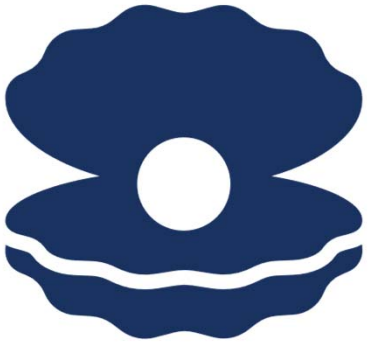


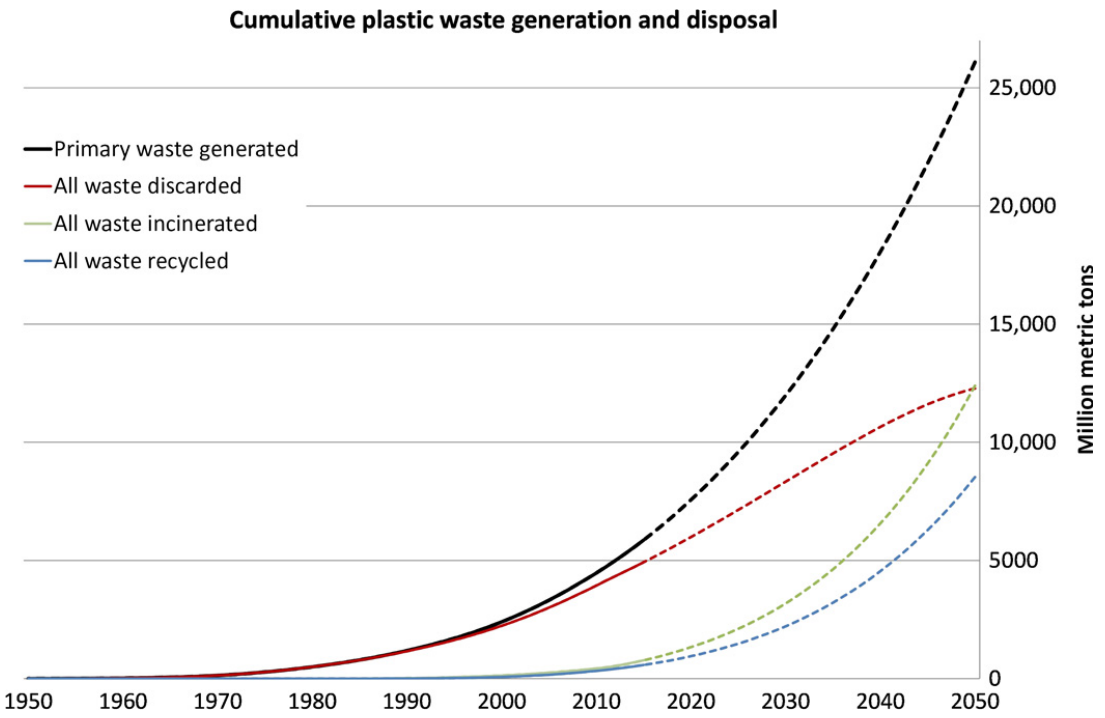
Microplastics in Oysters from the Mississippi Sound

