PAPER OR PLASTIC?

Does a baggy wrinkle made of natural fibers attract more macro invertebrates than a plastic baggy wrinkle?

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Rationale:

The succession rates of macro fauna and levels of dissolved oxygen are unknown in certain parts of the New York estuary. Areas where organic matter is excessively dumped into the estuary have lowered DO levels. These areas receive runoff from sewage pipes, rain water from urban areas, fertilizers, etc. DO can become so low to a point where hypoxic events will occur (Able, 1999). Organisms with a less complex anatomy structure begin to die. These organisms at the bottom of the food chain are macro fauna. When these organisms die, then bigger predators will either travel elsewhere in search of food or continue to live in the same area with low levels dissolved oxygen. If the larger predators continue to stay, these organisms will suffer from hypoxia, a state of which low dissolved oxygen levels affect aquatic organisms. These organisms will swim to the surface of the water column and ventilate at the top layer of the water where it contains relatively higher level of dissolved oxygen. Regardless of whether or not these organisms swim away to another area or stay and die, major components of the New York estuary will be absent. (Able, 1999)

The rate of succession of macro fauna are proportional the levels of dissolved oxygen. By measuring the rate of succession, ecologists and scientists can determine what steps are necessary to better the health of the New York estuary but also estuaries, harbors, and bays that are located in urban areas. The relatively sparse research on dissolved oxygen or the succession rate of macro fauna has left room for further research.

Dissolved oxygen and macro fauna have always been important factors in the aquatic world. Organisms in rivers, streams, lakes, oceans, and any other body of water consume and produce dissolved oxygen. Dissolved Oxygen (DO) is found in microscopic bubbles of oxygen that are mixed in the water and are present between water molecules. Water attains oxygen molecules by aquatic plants producing oxygen as a byproduct in photosynthesis or by absorption directly from the atmosphere. Dissolved oxygen levels fluctuate seasonally over a 24-hour period. The levels of dissolved oxygen vary with factors including water temperature and altitude. Therefore; the goal of this experiment is to record the succession rates of macro fauna using the baggy wrinkles (figure 1.) and measuring dissolved oxygen to support the data. It is not known whether or not the dissolved oxygen levels are adequate enough to support vast amounts of aquatic life in certain areas in the New York Estuary. Typically, a healthy aquatic ecosystem should have DO levels between 8 ppm and 10 ppm during the winter and fall (Mauricio, 2012). During the summer, DO levels should be between 6 ppm and 9 ppm. One approach to assessing the quality of the estuary, other than analyzing DO levels, is to compare the rate of growth of macro fauna. When observing macro fauna, there should be several different species group together to reveal the diversity of the estuary.

Methods:

The macro fauna will be collected on what is called a ‘baggy wrinkle.’ Baggy wrinkles are made from short pieces of rope. A 33 inch piece of manila line 6.35 mm x 15.24 m

in diameter become parallel at a fixed point (1 pound weight) (figure 2.), and the lengths of a 9.53 mm x 15.24 m diameter manila rope are attached using a hitch called a "railroad sennit" (figure 3). Manila rope is made from natural plant based material. When the baggy wrinkles decay in water they will deteriorate completely and add some amount of nutrients to the water. Plastic rope will take longer to breakdown but when it does it will only break apart into smaller pieces; therefore, will always be in the worlds waterThe average lengths of the baggy wrinkles, including the weight, are 31.8 inches. The average weight of the baggy wrinkles is 22.5 pounds. This creates a long, shaggy fringe which becomes a large hairy cylinder. This fuzziness will attract macro fauna and will be tested against a plastic counterpart. There will be four Baggy wrinkles made of manila rope and one of plastic.

Dissolved oxygen levels will be recorded with an YSI sonde. This sonde will be contained in a 20ft. shaft made of PVC tubes. At the bottom of the shaft will be a PVC pipe with 6in. diameter holes along its side to allow water to flow in and have contact with the dissolved oxygen probe. Dissolved oxygen will be recorded every 15 minutes consistently on a 24/7 schedule except for one day in each per month to recalibrate. All data will be sent wirelessly through a Bluetooth antenna to a receiving data port in the lab. The locations of the experiment site will both be at Pier 101 on the east side of Governor's island.

Materials:

Item	Quantity	Use
1lb Weight	5	To keep baggy wrinkles vertical in water
Nikon D80	1	To take pictures of field work
Manila Rope 3/8" x 50	1.8 Meters (for one baggy wrinkle)	To create base line for the baggy-wrinkles
Manila Rope ¼" x 50	25-30 12" Strips	To create the strips which later are unraveled of the fuzziness of the baggy wrinkle
Scissors	1	To cut rope into desired lengths
Pointer	3	To point and poke at organisms on baggy-wrinkles
Wooden 12" Ruler	2	To use for perimeter of 4" Quadrant

Fishing Line	1 Spool	Used to weave through drilled holes of quadrant perimeter creating individual squares
Drill	1	To drill holes in various objects
Drill Batteries	2	To power drill
Drill Bits	1 3/32	To drill through perimeter of quadrant
Hot Glue Gun	1	To glue down quadrant and fishing line.
Hot Glue Gun Stick	5	To provide glue
Clamp	2	To hold down perimeter of quadrant
PVC Glue	2 16oz cans	To glue PVC to pipe together
PVC Coupling	5	To connect PVC pipes together
PVC Pipes	4 12” dianmeter 5 feet PVC pipe	Put together, creates shaft for YSI sonde
Metal Band Kit	1	To Clamp PVC shaft around piling
6” diameter Saw	1	To cut 6” diameter holes in one PVC pipe
Phillips Head Screw Driver	1	To tighten metal bands around pilling if drill batteries die
Pencil	1	To record data
Data Sheets	4	To record data
Clipboard	1	To hold data

