that was positioned in a prime area of each ecosystem for a total of 7 days. We found that the wetland had the most amount of dragonflies observed, and the grassland had the most prey captured. The forest could not support a dragonfly population because food availability was low as well as basking opportunities. Our hypothesis was incorrect, and dragonfly congregations were mostly found in the wetland area.

**Keywords**

natural pest control, anispotera, mosquito consumption, basking insect, densities in ecosystems

**Introduction**

Dragonflies are needed in ecological systems because as an adults they consume pest insects such as mosquitos, and as a nymphs they also consume harmful aquatic organisms. Dragonflies are also important organisms in the transference of pollen when they move around from flower/plant to another when bask. They are known as an indicator species, which means that they are frequently studied in efforts to examine water quality. This is especially important in protected areas such as The Everglades.

In *Associations of dragonflies (Odonata) to habitat variables within the Maltese Islands,* the article describes how dragonfly breeding is affected by vegetation, environment and structure. This relates to our experiment because there will be three different areas we are observing dragonflies, and normally many dragonflies can be found in breeding areas such as a grassland or wetland area. We hypothesize that we will find the largest dragonfly population in the grassland area because of the availability of food and basking opportunities.

Although we hypothesize that grassland will have the largest population of dragonflies, we still speculate that the wetland will have considerable amount of dragonflies as well. Wetlands will be prime areas where dragonflies mate, but during this spring season many juvenile dragonflies are emerging and needing to mature into adults.

**Methods**

**Procedures:**

**Overview**: My team and I conducted our observational experiment in NATL, at the University of Florida, to count the individual dragonfly populations in the three different ecosystems: a grassland area (old field area), a forest area, and a wetland area. We compared the amount of adult dragonflies (Odonota anisoptera) observed in these areas and the amount of mosquitos (a combination of anopheles, coquillettidia, culex and culiseta) and smaller insects (families podidae, Sciaridae, and Mycephilidae) . We collected the smaller insects in a modified fly trap (without an attractant) that was positioned in a prime area of each ecosystem for a total of 7 days. We observed/ counted adult dragonflies on three separate experimentation days, in three different transects, one located in each of the three ecosystems, for every day.

We started by choosing our individual locations for each ecosystem type. We used a spinner iPhone application to randomly select a direction one of us will walk away from each other to select a suitable area that matched the ecosystem type we were currently testing. We decided to walk for at least 20 meters, but it could be further depending if we could find a suitable location. Once we were in the area for observational testing we each sectioned off a10 m^2 X10 m^2 area with the brightly colored rope and flags. The rope was to establish a solid square outline where we could clearly count. These areas were relatively far from each other so that we would not double count the dragonflies entering our own transect. We started at the same time based on the time we completed sectioning off our area. We counted as many adult dragonflies as we saw for exactly 10 minutes. We will only count the dragonflies that fly directly over or in the sectioned area, not near or around.

Each ecosystem had distinct characteristics. The forest areas had a large tree canopy over the dense shrubs on the bottom. It was difficult to move around this area because the undergrowth was so dense. The grassland, or old field, areas had waist high grass, with little to no trees in the sectioned areas. The wetland/marsh areas had few trees with a few inches of water. Any more water in the wetland it would constitute a lake.

**After area selection:** We used a hand clicker to make sure we were counting the individual dragonflies correctly and accurately. We did the same counting procedure on the other environment types on the same day. Since there were three members of the all observed dragonflies at the same time in our own transects. We did this on each of the different ecosystems for every observational testing day. To eliminate as much variables as we can we will conducted the experiment a total of three different dates and on similar weathered days. We conducted this experiment on three select days at approximately 5:00 PM- 7:30 PM.

As well as counting the population of dragonflies in these areas, we counted amount of mosquitos that are caught by mosquito/fly catchers (insect tape trap). The insect trap was modified with a plastic netting so that larger insects, such as other dragonflies or butterflies, would not get caught. The netting had small enough holes where only pest insects such as mosquitoes or gnats could get stuck. We set up three mosquito traps and positioned them in key areas inside each ecosystem type. Since we did not use attractants to manipulate our experiment, we left the mosquito/fly traps for an extended time of 7 days. We collected the mosquito/fly catchers around 8 pm of the last day and counted all the insects that could be considered food for dragonflies.

**Calculations:** Once we were done observing the dragonflies and counting the mosquitoes (that were stuck on the trap), we calculated averages and means for each ecosystem and for each day. We created double bar graphs with a standard error bar. On the bar graph we had the x- axis as the habitat and the y-axis as how many dragonflies and mosquitos were counted.

