# Collection of plastic debris within the Upper New York Harbor

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# Abstract:

Plastic abundance in the New York Harbor estuary was determined on Governors Island on pier 101 between January 9 and March 25, 2014. Within this experiment the quantities of different plastic debris within the New York Harbor were collected using a 500-micron phytoplankton net. The collected samples were then taken back to the lab and screened to isolate the plastic from the water and every piece of plastic is located. The data is then collected it is analyzed and graphed.

## Introduction:

Plastic is one of the world's most harmful marine pollutants. Plastic debris are dangerous to the marine environment, as it causes destruction of many marine habitats and the death of over 100,000 marine animals each year (Ocean crusaders, 2014) due to suffocation, and entanglement (EPA, 2011). There is still a lot that isn't known about the presents of plastic in a marine environment. Things such as the origin of plastic debris how long plastic items remain in their original form. Although there have been many studies on marine debris that have shown that plastics consistently make up 60 to 80% of all marine debris (Derraik 2002).

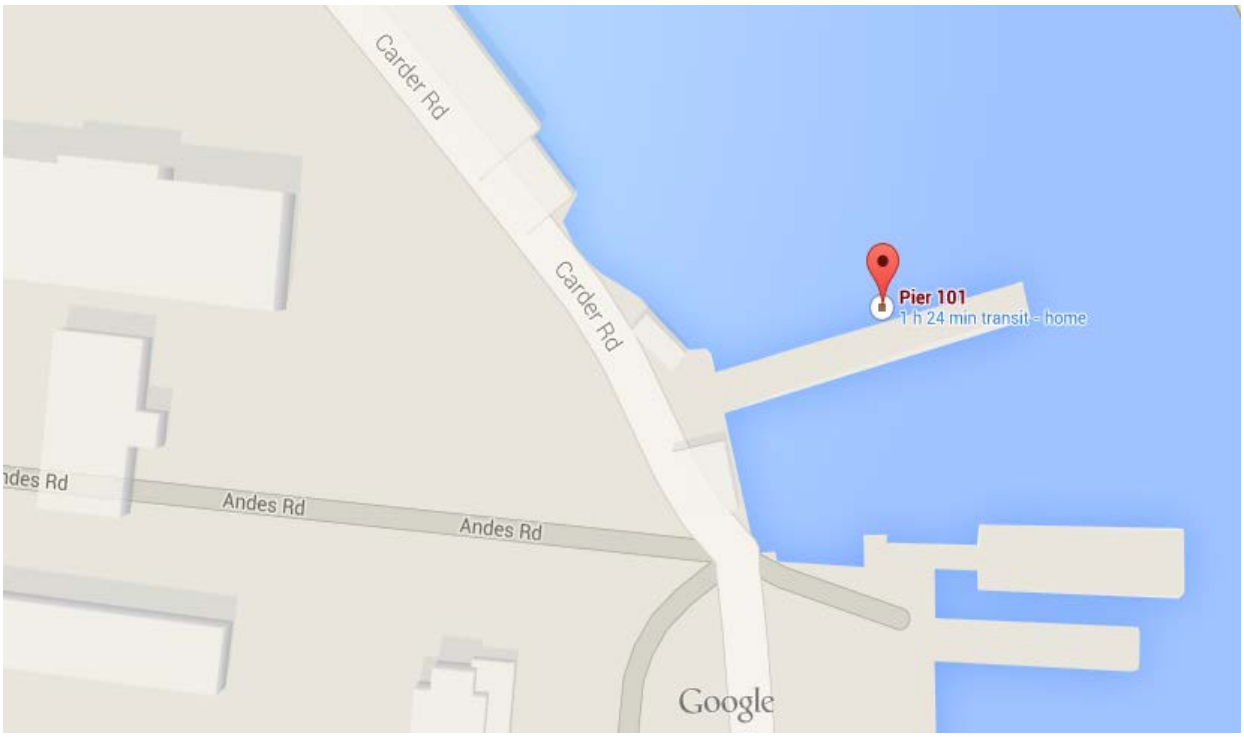
## Background information:

There have been many studies on the west coast of the United States as well as in other locations on eastern hemisphere, all of which have indicated that high levels of plastic in a marine environment causes major problems for marine animals as well as the environment they live in. What makes this situation worst is that it's not just in one area but it's an occurring problem all across the world *(Collignon.A, 2012) (Doyle.M, 2011)*.

