Plastic Pollution Action Team: Progress Update for Sustainable Fisheries GIT

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On Behalf of the PPAT

TETRA TECH

Chesapeake Bay Program
Science. Restoration. Partnership.

Presentation Overview

1. Background on plastics in Chesapeake Bay - Why this matters
2. PPAT's origin and charge
3. ERA, current studies, and other products
4. New charge from Bay Program Leadership
5. Next steps and potential for collaboration

Background on Chesapeake Bay Plastics - Why It Matters

Potential Consequences of Plastic Pollution

- Bikker et. al (2020) – 100% of water samples collected in the Chesapeake Bay mainstem contained microplastics.
- Murphy et al (2020)- found microplastic particles in greater abundance on leaves of SAV in Potomac River
- Penn Environment (2021) – 100% of water samples collected at 50 non-tidal sites in Pennsylvania contained microplastics.
- **Lopez et al. (2021) – Fate and transport models for Chesapeake Bay have show 94% of microplastics are retained within rivers causing the bay to be a giant plastic "trap."**
- Seeley et al. (2020) - Through lab experiments, found that presence of microplastics alters saltmarsh microbial community composition and nitrogen cycling processes. Polyvinyl Chloride (PVC) particles were found to inhibit both nitrification and denitrification.
- Cohen et al. (2021, unpublished data) - preliminary lab findings suggest that plastic microfibers hinder natural feeding in blue crabs, leading to delayed molting.

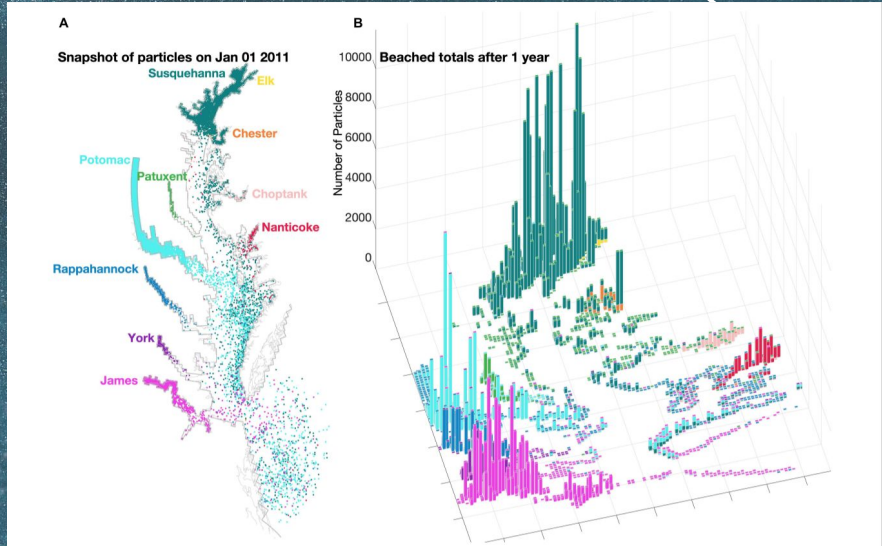
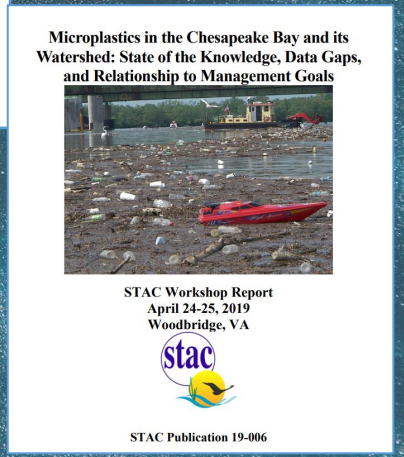


FIGURE 3 | Simulated locations of sinking and floating particles (color-coded by river) after 1 year in **(A)** the water column and **(B)** on the shoreline (i.e., beached). An animation of the full simulation exists as **Supplementary Video 1**.

Lopez et al (2021).

