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ASSESSMENT AND QUANTIFICATION OF MICROPLASTICS CONTAMINATION IN SOUTHPENNAR RIVER WATER

P. RAJADURAI[1], D. ROOPA[2]

[1]Department of civil Engineering, Gnanamani College of Engineering, Namakkal , Tamilnadu, India
[2]Assistant professor, Department of civil Engineering, Gnanamani College of Engineering, Namakkal , Tamilnadu, India

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ABSTRACT:- Microplastic pollution in freshwater is increasingly studied in the waterways of india. Detrimental to organisms, both through physical mechanisms such as false satiation and through chemical mechanisms due to contaminant adsorption and particle leaching, microplastics originate from a variety of yet-to-be-quantified sources. This ongoing study aims to support the quantification and source identification of microplastic pollution in the southpennar river through investigative studies to uncover patterns in microplasic concentrations. Over the past funding cycle, we found evidence to suggest that microplastic concentrations do change in time and that the change differs between streams with wastewater treatment plant contributions and streams without, depending on the flow conditions at the time of the sampling session. Ongoing work continues to compare results found using different sampling methods, investigate the influence of dams on plastic transport in rivers, and link fish diets with fish consumption of microplastics in southpennar river estuaries.

1. INTRODUCTION

Microplastics are generally classified as particles smaller than 5mm. They are used in some cosmetic and personal care products, for example as exfoliation microbeads, and can be generated unintentionally, for example from, fibres from clothes, particles from tyres, and abrasive sandblasting. Other microplastics result from the breakup of larger plastic objects in the oceans. The small size of microplastics means that they can end up flushed into the sea and causing damage to the marine environment. There are currently no systems to fully filter them out through waste water treatment. One study estimated that a total of 15-51 trillion microplastic particles have accumulated in the ocean. The Environmental Investigation Agency (EIA) estimated that there are between 80,000 and 219,000 tonnes of microplastics entering the marine environment from Europe per year. Our starting point for this inquiry was significant public concern around the environmental impact of microbeads - a sub-set of microplastics that are intentionally added to cosmetic products and other toiletries, usually to exfoliate the skin. Although microbeads are only one source of microplastic pollution, accounting for a small proportion of the overall impact, we took the view that looking at their use is an important starting point for addressing the wider issue of microplastic pollution. Microplastics and their environmental impact are a relative recent subject of study. There are many areas where further research will be required. The aim of our inquiry was to investigate the scale of the problem of microplastics and establish what is known. We looked specifically at the issues of microbeads and the impact of the Government's proposed legislative ban. This also included an examination of what is known about the health consequences microplastics and the extent of the damage to our marine ecosystems.

A research briefing note by the Parliamentary Office of Science and Technology (POST) summarises microplastic sources and spread, the evidence that they present a risk and possible strategies to reduce plastic pollution. A briefing paper produced by the House of Commons Library also provides key information on the use of microplastics and microbeads, and their possible impacts on the environment and human health.

2. MICROPLASTICS

There is an ongoing debate about the appropriate definition of microplastics. So far, the most widely used definition is that microplastics are particles less than 5 mm in their longest dimensions. This definition has been adopted in practical terms as it is considered the size under which ingestion by many species of aquatic biota occurs (GESAMP, 2015).

This loose definition has been accepted by the National Oceanographic and Atmospheric Administration (NOAA) of the United States of America and the Marine Strategy Framework Directive (MSFD) of the European Union for monitoring and the implementation of directives.

Thus, this document will follow the definition that microplastics are particles consisting of a heterogeneous mixture of differently shaped materials referred to as fragments, fibres/filaments, beads/spheres, films/sheets and pellets in the range from 0.1 μm to 5 000 μm in their longest dimensions (Lusher et al., 2017; EFSA, 2016), while nanoplastics are defined as plastic particles ranging from 0.001 μm to 0.1 μm.

2.1 SOURCES OF MICROPLASTIC POLLUTION

One source of microplastics arises from the breakdown of larger plastics. This happens due to the action of catalysing factors such as ultraviolet light, which can alter bonds in the

plastic polymers .Degradation is always happening and big plastics become smaller and small plastics have bigger impacts.

