

Plastic debris baseline studies in the Bay Islands National Marine Park (BINMP) of Honduras

Introduction

The BINMP is home to the second-largest coral reef in the world, the Mesoamerican Reef and three wetlands declared internationally important by the Ramsar Convention¹. Unfortunately, the area is threatened by over 8,000 tonnes of plastic debris from the Motagua River in Guatemala and various Honduran Rivers yearly². The impact of this pollution on the BINMP's delicate ecosystems is not yet known. Therefore, this study aims to explore the effect of anthropogenic marine debris on the mangrove ecosystem in Roatan.



Fig. 1: Pollution from Motagua river in the Gulf of Honduras.

Study area

The BINMP is located in the Caribbean and is composed of three primary islands: Roatan, Utila, and Guanaja. The study area, the Santa Elena Wetland System in Roatan, Honduras, covers an area of 1,543 hectares and it was designated to be of international importance under the RAMSAR convention in 2018.

The wetland system is characterized by a large mangrove cover, reefs, and seagrass meadows. Due to its size and conservation efforts, the site's mangrove forest is an important resting, feeding, and nesting area for fauna such as several species of resident and migratory birds, iguanas, and crocodiles³.

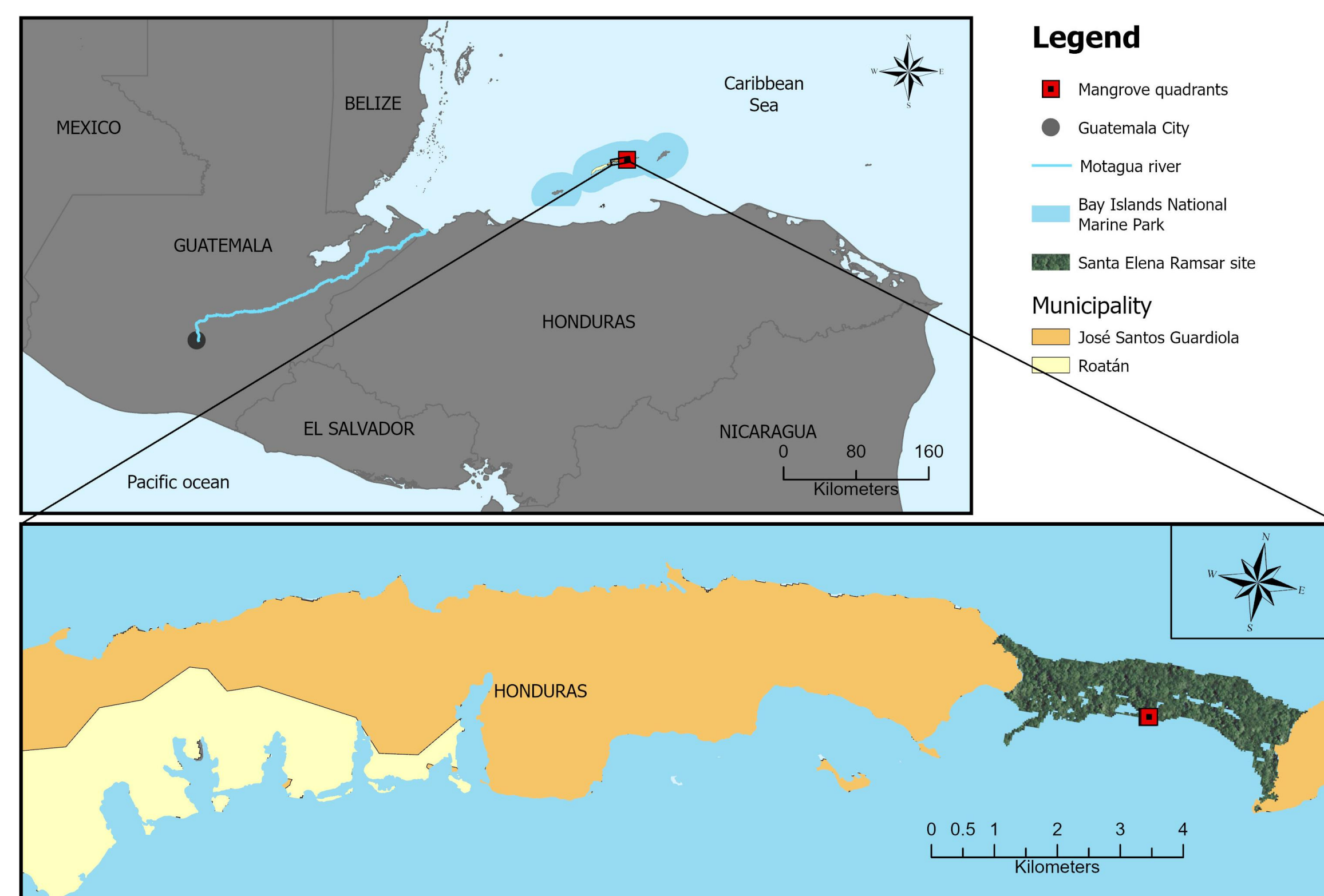


Fig. 2: The study site is located in the Santa Elena Wetland System in Roatan, Honduras

Methods

Mangroves

Three quadrants of 5x5 meters were delimited along the seaward side of the mangrove forest. The quadrants were spaced 5 meters apart from each other and were georeferenced and photographed for future reference. Each quadrant was marked, and all marine litter objects within the quadrant area were gathered, counted, and recorded by category.

