

Byapti Banerjee

Department of Zoology for UG and PG studies Serampore College, Serampore, and Hooghly, West Bengal, India

**Corresponding Author Email: bbyapti@gmail.com*

ABSTRACT

Plastics are one of the most widely used materials in the world; they are broadly integrated into today's lifestyle and made a major contribution to almost all product areas, be it the product itself or its packaging. Majority of consumer products used today thus uses some form of plastic or the other. Estimates show that worldwide almost 280 million tons of plastic materials are produced annually, much of which finally ends up in landfills or oceans. Plastics are lightweight, durable and inexpensive and these qualities can make them very harmful to wildlife, especially once they are in any form of water body. Plastics are often thrown mindlessly beside the roads or directly into water bodies after use. Once seaborne, plastics are more likely to be found circulating in ocean gyres. Plastics being lightweight and durable are capable of travelling long distances, ending up in huge amount along shoreline or floating in the open ocean. A growing concern is that once plastic reach wildlife; they may cause entanglement, death from ingestion and can even carry small invasive species. Globally, at least 23% of marine mammals, 36% of sea birds and 86% of sea turtle species are known to be affected by this menace. The animals of even ponds and lakes are facing similar problems. We often fail to realise that if a large section of us behaves in such irresponsible and mindless ways, our actions can cause potentially devastating ripple effects for virtually all residents of our planet. With respect to the particular problem concerned, it is still probably not too late to make more wise decisions individually as well as collectively to significantly decrease plastic use and pollution.

Keywords: *Plastics, marine mammals, turtles, sea birds, ocean gyres*

INTRODUCTION

The term plastic comes from the Greek word “plastikos” meaning “fit for molding”. Now days, the term plastic is applied to the wide range of synthetic organic compounds. The first plastic based on synthetic polymer was made from phenol and formaldehyde, with the first viable and cheap synthesis methods invented in 1907, by Leo Hendrik Baekeland. The majority of consumer products used today is comprised of some form of plastic. Worldwide, about 280 million ton of plastics are produced annually (Shaw & Sahni, 2014) for manufacturing of products such as storage containers, packaging materials or even automobiles. Plastic has become an optimal medium, used in vast amount of consumer products because it is lightweight, inexpensive and water resistant. Unfortunately, within last 30 years, scientists have realised that the attributes of plastics are what also make them detrimental to our environment, as it does not biodegrade in nature. Annually more than 35 million plastic bottles and 500

billion plastic bags are used by consumers (What a waste 2010), many of which end up in oceans and beaches. Since they are lightweight and durable, plastics are capable of travelling long distances; ending up in terrestrial environments, along the shorelines or floating in Open Ocean. As plastics float in the oceans they are affecting marine wildlife, causing entanglement, death from ingestion and can even carry small invasive species. As a result of plastic waste, Earth's oceans and fresh water biodiversity and ecosystems are being adversely affected. To solve these problems caused by plastics, new technologies are being applied such as cellular transmitters having citizens track plastic debris using their smartphones, using drones or barriers to collect plastic debris and turning plastics back into fuel.

Issues of plastic in waterbodies:

The accumulation of plastics in our environment is the result of improper disposal or shipping spills. The

magnitude of plastic pollution carried to sea and fresh water has significantly multiplied over the past several decades. Oftentimes, animals are injured due to entanglement or ingestion of plastics found in the environment. Globally at least 23% of marine mammal species, 36% of sea bird species and 86% of sea turtles species are known to be affected by plastic debris (Stamper *et al.*, 2009). Plastics are taking a huge toll on a number of groups of sea animals.

Effects on Sea Turtles:

Plastic bags floating in the water strongly resemble the shape of jellyfish, a primary food source for sea turtles, thus resulting ingestion of the bags. 8.7% death of turtles occurs due to blocking the passage of food (Mrosovsky *et al.*, 2009). Debris including fishing line, ropes, nets and plastic bags have been extracted from sea turtles' digestive tracts, causing un-natural death of sea turtles. Plastic has also been found to block the passage of female eggs. This causes internal damage of the organism. Due to anthropogenic impact, the population of *Dermochelys coriacea* has declined over last 2 decades, placing them on the IUCN's critically endangered list (Shillinger *et al.*, 2002). Even though some turtle may be capable of passing plastic through their digestive system, it can still cause internal injuries. Those that cannot pass the plastic will eventually starve as plastics accrue in their stomach cavities.

Effects on Cetaceans:

Most cetaceans live far from the shoreline which limits the amount of research on the ingestion of marine debris. It is evident that Plastics cause disturbance in the echolocation process of cetaceans. Ingestion is most likely because the debris is mixed in with the desired food. Two sperm whales (*Physeter macrocephalus*) were found of the coast of Northern California in 2008 with a large amount of fishing gears in their gastrointestinal tracts (Jacobsen, Massey and Gulland, 2010). In Brazil, the stomach analysis of Blainville's beak whale (*Mesoplodon densirostris*) showed the presence of a large bundle of blue plastic thread occupying a substantial part of the stomach chamber (Secchi & Zarzur, 1999). Currently, there have not been enough data that proves ingested plastics are the primary cause of death of cetaceans.

