



# Methods for Sampling Microplastics: Considerations for Standardization

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# Sampling Considerations

- In the beginning...what to standardize?
- Before you start:
  - What questions are you answering?
  - What are you measuring? Reporting how?
  - Is your sample representative?
- Sampling of Environmental Matrices
  - Some examples of approaches to sample:
    - Drinking water / Wastewater
    - Surface (storm) water / Sediment
    - Strongly linked to QA/QC
- Recommendations for Standardization

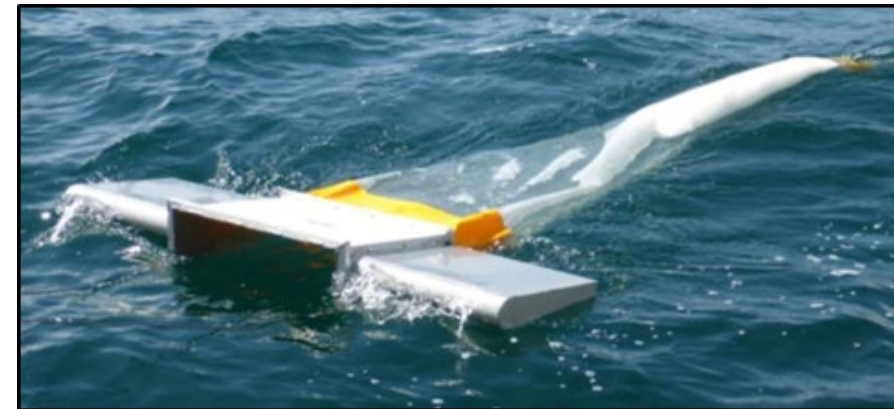


# The first microplastics studies in surface waters used Neuston nets...predecessor of the Manta Trawl

## Plastics on the Sargasso Sea Surface

Edward J. Carpenter and K. L. Smith, Jr.  
Science, 1972, Vol. 175, No. 4027, 1240-1241

- Abundance in counts and mass per square kilometer



## Plastic Particles in Surface Waters of the Northwestern Atlantic

The abundance, distribution, source, and significance of various types of plastics are discussed.

John B. Colton, Jr., Frederick D. Knapp, Bruce R. Burns

Science, 1974, Vol.185, 491-597



- Concerns noted re sampling bias
  - Particles passing through (forced) the net mesh
  - Surface sampling ignores water column and sediment

## What do we mean by “standardization”?

- Common approaches, principles or ISO, ASTM, EPA reference methods

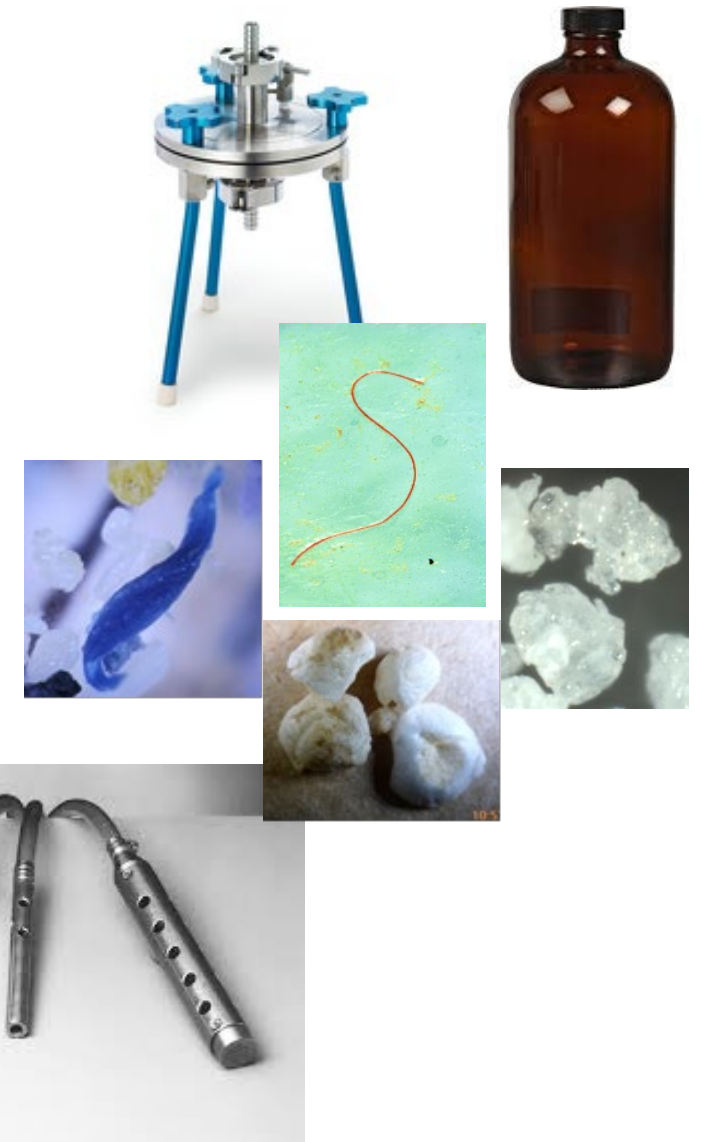
# Methods selected to sample / standardize are dependent on several considerations