He added that microplastic are "more damaging in general than larger plastics that break up as they move through the ocean. I think the issue is that as you break things down into smaller and smaller particles you increase the surface area. The surface area is where plastics can interact with chemicals and other things in the ocean and it is also the surface area from which things can leach out into the environment.

2.2 IMPACT ON HUMAN HEALTH

It is uncertain whether microplastics that are ingested by humans can be transported into tissues. Microplastics are widely used as carriers for medicines, and can transfer into tissues in humans. [The evidence] shows it could transfer to several layers of the human body, in simple layman's terms.If [microplastics used in medicine] can transfer to certain tissues to deliver the medicine, then it could also transfer to the tissues without the medicine.

Microplastics are present in seafood sold for human consumption, such as mussels from the North Sea. It is possible that the gut wall could stop microplastics from entering tissues, but very small particles could potentially pass through.

2.3ABOUT SOUTHPENNAR RIVER

The river originates in the Nandi Hills in the Chikkaballapura district of Karnataka and flows through Tamil Nadu before emptying into the Bay of Bengal. It has a catchment area of 1,424 square miles (3,690 km2) located in Karnataka and Tamil Nadu states. Small dams of Kelavarapalli and Krishnagiri dams are built across this river near Hosur and Krishnagiri.

The largest dam on this river, Sathanur Dam with 7.3 Tmcft Gross Capacity is built near Tiruvannamalai. Moongilthuraipattu Sugar Factory is also situated on the bank of river. The river is dry for the most part of the year. Water flows during the monsoon season when it is fed by the south-west monsoon in catchment area and the northeast monsoon in Tamil Nadu. However this water flow raises the water table throughout the river basin and feeds numerous reservoirs/tanks.

The old river Dakshina Pinakini does not exist anymore.Substantial part of Bangalore's sewage enters this river via Bellandur and Varthur Lakes and other channels.

The sand build of the river is quite impressive, suggesting that it may have been a perennial river with much larger water flow in the past. Mention of the river is found in Sangam and medieval (Thevaram - Bhakti cult era) literature, where it is depicted as rich with lush vegetation on its banks. There are various temples on its banks. It irrigates Krishnagiri, Tiruvannamalai, Vizhuppuram and Cuddalore districts and empties into the Bay of Bengal.

This river is now looted for its rich availability of sand. As the water flow will be only in monsoon seasons, the river is dry in remaining parts of the year.

FIGURE(1). Map of the SouthPennar river flowing through Karnataka and Tamil Nadu.

2.4 DESCRIPTION OF LOCATION TO BE STUDY

1. LOCATION : HOSUR (KELEVARAPALLI DAM)

2. STATE : TAMIL NADU

3. NAME OF THE RIVER : SOUTH PENNAR RIVER

The Kelevarapalli Dam, around 10km away from Hosur. The dam is built over the Ponnaiyar River, which enters Tamil Nadu from Karnataka.

Sample	Method	Microplastic load	Particle size
Water	Density separation	3.3 mg/L	<5mm

3.RESULT

MICROPLASTIC CONCENTRATIONS IN SEDIMENTS

Method	Explanation	location	Microplastic load	Particle size
Selective	Use of forceps or similar handheld	Up stream	28 g/m^2	>5 mm

sampling	tool to collect visible particles from sediment surface	Down stream	13 g/m²	>5mm
Separation of microplastics by dry sieving	Use of one or more sieves to extract larger microplastics from finer-grained material.	Up stream	0.75 g/Kg	<5mm
		Down stream	0.32 g/kg	<5mm

MICROPLASTIC CONCENTRATIONS IN WATER

4. CONCLUSIONS

This chapter deals with the categorization of microplastic pollution. In this study area (southpennar river) the contamination that present in the southpennar river sediments settle down in the year over a long period. Since the southpennar river is located across the industrial location the effluent from the industry is let in to the river without proper treatment which led to the huge contamination of river basin and Microplastics concentration of southpennar river are analysied.

