Lichen Bioindicators In Prospect Park

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Abstract

New York is one of the busiest places in the world. With more people here there is more transportation which results to pollution (Under the Raedar, Alasdair 2012). Does this mean everyday people breathe in harmful pollution? This Urban Barcode Project seeks to to identify what species of moss and lichen can warn us about pollution in New York. Mosses play an important role of cycling carbon and nitrogen between the land and air (European Commission - Science for Environment Policy, 2017). The samples we have collected are from Prospect Park in Brooklyn. These samples can help us learn if our environment has pollution.

Introduction

New York is one of the busiest places in the world, especially in Manhattan where there are many people and cars. The more cars and people the more pollution is spread in New York. This Urban Barcode Project seeks to to identify what species of moss and lichen can warn us about pollution in New York. This can help us learn more about the environment around us. Some species of lichen require clean air to grow while some species of lichen can survive pollution. *Lecanora conizaeoides* and *Lepraria incana* are lichen species that can survive poor air quality, while *Parmelia caperata* or *Evernia prunastri* need clean air to survive (Impacts of air pollution on Lichens and Bryophytes, mosses and liverworts). The more pollution in our home the harder it is to be able to live. Too much carbon dioxide can make it harder to breathe, making the temperature go hotter and making our oceans acidic. (Why is carbon dioxide bad?, 2017). Lichen are a mutualism relationship between algae and fungi. (Lichens: Symbiotic Relationship Between Algae and Fungus, 2012)

Sample Number	Location	Species of Organism	Invasive/Exotic Native Organism	Bit-score/e-value/ Mismatches
QJJ-001	Latitude: 40.6539 Longitude: -73.97202	Enkianthus deflexus	exotic	Bit-score:735 E-value:0.0 mismatches:35
QJJ-002	Latitude: 40.6539 Longitude: -73.47202			No Sequence
QJJ-003	Latitude: 40.6539 Longitude: -73.47202	Chenopodium album	Invasive	Bit-score:1072 E-value:0.0 mismatches:2
QJJ-004	Latitude: 40.654095 Longitude: -73.971504	Styphnolobium japonicum	Invasive	Bit-score:1040 E-value: 0.0 Mismatches: 1
QJJ-005	Latitude: 40.6540958 Longitude: -73.9715042			NO Sequence
QJJ-006	Latitude:40.654695 Longitude:-793.971504	Dicoma anomala	Exotic	Bit score:1058 E-value: 0.0 Mismatches: 5
QJJ-007	Latitude: 40.654007 Longitude: -73.971639			NO Sequence
QJJ-008	Latitude: 40.654695 Longitude: -73.971504			NO Sequence
QJJ-009	Latitude: 40.65007 Longitude: -73.9716939	Quercus x	Native Organism	Bit-score: 1081 E-value: 0.0 Mismatches: 0
QJJ-010	Latitude: 40.6594803854	Solidago missouriensis	Native organism	Bit-score:1063 E-value:0.0
QJJ-011	Longitude: -73.9723 Latitude: 40.659480385 Longitude: -73.97227764	Toxicodendron diversilobum	Native organism	mismatches:4 Bit-score:749 E-value:0.0 mismatches:13
QJJ-012	Latitude: 40.6594803854 Longitude: -73.9722776413	Ligustrum vulgare	excotic	Bit-score:1067 E-value:0.0 mismatches:3
QJJ-013	Latitude: 40.6550201494 Longitude: -73.9636731148	Boulaya mittenii	Excotic	Bit-score:1049 E-value:0.0 Mismatches:7
QJJ-014	Latitude: 40.6626707362 Longitude: -73.971118927	Ulota crispa	Native	Bit score: 704 E-Value:0.0 Mismatches:76

Materials and Methods

- We used a metal scraper to collect our samples and put them in a zipper bags to store samples.
- Wrote where we got the lichen from using coordinates. We applied for a permit to collect samples in Prospect Park.
- We isolated the DNA from the samples. We put the samples in tubes and added lysis solution. The sample was ground into the solution. We incubated the tube with the solution and sample for 10 minutes at 65 degrees Celsius. After, we centrifuged the tube for 1 minute to separate components. We transfered supernatant to a fresh tube to avoid the pellet at the bottom of the first tube. We then added silica resin to bind DNA it was white in the pipette. Then we washed buffer to clean the sample.
- After removing the remaining supernatant with a small pipette we added distilled water to remove DNA from silica. Then we mixed by pipetting in and out. Then we transferred the supernatant into a fresh tube and store at negative 20 degrees Celsius.
- The we added PCR reagents to the DNA and amplified in a thermal cycler and store at negative 20 degrees.
- PCR stands for polymerase chain reaction. This is a process that allows for millions of copies of a certain section of DNA. We used gel electrophoresis to confirm that the PCR worked.

Discussion:

Our results show that many of our plants are indicators for pollution. Thus meaning we have pollution in Prospect Park. Many plants such as *Ligustrum vulgare*, QJJ-12, this shrub can cope with harsh conditions such as pollution. These results are important because they show that in Brooklyn, a place many people live is surrounded by pollution. If we ignore this, the pollution in this area will get worse. Our results had few mistakes in them, some of our results came back without any sequence. Like QJJ-002, QJJ-005,QJJ-007,QJJ-008, came back with no sequence. This means we did something wrong during the DNA extraction stage. Next time we should make sure we do this properly so we don't miss any sequences again.

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