Fishing4Plastic: Research Regarding Single-Use Offshore and Onshore Plastics

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Research Goal

The ultimate research goal was to find the percentage of single-use plastics collected along the Gulf Stream during various offshore trips and the percentage of single-use plastics collected at onshore beach sweeps. The goal was to sort, quantify, and make observations of the type of plastics being recovered from the offshore trips, denoted on the map below, and onshore beach sweeps that took place at Wrightsville Beach and Kure Beach, North Carolina.

Introduction

What is the Fishing4Plastic Tournament?

- The Fishing4Plastic tournament is a competition put on by The Plastic Ocean Project in which charter boats compete to collect the most plastic off the Gulf Stream.

Why is it important?

- Plastic is known to be harmful to organisms and to human health, it has potential to increase the transport of organic and inorganic contaminants, it presents a hazard to shipping, and it is aesthetically detrimental, thus generating negative socio-economic consequences (3).
- A 2014 study, from six years of research by the 5 Gyres Institute, estimated that 5.25 trillion plastic particles (weighing 269,000 tons) are floating in the sea (4).

What are single-use plastics?

- A single-use plastic is defined as “plastic materials that are disposable and generally used only once before they are thrown away or recycled” (5).
- It is estimated that 50% of plastic is thrown away after a single-use (4).

About this experiment:

- This experiment consisted of sorting through 1,278 pieces of identifiable plastics, categorizing them into single-use versus reusable plastics, and calculating the percentage of single-use plastics found off and onshore. Samples included unidentifiable plastics such as hard, film, and foam plastics (polystyrene). These plastics were also sorted and counted but not included in the percentage of identifiable single-use plastics.

Our Hypothesis:

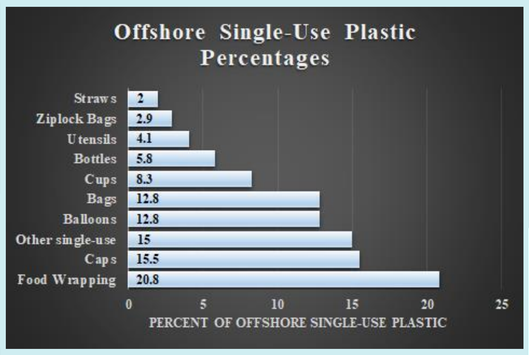
- If onshore and offshore plastic is collected and sorted then 50% of the sorted plastic will be identifiable as single-use plastic.

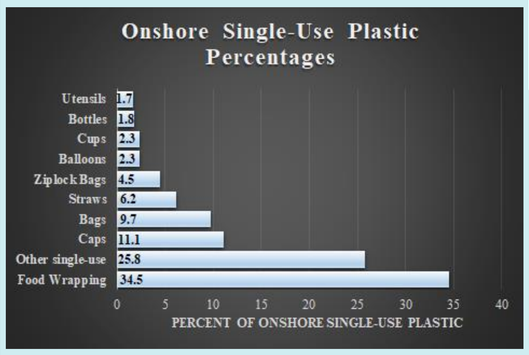
Methods and Materials

Methods:

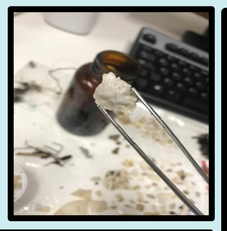
- Offshore samples were collected from:
  - June 2017 and October 2017 Fishing4Plastic tournaments
  - The Plastic Ocean Project team
  - Duke research teams
  - UNCW research teams
  - NC State research teams
- Onshore samples were collected from:
  - Fishing4Plastic beach sweep at Wrightsville Beach
  - UNCW POP Earth Day beach sweep at Kure Beach
- Samples were categorized by their date, coordinates, and surveyor(s).
- Samples were distributed across a flat surface and sorted using forceps, gloves, sifters, and the NOAA Marine Debris Shoreline Survey Field Guide. After each sample was laid flat, pictures were taken.
- To find the percentage of single-use plastic collected, the amount of on and offshore single-use plastic was divided by the total amount of identifiable plastic.
- Percentages were calculated for the top ten most common single-use on and offshore plastics collected.
- The GPS map was made using arcmap in esri arcGIS. All coordinates were converted to decimal degrees in excel.