## Hypothesis:

Due to New York City's history of pollution it is anticipated that high amounts of plastic material will be found within a five foot radius of pier101 located on Governors Island. If the levels of plastic debris continue to increase then the quality of the water as well as the organisms living in them will gradually diminish until it's too late to recover from all the damage.

## 1. Locality




- **Location:** Governor's island, Pier 101

# Procedures:

## Setting up your materials

- First create a list with all the materials that are going to need.
- Have all the equipment that is going to be taken into the field placed in one area, so that time isn't wasted looking for any materials.
- Before leaving double check that you have everything and that everything is functioning properly.
- Make sure to always have PPE (personal protection equipment) on when out in the field.

## Before going out into the field

- Go through the material list; check that all the materials are where you need them to be, including PPE.
- Create a plan of where the sampling sites are going to be located by looking into all the variables (ex. Accessibility, or is the area safe to work on).
- Have a designated spot which will be your work area for when you are working with samples you bring back or have an area where you can store the samples until you are capable of accessing them

## When out in the field

- When handling the net you want to put the cot-end jar the narrow metal end of the net into the water first, and slowly continue to lower the net into the water until you can't feel tension on the line.
- Then slowly lower the rest of the net into the water and make sure that the cot-end jar is on and the release valve closed.
- Record all the meta-data (time started, time ended, latitude and longitude of site tested)
- Then pull on the rope attached to the frame of the net and bring it out of the water

- Then release the seal on the cot-end jar to release the water into a vial and rinse the sides of the cot-end jar so that any debris that may be on the sides is washed into the vile.
- Then repeat the process (Based on the intended amount of samples).

## Steps for sample processing

- After collecting all the samples you need, take the samples back to your lab or work place.
- Take each sample and pour the water into a mesh to sift the water sample and collect everything floating around.
- Label each mesh so that the samples aren't confused.
- Place each sample into individual Petri dishes, and make sure that there is enough light around so that you can clearly see everything that is in the samples.
- Then using the naked eye, locate each of the individual plastic materials in each sample.

## Steps for data analysis

- When going through each sample remove out each individual piece of plastic debris from each sample. (To avoided introducing human error designate this task to one person).
- After that categorize each of the plastic debris by the type of debris (paint chips, micro and macro plastic) then tally the out the amount of each type was found in each sample and find the total of each type for that day.
- Create a graph for each sampling date; the graph should quantify the types of plastic found for each sample and an accumulation of all the samples from that sampling date.

Data:

