

## Marine plastics in the Philippines: a call for research

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Plastics in the marine environment, aptly named “marine plastics,” are considered as a global threat to marine biodiversity. A plethora of species has been reported to have succumbed to the harmful effects of these marine pollutants (Kühn et al. 2015). The number of affected marine species is expected to rise as research on this topic increases (Ryan 2015). For example, Abreo et al. (2016a) provided the first evidence of plastic ingestion by Deriniyagala’s beaked whale (*Mesoplodon hotaula*). Minimum estimates on the number of marine plastics in the world’s oceans are currently placed at 5.25 trillion pieces (Eriksen et al. 2014). Moreover, Jambeck et al. (2015) estimate the global input of marine plastic at 4.8 to 12.7 million metric tons per year. This increasing number of plastic in the marine environment through the years could also mean an increase in interactions with different marine species. Overlap in the distribution of marine debris, including marine plastics, and the foraging habitats of marine species will result as marine plastics become more ubiquitous.

Previous studies have implicated the Philippines as one of the highest contributors of plastics to the marine environment (Jambeck et al. 2015; Lebreton et al. 2017). The country is said to contribute 0.28–0.75 million metric tons of marine plastic per year (Jambeck et al. 2015). Pasig River alone is estimated to

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contribute  $3.21 \times 10^4$  tons of plastic per year to the marine environment (Lebreton et al. 2017). With the Philippines hosting a very high marine biodiversity, the interaction between marine plastics and marine species is inevitable. Published scientific literature on marine plastic in the country is surprisingly scarce. LITTERBASE, a database which creates an inventory of scientific publications focusing on marine plastic, shows that out of 1,756 scientific articles published on marine plastic worldwide, only three (see Abreo et al. 2016a, 2016b; Aloy et al. 2011) were from the Philippines (Tekman et al. 2017). Although other publications stating occurrences of marine plastic are present (e.g., Obusan et al. 2016; Orale and Fabillar 2011), these studies did not focus on the problem. Nevertheless, even if these studies are included, the number remains minimal.

A more daunting problem is the discovery of microplastics (plastics <5mm in size) and its role in increasing the bioavailability of toxins (e.g., heavy metals, PCBs (polychlorinated biphenyls), polycyclic aromatic hydrocarbons, among others) in the marine environment (e.g., Avio et al. 2016, 2015). Note that studies on microplastic and their interaction with toxins are still in their infancy. However, biomagnification and bioaccumulation of toxins through ingestion of microplastics have already been documented (Tanaka et al. 2013; Teuten et al. 2009). This development will have implications for food safety and may compromise food security in the future as more and more seafood species are found to ingest marine plastics (Rochman et al. 2015). Currently there are no studies of this nature published from the Philippines. This is a great source of concern, given that marine fisheries significantly contribute to fish production in the country and fish is considered as the main source of protein for most of the population (Macusi et al. 2011). Bioaccumulation of toxins through consumption of marine species tainted with microplastics may lead to adverse effects in large parts of the population in the country. No studies have explored the

possibility of toxic loading in humans through this pathway and the possible effects of this on human physiology.

The need for research on marine plastic in the Philippines is of utmost importance since the country is heavily dependent on the marine environment and the ecosystem services that it provides. Moreover, since the Philippines is a significant contributor of plastics in the marine environment, development of methodologies or strategies to address the problem will be a substantial contribution to the global community. The lack of data impedes the understanding of the problem and results in failure to recognize its gravity. This would, in turn, affect the attitudes and efforts toward addressing the issue. In simple terms, solving a problem is hard if one does not understand the extent of the problem.

## CONFLICT OF INTEREST

The author declares no conflict of interest.

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