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Chesapeake Bay Program
Plastic Pollution Action Team
Web Meeting #4:
Meeting Summary
January 19, 2021

Meeting Materials:
https://www.chesapeakebay.net/what/event/plastic_pollution_action_team_meeting_4

Attendance:

Alex Lopez (PSU)
Amy Uhrin (NOAA MDP)
Anna Kasko (MDNR)
Bob Murphy (Tetra Tech)
Brooke Landry (MDNR)
Carlie Herring (NOAA MDP)
Catherine Magliocchetti (EPA Region III)
Christina Davis (ICPRB)
Christy Kehoe (NOAA MDP)
Clare Sevcik (DNREC)
Denice Wardrop (CRC)
Diana Lin (SFEI)
Donna Morrow (MDNR)
Douglas Austin (EPA Region III)
Emma Sharpe (Western Washington University)
Hannah Sanders (EPA Region III)
Jennifer Flippin (Tetra Tech)
Jennifer Starr (CBP LGAC)
Jonathan Cohen (University of Delaware)
Julie Lawson (CBP CAC)
Justin Shapiro (CRC/CBP)
Kelly Somers (EPA Region III/Vice-chair)
Kirk Havens (STAC)
Kristin Saunders (UMCES/CBP)
Linsey Haram (SERC)
Mark Trice (MDNR)
Meredith Seeley (VIMS)
Michael Gonsior (UMCES)
Paige Hobaugh (Tetra Tech)
Patricia Gleason (EPA Region III)
Phong Trieu (MWCG)
Rebecca Whiteash (PA DEP)
Rob Hale (VIMS)
Robinson, Matthew (DOEE/Chair)
Ryan Woodland (UMCES)
Shawn Fisher (USGS NY)
Tish Robertson (VDEQ)
Wayne Landis (Western Washington University)

1:10 Presentation on the Microplastic Monitoring and Science Strategy for San Francisco Bay

(*Dr. Diana Lin, Senior Scientist, San Francisco Estuary Institute)*

Link to Presentation
Link to Science Strategy

- Dr. Lin used this presentation to share the San Francisco Estuary Institute's (SFEI) strategy, objectives, and findings from their management plan. This institute's diverse partnership, ranging from scientists, industry members, and government work together to answer management questions. The research aims to answer questions pertaining to microplastic pollution abundance, risk to human health, major sources and pathways, and relative increases or decreases in the San Francisco Bay. Click on the above presentation to learn more about the study design, resulting takeaways, and microplastic prevalence

by material type. A major point of emphasis was the large microplastic input from stormwater pathways (compared to wastewater treatment plants). Building off of this key stormwater finding/focus is a next step for the SFEI.

Group Discussion and Questions:

- Amy Uhrin (NOAA MDP) asks what type of sediments were sampled in the study? Were they Benthic or from the shoreline?
    - Diana Lin (SFEI) responds that they sampled benthic sediment covering the top 5 cm of the sea floor.

- Matt Robinson (DOEE) asks what the most prevalent micro plastic particle was by pathway?
    - Diana Lin (SFEI) responds that Wayne Landis (the next presenter) has a great diagram illustrating Matt's question in detail. In short though, the storm water pathway had a higher prevalence of fragments compared to fibers.

- Kelly Sommers (EPA) asks if there were there any major procedural differences/detection methods among the different watersheds that might account for higher microplastic numbers in the San Francisco Bay compared to similar body waters (ex. Chesapeake Bay, Great Lakes)
    - Diana Lin (SFEI) responds that results are recorded differently in each area of study. This San Francisco Bay study was careful to differentiate particles from confirmed, lab-analyzed plastics. That being said, based on detection methods and comparison to other methodologies, the best guess is that San Francisco has a higher concentration of microplastics.

- Denice Wardrop (CRC) asks if the study sees high spatial variability in sediment concentrations over a single sampling area?
    - Diana Lin (SFEI) responds that they collected field duplicates at one site, but not at all sites. There certainly could be high variability in sediment. We saw significant variability in surface water.