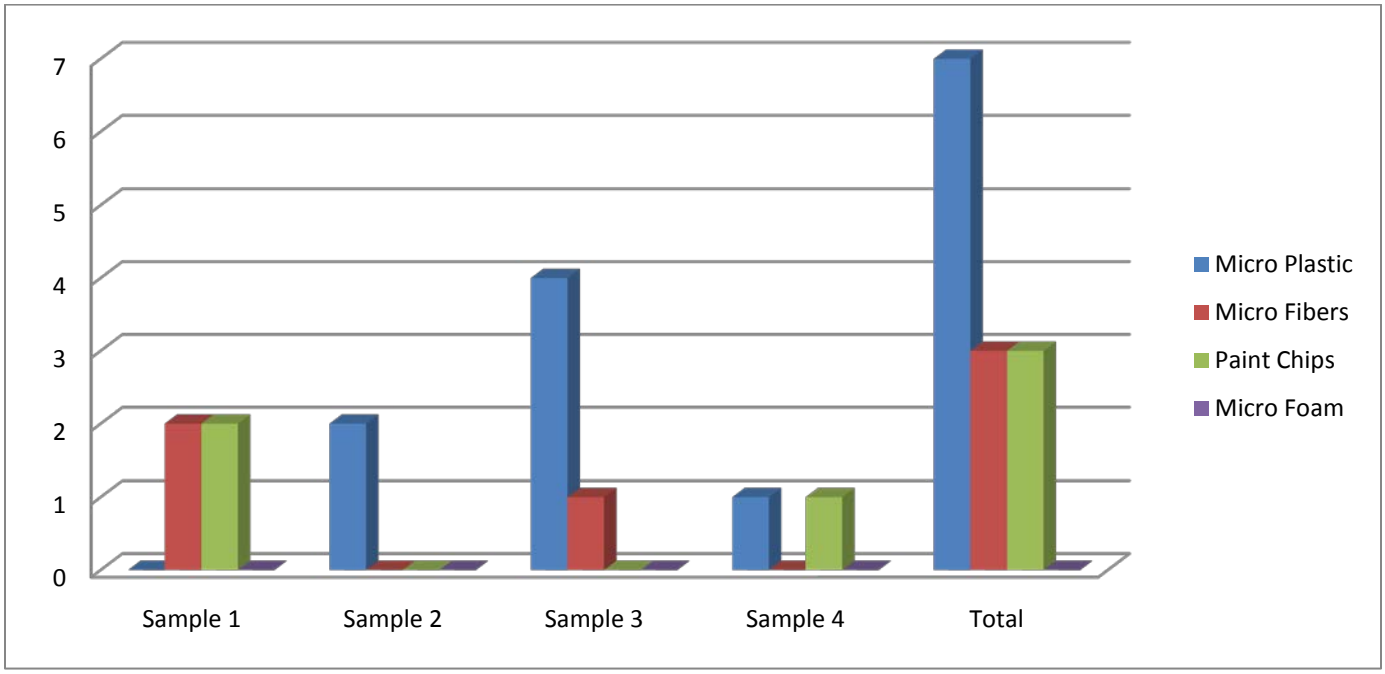



Fig. 1 – Displays the amount of plastic debris collected from each sample taken collected on 12/19/13.