Kendall Wontor

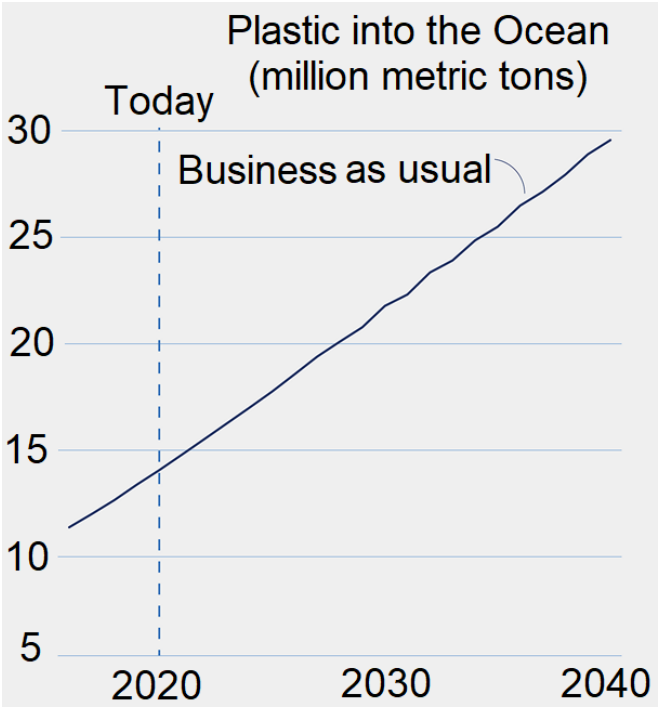
Department of Chemistry & Biochemistry

University of Mississippi

Microplastics as a Global Contaminant

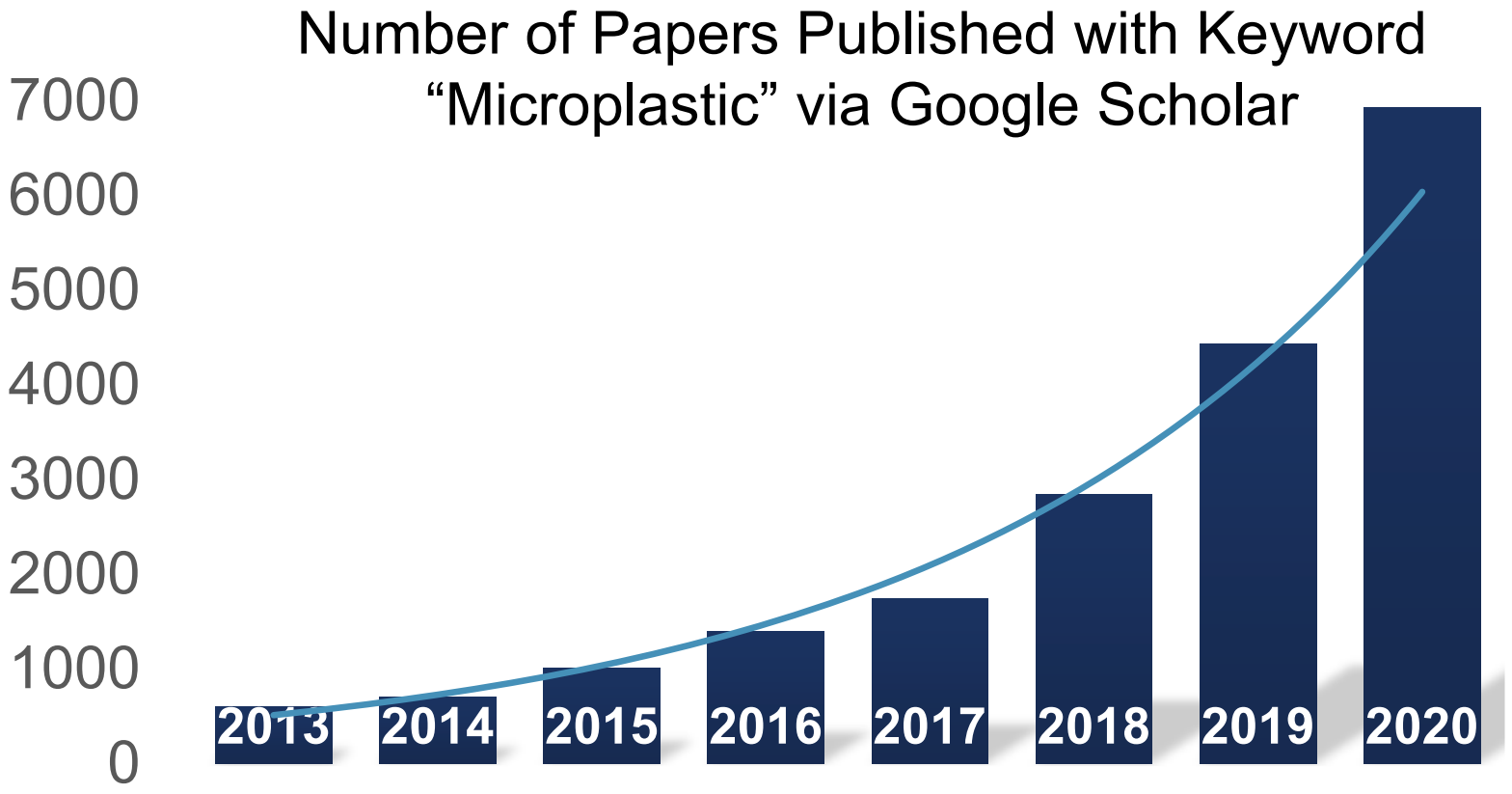


Geyer, R. et al. (2017) Production, use, and fate of all plastic ever made. *Sci. Adv.* 3(7).



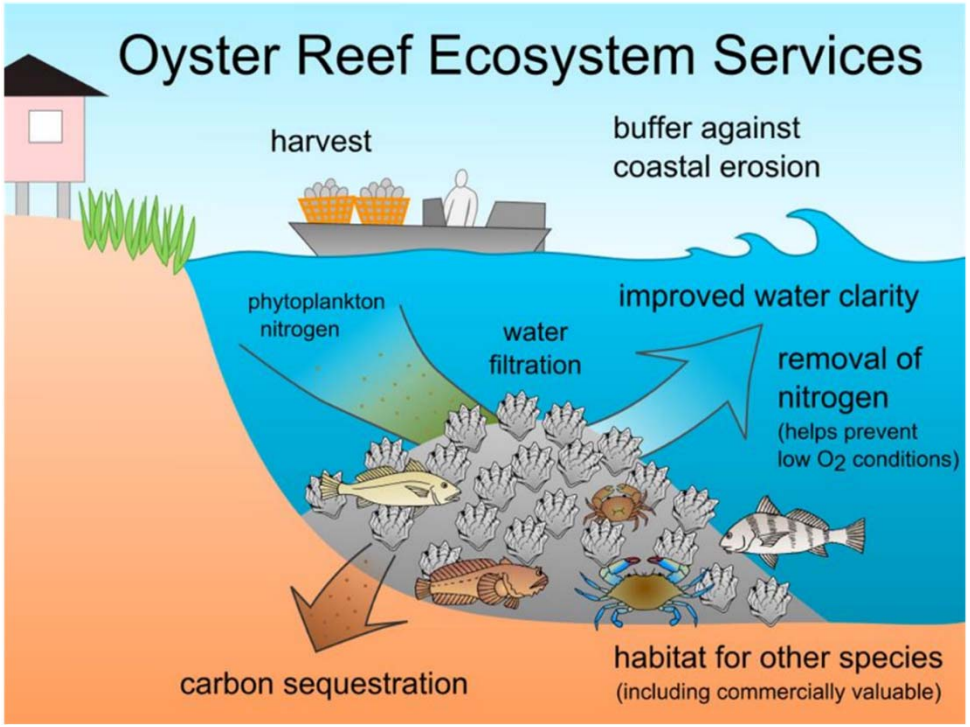
PEW Charitable Trusts and SystemIQ. "Breaking the Plastic Wave: A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution," 2020.

Microplastics as an Emerging Contaminant



Why Oysters?

