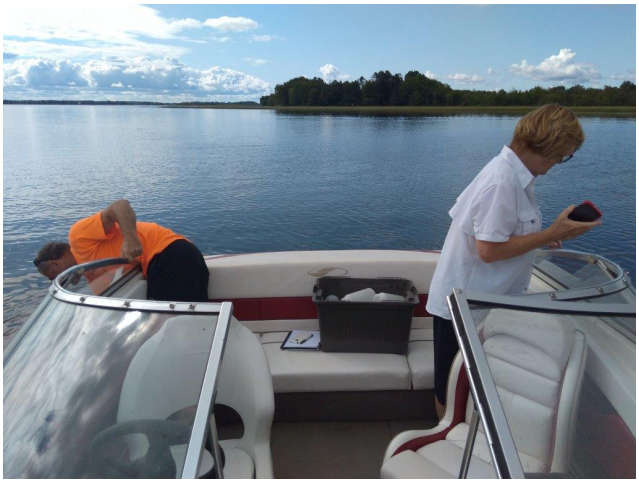
Summary of Artificial Materials (Microplastics) Found in Mississippi Lake

2019

(J.P Thonney and Doreen Donald)

Jean-Pierre (JP) Thonney, MSc, a freelance Marine Biologist working on behalf of Watersheds Canada, and Doreen Donald, Chair of the Mississippi Lakes Association (MLA) Environment Committee, recently conducted a sampling project on Mississippi Lake to assess the levels of microplastics in the Lake.



Background

Plastic is the most prevalent type of artificial debris found in our oceans and lakes. This debris can come in all shapes and sizes, but those less than 5 mm (0.2 inches or about the size of a sesame seed) in length are known as microplastics. These plastics enter natural ecosystems from a variety of sources, including cosmetics, clothing, and industrial processes.

Currently, there are two classifications of microplastics. Primary microplastics are defined as any solid plastic fragments/particles 5 mm in size or less before entering the environment. These include microfibers from clothing (Fig 1), microbeads and plastic pellets.

Secondary microplastics are microplastics that are created from the degradation of larger plastic products once they enter the environment through natural weathering processes. This type of microplastic includes water and soda bottles, fishing nets, and plastic bags breaking down to fragments and film (Fig 2).

Both categories of microplastics are known to persist in the environment at high levels, particularly in aquatic ecosystems.

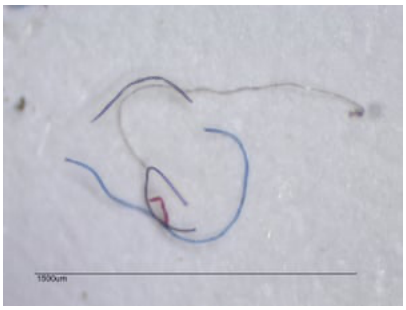


Fig 1- Example of microfibres

Fig 2- Example of fragments

Sampling and Analysis Protocol

Sampling took place on August 29th between the hours of 11:00 a.m. and 1:00 p.m. at 8 different locations on the Lake. Sampling for the 2 other sites (lake outlet at Highway 7) took place between 1:00 and 2:00 p.m.

Sampling and analysis was carried out according to Florida Microplastic Awareness Protocol (FMAP) with water samples collected from the subsurface (Fig 3) using 1L mason jars and processed (Fig 4) according to FMAP protocol: http://sfyl.ifas.ufl.edu/media/sfylifasufledu/flagler/sea-grant/pdf-files/microplastics/FMAP-Volunteer-manual-7-24-17.pdf

Fig 3- Water sampling

Fig 4- Sample processing

Results

Table 1 shows the findings from the sites sampled. Observations were based on a total of 20 samples collected at ten sites (2 replicates per site, except Pretties Island). The results indicated the following:

- The presence of artificial materials in all (100%) of the 20 (1L) water samples.
- That the predominant material type observed were 'fibres' (95%) occurring in a range of lengths and colours. These fibres were present at all sampling sites.
- The average number of individual pieces of material observed/sample was approx. 3.7 particles/litre. This was higher than the average (~2-3 particles/litre) found in some other area waterbodies.
- Very few fragments were found (a total of 3).
- One piece of film was found.

While any comparisons or specific conclusions drawn must be made with caution due to the general nature of the data collected, the main observation is that the presence of microplastics appears to be ubiquitous throughout the lake.