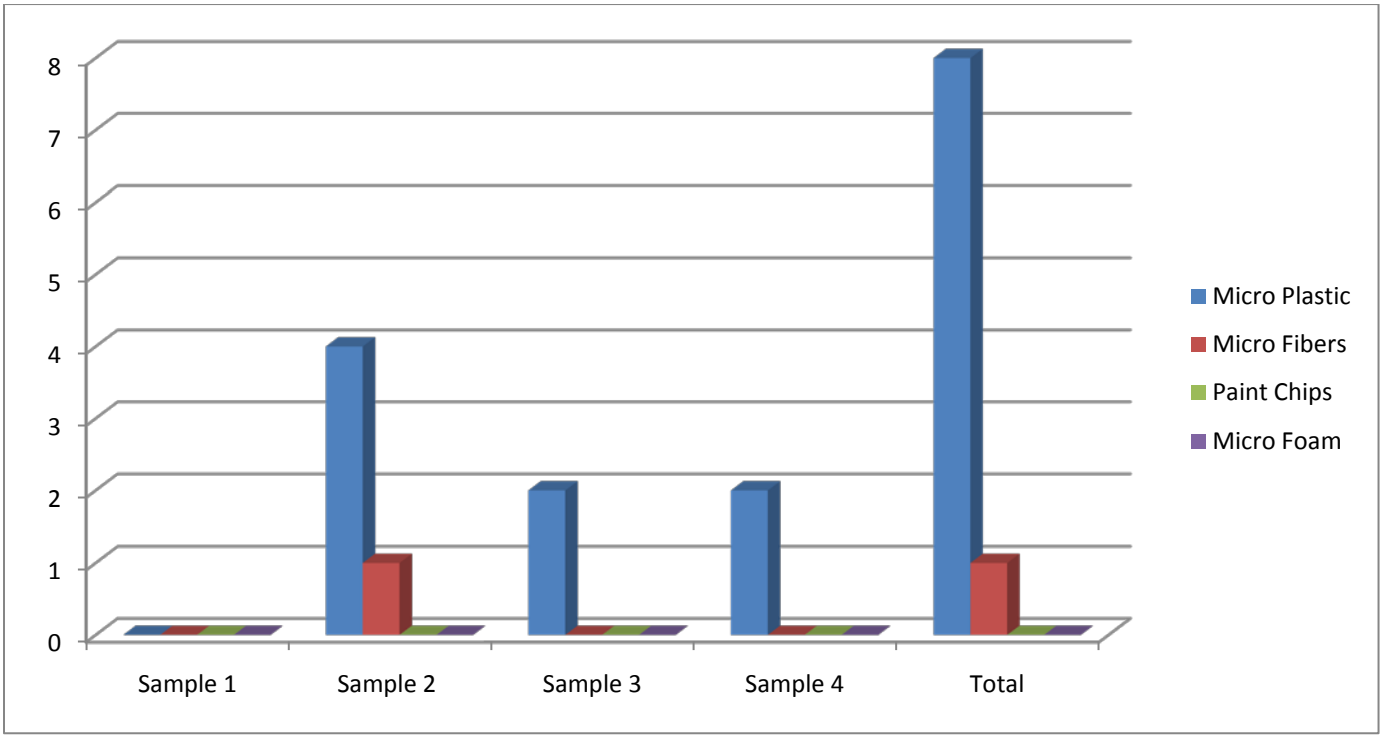



Fig. 2 - Displays the amount of plastic debris collected from each sample taken on 1/9/14; as well as the total accumulation of debris.

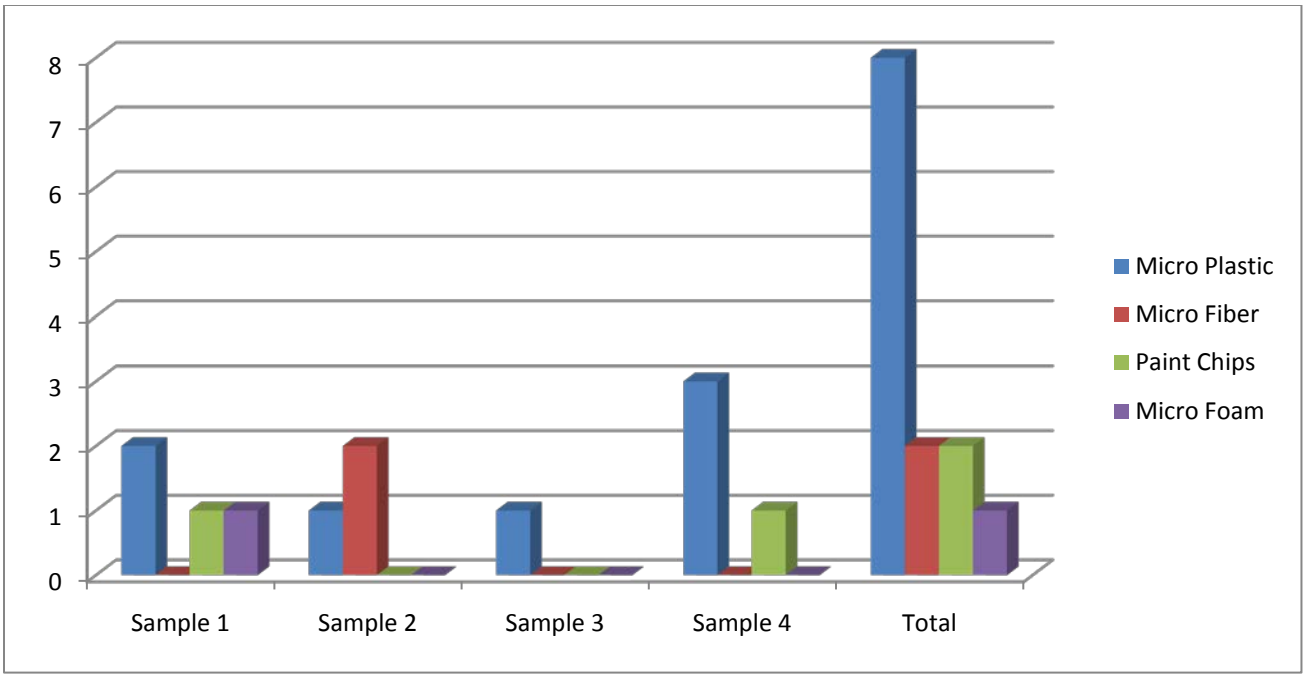



Fig. 3 - Displays the amount of plastic debris collected for each sample on 1/16/14 as well as the total accumulation of debris collected.