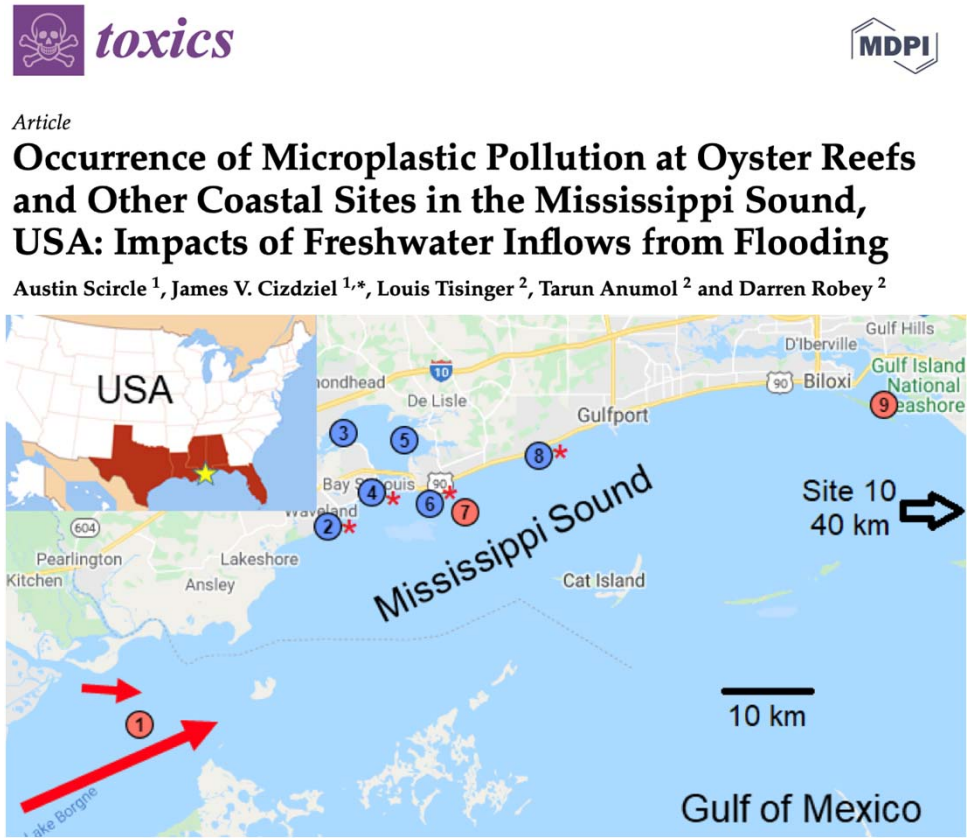
- "Foundational Species" that provides a variety of ecosystem services
- Filter feeders likely to have large exposure MPs
- Important part of the Gulf Coast economy



Updated Pre-filed Direct Testimony of Florida Witness David Kimbro, Ph.D., State of Florida vs State of Georgia 585 U.S. ___ (2018)

Previous Studies on MPs in Oyster Reef Waters

- Results showed an average of 129 ± 93 MPs/L
- Adults oyster filter roughly 189 L/day
- Potential exposure of ~5,600-36,000 MPs per day



toxics

MDPI

Article

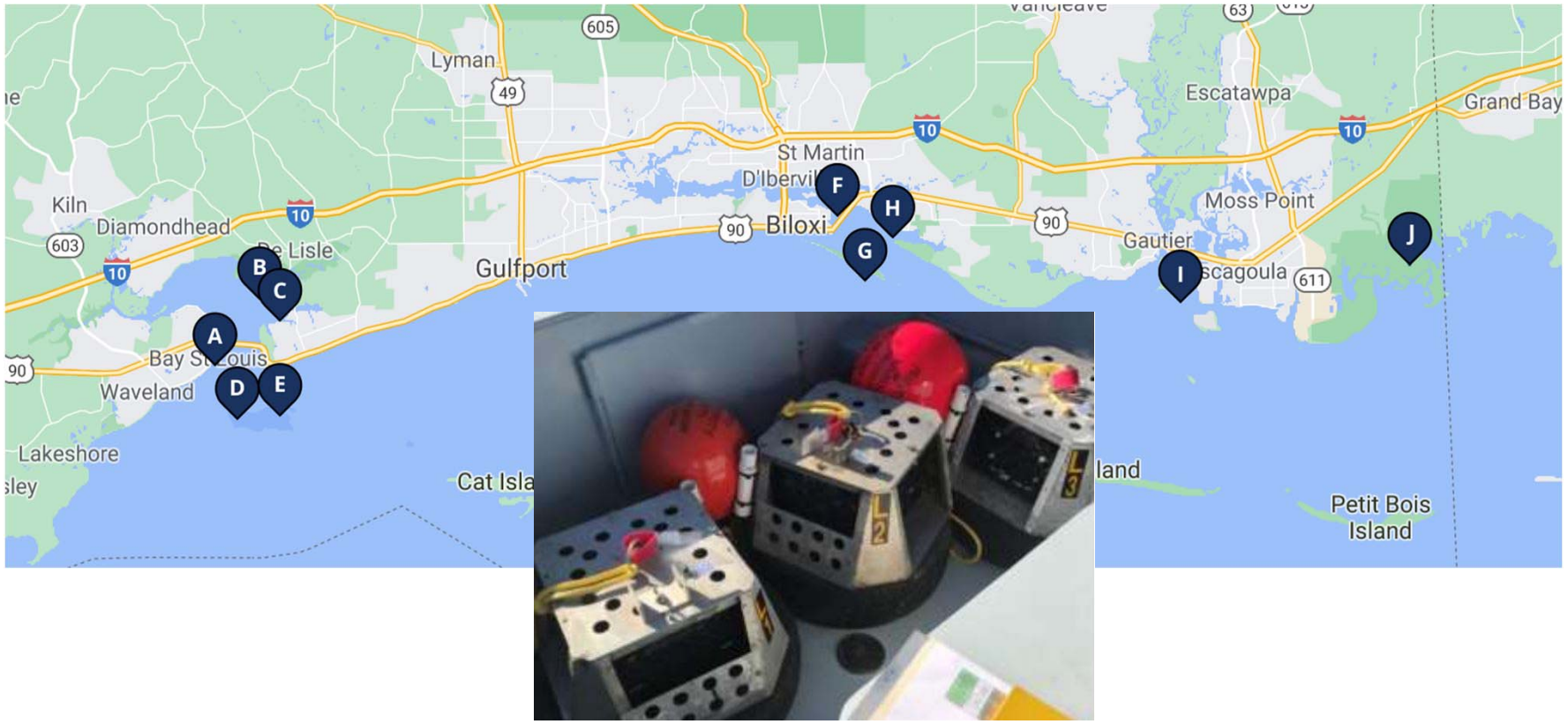
Occurrence of Microplastic Pollution at Oyster Reefs and Other Coastal Sites in the Mississippi Sound, USA: Impacts of Freshwater Inflows from Flooding