Cart	1	To carry equipment, and hold water when sampling
Buckets	2	To collect water
Sample Bottles	4	To collect organisms
Celetron Infi-Veiw 5 MP Microscope	1	To view organisms
Slides	10+	To place organisms
Slide Covers	10+	To place on organisms
Ro/Di Water	1000+ ml	To clean instruments
Personal Protective Equipment (goggles, gloves, apron)	1 set	To avoid skin damage/contamination
Carabiner	4	To quickly attach and detach baggy wrinkle from dock
Hose	4	Wrapped around the rope attaching to the baggy-wrinkles to prevent the rope from breaking
YSI 600 OMS V2 Data Sonde with Dissolved Oxygen Probe	1	To measure dissolved oxygen in water.

Project Design Chart

Objective
To observe the health of the Hudson River Estuary by viewing macro-fauna growing on baggy-wrinkles

Independent Variable • The type of rope used. • The weight attached to the baggy-wrinkle. • The type of weave used in the baggy-wrinkle • Exposure time in water
Dependant Variables • Species of organisms growing on baggy-wrinkles • Amount of fiber loss
Number of Sample Sites 1
Limitations • Time • Number of treatments
Risk • Drowning

Procedures:

The macro fauna will be collected on what is called a 'baggy wrinkle.' Baggy wrinkles are built with pieces of rope that are composed of natural paper fibers. Two parallel lengths of a smaller diameter pieces of rope are stretched between a fixed point and the lengths of a thicker diameter rope are attached using a, "railroad sennit", hitch. This creates long, shaggy fringes attached to one central "spinal column". The fuzziness will attract macro fauna as they begin to find a place where they can latch onto or attach themselves to something that has nooks and crannies. In addition the baggy wrinkles provide protection for macro organisms. The paper baggy wrinkles will be tested against a plastic counterpart.

-To make a Baggy wrinkle:

- Cut 6 ft. of 6.35 mm x 15.24 m diameter manila rope. (Thin rope)
- Slip rope through the ring of a one pound weight until it falls directly in the middle of the rope.
- Cut 50 pieces of 6in 9.53 mm x 15.24 m diameter manila rope. (Thick rope)
- Keep thin rope parallel to each other with weight at the bottom
- Lay 6 in pieces of thick rope over on one side of thin rope then loop ends around and out of the thin rope. Pull tight.

- Once all of the 50 pieces are tied on, begin to unravel the ends of those pieces. This creates the fuzzy consistency.
- Repeat this for the next 49 pieces of rope. Once done, tie off the ends of the thin rope with a zip tie.
- Attach end of baggy wrinkle to nylon rope and measure out the nylon rope to the depth of water it will be placed in.

-To create a PVC shaft for the YSI sonde:

- Secure 1, 5 ft. PVC pipe on a work bench. Proper personal protective equipment (gloves, apron, and goggles) must be worn.
- Using 6 in. diameter saw drill 4 holes on two sides of the pipe that are parallel to each other.
- On the other two sides drill 5 holes in between the previous made holes. This will be the bottom piece of the shaft.
- With another PVC pipe use a 7/32 size drill bit to drill one small hole on one end of the pipe. This will become the top.
- Apply PVC glue to the inside of each PVC couplet and to the ends of each PVC pipe except for the very end and very top.
- Attach PVC pipe to each couplet.
- String nylon rope through the 7/32 hole and tie back onto itself. This will be the rope to lower shaft into the water.
- Slowly the shaft is lowered down into the water. The two individuals of pier 101 secure the PVC shaft onto the fencing with metal wiring. Only two PVC pipes should stick out of the water.

-To analyze baggy wrinkle data:

- All data should be collected after a waiting period of 3 months after they are first deployed and measured. Wait 3 months to allow fauna to settle then sampling should take place every 20 days.
- Sea water collected from buckets is poured into push carts. This keeps any aquatic plants suspended and ensures baggy-wrinkle does not dry.
- After the Baggy wrinkles are pulled out of the dock, they must be weighed and recorded.
- Selected point are manufactured by coral plot program
- The percent of coverage should be measured with a 4x4 centimeter square
- Identify organisms

-To receive data from YSI Sonde:

- Pull sonde out of water and retrieve back to the lab.
- Connect sonde to blue tooth antenna and computer.
- Open HyperTerminal and view data
- Transfer data onto a data sheet to analyze.

Results:

On sampling date not many organisms were viewed in plots produced. Everywhere else arthropods were seen and a few solitary tunicates. The baggy-wrinkles did have sediment taking most of the space. Wherever organisms were found, it was a spot that contained no sediment. The baggy-wrinkles are 5 ft. above the sea floor. In the area that they are placed it is 20 ft. deep. Prior to sampling, it has rained for two to three days. This could have affected the amount of sediment floating near the seafloor.

3 Months later, oysters, tunicates, sea squirts, algae.

After the summer, on September 17, 2014 another sampling date was taking place. Upon pulling baggy wrinkles out of the water all of the "paper" baggy wrinkles were detached from the main line that was attached to the pier. Only the plastic baggy wrinkle remained.

Based on the circumstances, the line that the paper baggy wrinkles were attached to probably broke down or deteriorated and eventually snapped off and sank to the sea floor. Data collected is only limited to only few sampling dates. The YSI sonde has yet to be installed into the harbor.

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Annex:

Figure 1.

Figure 2.

Fig. 3