



Plastics: An Investigation of Distribution Due to Water Currents of the North Atlantic Ocean



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INTRODUCTION

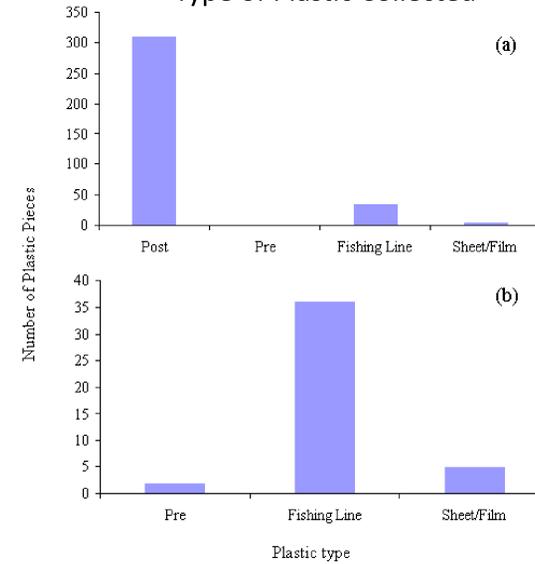
Plastic pollution has become an all too apparent problem to marine environment. Modern plastics have become a significant commodity because they have become stronger, lighter-weight, more resistant to decay, and more inexpensive to produce than ever before. Unfortunately these characteristic have cause plastics to build up in marine systems releasing toxins and due to ingestion, death of marine organisms. In an attempt to better understand the effects of plastic pollution and to implement its clean up massive samplings have been done. In the Atlantic Ocean, significant amounts of plastics are found to accumulate near the Sargasso Sea. Understanding the distribution and accumulation of marine macro and microplastics is crucial to understanding the potential effects of plastic on the marine environment. With continually increasing production and accumulation of plastics, determining where they converge is crucial in determining where to implement counteractive or cleanup strategies.

OBJECTIVE

To measure the abundance of plastic particles along the C229 cruise track. To improve understanding of plastic distribution in the Western Atlantic. To predict how the patterns of distribution are defined by natural systems.

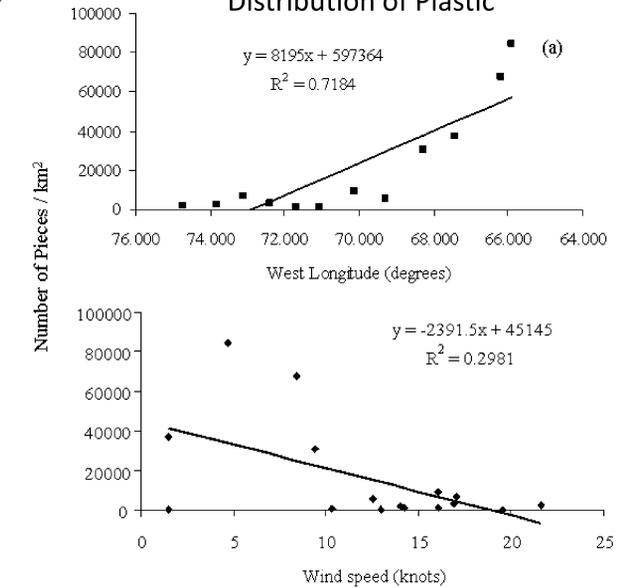


Type of Plastic Collected



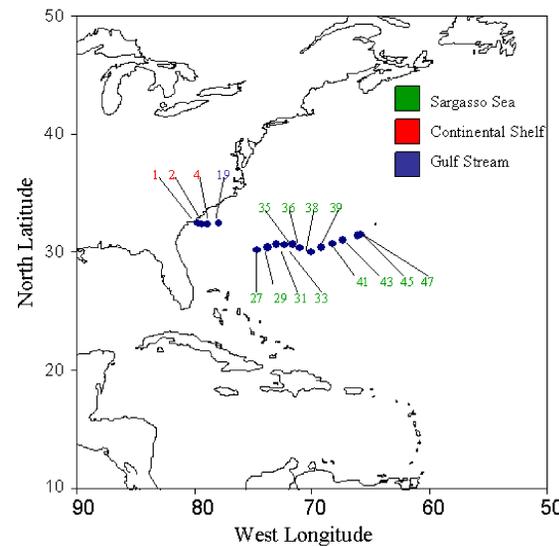
❖ The majority of plastic pieces collected were micro sized post-consumer fragments indicative of plastic that has spent extended periods of time in the ocean and undergone significant degradation