TABLE 1								
Sample #	**Location**	**Lat**	**Long**	**Fibres**	**Frag**	**Film**	**Total**	**Colour/Size (mm)**
1a	Kinch Bay	45.1147	-76.1796	2			2	Blue (2) Purple (2)
1b				7			7	Blue (1,1,1,2,12) Red (1) Black (1)
2a	Dixon Point	45.1178	-76.1618	8			8	Blue (2,1,4,1,2,1,2) Black (2)
2b				5			5	Blue (10,2) Black (1,2) Red (1)
3a	Code Bay	45.0990	-76.1763	3		1	4	Blue (3,1,2) Grey *film* (1)
3b				4			4	Blue (1) Black (1,3,2)
4a	McGibbon Bay	45.8608	-76.1618	6			6	Blue (2,3,1) Black (1,2) Pink (3) Clear (22)
4b				4	1		5	Blue (1,2,4) Black (12) Clear *fragment* (3)
5a	Pretties Island	45.0491	-76.1659	3			3	Black (2,1)
6a	Ebbs Point	45.0401	-76.1892	5			5	Blue (2,1,1,4) Purple (2)
6b				2			2	Black (3) Red (1)
6c				2	1		3	Blue (4) Black (3) Clear *fragment* (2)
7a	McEwens Bay/Anchor Point	45.0376	-76.2213	4			4	Blue (2,3) Grey (1) Red (1)
7b				2			2	Blue (8,1)
8a	Mallochs Bay	45.0119	-76.2033	4*			4*	Blue (3,2) Black (1) *Blue *bundle* (3-4 fibres)
8b				3			3	Blue (1,1) Black (1)
9a	Outlet (South of Hwy 7)	45.1255	-76.1595	2			2	Blue (1) Black (1)
9b				1			1	Blue (2)
10a	Outlet (North of Hwy 7)	45.1258	-76.1592	1			1	Blue (2)
10b				2	1		3	Blue (3) Red (1) White *fragment* (2)
			TOTAL	**70**	**3**	**1**	**74**	

Key:
Fibres= Artificial fibres
Frag= Solid pieces ('chunks' rather than thin fibres)
Film= Wrapping (e.g. thin wider material such as plastic bags)

Impacts of Microplastics on Environment and Health

Plastics degrade slowly, often over hundreds if not thousands of years. This increases the probability of microplastics being ingested and incorporated into, and accumulated in, the bodies and tissues of many organisms including humans.

By 2018, in marine and freshwater ecosystems combined, microplastics had been found in more than 114 aquatic species. They've been found lodged in the digestive tracts and tissues of sea animals. Fish and birds are likely to ingest microplastics floating on the water surface, mistaking the plastic bits for food. The ingestion of microplastics can cause aquatic species to consume less food and therefore, to have less energy to carry out life functions and it can result in neurological and reproductive toxicity. Microplastics are suspected of working their way up the aquatic food chain, from zooplankton and small fish to larger aquatic predators.

There is concern that microplastics could harm human health as they move through the aquatic food web. Microplastics both absorb and give off chemicals and harmful pollutants. Plastics' ingredients or toxic chemicals absorbed by plastics may build up over time and stay in the environment.

Additives added to plastics during manufacture may leach out upon ingestion, potentially causing serious harm to the organism. Endocrine disruption by plastic additives may affect the reproductive health of humans and wildlife alike. Plastics, polymers derived from mineral oils, are virtually non-biodegradable. That being said a recent study by the World Health Organization has recently concluded that ingestion of microplastics may not be cause for concern to human health at present although further studies are recommended to further determine risks:

https://www.who.int/water_sanitation_health/publications/information-sheet190822.pdf?ua=1

While there has been a lot of media attention on microplastics in the last few years, there has not yet been enough scientific research to indicate any clear or definitive statements about the impact of microplastics on the environment or on the health of people. Nonetheless, plastics are now truly ubiquitous in our world.

Jean-Pierre (JP) Thonney attained his MSc in Fisheries Science and Aquaculture from the Institute of Aquaculture, University of Stirling, Scotland, in 1988. He received a BSc-Honours Degree from Memorial University in Newfoundland in 1984 in the field of Fisheries Ecology as well as a D.E.C. in Fish and Wildlife Management from Vanier College in 1979.

His working experience encompasses the fields of environmental assessment/mitigation, fisheries management, aquaculture R&D and sustainable development. Over the past 30 years he has been involved in numerous international biodiversity related projects in the South Pacific, Caribbean, UK, Middle East, South Asia, West and South Africa and throughout Canada and the US.

Semi-retired from Fisheries and Oceans Canada, he divides his summer time between his commitments at F&O and carrying out various aquatic projects for organizations such as Watersheds Canada and the White Lake Preservation Project (WLPP).

Doreen Donald joined the MLA 4 years ago just after moving to the Lake. She has served on the MLA Board of Directors, and both the Communications Committee and Environment Committee. She became Chair of the Environment Committee 3 years ago and is also currently serving as the Vice-President of the Association. Doreen is also a member of the Carleton Place Environment Advisory Committee (CPEAC).