

NINETH INTERIM PERFORMANCE REPORT

AUGUST 31ST, 2023

**Project Title: The Fate and Toxicity of Microplastics and
Persistent Pollutants in the Shellfish and Fish of
Matagorda Bay**

Submitted To:

Matagorda Bay Mitigation Trust

Performing Laboratory:

Texas A&M University on behalf of Texas A&M University at Galveston

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The Fate and Toxicity of Microplastics and Persistent Pollutants in the Shellfish and Fish of Matagorda Bay

Personnel

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Location(s):

Texas A&M University at Galveston

Project Duration:

01 June 2021 – 31 August 2024

Objectives:

Objective 1: Quantify the extent of microplastics pollution in the surface waters and biota of Matagorda Bay.

Objective 2: Measure levels of persistent pollutants in surface waters, adsorbed to microplastics, and bioaccumulated in the biota of Matagorda Bay.

Objective 3: Study the toxicity of microplastics and adsorbed pollutants using embryolarval life stages of sheepshead minnow.

Objective 4: Public educational outreach to local high school students on the science of ecosystem health monitoring.

1. INTRODUCTION

1.1 Background

This project is studying the extent of microplastics, and persistent pollutant exposure of resident biota (shellfish and fish) sampled from Matagorda Bay and assessing any likely toxicity effects due to exposure. The *new knowledge* gained from the successful completion of this project will contribute to an understanding of the long-term fate and toxicity of microplastics (and adsorbed pollutants) in the Matagorda Bay system.

In this ninth interim report (June 1st, 2023 – August 31st, 2023) we provide a list of key accomplishments as per the first quarter of Year 3 of the project.

2. Key Updates

As of the period encompassing the ninth interim report (June 1st, 2023 – August 31st, 2023), the key achievements associated with each stated objective are detailed below.

Objective 1: Quantify the extent of microplastics pollution in the surface waters and biota of Matagorda Bay.

- We have completed all analyses of microplastics in the body-burdens (muscle and liver) of biota from Matagorda Bay (**Fig. 1**). For added comparison, we have also performed similar analysis in matching biota from Galveston Bay (**Fig. 1**).
- Our current focus is on preparing high-impact manuscripts on the method development for microplastics analysis (using the novel pyrolysis-GCMS analytical approach).