- **What are you sampling for?**
  - **Abundance / Exposure? Source apportionment?**
  - **Size matters in setting protocols**
    - e.g. microbeads in WWTP, particle character / source information, microplastic in drinking water, exposure/entry into organisms
- **Basis for reporting / units?**
  - **Particle count per:**
    - volume (water, air)
    - area (water, soil, sediment)
    - mass (soil, sediment, biota)
  - **What are the best measures for exposure / dose, eventually standard / guideline setting?**



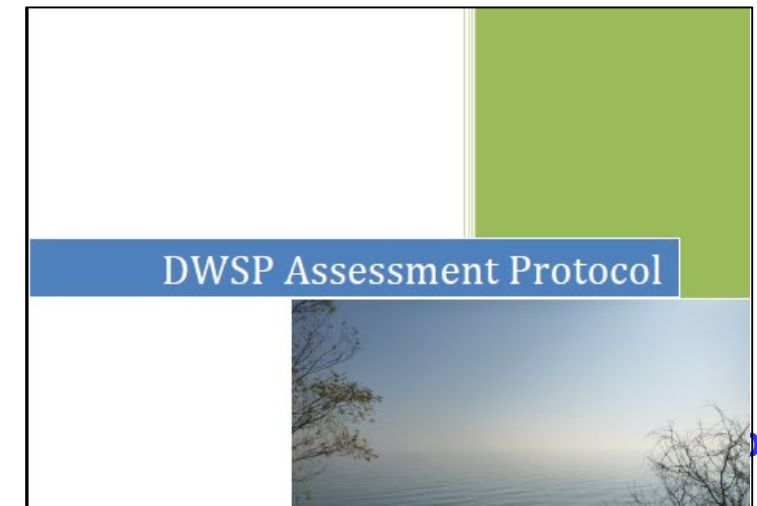
# Methods selected to sample / standardize are dependent on several considerations

- **Is your sample representative?**
  - Bulk grab samples or volume-reduced composites (time, flow)?
  - Location of sampling?
    - in DW and wastewater plants, rivers, lakes, sediment bed
    - Surface or at depth, well mixed
  - Sampling bias by plastic type, morphology?
- **Quality Control Starts with Sampling!!!**
  - Field Blanks, Replicates
  - Sampling efficiency (e.g. nets, sieves, intakes)



# Sampling for Microplastics: Drinking Water

- **Examples of studies to date:**
  - Mostly grab samples to date
    - Pivokonsky et al, 2018; Uhl et al, 2018
  - Enclosed filter, higher volumes
    - Mintenig et al, 2019
  - Plastic, glass, metal bottles / housings
  - At tap (houses), various points in plants
- **Standard protocols well established for regulated DW parameters**
  - Assess for microplastics
    - Sampling, container
    - Set particle size
  - Plant location, sample line materials



