Algae Spirits

Cleaning The Harbor:

A Method to Check the Mess

(http://www.plantedtank.net/forums/120-aquascaping/451449-bearded-algae-tank.html)
(A specimen of chlorophyceae, bearded algae)

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Summary

There are many species from algae in New York's harbor that act as bio-indicators. Samples will be collected from various points around the Estuary. Genetic tests will be run to identify their species. Among the techniques performed will be DNA extraction, amplification, separation, sequencing, and bioinformatics.

Introduction

When hearing many people's thoughts on the Hudson River, people believe that the Hudson River, along with all of the other New York water bodies are contaminated and very dirty, disgusting and lifeless. However, while there are many places in New York that are like the Gowanus Canal and the "poop wave", the actual water quality of the whole New York estuary is healthy and very beneficial to many creatures. In fact, from all of the water quality collected from the New York Harbor School's Marine Biology Research Program (MBRP) and the Harbor Seals, the results show that the pH, the Dissolved Oxygen, the Ammonia, Nitrates, Nitrites, Salinity, and all other tests to check how healthy water is, were suitable to many specimen of both creatures and plants when compared to other places that have those species in quantity. There are many species from algae to fish in New York's harbor, (contrary to popular belief) that was found through the sampling that students collected from all over the estuary, such as the East River, The Buttermilk Channel, Pier 101, The lower Manhattan area, and places as far off as Far Rockaway. From these samples, however, it is found that the goal of the present study is to find how the algae itself can identify and actually help see how the estuary has cleaned itself more, or just fallen to the abyss of filth and garbage that people have depicted the city's water to be.

Commented [1]: I agree, I love fishing off the pier! I caught many striped bass, groupers and bluefish this summer.

Having been in earth's oceans for thousands of years, Algae, a word from Greek origin(*φῦκος)*(fukos or phykos) and most other aquatic plants are plants,(eukaryotic cells mixed together to be exact), to be more specific, that are polyphyletic, or mixed together. In other words, algae is a group of plants that are mixed together, and, usually organized through their color. For instance, some species of algae include red algae (*Rhodophyceae*) green algae (*Chlorophyceae*) brown algae (*Phaeophyceae*) golden algae (*Chrysophyceae*) and yellow-green algae (*Xanthophyceae).* Of course, these are not the only specimens and orders of algae, but these are a few to give an example of what algae is.

These have a huge and a very beneficial purpose to the main idea of this project. Most algae could be very beneficial to this project. *"They are suited to water quality assessment because of their nutrient needs, rapid reproduction rate, and very short life cycle. Algae are valuable indicators of ecosystem conditions because they respond quickly both in species composition and densities to a wide range of water conditions due to changes in water chemistry."* (Washington State Lake Protection Association, 2012) In other words, Algae are excellent because they are amazing bio-indicators . So, with the qualities algae have, it can be identified that the pH, the Dissolved Oxygen, the Ammonia, Nitrates, Nitrites, Salinity and the other qualifications that the water needs to have in order to support that species of algae, and then we can use this information to tell how healthy the New York Harbor is those specific areas.

In conclusion, this project has a goal that could be a very beneficial in the way that it could be a stepping stone for future projects that could further benefit the New York Harbor. A plan to push forward by barcoding, or duplicating and sequencing the DNA to find the specimen of algae to see how clean and healthy the Hudson is. With this project, it would be best to find some Chlorophyceae and Rhodophyceae because of how common it is to find in other sources, and how abundant it could be. This project is planned not just for the benefit of the people living

here but for all other creatures and aspects that hide under the murky and turbid surface known as the Hudson.

Method Section

The Harbor contains life in many different sizes that survive in different conditions. The study of algae around the New York waterways such as the New York Harbor are being observed. They live all over from on lines off piers to the bottom of the seafloor. Samples will be collected for the experiment so that the genetics can be observed. With the genetics the group will be able to test the health of the harbor.

I

Samples will be extracted from lines and piers around New York waters with dissection kits. While this is done, pictures of the samples on a clipboard next to a ruler and vile to record size and location will be taken where the algae is found. We will record all this on our metadata sheet for our experiment to keep track on where they're from. We will place these samples in vials that would be labeled with tape on vials and marking them XRB- 1-30. However, before we take the algae to the lab we plan to hypothesize the species of algae collected using the internet and books about macro-algae that live and survive inside of the Atlantic.