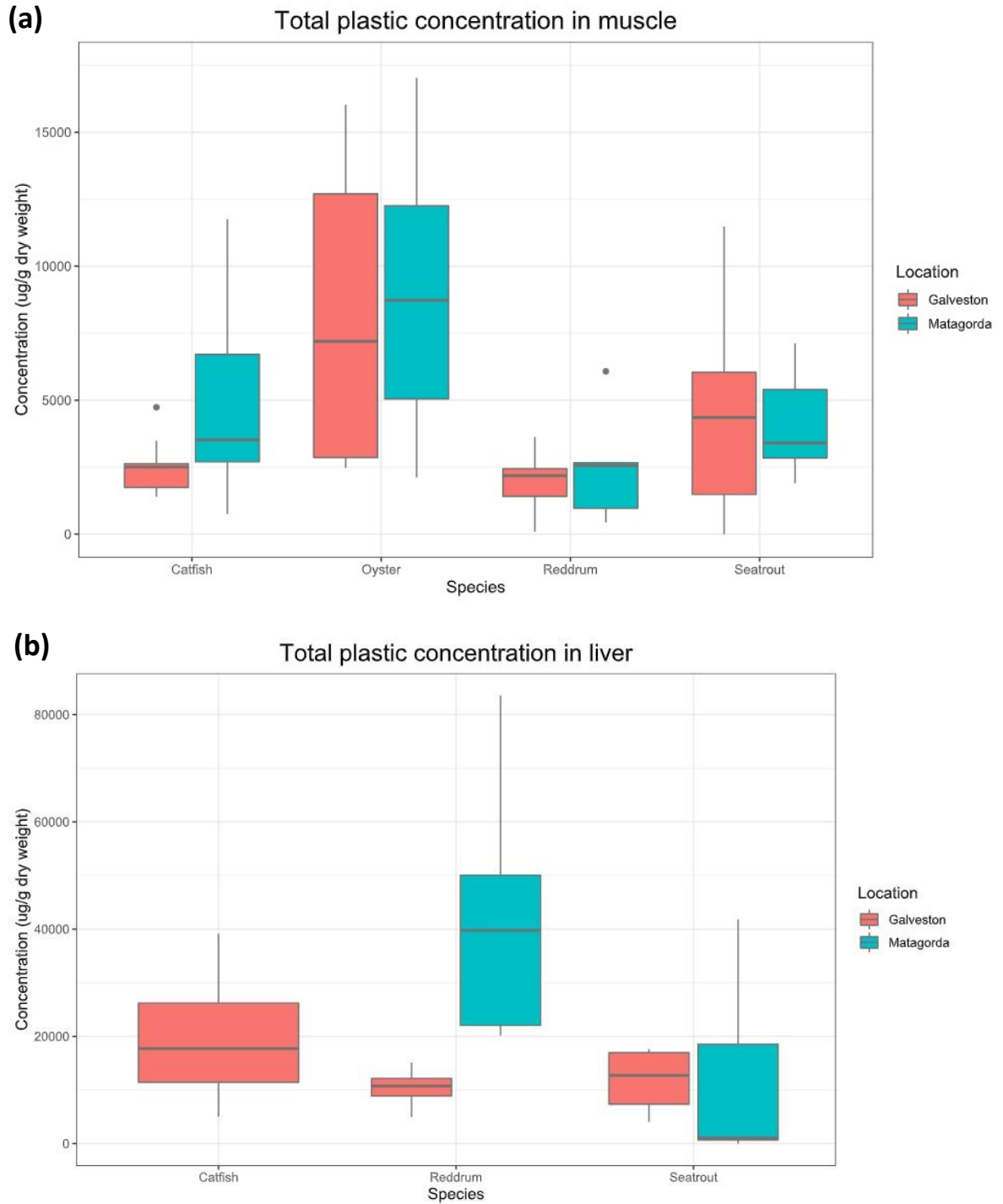
