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Distribution of Fish Species in Cedar Lake

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Introduction

With over 13,000 described species of freshwater fishes, diversity within aquatic systems can vary extensively. Small changes in the diversity of fish species within an ecosystem will modify processes within the ecosystem such as community decomposition and metabolism. Recent analyses indicate that actual species diversity within small, shallow ponds may be higher than previously thought. Fish species distribution will differ based on location within the aquatic system relative to the species' position in the trophic web.

We will measure both quantitative and qualitative differences among species across different regions of Cedar Lake, expecting to find a decrease in both species diversity and total number of fish as the depth increases. We will count the number of fish species and the total number of fish at each depth and use t-test analysis to determine if depth influences fish diversity. Our results will help us understand the different roles which fishes play in an aquatic ecosystem.

Hypothesis

We expect to find a decrease in both species diversity and total number of fish as the depth increases.

Methods

Field Sampling

- Over the course of two weeks we set traps around the lake. These traps were set at locations with different water depths.
- We checked the traps the day after setting them and each day for a week and then counted the number of fish from each location, taking note of the species diversity at each location.
- We took the data from each location and compared it with the data from the other locations in order to determine which spots have the largest and smallest total number of fish, which have the most species diversity, and if a pattern of distribution can be discovered.
- We used statistical analysis to determine if larger sections of the lake, each containing several traps, have significantly different distribution and species diversity.

Statistical Analysis

- We calculated the average number of fish caught per day in each trap.
- We then used t-tests to determine if some traps had significantly different averages.
- We found the average number of fish caught per day for all traps at certain depths. Again, we used t-tests to determine if there was a significant difference in the average number of fish caught at different depths.

Results

Traps around the perimeter of Cedar Lake:

Species:

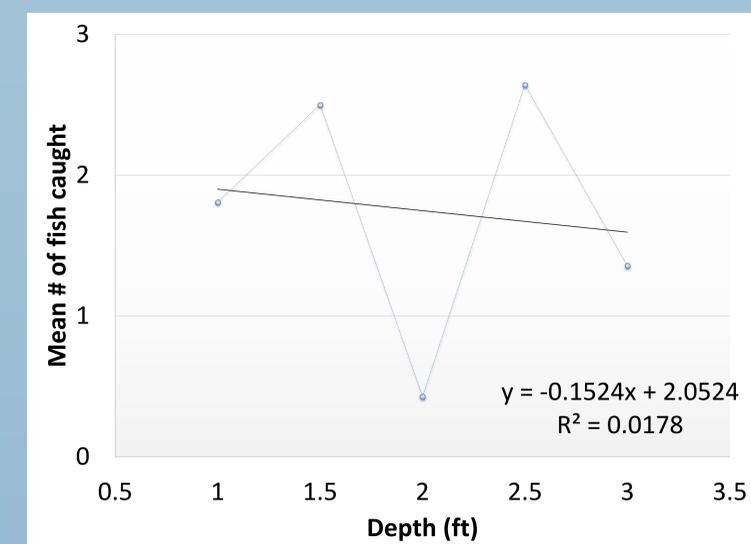
- We caught only one species of fish, the bluegill.
- We also caught several crawdads, but did not include them in our data.
- The fish that we caught were in early developmental phases, and were typically quite small.

Number of fish:

- On average, the greatest number of fish caught per day was at a depth of 2.5 feet.
- There was a significant difference between the number of fish from 1.5 to 2 feet, as well as from 2 to 2.5 feet (p-values = 0.017 and 0.0047, respectively)
- There was not a significant difference between the number of fish at 2.5 to 3 feet (p-value = 0.06)
- There also was no significant difference between the number of fish at 1.5 feet and the number of fish at 2.5 feet (p-value = 0.46)
- There was no significant difference between the number of fish at 1 foot and at 3 feet (p-value = 0.19)

Traps in the center of Cedar Lake:

- We set traps in the center of Cedar Lake for two days instead of the full week due to weather limitations.
- The traps did not yield a significant amount of data, but we did notice a trend of catching more fish in the traps set at deeper depths such as 6 or 8 feet, rather than the traps at 2 or 4 feet in the center of the lake.



| Sample date | Sample point | Depth | | | |
|-------------|--------------|--------|--------|--------|--------|
| | | 2 feet | 4 feet | 6 feet | 8 feet |
| 4/9/2014 | A | 0 | 0 | 0 | 7 |
| | B | 1 | 1 | 2 | nd |
| | C | 0 | 0 | 0 | nd |
| | D | 0 | 0 | 2 | nd |
| 4/10/2014 | A | 0 | 0 | 0 | 1 |
| | B | 0 | 0 | 0 | nd |
| | C | 0 | 0 | 3 | nd |
| | D | 0 | 7 | 2 | nd |



Conclusions

- There was no consistent trend that the number of fish followed as the depth of water increased, other than a significant increase in the number of fish when the depth dropped from 2 to 2.5 feet.
- The number of fish did not tend to decrease as the depth increased and depth described little of the observed variability ($r^2 = 0.02$).
- We found that in the center of the lake we trapped fewer fish close to the surface as compared to those caught at greater deeper traps
- We also noted that the size of the fish inhabiting the bottom of the lake were smaller. We expect that this may be a behavioral aspect of the small fish seeking refuge from predation that may occur in the shallows. This supports the second part of our hypothesis.
- Our data was affected by the fact that many fish will not come out till later in the season, as well as the fact that the fish in Cedar Lake were put there by the University.