Austin Scircle [1], James V. Cizdziel [1,*], Louis Tisinger [2], Tarun Anumol [2] and Darren Robey [2]

Project Goals

- Determine
  - If oysters in the Mississippi Gulf are ingesting MPs
  - If the levels of MPs ingested differ by location
  - If ingested MPs localize in specific tissues
  - What type of polymers are ingested

Initial Oyster Deployments, Aug 2020



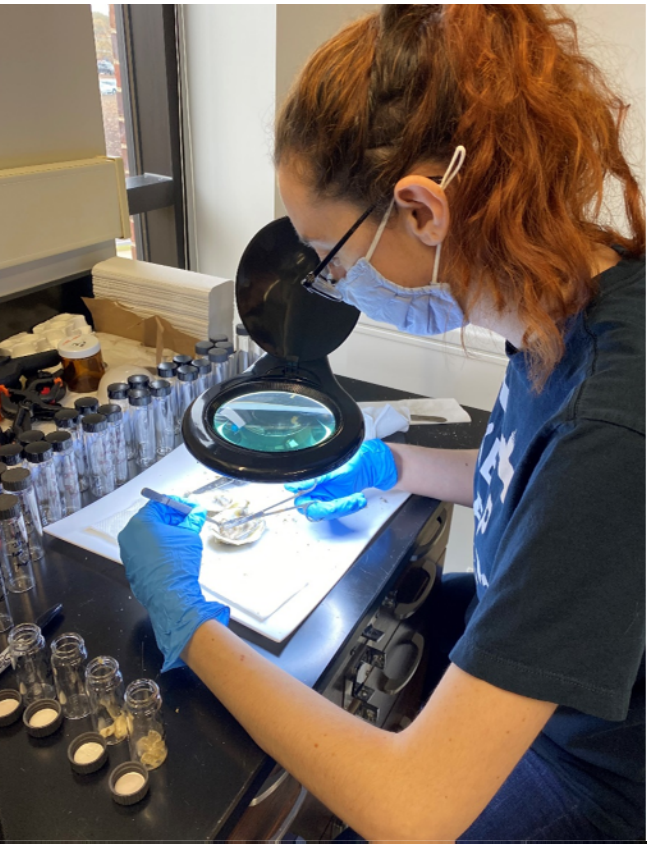
Oyster Deployment Following Hurricane Season 2020

Mississippi Oyster Gardening Program Sites

Mississippi Oyster Gardening Program

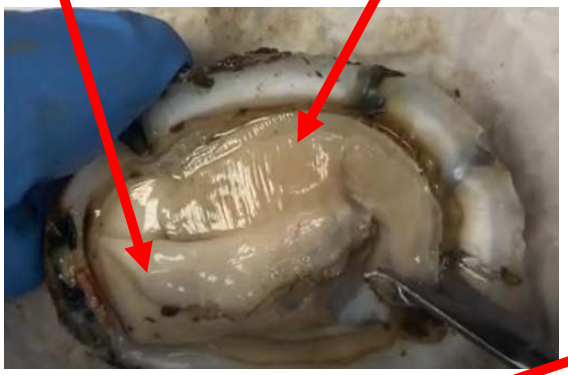
Mississippi Oyster Gardening Program Sites

Dissection of Oysters



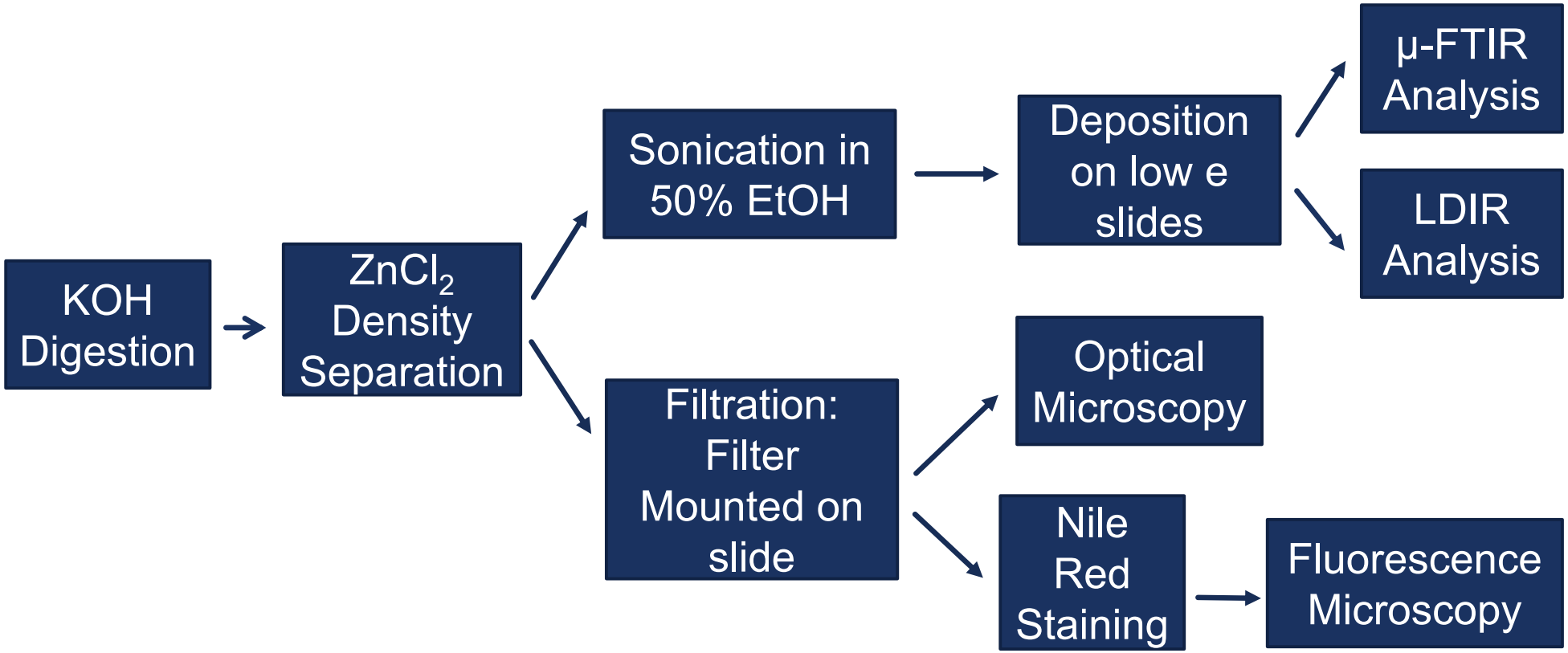
Mantle cut & peeled away to reveal gills