Effects on Sea Birds:

Small plastics such as bottle caps are often mistaken by sea birds for food, causing death of the birds. Since most adult birds regurgitate what has been ingested as a way to feed their chicks, they pass the bolus containing plastics onto their young ones. Birds such as the albatross and shearwater had more plastic in the first region of their stomachs and gizzards, indicating that when these plastics were regurgitated, they would be passed to their young during feeding (Moser & Lee, 1992). Similar to other marine life, swallowed plastic can obstruct and damage birds' digestive system, reducing foraging capabilities, fitness, growth rate and food consumption.

Effects on Fish:

There has not been any found published study about the effect of plastics on fish. Of the 7-different species studied in North Sea, only 2.6% of the 1203 collected fish contained plastic pieces in the digestive tracts (Foekema *et al.*, 2013). Consumption of plastics may facilitate the transport of absorbed pollutants to predators within the food chain. Micro plastics resemble phytoplankton which is eaten by fish and many other animals causing reduction of stomach capacity, internal injuries and intestinal blockage.

Effect on Corals:

Coral reefs are already under threat from increasing water temperatures, ocean acidification and various forms of anthropogenic activities and plastic pollution is the latest complication. Corals are non-selective feeders that can consume microplastics. The coral stomach can potentially fill with the indigestible plastics leading to the degradation of the coral reefs.

Possible remedies:

The issues of plastic pollution are of such a magnitude that it requires a combination of measures and changes to combat it. The following possible remedies are suggested.

Use of biodegradable plastics:

Biodegradable plastics are eco-friendly as they take lesser time to break down after being discarded. They easily get absorbed in the Earth, thus reducing tons of

plastic wastes. Biodegradable plastics do not contain harmful chemicals or toxins. So it is safe for our environment.

Recycling of used plastics:

Plastics have an intrinsic value as a fuel source. The hydrocarbons that make up plastics are embodied in the material itself, essentially making plastics a form of stored energy, which can be turned into a liquid fuel source. The shredded plastic waste can be used for making road and construction, as it is durable. Thus, used plastic can be recycled.

Modern Techniques:

One of the most effective ways to reduce plastic pollution is to use modern techniques for waste management. By this method, plastics can be gathered from ocean water. Some of the scientific methods are: - use of cellular transmitter, having citizens track plastic debris using their smart phones, use of drones or barriers to collect plastic debris.

Throwing Plastics in proper places:

There is no natural process that can absorb non-biodegradable plastics into the biological cycle. Plastics last for decades; therefore, it should never be dumped at the sides of the roads or in the water bodies. We must dispose of plastic in proper place.

Mass Awareness:

To reduce plastic pollution mass awareness is an important step. Spreading awareness among the common people by setting up different campaigns and proper disposal techniques, awareness among students will help to achieve the goal of waste management up to a certain level.

CONCLUSION

Due to ingestion or entanglement of plastic debris, over 270 species including turtles, fish, sea birds and mammals have experienced impaired movement, starvation or death (Laist, 1997). With respect to this particular problem, we have to think and act wisely both individually and collectively to reduce the plastic use and pollution and make the Earth more beautiful for us and for them who are indirectly dependent on us for a healthy environment.

Acknowledgement:

I am grateful to Serampore College for providing required infrastructure and academic resource for this work.

REFERENCES

- Foekema, E. M., De Gruijter, C., Mergia, M. T., Van Franekar, J. A., Murk, A. J. & Koelmans, A. A. (2013). Plastic in North Sea fish. *Environmental Science & Technology*, 47(15), pp 8818-8824.
- Jacobsen, J. K., Massey, L. & Gulland, F. (2010). Fatal ingestion of floating net debris by two sperm whales (*Physeter macrocephalus*). *Marine Pollution Bulletin*, 60(5), pp 765-767
- Laist, D. W. (1997). Impact of marine debris: entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records. In: J. M. Coe. & D. B. Rogers. (Eds.), *Marine Debris Sources, Impacts, and Solutions*, (1st ed.) Springer Series on Environmental Management, Springer-Verlag, (pp. 99-140). New York: Springer.
- Moser, M. L. & Lee, D. S. (1992). A fourteen-year survey of plastic ingestion by western North Atlantic seabirds. *Colonial waterbirds*, 15(1), pp 83-94
- Mrosovsky, N., Ryan, G. D. & Jamws, M. C. (2009). Leatherback turtles: the menace of plastic. *Marine Pollution Bulletin*, 58(2), pp 287-289.
- Secchi, E. R. & Zarzur, S. (1999). Plastic debris ingested by a Blainville's beaked whale, *Mesoplodondensirostris*, washed ashore in Brazil. *Aquatic Mammals*, 25(1), pp 21-24.
- Shaw, D. K. & Sahni, P. (2014). Plastic to oil. *IOSR Journal of Mechanical and Civil Engineering*, pp 46-48.
- Shillinger, G. L., Di Lorenzo, E., Luo, H., Bograd, S. J., Hazen, E. L., Bailey, H. & Spotila, J. R. (2012). On the dispersal of leatherback turtle hatchlings from Mesoamerican nesting beaches. *Proceedings of the Royal Society B: Biological sciences*, 279(1737), pp 2391-2395.
- Stamper, M.A., Spicer, C. W., Neiffer, D. L., Mathews, K. S. & Fleming, G. J. (2009). Morbidity in a juvenile green sea turtle (*Cheloniemydas*) due to ocean-borne plastic. *Journal of Zoo and Wildlife Medicine*, 40(1), pp 196-198.
- Plastic Ocean. (2017) Available at: <https://www.plasticoceans.org/the-facts>