Fauna

An American crocodile (*Crocodylus acutus*) was found dead on Roatan Island on June 9, 2022. The crocodile's digestive system was extracted for research purposes⁴. The macroplastics found were measured for length, width, weight, and photographed. The composition of the plastic was confirmed using FTIR.



Fig. 3: A) Mangrove ecosystem. B) Anthropogenic Marine Debris (AMD) in mangroves. C) and D) Illustration of the most common items found in mangrove quadrants, footwear, and drinking bottles, respectively. E) Items found in quadrant 2.



Fig. 4: Procedure for crocodile's necropsy. A) Specimen found dead. B) Measurements, examination of carcass and dissection of the animal. C and D) items found in the digestive tract.

Preliminary results

A total of 367 litter items were found in the Santa Elena mangrove forest, resulting in a density of 4.9 ± 0.5 items/m² in the quadrants. Moreover, the weight of the collected samples was 247.5 ± 57.7 g/m² in the study site (Figure 5).

The crocodile was an adult male with a total length of 3.76 m. In the process of the necropsy, 20 anthropogenic items were removed from the digestive tract, including bags, hooks, fishing lines, and straws. The largest item was a red sac of 0.7x0.4 m that weighed 75.1 g (See Figure 4).

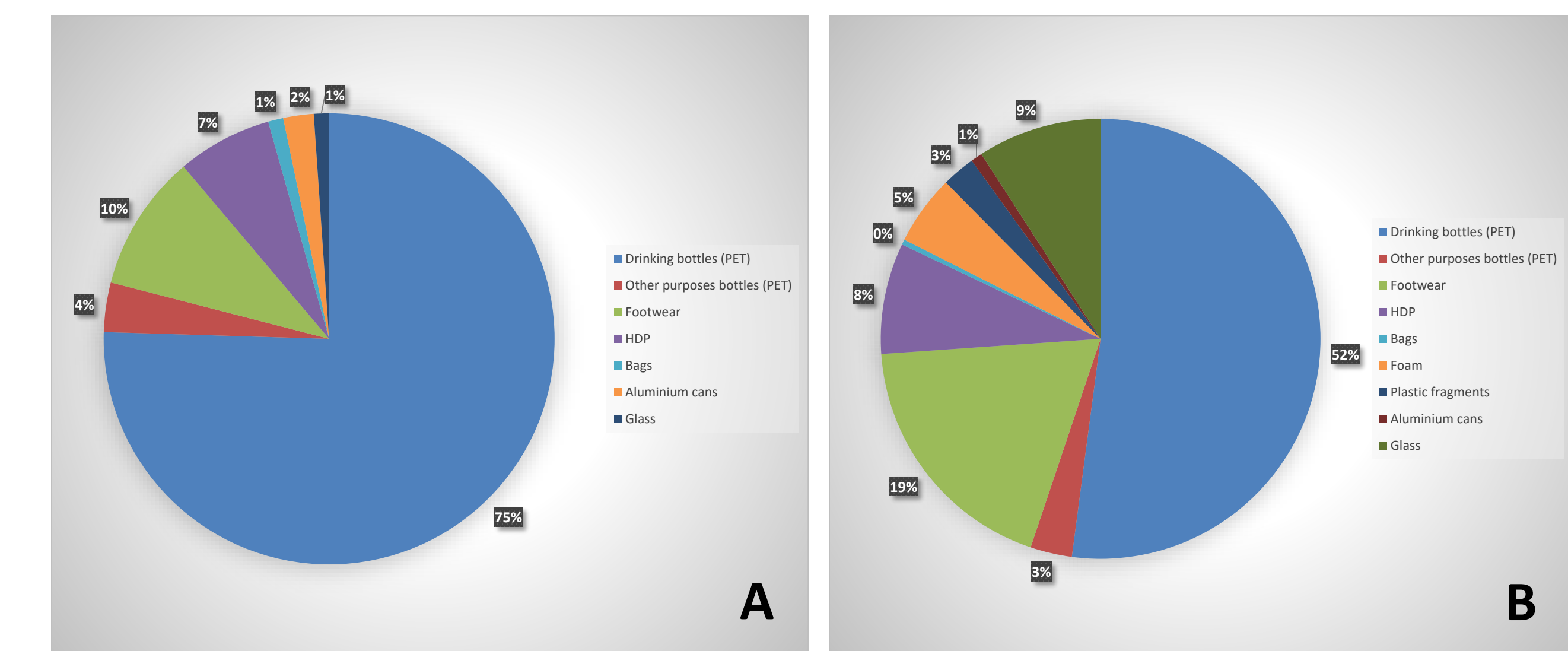


Fig. 5: A) Percentage composition of AMD across the sampled area in Santa Elena mangroves. B) Weight of AMD sampled.

Discussion

Our preliminary results found a high density of anthropogenic debris items in the Santa Elena mangroves, which is concerning for a few reasons. Firstly, there are no large communities situated close to the study site. Secondly, since 2019, the western side of Roatan Island has prohibited single-use plastic, including plastic bottles, yet they constituted 75% of the litter found. Finally, the mangroves of Roatan have a significantly higher density of litter items compared to studies conducted in the Red Sea and Arabian Gulf regions, despite the latter two being closer to larger cities⁵.

Work underway

- Return to the study area to measure the rate of accumulation of plastic waste in mangroves.
- Use satellite trackers from Motagua River and Roatan creeks to determine if they are the source of plastic waste to the study area.

Acknowledgments Funding provided through the NSERC Discovery Grant to J.C.V.

References

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