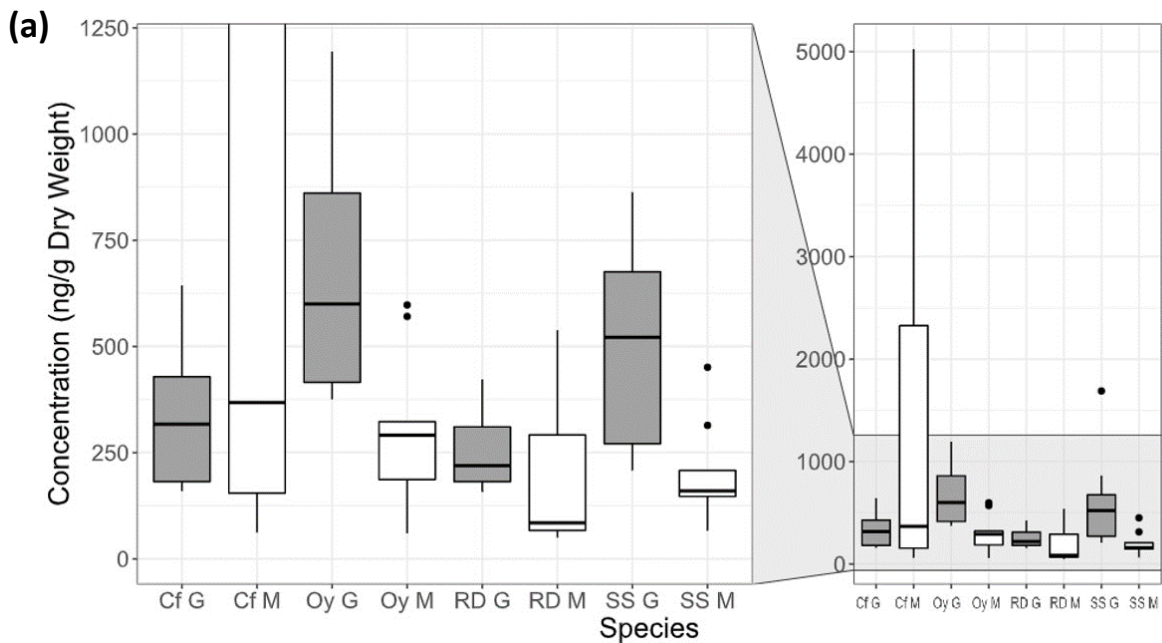