1:40 Presentation on Ecological Risk Assessments for Microplastics in San Francisco Bay

(Dr. Wayne Landis, Director, Institute of Environmental Toxicology and Chemistry, Western Washington University)

Link to Presentation

- This risk assessment was built using Bayesian networks, representing a basic cause and effect structure. The assessment uses this framework to move from sources to stressors to habitat to effects to impacts (endpoint). In the context of San Francisco, the risk assessment is broken into 12 distinct spatial regions that represent sub-watersheds into the bay (based on location type and characteristics). Click on the presentation above to explore various inputs considered for this model. It is important to remember that endpoints are chosen by stakeholders and the management community. As far as applications to the Chesapeake Bay, an important note is that ecological risk assessments point out critical variables and data needs/gaps. These assessments serve as part of the cyclical nature of adaptive management.

Group Discussion and Questions:

- Matt Robinson (DOEE) asks if human health impacts were considered as an endpoint of interest?
    - Wayne Landis (WWU) answers that this is very difficult to quantify with current lack of information. That being said, the oyster fishery will be important to look at as related to health. He also mentions that human wellbeing is something to consider beyond medical/health implications. Fisheries health, recreational opportunities and resulting economics greatly impact communities and their well-being.
    - Diana Lin (SFEI) also adds that they would like to look at micro plastic impact on forage/sport fish likely to be consumed by humans. She believes this will be a logical step to begin making connections to human health.

- Bob Murphy (Tetra Tech) adds that Dianas made a great point about the emphasis on forage fish. Forage species are hugely important to the stated Chesapeake Bay Program restoration goals. This is greatly connected to our region's commercial fishery impacts as well. This currently serves as an important data gap. Bob also noted that when choosing striped bass as our risk assessment endpoint, we focus on age class because sport fish, like striped bass, move outside the bay. How do you account for movement outside of space of interest ?
    - Wayne Landis (WWU) mentions the critical nature of survivorship between age classes. Bob concurs and mentions lower recruitment as an endpoint of interest.

- Denice Wardrod (CRC) asks Wayne if he builds models on spatial delineations. And what about spatial granularity? Is it assumed that the management sector of interest will work on that granularity?
    - Wayne Landis (WWU) responds that they build a more general model and then put in site-specific information. This allows data sets to be directly comparable to each other. It is important to accommodate managers and make sure to understand the level at which they work.
    - Matt Robinson (DOEE) adds that the Chesapeake Bay Program is an important tool to connect managers and facilitate conversations such around uses, mentioned above.

2:10 Presentation on Microplastic Research in Delaware Bay

(*Dr. Jonathan Cohen, University of Delaware)*

- Dr. Cohen provided the PPAT with an overview of the microplastics research framework in the Delaware Bay. The overall approach for calculating risk is through the equation, Risk (R) = Exposure (E) * Adverse Response (A). Exposure is calculated through modeling, whereas adverse responses are studied in lab settings. Initial models showed much higher microplastic levels in riverine sections of Delaware Bay and at the estuary turbidity maximum (ETM) (Dr. Cohen believes the ETM is acting as a physical trap for microplastics). As far as adverse responses, Dr. Cohen's lab studied a species of zooplankton (*Acartia tonsa*). Initial lab analysis showed very little correlation between microplastic presence and acute lethal effects. All said, this copepod-based approach is promising for integrating exposure and adverse responses to calculate microplastic risk. New studies are shifting focus toward blue crab and their risk to microplastics. By studying larval responses on the continental shelf, as well as adults in the riverine systems, blue crabs provide a useful model to consider microplastic interactions in a life-cycle context.

Group Discussion and Questions:

- Matt Robinson (DOEE) mentions that a recent study shows that microplastic exposure can affect oyster larvae behavior (specifically related to settlement delays and time spent in the water column). Are other behaviors, such as feeding, being affected by microplastics in copepods?
    - Jonathan Cohen (UD) responds that his team is planning to look at blue crab reactions to light responses (movement back to estuary as juveniles) and how microplastic exposure may affect this process.

- Matt Robinson (DOEE) asks Dr. Cohen's thoughts on why we aren't seeing mortality in copepods?
    - Jonathan Cohen (UD) believes this could be based on the particles in use or the amount used. He mentions that it is important to make sure we are testing environmentally relevant numbers. That being said, the likely prevalence of microplastic "hot spots" may represent a number above what we consider the environmental baseline, making relevance tricky to calculate.
    - Wayne Landis (WWU) added that environmental relevance can be a misleading term. In certain instances a high concentration will/can be relevant. He says it is better to design an experiment to exceed effects in order to watch the response curve. In turn this helps our understanding of probabilities associated with different levels of microplastic exposure.

