

BACKGROUND

- Marine debris (MD) is a persistent issue across the world and is expected to increase under current conditions (Jambeck et al., 2015)
- Debris can persist in the environment indefinitely (especially plastics), and can harm wildlife and local economies
- Islands serve as environmental monitors, remaining passive bystanders in the distribution and dispersal patterns of global debris
- Remote islands with low populations have been found to have some of the highest accumulation of debris in the world (Lavers et al., 2019)
 - Debris is highly transient/mobile and can reside on beaches distal from it's origination point
- The Caribbean is a hotspot of MD (Ivar do Sul & Costa, 2007), especially locations adjacent to tourist sites and urban centers (places with higher foot traffic) (Schmuck et al., 2017)

OBEJECTIVES AND PREDICTIONS

Goal: To analyze the standing stock of debris present on various Belizean beaches.

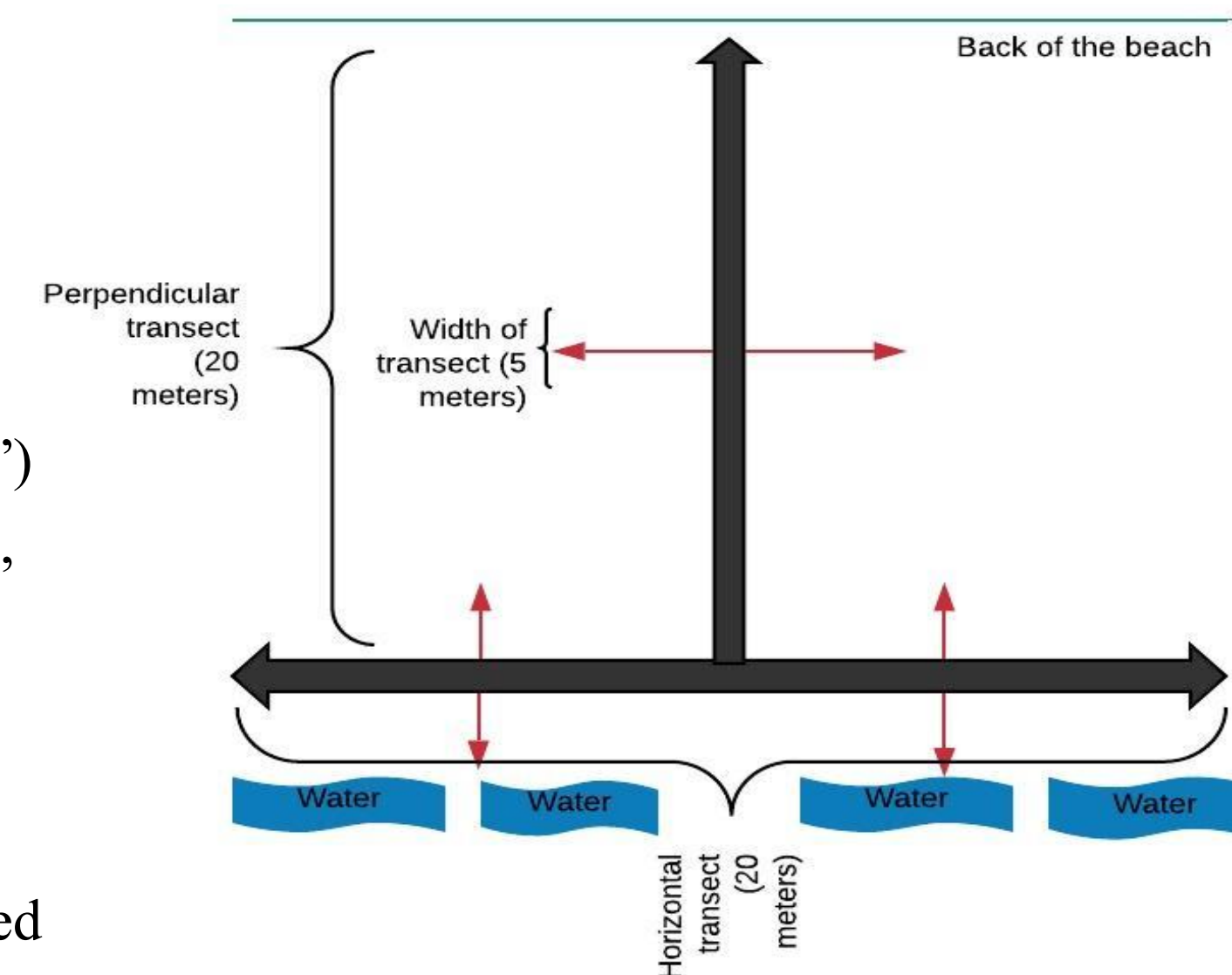
H1: Beaches with higher foot traffic will have less debris present overall.