II

Examinations will be done based on the genetics of the algae that will be sampled from around the New York waters. This will be done by observing the algae and aquatic plants as a gel created by amplifying the DNA by following the barcoding procedure to analyze. In the project a study of the DNA that belongs to that plant and try to identify which kind of plant it is based on the DNA structure. Once this organism is identified a study will be done in more details using research that has been gathered from the experiment and background information. The results would be analyzed using bioinformatics using the DNA subway to test. The gene that will be studied is cytochrome oxidase subunit 1.

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III

The samples will need to have DNA isolated from the algae. First the sample will be put in a tube with lysis solution and it will be grinded up. Then the sample will be incubated and centrifuged and the supernatant will be placed in a new tube. After that silica resin will be mixed in, incubated and centrifuged. Then the supernatant will be taken out and wash buffer will be vortexed in. Next it will be centrifuged so we can remove the supernatant again and add wash buffer to be vortexed in. The sample will then be centrifuged and the supernatant will be removed and dh2o will be mixed in by pipetting in and out. After that the sample would be incubated and centrifuged to transfer supernatant to a fresh tube so it can be stored at -20 degrees Celsius.

IV

The DNA will be amplified by PCR. First primer mix, DNA and mineral oil will be added to the tube. Then the thermal cycler will be amplified and the sample will be stored at -20 degrees Celsius. Next we will analyze the gel by pouring the gel setting it for 20 minutes and it will be loaded. Finally it will be electro phased at 130 volts.

V

The information gathered from these procedures will be used to compare the health of the harbor. The data will show the health of the harbor depending on the species of these aquatic plants and the abundance of that species in this water body. This will be compared from research developed by other people who have studied the population of certain types of algae in the New York waters. The data observed about how much resources the plant requires such as salinity and dissolved oxygen levels. The conditions needed for algae to survive in certain habitats underwater will be learned.

VI

The algae will be a good indicator on how much pollution is in the water because of their need for a lot of nutrients and rapid ability to reproduce. They depend on the environmental conditions they live and survive in. When the water is healthy it should contain a lot of algae that are reproduced quicker in cleaner waters. Algae will help us understand the water around them and how sufficient it is for being a home for many different creatures that live in the New York waterways.

Specific Aim

Algae comes in many different types of forms. There is green algae along with red and brown. Observations and indications of the algae will be taken and set up into a data table that will be updated when new information is given. Information will be taken and studies will be done through genetic and microscopic work. Algae is particularly grown in New York's brackish water (A mixture of both salt and fresh water).

Most of the samples of algae were collected on Pier 101 on Governors Island. Algae can grow to about 63 meters in length. All samples must be no bigger than the sample bottle itself. A sample the size of a grain of rice is recommended. The length of the sample in centimeters will be taken down as well as its code (ex: XRB-001). The goal is to take a picture of each and every piece of algae with its size and bottle, that way the samples do not mix with the others. After collecting the algae they would be soon placed into a freezer until further testing is done.

Not only will the algae be identified but the water quality will be tested as well. This water would be taken from areas that the algae usually grow in. It's important to identify the conditions that the algae are surviving. Especially if the algae's water source has any effect on the plants growth or DNA in this case.

Taking tests on the water will give a huge reflection as to what condition the New York Harbor is in as well as how well the algae is growing in its brackish waterways. This an important goal that must be completed by the end of our project. Soon enough Marine Biology Research students will have an insight on the progress that they, and other programs have done throughout the years.

Many improvements and ideas on what else can be done to help New York's waterways can be discovered with this information on a whole. Making sure that these colonies of algae are completely safe in their environment is crucial. Without a safe water body and home, colonies of algae will have an extremely hard time trying to grow. Algae is a large food source for many animals. Without algae many of these creatures will slowly decrease within New York Harbor. So will the amount of creatures that eat those who eat algae, and so on.

Algae are eukaryotes (Eukaryotes is an organism that contains cells with genetic material called DNA inside the nucleus, and various organelles). This DNA, once found, is then shaped in the form of chromosomes which also contain a nucleus and, go through the process of photosynthesis within a membrane form called chloroplast.

This area of the algae will be closely identified as well as the other species and samples that the Marine Biology Research students had collected. Each sample's data will be compared to the rest of the 30 and comparisons should be done. Making sure that every piece of information is taken down is crucial, Data sheets along with observations must be taken into consideration and plays a huge part in the project, Doing this data table will help keep up with everything going on in the project and will mark progress.

