Correlations between macroinvertebrate populations and phosphates/nitrate levels in the Bronx River

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ABSTRACT

The results seem to support the hypothesis in that there was a correlation between higher levels of pollutants and lack of EPTs found in the different sites. The nitrates and phosphates found in particular tended to be found in higher amounts repeatedly in the same area and in small amounts the same. The areas where phosphates were found to be abundant were located with streams that moved slowly through a part of the garden (or zoo), the reason for this is because rain probably caused the phosphates and nitrates in the fertilizer put into the soil to run off into the stream. Nitrates have the same general reasons for being in the water.

DISCUSSION

The pH’s found also varied slightly from location to location. The Bronx River had an average pH of 7.1. Two Lakes and the Forest Stream had slightly lower pH meaning they are more acidic and the Zoo had the highest average pH at 8.5 meaning the water was basic. The Bronx River water was found to have a pH very close to 7 this is likely because the dissolvant in the water were to diluted by the massive amounts and relative (to the other streams looked at) speed were found in. The other two locations in the Garden (Two Lakes and the Forest Stream) were found to have slightly acidic water. The Zoo outlet was found to have slightly basic water and has a pH of 8.4 this is most likely because the water run over a bed rock of limestone before running through a ceramic pipe thus dissolving into the water raising the pH. Ammonia levels in the water were also found, and not only found to be common in the Twin lakes in the other three locations it was almost nonexistent. The macroinvertebrates found and the amounts of them also differed from location to location. The Bronx River had both the second highest amount of macroinvertebrates found and was the only location to have EPTs present, there were a few damselfly larvae found. Twin Lakes had the most of any locations found and had the second most diversity after the Bronx River. The Forest Stream had very low diversity and simply contained a lot of amphipods, isopods and planaria. The location in the Zoo was lacking in almost everything and had very limited amounts of every species, only Scuds, Isopods, and Planaria were really found. In every location the two most commonly found species, amphipods (scuds) and isopods (sowbugs) were found and in general in huge amounts. Planaria were often found in several locations and as with the two previous were often found in large amounts. The EPT species of damselfly, stonefly, and caddisfly larvae were all vacant in the locations. The reason for the lack of diversity in amphipods and isopods is not clear. One species the Damselfly larvae was ever found in any of the locations and on the Bronx River the location being the Bronx River. The most likely reason for this and being true is the fact that the Bronx River had the lowest amounts of pollutants and also had the fastest moving water. The reason that the speed of the water affects what is found is that the faster the water the more dissolved oxygen found in it and EPT species (more than other macroinvertebrates species) require a lot of dissolved oxygen to survive.

INTRODUCTION

One system of checking the health of a river that researchers often use is monitoring leaf packs. Leaf packs, as defined by the Stroud Center(http://www.stroudcenter.org/opn/) are mesh bags of 30 grams leaves put into a river, or other body of water, to sit for 3 weeks. Over this period macroinvertebrates colonize the package due to the fact that they will be attracted to the safe environment and the abundance of food within. After the 3 weeks pass the leaf packs are removed from the body of water and the macroinvertebrates within counted and identified. The macroinvertebrates are categorized based on their pollution tolerance, the 3 least resistant are called the EPTs (Ephemeroptera, Plecoptera and Trichoptera) are macroinvertebrates that have gills that are outside of their body and thus pollutants hurt them more. Based on the amount of EPTs as a percentage of the leaf pack a quality assessment can be done, the higher the EPTs the better the water quality.

For this experiment the populations of different macroinvertebrates species is to be correlated with different amounts of 3 dissolvents found across 4 locations in the Bronx River watershed. The dissolvents that were tested were nitrates, phosphates, and ammonia.

The significance of the different chemicals and pH levels in the water is that they all have been proven to have an effect on aquatic life and in lakes and rivers around the world. Having high levels of pollutants in the water has two major impacts.

MATERIALS AND METHODS

1. Locations were chosen that were viable for placing leaf packs and allowed by the New York Botanical Garden. Locations were selected where there was a shallow amount of water (less than a foot) and the water is not running very fast and having a place for the leaf packs to be attached.

2. Leaf packs: ten grams of the three most dominant trees in the area were placed in mesh bags. A brick with the bag attached was attached to a stable object overlooking or next to the body of water that the bag was going to be put into.

3. Two bags were placed at each location this was repeated four times for each of the four locations as there were two bag groups put twice into the same location with two weeks staggered between them.

4. The packs were then tested and the different macroinvertebrates were removed and identified.

5. Tests were done to find the pH, nitrates, phosphates, and ammonia levels in the regions the pH had strips that were put into water and then allowed to sit for one minute and then the pH was recorded. The phosphates were tested using CH4Mets Kit Phosphates K-6510, after the test was done the amounts of phosphates were recorded. N03 and N02 were tested with the LaMotte Insta-Test Analytic Nitrite & Nitrate. Ammonia was tested with the Sienty Q Mardel "Ammonia Test Strips" Ammonia indicator kit.

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7. Results: The results for this experiment were done to find the pH, nitrates, phosphates, and ammonia levels in the regions the pH had strips that were put into water and then allowed to sit for one minute and then the pH was recorded. The phosphates were tested using CH4Mets Kit Phosphates K-6510, after the test was done the amounts of phosphates were recorded. N03 and N02 were tested with the LaMotte Insta-Test Analytic Nitrite & Nitrate. Ammonia was tested with the Sienty Q Mardel "Ammonia Test Strips" Ammonia indicator kit.

8. In conclusion it can be seen that there is a correlation between the different amounts of pollutants in the water and the amounts of macroinvertebrates found in the water. From the data it can also be seen that the dissolvant NO3 seems to have the most effect on the species found as it was only ever found in the Zoo locations which was also the most devoid of life. This also shows that pH has an effect on the species found as the Zoo was also the only location with a significant difference in the pH.

ACKNOWLEDGEMENTS

I would like to acknowledge many people for their help through my experiment. First of I would like to thank Mr. Ward and Ms. Jesus Anthony for helping me through the process of working in the New York Botanical Garden. I would also like to thank my teacher Dr. Markiewicz with her throughout this entire process. Lastly I would like to thank my friends and family for often helping me with the many hard parts of this work, mainly among these are my mother, father, and brother Jared, and my friend Zayd Mohammed.