H2: Beaches with lower foot traffic will have a higher accumulation of fragmented and worn debris.

Table below: Descriptions of study islands. Presence of tourist resorts is a proxy for foot traffic.

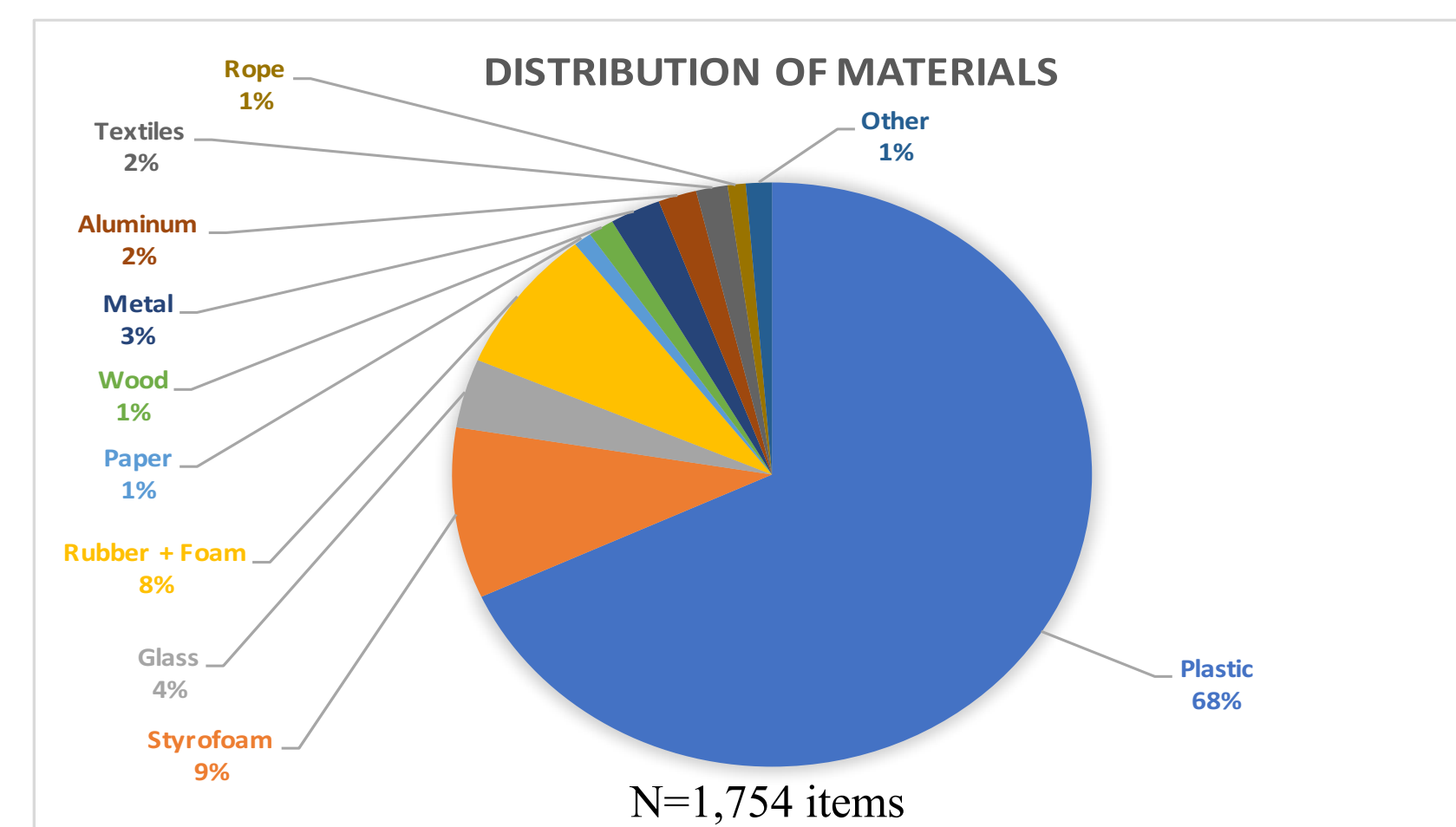
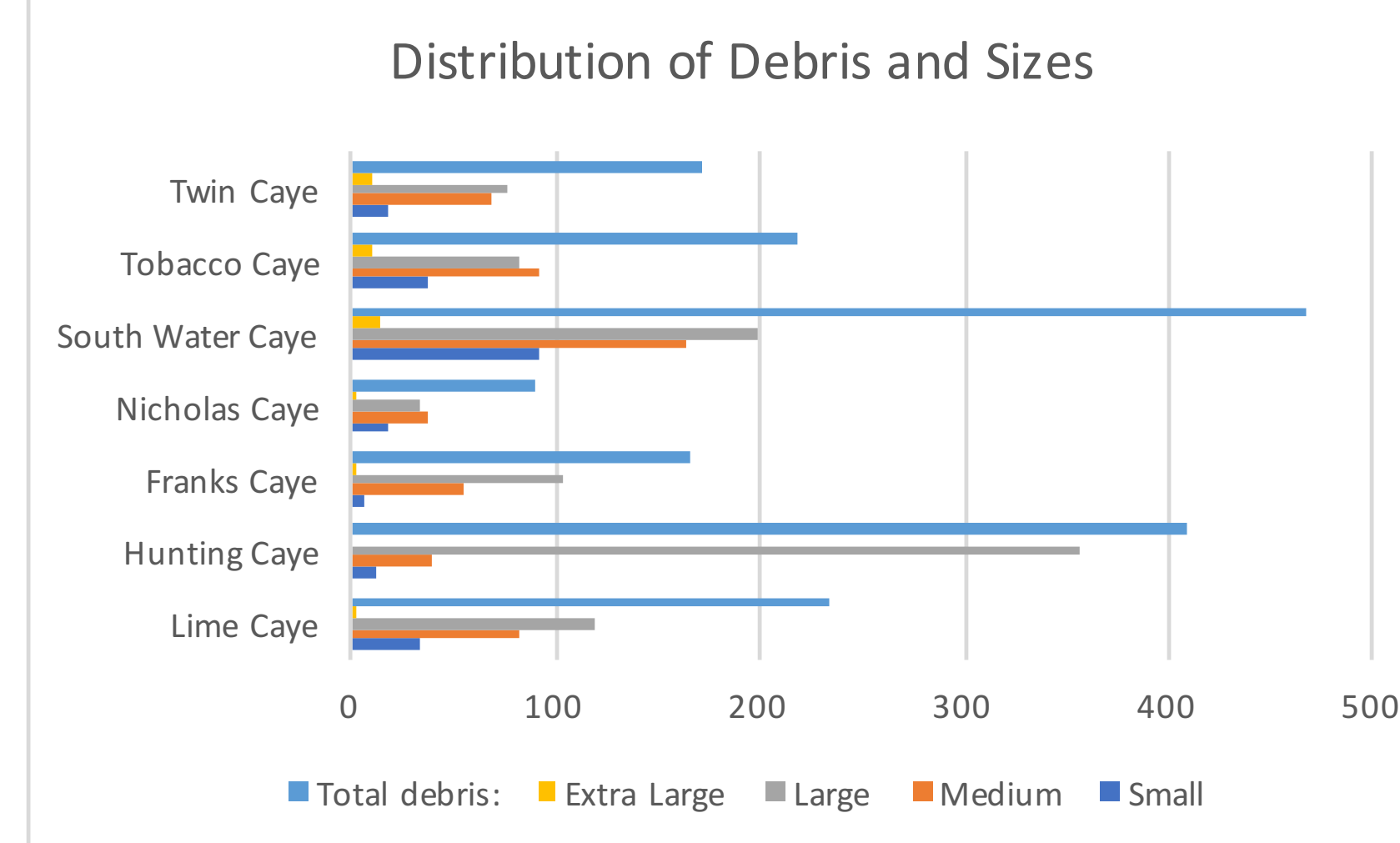
METHODS