Gill layers below mantle

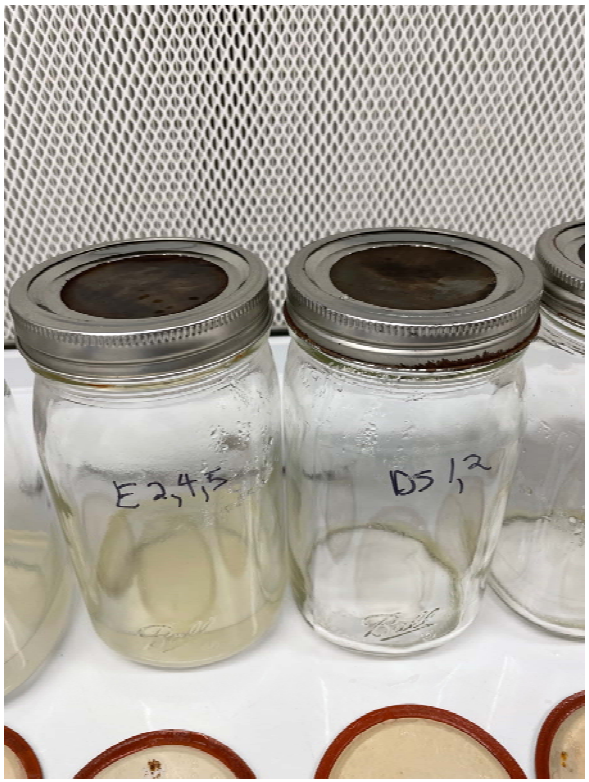


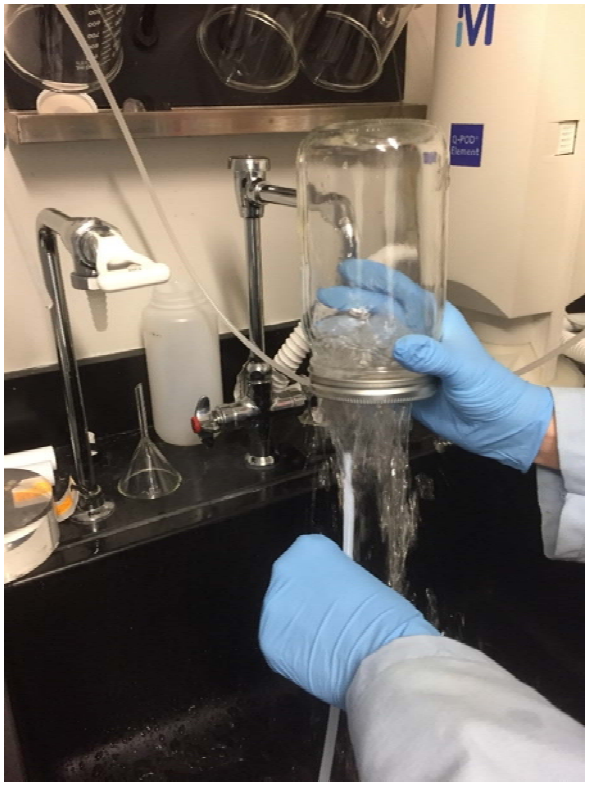
Digestive system after removing gills, mantle, & cutting away abductor muscle

Methodology



KOH Digestion



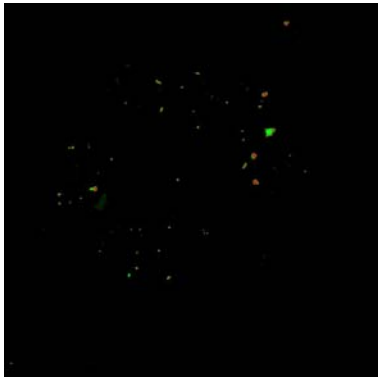


$ZnCl_2$ Density Separation and Filtration

Analysis

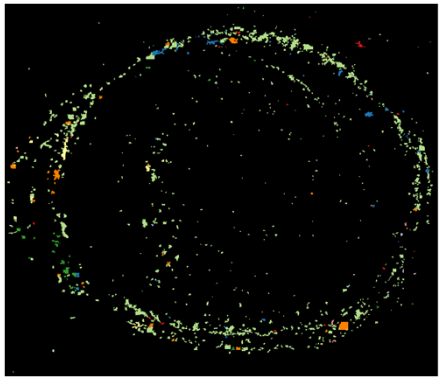
Fluorescence Microscopy

- + Low cost, ability to automate
- - No chemical information
- Majority of samples