- Ryan Woodland (UMCES) asks if there are differences in microplastic concentrations near shorelines vs deeper channels. Shallows are important for forage and could have higher numbers?
    - Jonathan Cohen (UD) responds yes, and this was also shown in Alex Lopez's (PSU) modeling. Estuary turbidity maximum water hugging shoreline may have implications.

- Mark Trice (MDNR) adds that there may be implications for certain larvae because of spawning in previously mentioned ETMs.
    - Jonathan Cohen (UD) agrees. We expect higher exposure in species such as spot, weakfish, striped bass. His team is just digging into this concept now.
    - Matt Robinson (DOEE) adds that this is an important point for the PPAT's Potomac work, because the ETM goes into the river where striped bass spawn. Bob Murphy (Tetra Tech) confirms Matt's point and adds that the Potomac is the second most important spawning ground for bass in the Chesapeake.

- Rob Hale (VIMS) asks What does environmental relevance mean when methods are poor? Are we missing plastics that are presents?
    - Jonathan Cohen (UD) agrees with this point.

2:40 First Discussion on a Science Strategy for Microplastics in the Chesapeake Bay and Watershed

(*Matt Robinson, PPAT Chair, DC Department of Energy and Environment)*

- Matt gave an overview of the role of PPAT outlined by the Bay Program's management board. Tasks include: Developing the ecological risk assessment, using results to develop a science strategy, presenting results of the assessment to the Management Board, and monitoring policy advances across the bay watershed. Today's discussion is focused on the second of our four outlined tasks: Developing a science strategy. The below discussion uses guiding questions to facilitate membership input.

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Question #1 - Should we define our goals more broadly for our science strategy so we can under the threat? Does a single ecological risk assessment (ERA) endpoint get us there?

- Guiding example questions from the San Francisco Estuary Institue's (SFEI) strategy
    - How much microplastic pollution is in the bay?
    - What are the health risks?
    - What are the sources, pathways, and loadings leading to bay microplastics?
    - Have microplastics increased or decreased
    - What will be effective management questions to address the issue?

- Denice Wardrop (CRC) asks what we mean by defining management goals more broadly? What is the current goal?
    - Matt Robinson (DOEE) responds that right now we are focused on the context of aged 0-2 striped bass. Do we want to move beyond that and expand our focus?
        - Denice asks a clarifying question - is the striped bass focus in writing under PPAT goals?
    - Kelly Somers (EPA) adds that in other terms "should we define a goal for our science strategy." Of the example questions above, how many of those questions can we currently answer?
    - Denice Wardrop (CRC) adds that yes, maybe starting from scratch when considering our strategy may be the best approach.
    - Bob Murphy (Tetra Tech) adds that we have too many data gaps to even answer these questions. These example questions assume certain reference points, that we currently do not have.
    - Denice Wardrop (CRC) jumps back in to note that our striped bass endpoint was chosen to make sure the PPAT stayed in context of Chesapeake Bay Program management goals.
        - Matt Robinson (DOEE) agrees with mentioned CBP context, but also notes that data used in our contextualized ERA is from elsewhere.

- Wayne Landis (WWU) joins the conversation to provide advice on creating effective risk assessments. He states that you must define your overall goal and where it is. The Chesapeake Bay Program has much more than striped bass as a goal and management, and only focusing on that endpoint could negatively impact other goals. Wayne recommends listing out current goals and existing data that we do know (not just about microplastics) in the Chesapeake. In short, an endpoint beyond striped bass is recommended.
    - Wayne also recommends contacting John Carriger (USEPA Cincinnati - Carriger.John@epa.gov) for assistance on risk assessments
    - Bob Murphy (Tetra Tech) uses SAVs as an example of a restoration goal that is directly connected to the striped bass endpoint. The point being that striped bass health can tell us about other defined goals.
        - Wayne Landis (WWU) disagrees with the above point, because SAV and striped bass could be completely unrelated in some scenarios. Notes that this is why multiple endpoints are crucial
    - Matt Robinson (DOEE) jumps in to make a clarifying point to separate the science strategy from the ERA. The science strategy will guide research down the road (including identified gaps). He adds that this ERA will not define thresholds of microplastic effects on striped bass, and that this is a preliminary product.
        - Wayne Landis (WWU) responds that ERAs never define thresholds. It will always be managers/stakeholders. ERAs are strictly about risk probabilities.

