2020

Microplastics Invade Manta Ray Feeding Grounds Giving Rise to the Effects of Global Plastic Pollution

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The collection of manta ray waste showcases the presence of microplastics in their diets, increasing global concern regarding the role that plastic is playing in the world's oceans.

SOURCE: Frontiers in Marine Science
By Meghan Ulmer 5 March 2020

Manta rays are gentle giants of the of ocean that evoke a sense of elegance, beauty, and mystery. Sadly, anthropogenic effects on marine ecosystems have created obstacles for numerous species, such as manta rays, ultimately causing a steady decline in some of the world's most wonderous creatures.

Plastic pollution has become a rising issue in marine ecosystems across the world. Microplastics, or plastic pieces smaller than 5 mm in diameter, have become an alarming problem. Studies show marine organisms have been ingesting these materials when feeding. A new study, conducted by Germanov and co-authors, has emerged showcasing that large filter-feeding marine species, specifically manta rays, are likely to be ingesting plastics at a distressingly high rate. This in turn is affecting the physiological and developmental functions of manta rays, making for a challenging and uncertain future for these elegant marine creatures.

The Coral Triangle, a shallow marine region in Indonesia, is a global marine biodiversity hot spot. This marine ecosystem has also become infamous for its high levels of plastic pollution. Manta rays frequent the Coral Triangle as a main source of food, making them prone to digesting floating debris. With no current confirmation of manta rays ingesting plastics when consuming food resources, scientists began surveying these feeding grounds. The findings were alarming.

Scientists conducted visual surveys from the surface and underwater to observe manta ray feeding habits in areas where plastic contents were present in the water. Additionally, they collected manta ray egested material in the form of feces and vomit. In order to do this, they used boat trawling as well as snorkelers to follow behind these giant marine creatures and collect their regurgitated waste. These samples provided ample evidence of microplastic presence in manta ray diets.

Scientists sorted the plastics into five categories: foam (i.e., polystyrene), fragment (i.e., hard plastics), film (i.e., plastic bags/wrap), bottle (i.e., beverage bottles, single use cups), and other (i.e., straws, shoes, cigarette butts, etc.). They then quantified the plastic and microplastic abundance from the trawls in the open water feeding ground as well as material found in egested contents. In order to measure the weight of plastic from fecal matter and regurgitated food, they dried the materials for a 24-hour period at 60˚C and then created a plastic to plankton ratio. Plankton is the main food source for large filter feeding marine organisms. Therefore, scientists used this ratio to provide concrete evidence, as well as the first ever documented data set, of manta rays ingesting plastic pollution when feeding.

Results of trawling showed that the presence of microplastics in the Coral Triangle were at the upper end of their modeled predictions. With this information, scientists were able to estimate that the plastic ingestion rates for manta rays were nearly 63 items h^{-1}. Additionally, with the collection of both manta ray vomit and fecal matter, the researchers were able to conclude two important facts. First, manta rays are unable to separate plastics from plankton while feeding. Secondly, plastic observed in regurgitated material indicates that manta rays are able to rid plastic content from their system before it reaches their digestive tract. However, not all plastic was regurgitated, so plastic present in the fecal matter indicated that polluted waste made its way through their digestive system, likely causing physiological complications.

Plastic is seeping into the oceans at an alarming rate and global ocean currents are circulating plastic material to the deepest ocean depths. Marine organisms are becoming more likely to eat food sources that are littered with fragmented pieces of anthropogenic plastic waste. The results from this small-scale study confirm a chilling truth that plastic pollution is affecting marine ecosystems and marine organisms on a much grander scale than previously anticipated. A global shift in awareness could greatly improve the health of not only our oceans but also of the amazing creatures, such as manta rays, that roam the deep blue.

Citation: Germanov Elitza S., Marshall Andrea D., Hendrawan I. Gede, Admiraal Ryan, Rohner Christoph A., Argeswara Janis, Wulandari Raka, Himawan Mahardika R., Loneragan Neil R. Microplastics on the Menu: Plastics Pollute Indonesian Manta Ray and Whale Shark Feeding Grounds. Frontiers in Marine Science. 6. (2019). 679.