Microspectroscopy

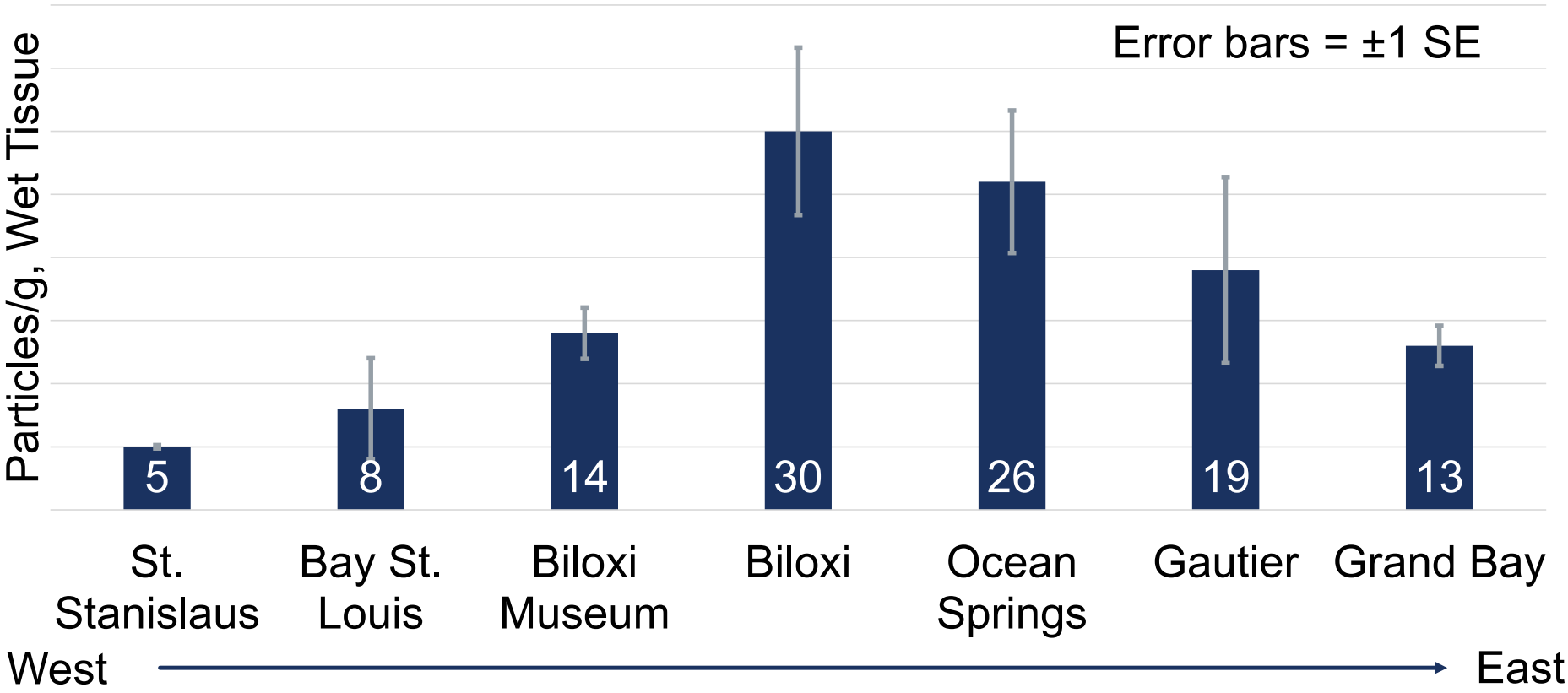
- + Chemical identity of the MPs
- - High cost of instrument, long scans
- Select samples (collaborators)



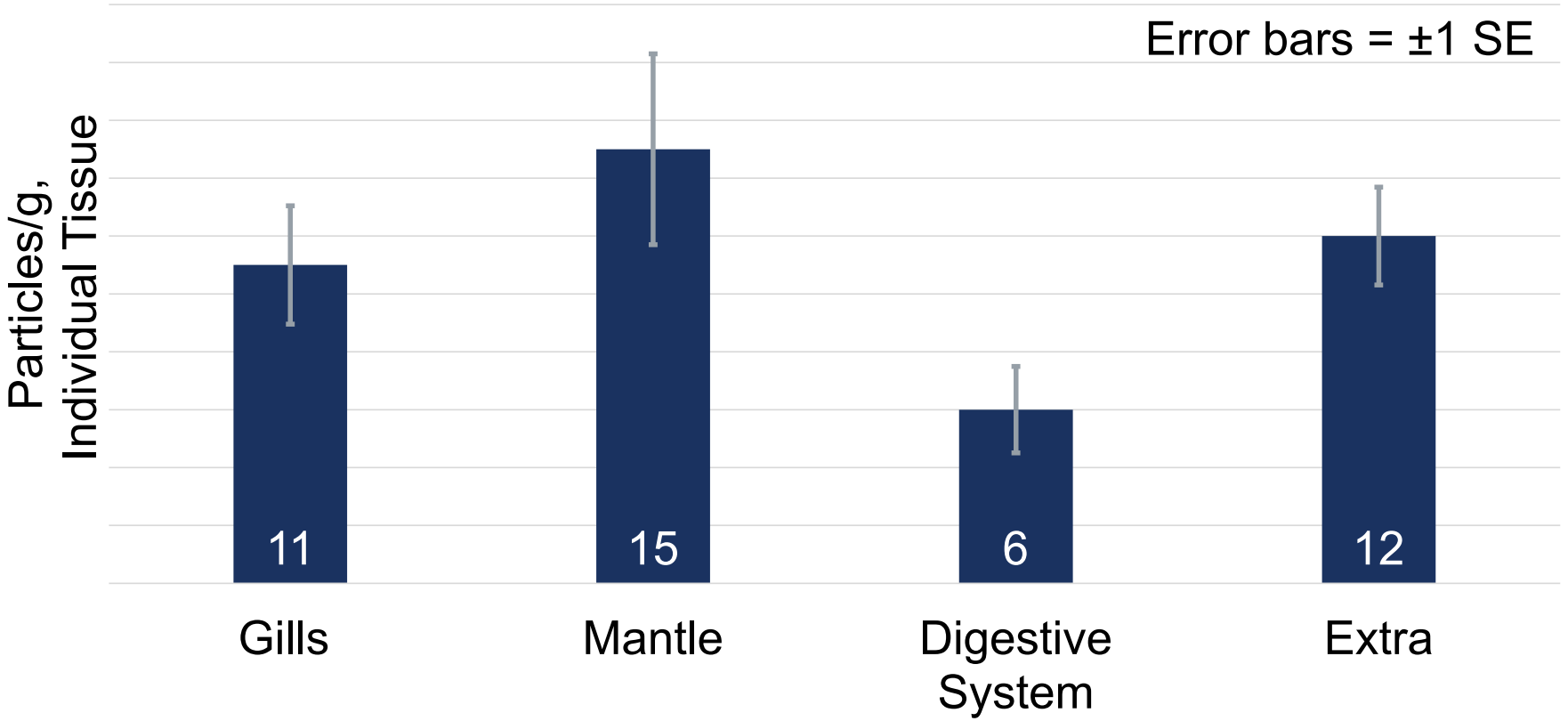
Blanks

- All blanks contained microplastics
- Steps to reduce contamination
  - Prefilter all reagents
  - Always keep samples covered
  - Work in laminar flow hood
  - 100% cotton lab coats and natural fiber clothing

