Summary of Microplastics Conference Session, IAGLR 2023

A plastic/microplastic-themed session was held at the Toronto annual meeting of the International Association for Great Lakes Research (IAGLR) consisting of morning and afternoon oral sessions on Tuesday, May 9, and an evening poster session on the same day, as well as a morning oral session on Wednesday, May 10. Summary information from each presentation and poster is compiled in the attached table. Presentation and poster abstracts are also available in the conference abstract book.[1] Additional information is compiled in the brief bullets and synthesis text below. This information will be incorporated into the overall project report and other interim activities such as workshops and risk assessment.

Presentation and Poster Data

Presentation type:

- Total number of oral presentations: 22
- Total number of poster presentations: 17
- Combined total: 39

Affiliations:

- Canada-affiliated first authors: 25
- US-affiliated first authors: 12
- Other affiliations: Portugal, Italy

Study targets and media:

- Water: 22
- Sediment: 14
- Air/Rain/Snow: 6
- Organisms (invertebrates, fish, phytoplankton, zooplankton, biofilms, moss, plants): 14
- Other: polymer breakdown

Study types:

- Field sampling: 32
- Field or mesocosm experiment: 7
- Laboratory experiment or lab methods development: 4
- Data and publication synthesis: 4
- Modeling: 3

[1] Visit https://iaglr.org/conference/docs/2023_abstracts.pdf.

Plastic size and shape:

- Microplastics/Nanoplastics: 30
- Macroplastics/Litter: 5
- Fiber only: 2
- Particle only: 4
- Particle and fiber: 26
- Other: tire wear debris, tire-derived chemical

Highlights

Posters and presentations were dominated by field sampling studies with a mixed microplastic focus in a variety of media. A size cutoff of 5 mm was commonly reported as the upper limit for microplastics. Water sampling was most common, followed by sediment sampling. Biological studies included field sampling, mesocosm experiments, and lab experiments. Most field work targeted the Great Lakes or tributaries and inland lakes or ponds in and outside the watershed, with the exception of studies in Portugal and Italy. Results of several experiments performed at the Experimental Lakes Area in Ontario were also presented.

There were more than twice as many Canadian first authors as US authors, which may have been influenced by the meeting location—many Canadians were student authors. Many field studies documented spatial and temporal variation in microplastic properties with some flux studies, especially of atmospheric deposition and of sediment deposition derived from dated cores. Microplastics were found in all locations sampled, including remote rural areas.

Biological studies in field and lab settings tended to show few strong patterns of microplastic impacts including in paired upstream and downstream studies of fish and clams in relation to wastewater plant outfalls, or particle and fiber addition experiments to mesocosms or laboratory incubations with biofilms, snails, phytoplankton, cyanobacteria, and benthic invertebrates. Informal or planned public engagement was a component of several of the urban macroplastic projects reported.

Gaps

Most studies presented were empirical measurements of microplastic occurrence in a variety of settings and media, which is consistent with the need for numerous reconnaissance-level studies at this early stage of understanding of microplastic occurrence in the environment. Fewer studies quantified fluxes, as opposed to simply measuring concentrations. Several studies inferred relative source strengths from spatial patterns but attempts to detect gradients were not always successful. Stormwater pond studies did tend to show the expected pattern of higher concentrations of particles in forebay water or sediment than in main bays. Biological experiment results reported in the oral and poster sessions show limited impacts of particles or fibers on organisms, but it is unclear if this is due to experimental design, low sensitivity of test organisms, or other factors. Many studies had relevance to ecological risk and standardization of sampling approaches and laboratory methods. These will serve useful for indicator development. Additional research is needed on the following microplastic topics:

- Sublethal and non-reproductive health impacts on organisms at different life stages exposed to typical environmental concentrations of particles
- Potential for biomagnification in food webs
- Quantitative linkages among sources, air and water transport pathways, biota, and sinks
- Environmental degradation rates and mechanisms for particles with different properties
- Patterns of urban source impacts on Great Lakes surface water, sediment, and biota
- Seasonal patterns of particle transport, particularly in winter and spring
- Mechanistic understanding of patterns observed in field studies across the Great Lakes
- Numerical modeling of transport, biological interactions, and deposition
- Process understanding of ways that particles are concentrated during transport
- Particle surface interactions (chemical, physical, biological)
- Effective engineering and policy approaches to mitigation