Remodeling The Plastic Ocean Trawl

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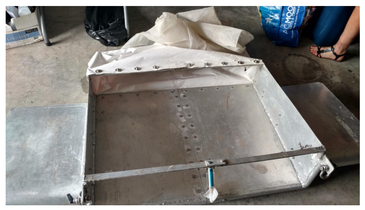
Abstract

The purpose of this project was to improve or replace the current trawl set up that is being used to collect samples of plastic in the ocean. The study of plastic that can be found in the ocean is a relatively young and growing practice. The methods used to collect this plastic and learn about it are still changing and being improved. We hope to create a more functional and possibly re-creatable tool to collect plastics from behind a boat. If successful, this invention could hopefully be used by other researchers in need of an efficient tool to collect plastic from the ocean. The trawl being used right now has many areas that could be improved. It is too large and difficult to transport. I will be aiming to cut down on both size and weight, while maintaining or possibly improving the functionality.

Objectives

The objective of this project was to improve the current trawl set up. The main things I wanted to improve were the attachment for the cod end and the overall weight and size of the trawl. The current method for attaching the cod end used a metal plumbing ring. This was very difficult to tighten and loosen on a rocking boat, so the goal was to find a more convenient method.



In order to improve the body of the trawl itself, we had to decide if it was best to start from scratch, or to improve the current system. The current Trawl, named the “Manta”, is quite large and inconvenient to move around. In order to take it places it is sometimes required to be taken apart. It takes quite a long time and many nuts and bolts in order to disassemble it. It is also too heavy to be taken on a plane without paying extra charges. These are all problems that I needed to fix while maintaining its functionality. The Manta, as it was, only can collect sample that are on the surface, so another possibility was that I could create something that could also collect plastics slightly below the surface.

Methods

The first step to improving the current system was to observe how the current system worked. I went out on a boat in order to observe the normal process used to collect samples and run transects with the Manta. I noted down the initial problems that I thought took priority. I quickly realized that I would have to start from scratch with a new invention. The first problem I wanted to address was the size and weight. I talked to the first mate on the boat as well as others using the Manta in order to get their ideas.

Through my observations I decided that the new creation may not have to be buoyant like the current one. The Manta had foam in the fins that kept it a float, but I decided that the speed of the boat combined with the tension from the net would be enough to keep the new trawl near or on the surface. This would also make it possible to alter the depth of the trawl by changing the speed of the boat pulling it. With help from Bonnie Monteleone, I decided to make a simple aluminum rectangle to attach the net to. I went to a recycled metals resale warehouse and looked for something that could replace the Manta. I decided upon the shape of aluminum that would best work. I picked a flat bar that should be light enough yet still strong. It would have enough surface area to screw the necessary attachments. This only attachment attached at this point is the loops in which the ropes will attach to.

The construction of the frame was simple. We screwed holes in the end of each bar that lined up with the corner brackets in order to bolt the bars together to make a study rectangle. The loops for the pull rope were also bolted directly to the frame. The net is bolted with approximately eight bolts on both the top and bottom.

Results/Final Product

The first problem I found a solution for was the attachment of the cod end. I decided to try and come up with a way that it could twist on and off. The old system used pvc pipe and plumbing rings. I stuck with the pvc pipe, but looked for pieces that could twist apart from each other. The images to the right show what I came up with. Now the two pieces of net can be attached to either end of the pipe and the pieces can screw apart or together. This is much easier to do on the boat and still provides enough strength to keep the pieces together against the tension from the net. The prototype seems to work well and the pictures below show how it can be twisted apart after use.

The next step was to recreate the body of the trawl itself. The final product I came up with for this was a simple aluminum rectangle the same size as the opening of the Manta. The aluminum used in the construction was a quarter inch thick and three inches wide. The opening of the structure was approximately 15cm by 1 meter. I used corner brackets of the same dimensions to hold it all into shape. The net from the Manta was taken off and fit onto this frame.

The half loop bolted to the side shown in the picture is one of two rings used to attach the rope used to pull the trawl. Trawl will be pulled the same way as the Manta using a rope tied off to both sides of the frame.

Conclusion

The final product is yet to be pulled behind a boat, but our initial observations are promising. The new contraption does not float, but with very little speed, as much as a man walking, it will stay close to the surface. It weighs much less then the Manta and is exponentially easier transport. It can easily be carried by one person and most likely fit inside a decent sized suitcase. The new screw off cod end works much more efficiently then the previous method. Plumbing rings are still used to hold the nets together, but it is not necessary to remove them in order to gain access to the cod end. They pieces are easy enough to twist apart by hand but provide enough strength to keep the pulled of the net from twisting it apart. I think that future improvements are possible, but we have made a huge step in the right direction.

Acknowledgements

- Bonnie Monteleone and the Plastic Ocean Project
- University of North Carolina Wilmington department of Environmental Science
- Butch Barnhardt – Owner Current Electric