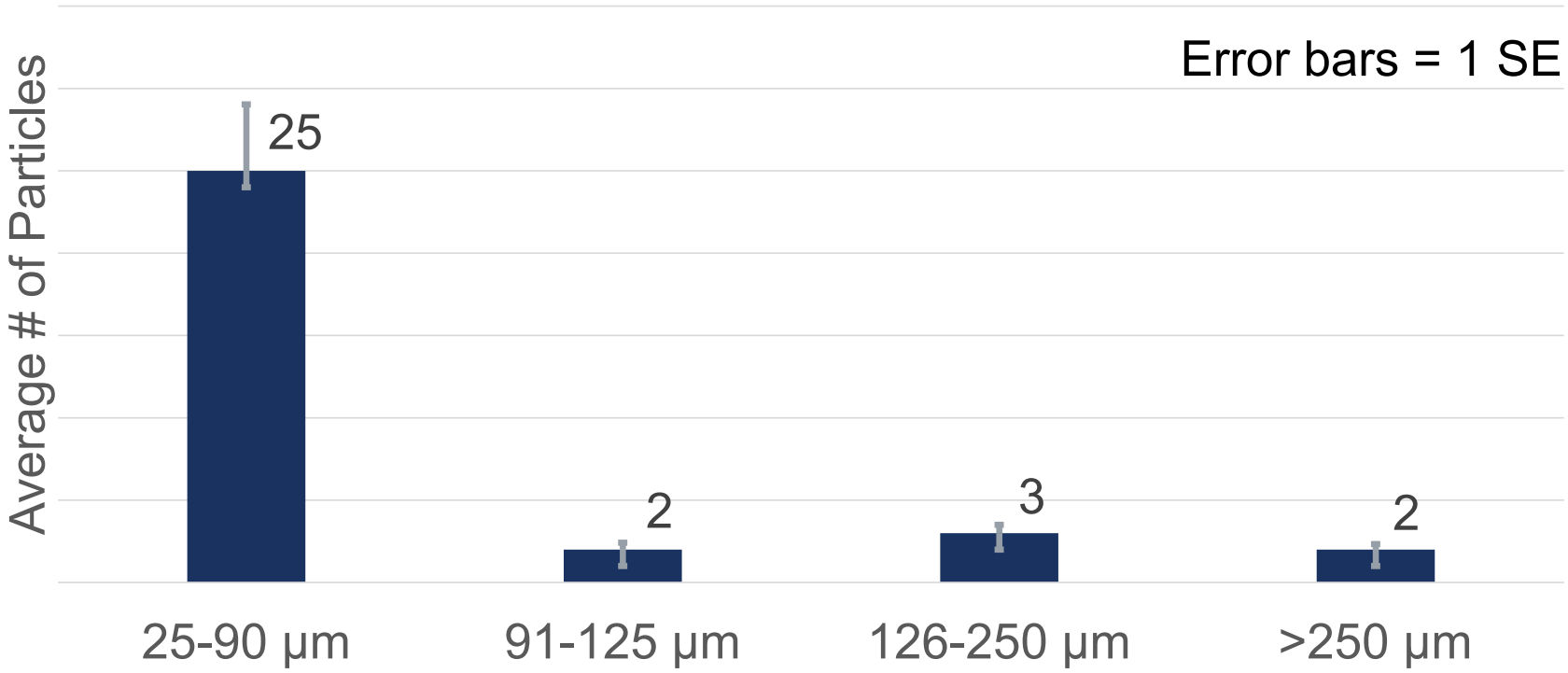
Microplastics in Oysters by Location, n = 5



