

# Abundance and Distribution of Marine Debris in Mangrove Environments in Key Biscayne, Florida.



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## INTRODUCTION

- ❖ In 2014, there were an estimated 5.25 trillion plastic particles floating throughout the oceans, totaling at a weight of 268,940 tons (Eriksen et al., 2014).
- ❖ South Florida houses over 400,000 acres of mangroves, which provide crucial ecosystem services including nursery grounds for juvenile marine life, sediment trapping, sequestering carbon, and protecting coastlines from waves and wind.
- ❖ Harboring of marine debris in mangrove forests can be detrimental to the vegetation and associated fauna if harmful chemicals are released by debris (Martin et al. 2019) (Fig 1).
- ❖ The purpose of this research is to determine how the abundance and distribution of marine debris varies with different mangrove environments (Fig 2) within the island of Key Biscayne, Florida (Fig 3).

## RESEARCH OBJECTIVES & HYPOTHESIS

- ❖ Determine if the orientation and characteristics of different mangrove environments change the abundance and distribution of marine debris that is collected.
- ❖ Evaluate whether areas facing the Atlantic Ocean collect more marine debris.
- ❖ Characterize the type and size of marine debris in mangrove environments.
- ❖ Evaluate role of sediment texture on trapping marine debris; quantify changes in sediment size between the study sites.
- ❖ **Mangrove areas in South Florida that are exposed to the Atlantic Ocean will have greater distribution and abundance of marine debris compared to mangrove areas more sheltered or facing intracoastal waterways.**



Figure 1: Balloon found entangled in mangrove prop roots.

## METHODOLOGY

- ❖ Study sites: Crandon Park (CP) and Bill Baggs Cape Florida State Park (BB) (Fig 3).
- ❖ Line transects were conducted perpendicular to shore for sediment and marine debris data collection (Fig 2).
- ❖ Ro-Tap dry mechanical sieve utilized for sediment analysis.
- ❖ Sediment sample and marine debris locations per transect mapped on ArcGIS.



Figure 2 L to R: Fishing gear found along line transect in mangroves, sediment samples being washed to prep for analysis, oyster shells sorted by Ro-Tap.

## KEY TAKEAWAY:

**Marine debris is in higher abundance and distribution in mangrove environments exposed to the Atlantic Ocean (Crandon Park)**



Figure 3. Clockwise from L to R: Map of study area Key Biscayne, Florida. Two study sites noted by blue stars. Study Site #1 Crandon Park (CP). Study Site #2 Bill Baggs Cape Florida State Park (BB). Red, yellow and green points represent Low Water (LW), Mid Water (MW), and High Water (HW) values, respectively.



Figure 4 L to R: Comparing Sediment Composition Averages, Comparing Mean (Φ) Averages for CP and BB study sites.