We calculated the standard error, for the observed adult dragonflies, using the following steps:

Step 1: Calculate the mean (Total of all samples divided by the number of samples).

Step 2: Calculate each measurement's deviation from the mean (Mean minus the individual measurement).

Step 3: Square each deviation from mean. Squared negatives become positive.

There was definitely errors in our dragonfly counts because there is no way to know that we counted 100% of the dragonflies that were in the sectioned area.

We used an ANOVA test to determine whether there are any significant differences between the means of the dragonflies observed and the mosquito population counted.

Our experiment is uncontrolled so there is not a control variable. This was a natural experiment.

**Results**

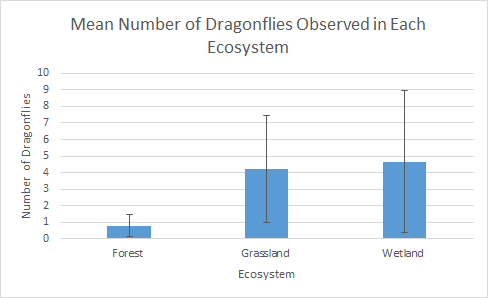


Figure 1.1- This table shows the mean of dragonflies counted at the end of the three observational testing days. The forest ecosystem standard error is 0.67. The grassland ecosystem standard error is 3.23. The wetland ecosystem standard error is 4.30.

Figure 1.2- This graph shows the total amount of dragonflies and prey collected at the end of the all of the trial periods.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Groups | Count | Sum | Average | Variance |
| Forest | 9 | 7 | 0.78 | 0.44 |
| Grassland | 9 | 38 | 4.22 | 10.44 |
| Wetland | 9 | 42 | 4.67 | 18.52 |
| R^2= 0.83 |  |  |  |  |

Table 1.1- This is the total number of adult dragonflies counted. After a linear regression was calculated with the number of dragonflies, we analyzed r-squared.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Source of Variation | SS | Degrees of freedom | MS | F | P-value | F critical value |
| Between groups | 81.55 | 2 | 40.78 | 4.12 | 0.03 | 3.40 |
| Within groups | 235.11 | 24 | 9.77 |  |  |  |
| Total | 316.67 | 26 |  |  |  |  |

Table 1.2- The table shows the values calculated in an AVOVA test.

**Discussion**

Our hypothesis was that we would observes a larger dragonfly population in a grassland area based on food availability and basking opportunities. Our results do not support our hypothesis. In Figure 1.1 we can see the mean amount of dragonflies in the wetland area is greater than the means of the grassland/old field and the forest area. The standard error is small in the forest because all the dragonfly values were close to each other. There are higher standard errors in the grassland and wetland because there was a greater variation in the number of dragonflies we observed. In Figure 1.2 we can see the relationship between dragonflies and prey captured in each ecosystem. We can see that there is a strong correlation to the amount of prey capture in the wetland and grassland areas and the dragonflies observed; the more prey the more dragonfly population observed in the area.

In Table 1.1 we see that the wetland has the highest variance and this could be because on each observational testing day dragonflies could have been congregating to grassland areas or wetland areas depending on the weather of the day. We counted the number of insects in the bug traps and did a linear regression with the number of dragonflies to get r-squared. The higher the r-squared the better fit for data. Essentially, our r-squared value accounts for ~83% of the variance we observed in the data. We find more dragonfly population soon after it stops raining because mosquitos thrive in very humid settings. The same can also be said in the grassland area because dragonflies might congregate in other locations that might have had better sun exposure. In Table 1.2 we calculated that our p-value is 0.3 meaning that the data is significant. The p-value was calculated using an ANOVA test.

Our rejected hypothesis leads us to discuss how another new testable hypothesis could be made. We most likely have to change the experiment for different time of the year, or different time of day and we might have the desired evidence to support our hypothesis. *In Landscape ecological networks are successful in supporting a diverse dragonfly assemblage* describes how dragonflies behave in certain environments, especially environments with water. They found adult dragonflies can be commonly found in wide rivers. This is exactly what we found. Most dragonflies were observed in the wetland area.

The key implications of the study are that dragonflies will congregate normally in wetland areas. This is important because the more studies done on dragonfly behavior, the easier it will be to collect dragonflies for water quality analysis.

**Acknowledgements**

I’d like to acknowledge my team, Lydia Milsark. Timothy King, as well as our TA Tongyi Huang.

**Literature Cited**

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