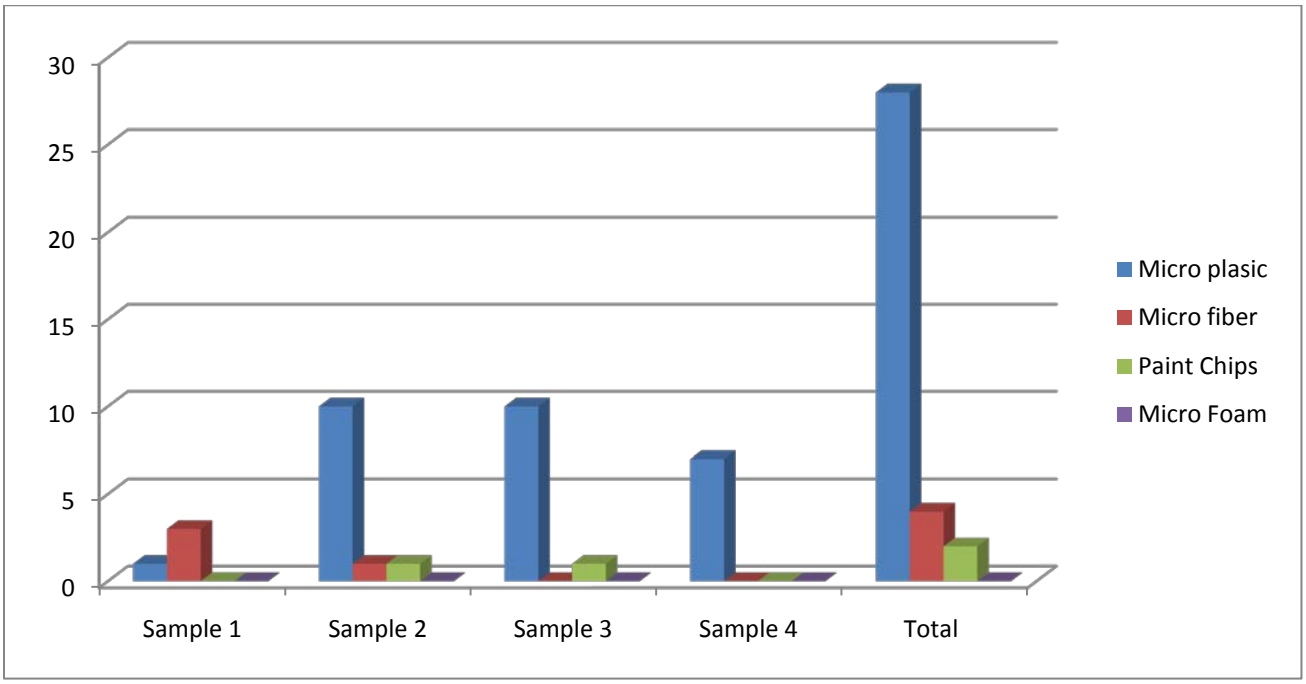



Fig. 4 - Displays the amount of debris collected from each sample taken on 5/24/14; as well as the total accumulation of debris.