Fig. 1. Summary of total microplastics particles determined in the muscle (a) and liver (b) tissues of biota sampled from Galveston and Matagorda Bays. (Catfish = gafftopsail catfish; Reddrum = red drum; Seatrout = spotted seatrout).

- The comparison of median microplastics levels in muscle tissue of fish and gill/mantle tissue of oysters indicates that oysters from Galveston and Matagorda Bays to have ~2x higher microplastics levels than in fish from the same bay systems (**Fig. 1(a)**).
- The comparison of median microplastics levels in liver tissue of fish indicates red drum from Matagorda Bay to have levels ~2x as high as the remainder of fish species from the two bay systems (which appear to have relatively comparable levels to one another) (**Fig. 1(b)**).

Objective 2: Measure levels of persistent pollutants in surface waters, adsorbed to microplastics, and bioaccumulated in the biota of Matagorda Bay.

- We have completed all analyses of PAHs and PCBs in the body-burdens (muscle and liver) of biota from Matagorda Bay (**Fig. 2 and 3**). For added comparison, we have also performed similar analysis in matching biota from Galveston Bay (**Fig. 2 and 3**).



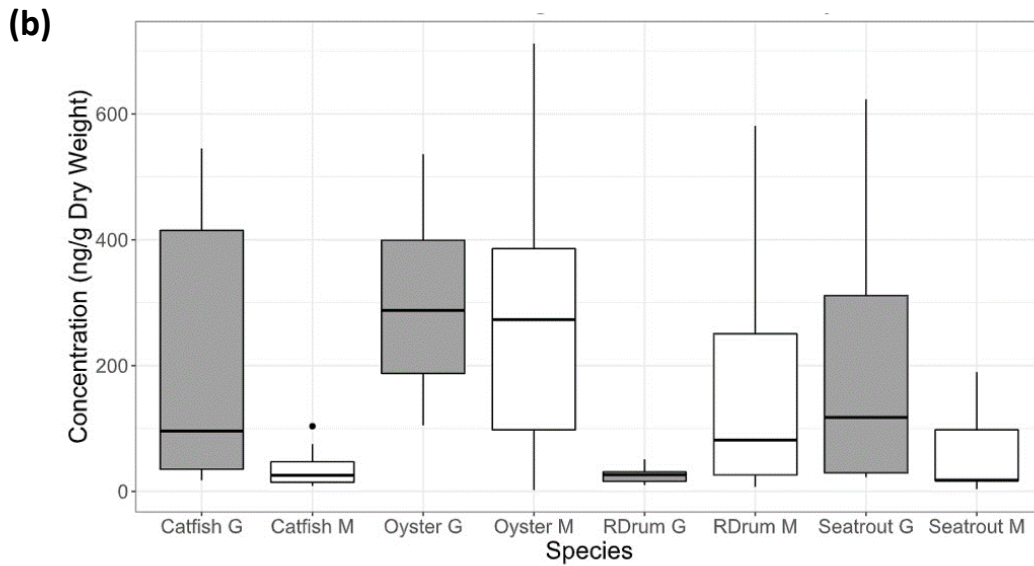
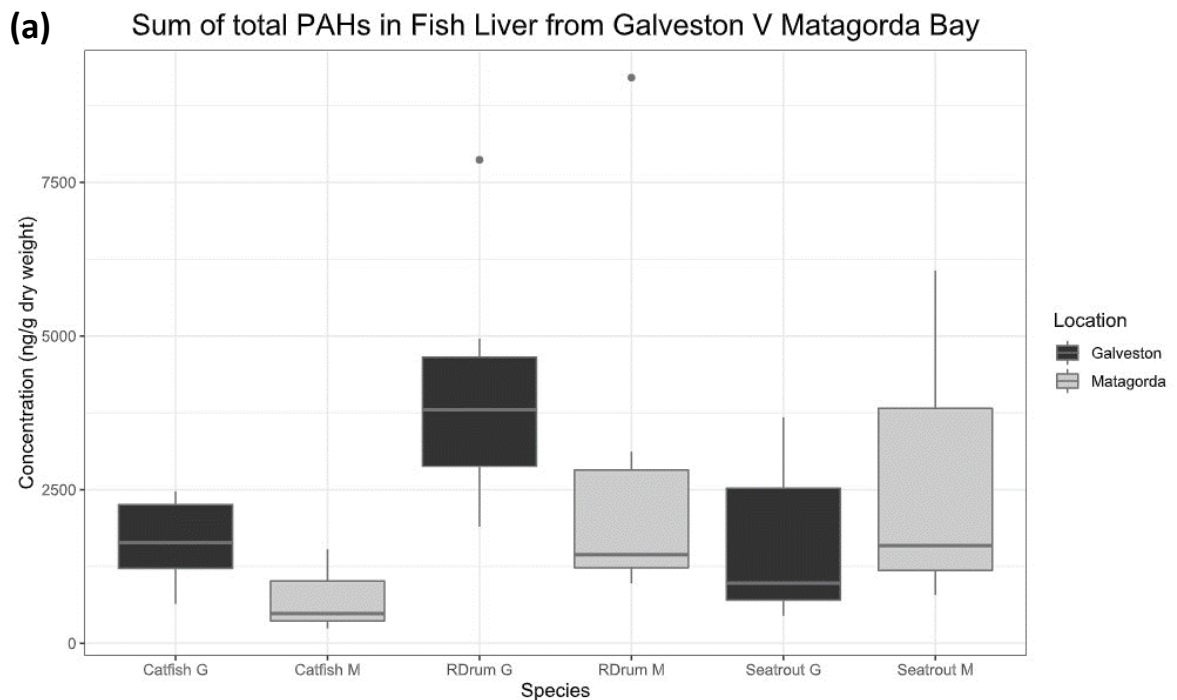


Fig. 2. Total PAHs (a) and PCBs (b) levels in the muscle tissue of biota from Galveston and Matagorda Bays. (Catfish = gafftopsail catfish Galveston Bay; RDrum = red drum; Seatrout = spotted seatrout; Oyster = eastern oyster; G abbreviation for each species = Galveston Bay; M abbreviation for each species = Matagorda Bay).