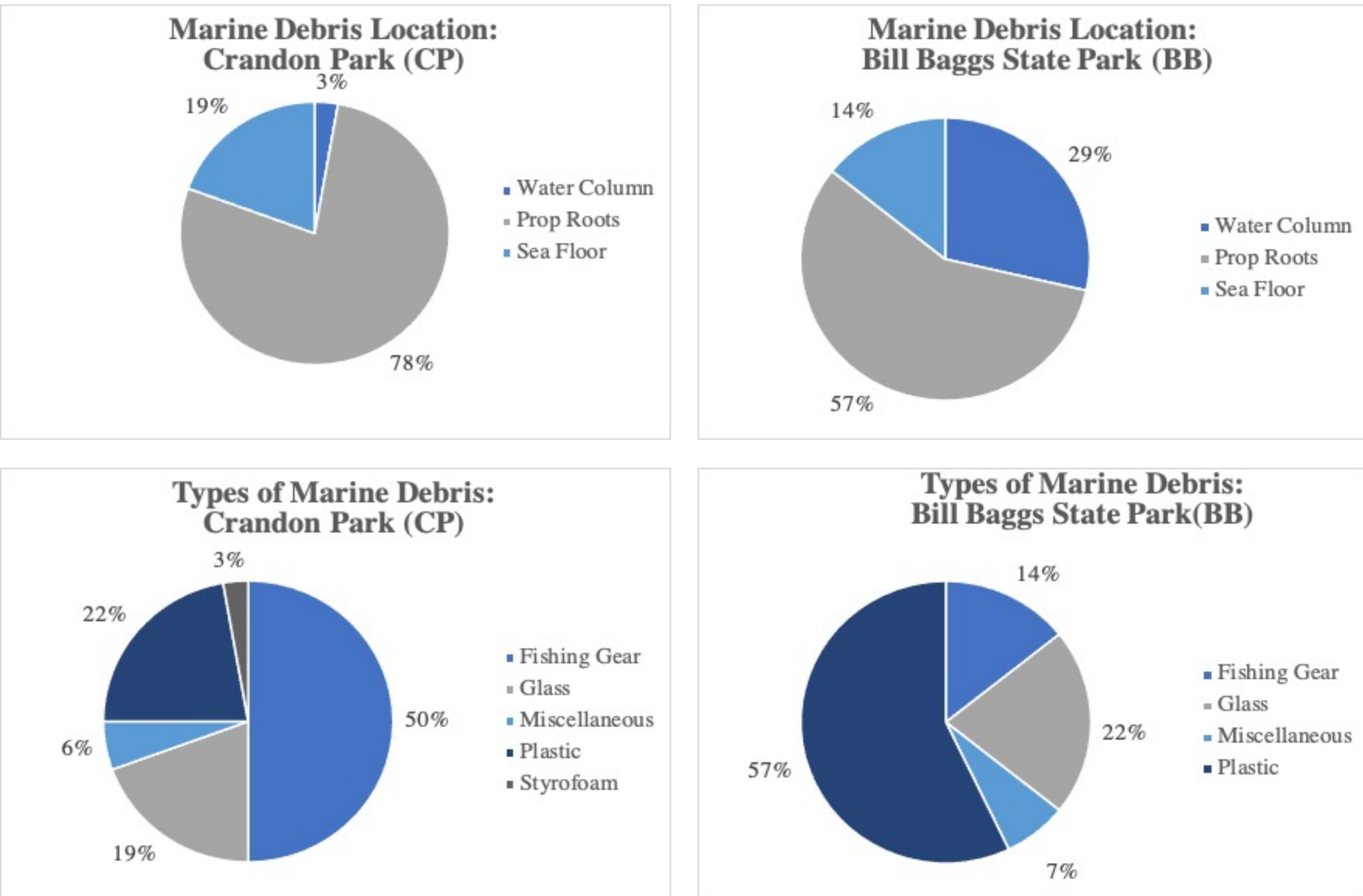


Figure 5: Types of Marine Debris and Marine Debris Location for CP and BB study sites.



Figure 6: Aerial photo of marine debris collected along transects. Left of the dotted line represents marine debris found in CP, right of the dotted line represents marine debris found in BB.

## RESULTS

- ❖ Both study sites had an overall increase in Mean (Φ); sediment composition became finer along the transect from Low to High Water.
- ❖ CP had a greater average sand % and Mean (Φ), indicating overall finer sediment.
- ❖ BB had greater variability in sediment composition (Fig 4).
- ❖ Potential Outlier: BB Transect #6 had high gravel % and was located near a flowing channel.
- ❖ 50 pieces of marine debris were collected: 36 from CP (72%), 14 from BB (28%) (Fig 6).
- ❖ Fishing Gear was the most common marine debris at CP (50%), and Plastic was the most common marine debris at BB (57 %).
- ❖ Mangrove Prop Roots were the most common marine debris location for CP (78%) and BB (57%) (Fig 5).
- ❖ CP had double the amount of marine debris, averaging 3 items/transect, and BB averaged 1.5 items/transect.

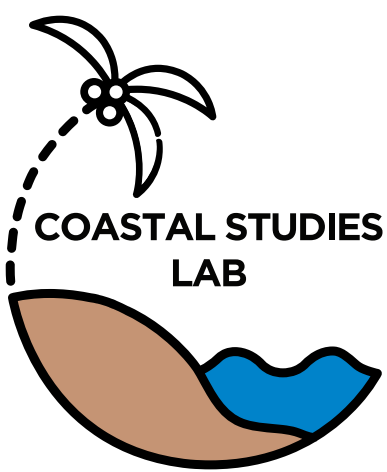
## DISCUSSION & CONCLUSION

- ❖ Overall, CP had the greatest abundance and distribution of marine debris throughout the study site.
- ❖ Greater sand percentage correlated with greater abundance of marine debris.
- ❖ Next steps should address management strategies in Crandon Park to minimize the large influx of fishing gear found in the mangroves.
- ❖ Future studies should consider tidal flow and additional study sites to better understand abundance and distribution of marine debris. Tidal flow measurements could also further explain the potential outlier at BB Transect #6.
- ❖ Future studies should conduct additional transects for a more representative dataset of study sites being analyzed.

## SELECTED REFERENCES

- Eriksen M., Lebreton, L. C. M., Carson, H. S., Thiel, M., Moore, C. J., et al. 2014. Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea. *PLoS One*. 9: 1-15. Accessed on 6 October 2019. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0111913>
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