Due to the long-life of plastics on ecosystems, harm to the life would continue for many decades even if the production and disposal of plastics suddenly stopped.

In this respect, it is imperative that severe measures are taken to address the problem.

Further studies are needed to better elucidate factors influencing the occurrence of microplastics in river organisms, and modulation of biological effects. New scientific data should sustain input for conservation management, provide marine scientists with better evidence for political authorities responsible for normative guidelines, and strengthen the basis for educational campaigns.

At the same time, the rise of public awareness on environmental microplastics should also stimulate technological innovation to reduce the use and consumption of plastics, minimize their input into the environment, stimulate a new approach toward collection and re-use of stranded materials.

REFERENCES

1. Andrady, A.L., 2011. Microplastics in the marine environment.

Mar. Pollut. Bull. 62 (8), 1596e1605.

2. Arthur, C., Baker, J. (Eds.), 2011. Proceedings of the Second Research Workshop on Microplastic Debris. November 5-6, 2010. NOAA Technical Memorandum NOS-OR&R-39.

3. Bakir, A., Rowland, S.J., Thompson, R.C., 2014a. Enhanced desorption of persistent organic pollutants from microplastics under simulated physiological conditions. Environ. Pollut. 185, 16e23.

4. Bakir, A., Rowland, S.J., Thompson, R.C., 2014b. Transport of persistent organic pollutants by microplastics in estuarine conditions. Estuar. Coast.

Shelf Sci. 140, 14e21.

5. Ballent, A., Purser, A., de Jesus Mendes, P., Pando, S., Thomsen, L., 2012. Physical transport properties of marine microplastic pollution. Biogeosci.

Discuss. 9, 18755e18798.

6. Ballent, A., pando, S., Purser, A., Juliano, M.F., Thomsen, L., 2013.

Modelled transport of benthic marine microplastic pollution in the Nazare Canyon. Biogeosciences 10, 7957e7970.

7. Barnes, D.K.A., Walters, A., Gonc¸alves, L., 2010. Macroplastics at sea around Antarctica. Mar. Environ. Res. 70, 250e252.

8. Browne, M.A., Niven, S.J., Galloway, T.S., Rowland, S.J., Thompson, R.C., 2013. Microplastic moves pollutants and additives to worms, reducing functions linked to health and biodiversity. Curr. Biol. 23, 2388e2392.

9. Carpenter, E.J., Anderson, S.J., Harvey, G.R., Miklas, H.P., Peck, B.B., 1972. Polystyrene spherules in coastal waters.

Science 178 (4062), 749e750.

10. Carr, A., 1987. Impact of nondegradable marine debris on the ecology and survival outlook of sea turtles. Mar. Pollut. Bull. 18 (6B), 352e356.

11. Carson, H.S., Nerheim, M.S., Carroll, K.A., Eriksen, M., 2013. The plasticassociated microorganisms of the North Pacific Gyre.Mar. Pollut. Bull. 75, 126e132.

12. Castan~eda, R.A., Avlijas, S., Simard, M.A., Ricciardi, A.,

2014.Microplastic pollution in St. Lawrence River sediments.

13. Claessens, M., De Meester, S., Van Landuyt, L., De Clerck, K., Janssen, C.R., 2011. Occurrence and distribution of microplastics in marine sediments along the Belgian coast.

Mar. Pollut. Bull. 62, 2199e2204.

14. Derraik, J.G.B., 2002. The pollution of the marine environment by plastic debris: a review. Mar. Pollut. Bull. 44 (9), 842e852.

15. Desforges, J.P.W., Galbraith, M., Dangerfield, N., Ross, P.S., 2014. Widespread distribution of microplastics in subsurface seawater in the NE Pacific Ocean. Mar. Pollut. Bull. 79, 94e99.

BIOGRAPHIES

Mr.P.RAJADURAI, Department of civil Engineering, Gnanamani College of Engineering, Namakkal, Tamilnadu, India

Mss.D.ROOPA, Assistant professor, Department of civil Engineering, Gnanamani College of Engineering, Namakkal, Tamilnadu, India