Microplastics in Oysters by Tissue, n = 17

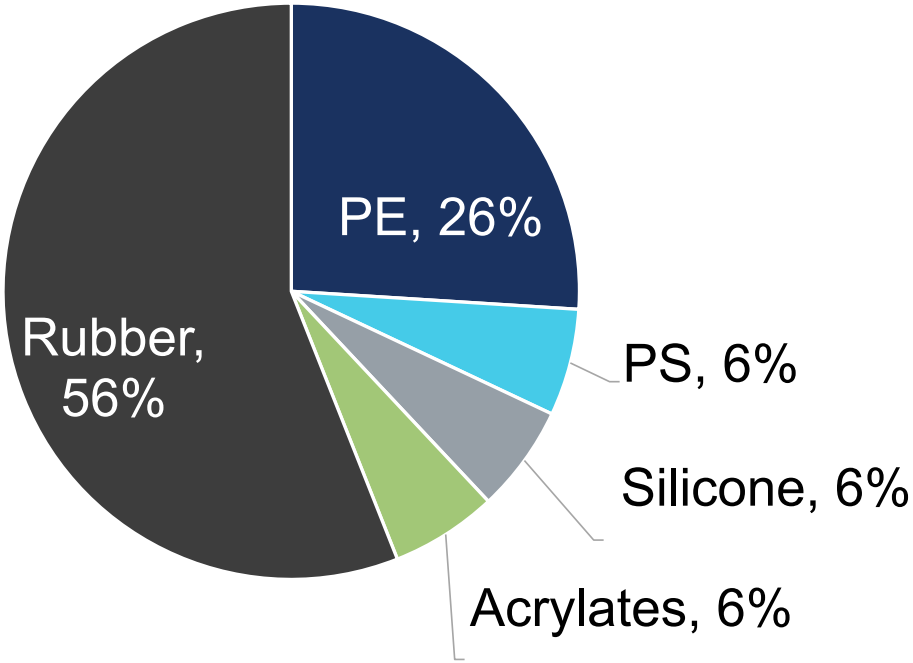


Size Distribution of Microplastics

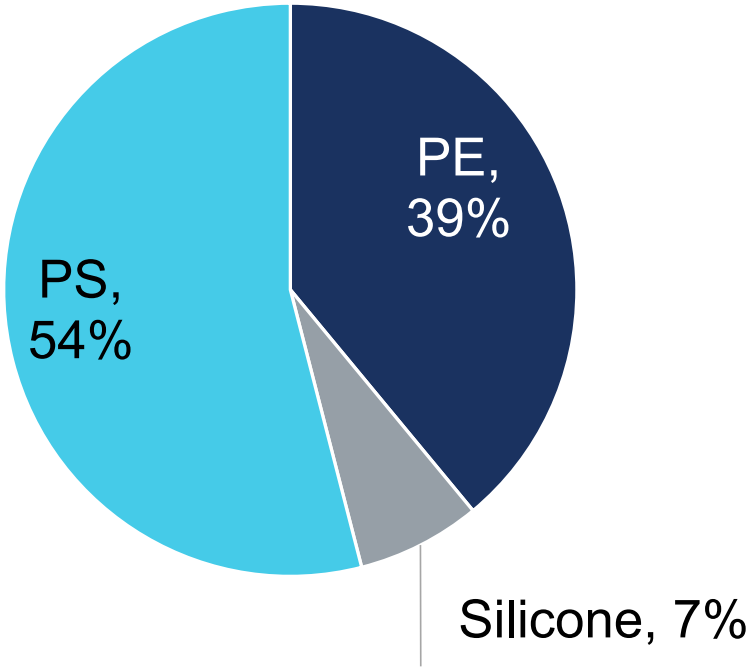


Composition of Retained MPs

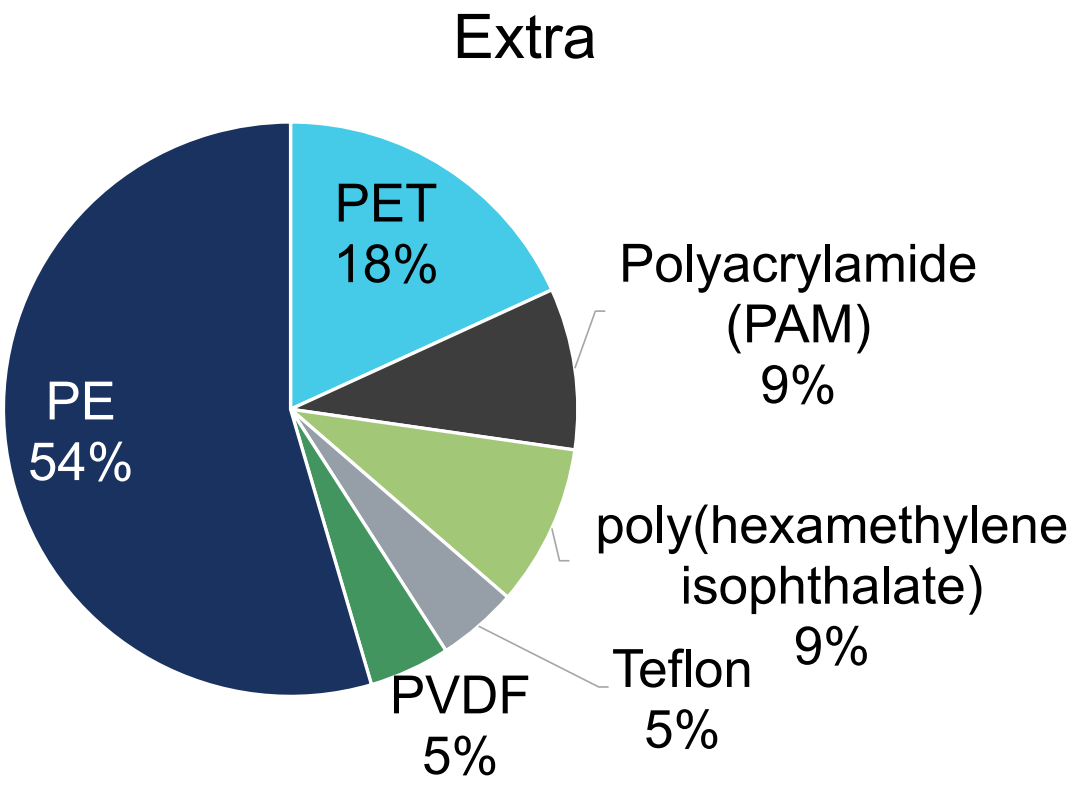
Whole Oyster



Digestive System



Composition of Retained MPs

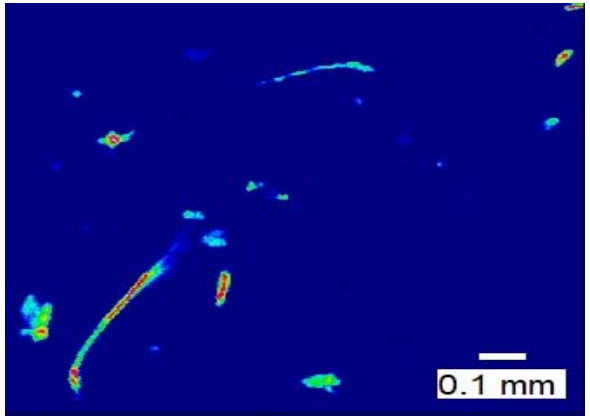


Conclusions

- # of MP particles per individual oyster is highly variable
  - MPs per gram of wet tissue makes data more comparable
- Average # of MPs varies with location
  - Biloxi shows highest levels
- MPs are in all tissues, slightly higher levels in the mantle
- More chemical analysis is needed but currently PS and PE are predominant

Future of the Project

- Use μFTIR spectroscopy to characterize the MPs present in MSOGP samples
- Analyze samples from the remaining MSOGP sites
- Recent NSF MRI Grant: “Acquisition of an Advanced FTIR Imaging Microscope for Multidisciplinary Research and Training in the State of Mississippi”



LUMOS II 2D contour plot depicting polystyrene microplastics isolated from Mississippi sound oyster gills

Acknowledgements

Advisor
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