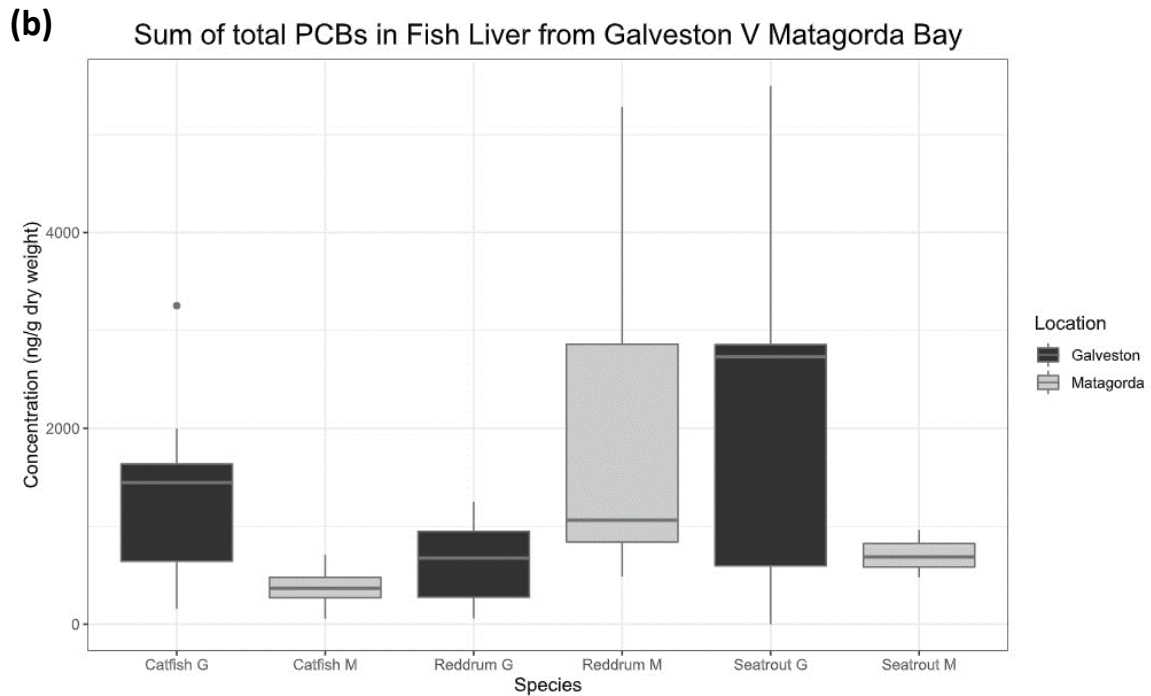


Fig. 3. Total PAHs (a) and PCBs (b) levels in the liver tissue of biota from Galveston and Matagorda Bays. (Catfish = gafftopsail catfish Galveston Bay; RDrum = red drum; Seatrout = spotted seatrout; G abbreviation for each species = Galveston Bay; M abbreviation for each species = Matagorda Bay).

- Our current focus is on preparing a high-impact manuscript that compares the levels of these legacy pollutants in the two Gulf of Mexico estuaries (i.e., Matagorda and Galveston Bays).

Objective 3: Study the toxicity of microplastics and adsorbed pollutants using embryo-larval life stages of sheepshead minnow.

- This objective will be engaged with starting in Fall 2023 and onwards.

- An Animal Use Protocol (AUP) to perform *in vivo* experimentation with early life-stages of embryo-larval sheepshead minnows (*Cyprinodon variegatus*) has already been approved by the A&M Institutional Animal Care and Use Committee (IACUC).

Objective 4: Public educational outreach to local high school students on the science of ecosystem health monitoring.

- Educational outreach engagement was pursued in collaboration with the TAMUG Sea Camp program in Summer 2022. Outcomes from the outreach activity were reported in the *sixth* interim report.

3. FURTHER WORK

Planned work for completion over the duration of the *tenth* interim report (Year 3) are as follows:

- 1) Prepare and submit manuscripts for publication by late Fall 2023 on PAHs and PCBs levels in biota from Matagorda vs. Galveston Bays.
- 2) Prepare a manuscript describing the microplastics analysis methods and application to measuring levels in biota from Matagorda Bay (Fall 2023).
- 3) Prepare and submit manuscripts for publication by Spring 2024 on microplastics levels in biota from Matagorda vs. Galveston Bays.
- 4) Plan the initiation of toxicological studies on the effects of microplastics and PAH/PCB mixtures on embryo-larval life stages of sheepshead minnows (Spring 2024).

4. REFERENCES

None reported for this interim report.

Reviewed by:



Dr. David Hala, TAMUG, P.I.

8/31/2023

Date: _____

Approved by:



Mr. Steven J. Raabe, Trustee

8/31/2023

Date: _____