Original Findings from STAC (Scientific and Technical Advisory Committee)

- Two reports in 2016 and 2019:
  - Microplastics represent a significant and widespread threat in Chesapeake Bay
  - Current monitoring is insufficient
- 2019 report looks at the current “state of knowledge” and suggests creation of a Plastic Pollution Action Team (to report to CBP Management Board)



Completed Products from the Plastic Pollution Action Team

Progress to date:

1

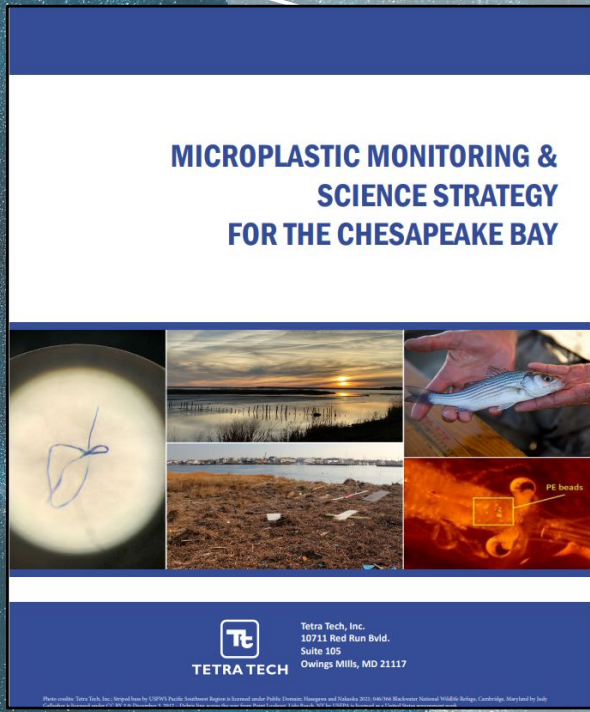
Development of a preliminary ERA for Striped Bass in the Potomac River

2

Development of a microplastic monitoring and science strategy for the Chesapeake Bay

3

Development of a Standardization of Terminology document for conducting microplastic research in the Chesapeake Bay and watershed.

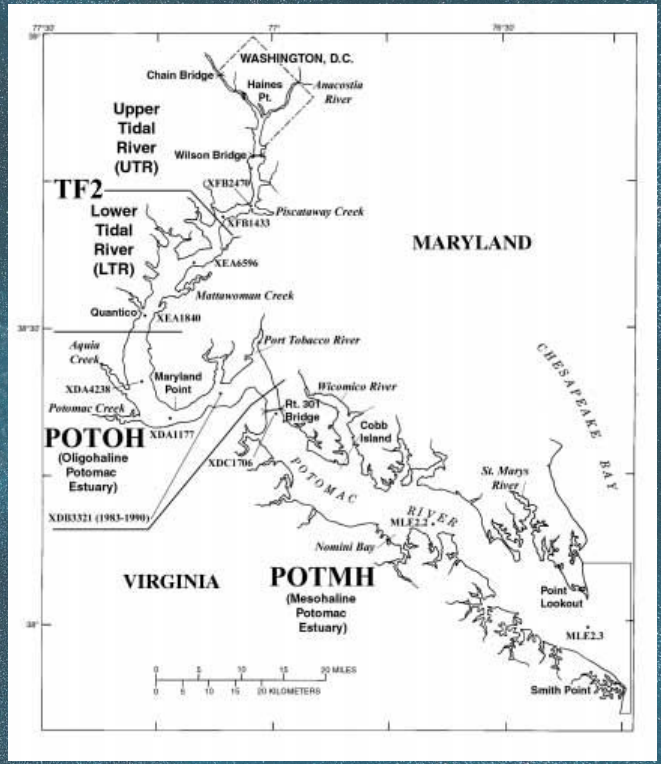


MICROPLASTICS ECOLOGICAL RISK ASSESSMENT: STRIPED BASS CONCEPTUAL MODEL

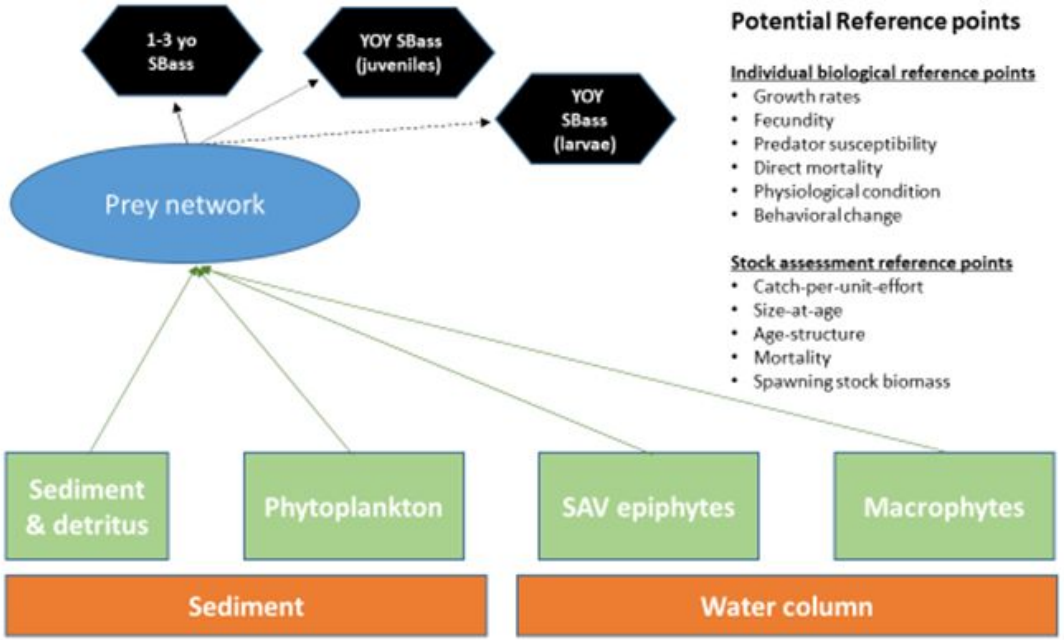
Model Input and Criteria for Inclusion Potomac River Striped Bass 0-2YO[1]