Distribution of Plastic



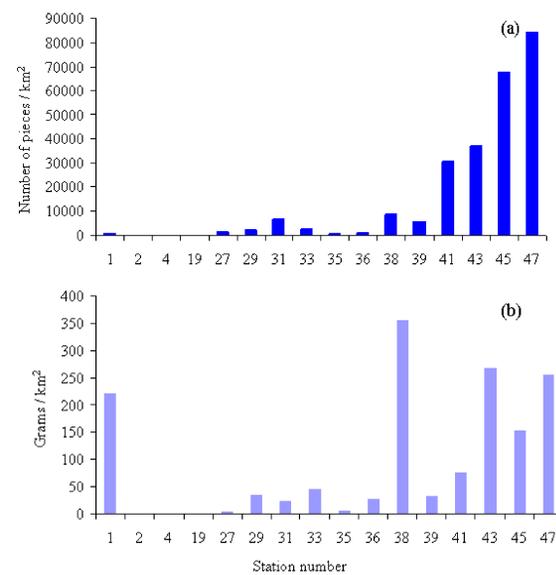
❖ A positive correlation exists between plastic concentration and proximity towards the center of the Sargasso Sea
 ❖ Surface conditions were shown to have less of an impact on plastic concentration compared to the location in the Sargasso Sea.

Map of Neuston Tow Stations



= station number by oceanic location

Abundance of Plastic per Station



❖ The abundance of plastics greatly increases as you get closer to the center of the Sargasso Sea
 ❖ Even though the number of pieces increase significantly along the cruise track the overall weight of the plastics per station is relatively unchanged

Map of Major Oceanic Gyres



METHODS

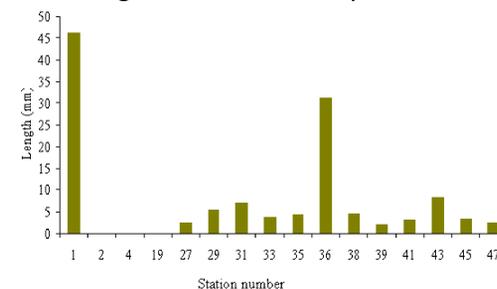
❖ Neuston samples were collected at 16 sites along the C229 cruise track in Continental Shelf, Gulf Stream, and Sargasso Sea waters

❖ Individual plastic pieces were removed, counted, weighed, and categorized (Post Industrial, Pre Industrial, Fishing line, and Sheet/film)

❖ Based on abundance of tow, abundance of plastics was calculated per km² of the area



Largest Size of Plastic per Station



❖ Plastic pieces are significantly larger closer to the coast along the Continental Shelf

CONCLUSION

The distribution of plastics along the C229 cruise track demonstrated a positive correlation between increasing abundance of plastic and eastern longitude. This is primarily due to megascale mechanism of the North Atlantic Gyre. Minorscale mechanisms like wind speed and wave height have an effect on the plastic distribution, but as the samples revealed, not a major influence when compared to the effects of oceanic currents. Currents forming the Atlantic Gyre are what ultimately retain the converged neustonic material and distribute them in the Sargasso Sea. Plastic that accumulates in the Sargasso Sea do not down well with the water mass because of its relative density causing it to float and accumulate. Because of this increased retention at the surface, the plastic degrades into much smaller pieces due to physical destruction by waves, and chemically by photodegradation.

Compared to similar research in the Sargasso Sea area, the observed distribution supports and confirms already known plastic distribution data showing plastic accumulation in the center of large ocean gyre systems. Unfortunately, the calculated abundance of this study's sampling far exceeds the maximum calculated abundance 30 years ago, most likely due to the increasing production and consumption of plastics. From this recent data sample of plastic abundance it is obvious that more effort needs to be placed in the clean up of such neustonic pollutants.

Acknowledgements

This research was conducted as part of the Gulf Stream Oceanography (GUSTO) Program, funded by a grant from the SC Sea Grant Consortium, with shiptime support from the College of Charleston. We want to also thank Gorka Sancho, Leslie Sautter, and Scott Harris from CoC, and Amy Siuda from SEA for all of their help preparing and refining this research. And to thank all of the crew of the Corwith Cramer for an amazing leaning experience.