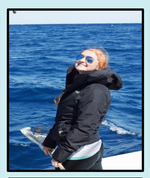
Results



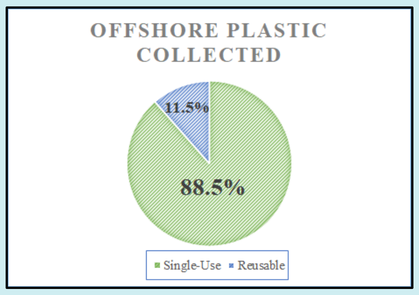


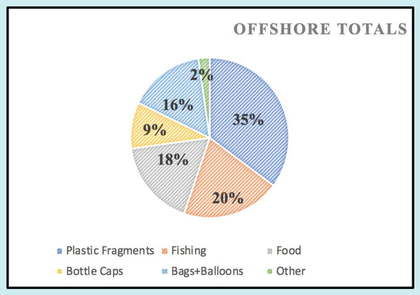
These pictures show various samples that we sorted through. A piece of gum is shown to the right.

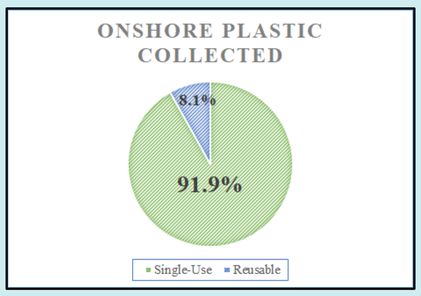


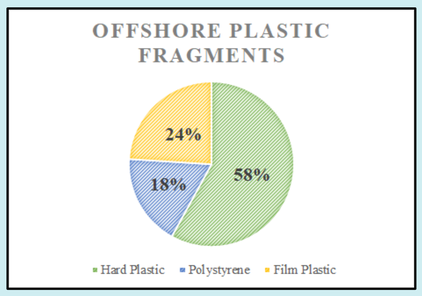


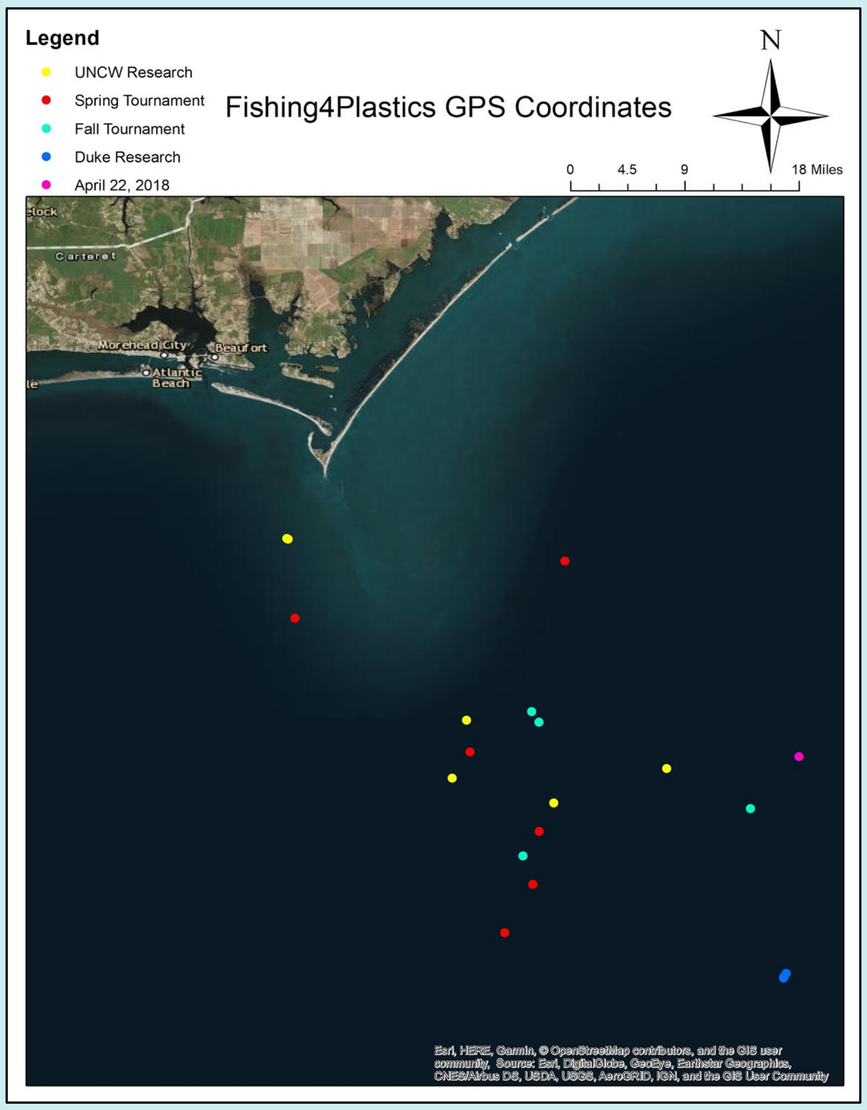
Summer Brooks collecting samples offshore on April 22, 2018.