- 20 meter transects were used along beaches
 - 5 m width of each transect (Araújo et al., 2006) (see diagram), with maximum area of 100 m² for each transect
- Transects horizontal (H) and perpendicular (P) to the shoreline account for fresh and accumulated debris (Velander & Mocogni, 1999) (related to debris “condition”)
- Debris was cataloged and categorized based on: size (S, M, L, & XL), material, object form, physical condition, and source (recreational, industrial, fishing, or unknown)
- Size categories: S (<2.5cm), M (≥2.5 cm; ≤10 cm), L (>10 cm; ≤1 m), and XL (>1 m) (based on Ribic et al., 1992)
- “Condition” or fragmentation: Whole, partial, or fragmented
- ANOVA and Chi-Square statistics were used to investigate relationships of debris sizes/condition across transects



RESULTS

- Plastic was most common (68.13%), with beverage bottles being the most common object (571 plastic and 53 glass bottles) [N=1,754 debris items]
- 55.1% of debris were large (967 items; >10 cm; ≤1 m)
- Debris sources: 75% recreational, 19% unknown, 4% industrial, and 2% fishing
- Hunting Caye had highest average items/m² (4.09); South Water Caye had highest area surveyed (600.25 m²), but third lowest average (0.79 items/m²)
- H transects had 66.6% (1,168 items) of total debris, P transects had the remaining 33.4% of debris
 - H and P transects had statistically similar distributions in debris size [F=1.48, p=0.22, α=0.05] and condition [F=0.33, p=0.57, α=0.05]
- NW facing beaches had highest average items/transect (148.25), followed by S facing beaches (142 items/transect)
 - Using Chi-Square analysis, N,NW, S, and SE facing beaches found significant [F=6, p > 0.05]



CONCLUSIONS

- Abundance of single-use plastic and Styrofoam found here indicates a heavy anthropogenic influence on debris; most of these items seem to have originated from everyday human activities (e.g. water bottles, take-out containers)
- Islands with lowest amounts of foot traffic (Hunting, Franks, and Twin Cayes) were found to have highest average debris/m² present (supporting H1)
- The most trafficked island (South Water) had the highest incidence of fragmented debris; H2 is not supported
 - Can be attributed to daily cleaning of beaches
- Daily cleaning of beaches effects composition (size/condition) of debris, leaving heavily trafficked (tourist) islands with smaller, fragmented debris
- Currents and prevailing winds can influence debris accumulation patterns (based on Chi-Square statistic)
- Further research is necessary to gain a longitudinal understanding of debris in Belize and should include debris accumulation rates
- This research provides a baseline analysis of debris that policy makers can reference for future legislation regarding environmental pollution, permitting targeted mitigation efforts

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