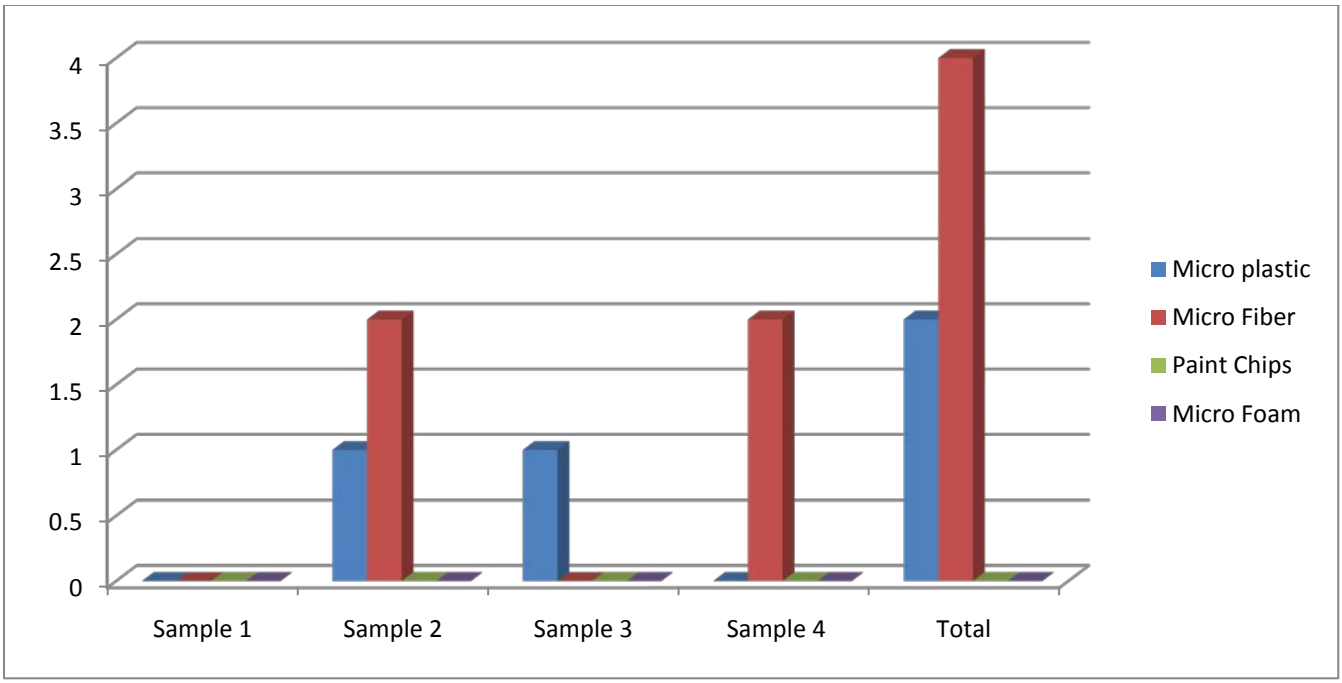



Fig. 5- Displays the amount of debris collected from each sample taken on 5/22/14; as well as the total accumulation of all debris collected.