- Meredith Seeley (VIMS) asks - “I don't know if this is really a management goal, but I wonder if this is a place to suggest enterprising on existing Chesapeake Bay monitoring programs by expanding them to monitor microplastics, toward the goal of understanding the extent of microplastic pollution in the bay (especially in resource-rich habitats).
    - Denice Wardrop (CRC) responds that people are definitely thinking about this. It has to be integrated instead of a completely separate effort. Good thought.
    - Bob Murphy (Tetra Tech) adds that the monitoring aspect was a recommendation from the STAC workshop, so yes, we definitely would include this. It would also help answer many of the questions being posed.
    - Mat Robinson (DOEE) adds that we will discuss this point more during our “tools” discussion in the next meeting

- Shawn Fisher (USGS) asks - “Instead of one path forward, could be a two/multi-prong approach where determining gaps and filling them brings us back to help answers question 1-5, and simultaneously acknowledge what's been done with sources (i.e., WTPs, stormwater) and address those issues directly and focus a study to see how those observed changes in concentrations and particle type can change the output/outcome of the models that were identified/used in the ERA?”
    - Matt Robinson (DOEE) responds that this is a good point, but we should cover during our "tools” discussion next meeting.

- Matt Robinson (DOEE) mentions that it currently seems that the striped bass ERA is a good starting point to accomplish our management goals.
    - Bob Murphy (Tetra Tech) jumps in to add maintaining the striped bass fishery is a good way to focus on CBP management goal, reiterating Denice’s earlier point.
    - Denice Wardop (CRC) adds that striped bass is an important aspect, and important contextually for CBP, but not sufficient to answer the "whole question". We should focus more on how the ERA can get us to a science strategy and not worry about learning everything from ERA. We've answered what's important and where it is (Wayne’s guiding questions). The ERA helps tell us what we know.
    - Donna Morrow (MDNR) adds that to expand end points of interest we could focus on juvenile blue crab and oysters. They are directly related to striped bass and are still well within interest of CBP restoration goals.

- Tish Robertson (VDEQ) mentions that the idea for management action rests on a threshold microplastic number existing. This is currently a major gap.

- Jennifer Flippin (Tetra Tech) and Kelly Somers (EPA) both see the science strategy as an opportunity to outline and focus our next steps and research. The ERA, and it's one endpoint, is a test run and a good start to answering the Chesapeake Bay microplastic question.

Question #2 - What are potential gaps in information?:

- Examples of gaps from the SFEI: Characterizing sources, pathways, and contamination levels in the bay.

- Current gaps identified by Tetra Tech: Data sources, microplastic pathways, occurrence in water and sediment, organismal contamination, and human health effects.
    - Ryan Woodland (UMCES) and Bob Murphy (Tetra Tech) add that they are looking at diet

information from Potomac and greater-bay if necessary.
    - Wayne Landis (WWU) notes that ERAs do not need perfect data, and that we can account for uncertainty.
  - Matt Robinson (DOEE) mentions that this current list from Tetra Tech is ongoing and we can continue the dialogue on identified gaps.
  - Bob Murphy (Tetra Tech) ends the conversation by highlighting the importance of group input from the PPAT membership. Developing this strategy will require input from all participants.

- Discussion on the Science Strategy will be picked up at our next meeting

3:30 Update on Project Schedule and Next Steps
(*Kelly Somers, PPAT Vice Chair, EPA Region III)*

Link to Presentation

- Upcoming dates:
  - February 4th - EPA receives final Conceptual ERA and Comment responses for ERA.
  - February 10th - Final ERA for PPAT/STAC for 2 week review
  - February 24th - Final Comments on ERA due from PPAT and STAC
  - First week of March - PPAT meeting #5 (Discuss final ERA and draft of science strategy)