# Sampling for Microplastics: Wastewater

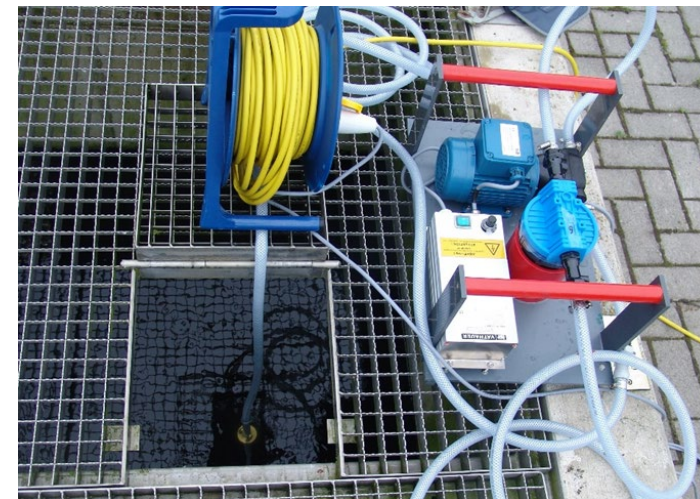
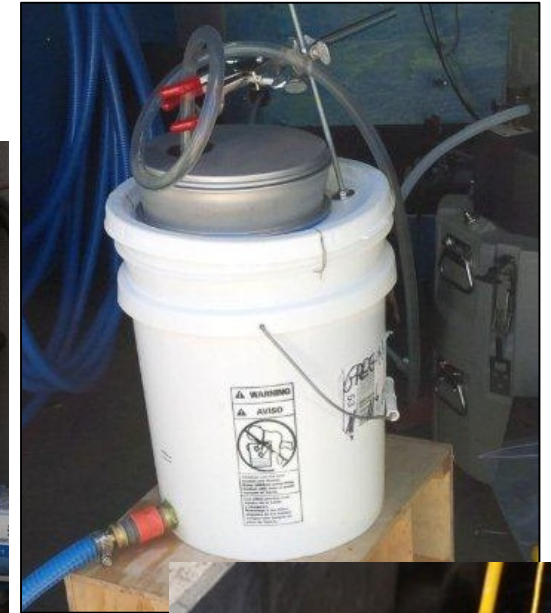
- **Examples of sampling techniques**

- Sieve stack and pumping
- Enclosed in-line filtration
- Drift nets, skimmer
- Flow or time weighted composites (autosamplers)
- Grab samples (range of volumes, locations)

- **Considerations**

- Tailor to study aims (microbead, fibers, size) and plant conditions (e.g. TSS)
- 24-hr composites for variability (e.g. CMP), replication
- Reporting units (mass, count)

Carr et al., 2016



Mintenig et al., 2017



# Sampling for Microplastics: Surface Water / Stormwater

- **Techniques similar to other waters**

- Neuston, drift nets
- Autosamplers for grabs / composites

- **Considerations:**

- Representative locations, volumes
- Intake bias, net lengths / capacities
- Appropriate field blanks
- Flow
  - grit in flowmeters
  - safety (e.g. Marsh McBirney)
- Materials (e.g. ropes, tubing)



Baldwin et al., 2016



USGS



# Sampling for Microplastics: Sediment

- **Standardized sampling equipment / approaches exist**
  - Same approaches for other contaminants
- **For microplastics, consider:**
  - Deposition zones, sediment type (e.g. does TOC matter?), other info
  - Evaluate techniques for microplastics
    - E.g. Loss of top layers
    - Homogenization, composites
  - Appropriate field blanks, replicates
  - Reporting units (wet/dry, mass/volume)



# Recommendations for Standardizing Microplastics Sampling

- **Set appropriate particle size limit**
  - Drinking water, air, food (exposure monitoring)
- **Set reporting units**
  - Counts or masses
- **Criteria for representativeness, frequency, efficiency**
- **Criteria for site selection**
  - Varies for different sample types/matrices
- **Set protocols for consistency, data collection, QA/QC**
  - Containers / materials (glass, metal, lids), rinses, flush time, filter and housing materials
  - Additional information (flow rates, volumes, distances)
  - Replication and appropriate field blanks



# Questions, Discussion