Conclusions

- From the offshore plastic sorted, 554 out of the 626 pieces of identifiable plastic were single-use resulting in a percentage of 88.5%.
- From the onshore plastic sorted, 597 out of the 652 pieces of identifiable plastic were categorized as single-use, resulting in a percentage of 91.9%.
- The most common single-use plastics found were food wrapping, caps, balloons, bags, cups, beverage bottles, ziplock bags, utensils, and straws.
- Food wrapping was the largest contributor of single-use plastic found on and offshore.
- Food wrapping made up 20.8% of the offshore single-use plastic collected and 34.5% of the onshore single-use plastic collected.
- The percentage of straws included in the single-use plastic percentage was expected to be higher in the offshore results; However, straws made up a higher percentage, 6.2%, of the onshore single-use plastic.
- Collecting samples from the segasm was incredibly difficult due to inadequate tooling. An improvement in the method could aid in the collection process.
- For future research, an increase in participation to collect and quantify larger amounts of plastic from all five gyres would provide a more accurate percentage and could be compared geographically to make more meaningful conclusions on single-use plastics.

Discussion

- What were the alterations to methodology?
  - The NOAA data sheets should be updated in order to more specifically categorize marine debris and include sections such as single-use plastics, ziplock bags, unidentifiable hard plastics, and unidentifiable plastic film.
- Relevant Policy (1):
  - Act to Prevent Pollution from Ships (APPS)
  - Marine Debris Research, Prevention, and Reduction Act (MDRPRA)
  - Shore Protection Act
  - Endangered Species Act
  - Marine Protection, Research, and Sanctuaries Act (MPRSA)
- Plastic bag bans have been successful in areas like San Francisco, Hawaii, and Washington D.C. and should be used as a stepping stone to more plastic bans such as, banning single use plastics. Imposing a fee on single use plastics, establishing a national deposit/refund system, and implementing producer responsibility programs are all potential policy recommendations (2).
- Challenges?
  - Quantifying the individual plastic pieces was a very tedious process that required delicate sorting in order to prevent small microplastic pieces from easily breaking into additional fragments. Transportation of the plastics to the counting labs may have also broken fragile plastics into additional pieces. These factors could potentially skew the results and must be considered.
- Microplastics:
  - Microplastics pertained, mainly, to the offshore plastics. A large amount of microplastics were found in the offshore samples. This shows that it’s important that we collect the larger pieces of plastic before they break apart to create microplastics.

References

GPS offshore map created in ESRI ArcGIS by Michael Mosure. Arisa Yoon for the offshore trip photo.
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Acknowledgements

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