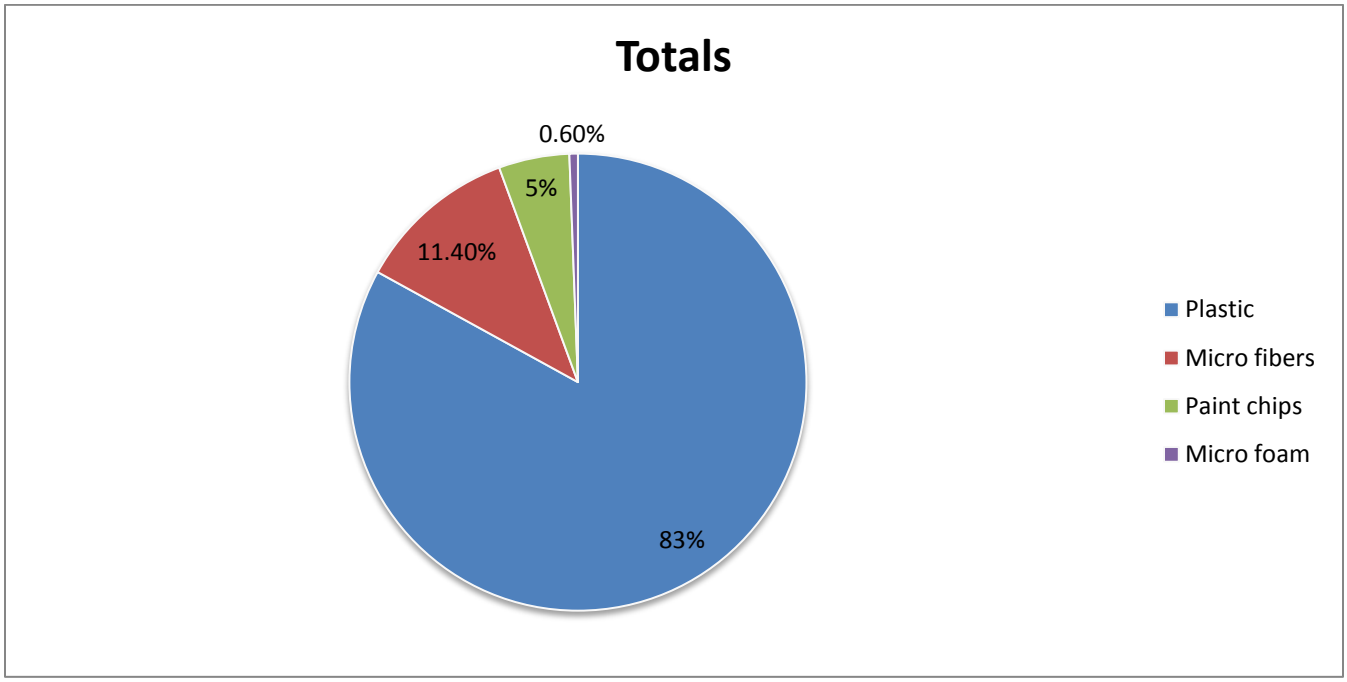



Fig. 6 – displays the different types of plastic found within the duration of this project.

## Data Analysis:

Over the course of this project there have been multiple accounts where the water samples collected had over fifteen plastic particles. In each sample that was collected there was an average number of plastic that was found of with the exception of the samples that were taken on the 1/16/14 where it was raining. Rainfall needs to be taken in to consideration because it can causes the combined sewage overflow (C.S.O) pipes to release all the sewage into the harbor and also that day the currents were flooding which means that the water was moving up from the Atlantic Ocean toward Manhattan causing all the trash and plastic debris swirl around in the harbor which can cause the plastic count in the harbor that day to be extremely high. On 1/16/14 the plastic count was almost four times the amount of plastic was found from the sample collected compared to all the other samples.

## Conclusion:

With the introduction of synthetics materials, the usage of plastic materials all over the world has increased. Due to this increase as well as the lack of regulations for dumping trash the presents of plastic debris in a marine environment has dramatically increased. It has gotten so bad that in big cities near bodies of water like New York City there is an increase in marine debris which is hazardous for marine habitat and marine life. Plastic makes up 60 to 80% of all marine debris. The presents of plastics in a marine environment causes many environmental problems such as the death of organisms due to entanglement and ingestion as well as habitat degeneration.

# Bibliography:

Collignon .A, Neustonic microplastic and zooplankton in the North Western Mediterranean Sea Marine (20120 Pollution Bulletin).

Doyle .M, Plastic particles in coastal pelagic ecosystems of the northeast pacific ocean(2011) page 41-52 of the Marine Environment Research 71.

EPA, (2011). Marine debris in the north pacific EPA-909-R-11-006

Moore. C, Density of plastic particles found in zooplankton trawls form coastal waters of California to the north pacific central Gyre. Aligalita marine research foundation.

Moore .C, A comparison of Neustonic plastic and zooplankton at different depths near the southern California Shore(2004) page 291-294 of the Marine Pollution Bulletin 49

| MATERIALS | QUANTITY | PURPOSE |
|---|---|---|
| 500-micron Neuston net | 1 | To collect samples. |
| 70% isopropyl Alcohol | Depends on the size of the tow. | Cleaning the Neuston net. |
| GPS | 1 | To check latitude and longitude. |
| 50ml vials | 4 | To hold samples in. |
| Forceps | 1-4 | To help pull each individual piece of plastic in each sample. |
| Petri dish | 4 | Used to hold sample when going through. |
| Gloves | Depends on the amount of workers | To protect hands form any contaminates. |
| PDF | Depends on the amount of workers | To protect from drowning. |
| Cooler | 1 | To hold sample vials and other equipments. |
| Ice packs | 2 | To pack the samples at a cool temp. |
| Filtered water | 1 | To rinse off all the equipment after use. |
| Sharpie | 1 | To label the samples vials. |
| Rope | 1 | To lower the Neuston net into the water. |