Data Analysis

In order to completely examine all of the test subjects and successfully record them, a data table needs to be created that can record and can check to see the water quality that each specimen can have, its biodiversity, and how close the water quality in the Hudson is to that water. The table proposed below would be an example of one that can possibly be used to examine the abundance of the algae in the water quality found inside the sampling places like the East River, Far Rockaway, Pier 101 and the Buttermilk channel, and many other places.

Average New York Water Quality Compared to the Algae Water Quality

Date	Sample	Dissolved Oxygen	pH	Ammonia	Nitrates/ Nitrites	Salinity	Temperature (Celsius)	Location	Abundance
	East River								
	Hudson River								
	Buttermilk Channel								
	Pier 101								
	Far Rockaway								
	XRB-001								
	XRB-002								
	XRB-003								
	XRB-004								
	XRB-005								
	XRB-006								
	XRB-007								
	XRB-008								

Commented [2]: Very good proposal, also interesting use of DNA barcoding. Please update the methods section and resubmit!

I recommend reading following publication:

Entwisle, T., & Nairn, L. (Eds.). (n.d.). How to Preserve FW Algae. Retrieved October 4, 2015.

This publication mentions how to preserve freshwater algae:
Once you have collected our samples, you can preserve them with Lugol's solution, which is comprised of one gram of iodine crystals and two grams of potassium iodide for every 300 ml of water. Three drops of the solution are used in a 100 ml samplehttp://plantnet.rbgsyd.nsw.gov.au/PlantNet/fwalgae/Introduction/preserve.html

Commented [3]: Great table!

	XRB-009								
	XRB-010								
	XRB-011								
	XRB-012								
	XRB-013								
	XRB-014								
	XRB-015								
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	XRB-027								
	XRB-028								
	XRB-029								
	XRB-030								

Seth Rivera Biography

Seth Rivera is a student in the Marine Biology Research Program (Career and Technological Education/CTE) inside of the New York Harbor School.Seth currently lives on 351 West 114st 10026.Born on December 20, 2000, in Manhattan, New York, he's always enjoyed the study of Marine biology and also the basic study of genes. So Seth jumped right in when given the chance to do this project that included both. Seth is currently 14 years old and still living in Manhattan, hoping that he can soon learn more about both biology and our own general anatomy. As of now his dreams for the future are to study and become a marine biologist (specifically a shark biologist) and learn more about some of his favorite species of sharks: the thresher, great white, and tiger sharks.

Jared Vittore Biography

Jared Vittore was born July 20, 2000 in Ozone park Queens living on 9805 103 avenue, and he has been raised there his whole life. As a kid he's always liked the water whether it was swimming or learning about underwater life. Jared used to love going to the beach to swim and look at whatever life drifts by the shallow water. Vittore also had lots aquatic toys such as a toy crab he used to play with. As he got older Jared always wanted to have a pet fish. At one point he had two hermit crabs and 2 beta fish in his house. He used to sit in front of the tank watching the fish swim around and the hermit crabs crawl around. To this day Jared loves marine life and he wants to learn more about these creatures. That is why he picked Marine biology as his Career technological education. Seth, Isabella and Jared were really interested in this project they created about studying biology and genetics. Jared is really excited to do this experiment with two of his best friends.

Isabella Torres Biography

Isabella Torres is a 15 year old that lives on 104st 103-57 11417 Ozone park Queens, New York with her mother and little brother. Isabella was born on June 28, 2000. She attends The Urban Assembly New York Harbor School on Governors Island and is a sophomore in the program Marine Biology. As a child she was always fascinated with the marine life. She never pictured herself to become a marine biologist because of her lack of patience, but after a while decided that maybe it was the best thing for her and her future. Isabella went from having an urge to sing and perform to having an itching urge to study and care for marine life. Wanting to succeed in life and making risks that were truly worth it, along with going to a great college was something she needed to achieve. Isabella not only wanted to make herself happy, but she also wanted to prove to her extended family that she can push past limits and become something great and important. Not going to college or having a job that made her miserable had to be one of her most feared nightmares, and she was determined to set her life straight. This would then hopefully inspire her younger brother to go against all odds and strive. To not only achieve but to have confidence in himself and develop great skills.

Reference Section

http://www.walpa.org/waterline/june-2012/algae-can-function-as-indicators-of-water-pollution/

http://ibol.org/about-us/what-is-dna-barcoding/