Literature Review

1. Potomac River data
2. Chesapeake Bay/other tributary studies
3. Other Atlantic Coast



Biological Endpoints



Potential Reference points

Individual biological reference points

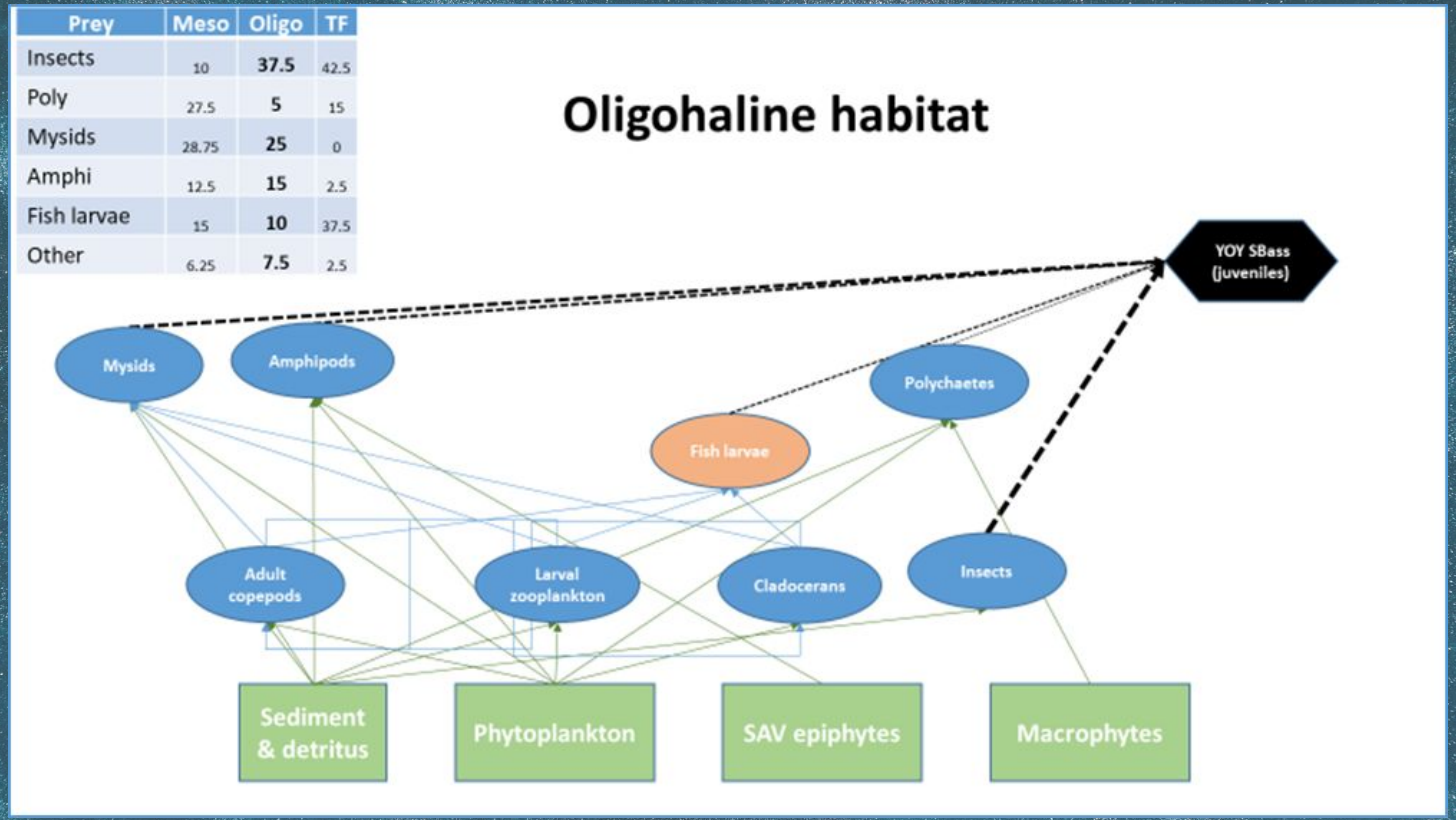
- Growth rates
- Fecundity
- Predator susceptibility
- Direct mortality
- Physiological condition
- Behavioral change

