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Galápagos and the plastic problem (excerpt)

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Plastic pollution (PP) is an ongoing, pervasive global problem that represents a risk to the Galápagos archipelago, despite it being one of the world's most pristine and well-protected regions. By working closely with citizen scientists, we aimed to quantify and map the magnitude and biological effects of PP. With macroplastic abundance ranging from 0.003 to 2.87 items/m², our research indicates that all five sampled Galápagos bioregions are contaminated with PP along their coastlines. The distribution of this debris is not uniform, with macroplastics significantly higher on the windward shores. Based on the identification information found on the examined items, Polyethylene terephthalate (PET) was the most predominant type of plastic originating from both consumer and fisheries-based products deriving primarily from Perú, China, and Ecuador. The top three manufacturers were AjeCroup, Coca-Cola, and Tingy Holding Corporation. Through citizen science, we documented PP exposure in 52 species (20 endemic) in Galápagos terrestrial and marine environments, with exposure occurring in two ways: entanglement and ingestion. These included reptiles (8 species), birds (13 species), mammals (4 species), cartilaginous fish (7 species), bony fish (14 species), and invertebrates (6 species). The top five species with the greatest risk of serious harm due to entanglement (in decreasing order) were identified as green sea turtles, marine iguanas, whale sharks, spine-tail mobulas, and medium-ground finches. In contrast, Santa Cruz tortoises, green sea turtles, marine iguanas, black-striped salemas, and Galápagos sea lions were at the highest risk of harm due to the ingestion of plastics. Our research indicates that PP is a growing problem in the Galápagos archipelago and that additional work is necessary to mitigate its impact now and in the future.

Conclusions

This is the first comprehensive assessment of plastic pollution distribution, composition, source, and impact on animals within the Galápagos archipelago. Macroplastics were observed on every shoreline surveyed throughout the archipelago, including every major island. The prevailing wind direction affected the distribution and macroplastic density (items/m²), with the windward coast of Santiago Island having the highest density of plastics, while the leeward coast had the lowest density. Hard plastic fragments (HPF) are the most common type of debris, while fishing-related waste is the second most common and distinguishable category of macroplastics. The main countries of origin of the examined

macroplastics were Perú, China, and Ecuador, and they were primarily produced by AjeCroup, Coca-Cola, and Tingyi Holding Corporations. While oceanographic models indicate that waste from Perú and mainland Ecuador could certainly reach Galápagos, it is highly improbable that plastic debris released from China could. Therefore, it is hypothesized that debris with Chinese markings may have been sourced from large fishing fleets surrounding the Galápagos marine reserve. However, further research is required. Our study uncovered evidence of 52 species (including 20 endemic species) interacting with plastic pollution through ingestion and entanglement. Moreover, 15 of these species were ranked as being at the greatest risk of severe harm on the Galápagos Islands because of the possibility of ingesting or becoming entangled with PP. The top four species at overall risk of PP interactions in Galápagos include (1) Santa Cruz tortoises (*C. porteri*); (2) Green sea turtles (*C. mydas*); (3) Marine iguanas (*Amblyrhynchus cristatus*); and (4) Galápagos sea lion (*Z. wollebaeki*).

Our research indicates that plastic pollution is a problem in the Galápagos Islands; however, it is not restricted to this region. Therefore, global solutions must be implemented to alleviate global plastic pollution crises. Those who have learned to collaborate and improvise more effectively in the natural world have succeeded (Darwin, 1876). The Galápagos Islands have a relatively small human population, strict immigration laws, and a unique system of nature protection. As a result, the archipelago provides the opportunity and duty to serve as a “social and natural laboratory” to generate data for solving the complex global socio-ecological issue of plastic pollution.