Stock assessment reference points

- Catch-per-unit-effort
- Size-at-age
- Age-structure
- Mortality
- Spawning stock biomass

Semi-quantitative food web interaction

Prey	Meso	Oligo	TF
Insects	10	**37.5**	42.5
Poly	27.5	**5**	15
Mysids	28.75	**25**	0
Amphi	12.5	**15**	2.5
Fish larvae	15	**10**	37.5
Other	6.25	**7.5**	2.5



Data from Boynton et al 1981

Key Recommendations from Science Strategy Document

1. **Design and implement a microplastic monitoring program**, integrated into the existing Chesapeake Bay watershed monitoring framework;
2. **Support research to understand microplastic pathways in the Bay**, including trophic pathways that may affect living resources such as Striped Bass, Blue Crabs, Oysters, and other species critical to the Bay ecosystem.
3. **Ensure adequate infrastructure resources are available** to process microplastic samples, including analytical equipment; and
4. Continue to support the PPAT in order to direct research, management, and policy development;

Recent Charges from the Principals' Staff Committee

Recent Charges from PSC:

1

Identify strategic investments in science

2

Send needs signals to regional academic institutions

3

Assess reduction strategies

4

Continue convening for additional two years

PPAT Needs, Existing Questions, and Gaps

Needs, Responses, Gaps to Addressing the PSC Charge

Charge: Send needs signals to regional institutions

- **Need/Gap:** Highlight infrastructure/capacity needs for analysis of plastics
- **Response**: Coordinating outreach to academic institutions, private/federal/state labs to inquire about capacity for lab analysis

Charge: Assess reduction strategies

- **Need**: Highlight best approaches for comprehensive source reduction
- **Response**: Source assessment should be considered in monitoring sampling design.

Needs, Responses, and Gaps to Addressing the PSC Charge

Charge: Strategic Investment in Science

- **Need**: Establish a monitoring sampling design that integrates available resources from existing Chesapeake Bay networks
- **Response**: A PPAT working group has been established to outline a proposed sampling network highlighting potential costs, and spatial and temporal areas of focus
- **Gaps:** Need to better quantify linkages between plastics and negative impacts on living resources. Contextualize this issue under goals of Chesapeake Bay Program.

Plastics and Fish - Establishing Linkages

- **Ongoing work:**
  - Morgan State study looking at plastic impacts on oysters
  - UMCES- HPL, Oyster larvae uptake
  - UDEL- Blue crabs (Delaware Estuary)
  - Anacostia/Potomac Study
- **Gaps to addressing these linkages?**
  - Fish tissue sampling
  - Looking at trophic linkages
  - Lab experiments focused on physiological responses to plastics

Anacostia & Potomac River Study

- **GOAL**: Assessment and characterization of microplastics in finfish in the tidal fresh region of the Potomac & Anacostia Rivers

Objectives:

- Characterize microplastics by trophic level
  - Four trophic levels (*Fundulus*, *Lepomis*, *Ictalurus*, *Micropterus*)
  - Striped Bass YOY
- Seasonality - changes in microplastic abundance related to season
- By Regions- Potomac River (DC), Upper Anacostia (DC + MD), Lower Anacostia (DC)

Anacostia & Potomac River Study

- Over 200 fish caught and kept for analyses
- 20% of fish processed
  - Microplastics in 26%
  - Microplastics in 21% of striped bass stomachs
- Dominant form is fibers

Acknowledgements

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Phong Trieu (MWCOG)

Questions for the Fish GIT (Where are the overlapping opportunities)

- *Are there avenues to include plastics analyses in existing fish sampling projects?*
- *Are there funding opportunities to better address these key linkages?*
- *What major fisheries/living resource monitoring needs align with plastics monitoring needs? (ex. zooplankton)*
- *Are there particular questions related to fish/ecological interactions with plastics that are a priority for this GIT?*