Impacts of Marine Plastic Pollution on Sea Turtles

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Sea turtles have been around since dinosaurs roamed the earth. These air-breathing reptiles are adapted to live in the tropical ocean waters around the world. They can hold their breath for 4-7 hours during which their heart rate decreases to conserve oxygen underwater. This also enables them to dive up to 290m deep in the ocean to find food (Bennett, 2018).

Unlike freshwater turtles, the head and limbs of sea turtles are located outside of the shell and cannot be retracted. Figure 1 shows how the streamlined shell and flippers make sea turtles more hydrodynamic so that they can move easily through their habitat. They are generally not fast swimmers (Bennett, 2018).

Although they remain submerged most of their live, they come ashore because they require air to breathe. The female sea turtles lay their eggs on the beach during nesting season (Bennett, 2018).

Human activities have affected sea turtles' habitats and lives. Six out of seven species are identified as vulnerable to extinction, endangered, or critically endangered. The reasons include direct impacts from hunting of the turtles and their eggs as well as indirect impacts from fishing, pollution, and climate change (Bennett, 2018).

Plastic pollution in the oceans has become a global crisis. We are surrounded by plastic whether it's used in packaging, consumer goods, or in clothing. They all end up in the world's oceans because of inefficient collecting systems for discarded plastics. The concern arises over the lifespan and wide dispersal of debris which poses threats to the thousands of sea turtles killed each year after ingesting or getting entangled in plastic (Wilcox, et al., 2018).

Ingestion

Sea turtles are at risk of ingesting plastic. They may consume debris because it is mixed with their usual dietary food or because they misidentify the objects as prey. These visual feeders readily ingest white and transparent plastics and are attracted to food-like odours emitted by microbes and algae colonising the plastics (Nelms et al., 2016).

A study tested the relationship between the amount of plastic ingested and the likelihood of death amongst sea turtles. One dataset was based on necropsies of 246 sea turtles and a second dataset was based on 706 records from a national stranding's database. The study found a 50% probability of mortality among sea turtles with 14 pieces of plastic in their guts. As shown in Figure 2, the greater the concentration of plastic in the gastrointestinal tract, the greater the likelihood of death (Wilcox et al., 2018).

Entanglement
Sea turtles are also at risk of getting entangled in abandoned or lost netting. Natural fibers have been replaced by synthetic materials to produce more buoyant and durable equipment for marine activities. Sea turtles that get entangled find it difficult to escape and die from injury, starvation and debilitation which reduces their quality of life and reproductive potential (Gregory, 2009).

A second study analyzed the causes of strangling of 1860 turtles admitted at the Tafira Wildlife Rehabilitation Centre in Spain. As shown in Figure 3, the primary causes of morbidity were classified into seven categories with the most frequent cause being entanglement in fishing gear or plastics. They demonstrated that at least 72% of turtles stranded were due to anthropogenic causes (Oros et al., 2016).

Solutions
Given the extent of plastic pollution within marine habitats, there is a need for mitigation. Current clean-up strategies are unable to compete with the increasing amounts of plastics entering the environment. As a result, the disposal of waste must be managed.

Scientists have used risk assessment models to find global hotspots with the highest risk of debris ingestion to the sea turtle populations. This can guide the design of effective management measures (Lohr et al., 2017).

Studies have found that waste management must be improved by 85% in the top 35% countries of mismanaged plastic to achieve a 75% reduction. Collection of waste in the form of door-to-door, curbside collection, buy-back centres, or drop-off centres can allow for proper disposal. Generally, buy-back programs have proved effective because consumers are returned a sum of money per weight of the plastic they bring back. This can reduce littering, illegal dumping, and cost of collection (Lohr et al., 2017).

Additionally, many developed and developing countries have introduced taxes, bans, and restrictions on the use of plastic bags as well as market-based instruments such as bottle and container deposit refund which have proved to be successful. Establishing a legal framework can allow for more better monitoring and enforcement. (Lohr et al., 2017).

Moreover, awareness raising is the best way to move towards a sustainable society. With campaigns that inspire change-oriented actions, both the consumers and manufacturer feel a greater sense of responsibility. Increasing public involvement in beach clean-ups, education programs, and outreach experiences will encourage behaviour change. A review study concluded that people with knowledge on the problems and potential solutions surrounding the environment are more likely to care and respond pro-actively (Lohr et al., 2017).

Together, we can reduce the input of plastic into the marine ecosystems and reduce the harmful impacts of ingestion and entanglement on sea turtle populations.

Work Cited

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Figure 1: The streamlined shell and flippers make sea turtles hydrodynamic swimmers and allow them to adapt to life at sea (Bennett, 2018).

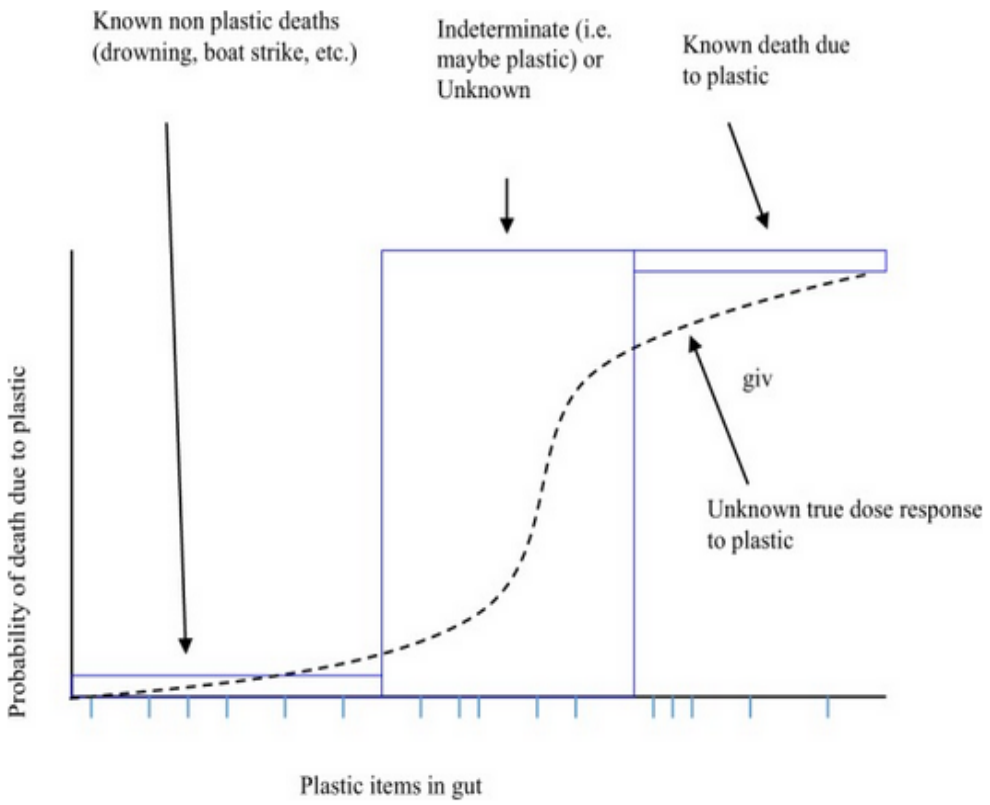

Figure 2: The change in probability of mortality based on increasing plastic load in the gastro-intestinal tract of sea turtles (Wilcox et al., 2018).

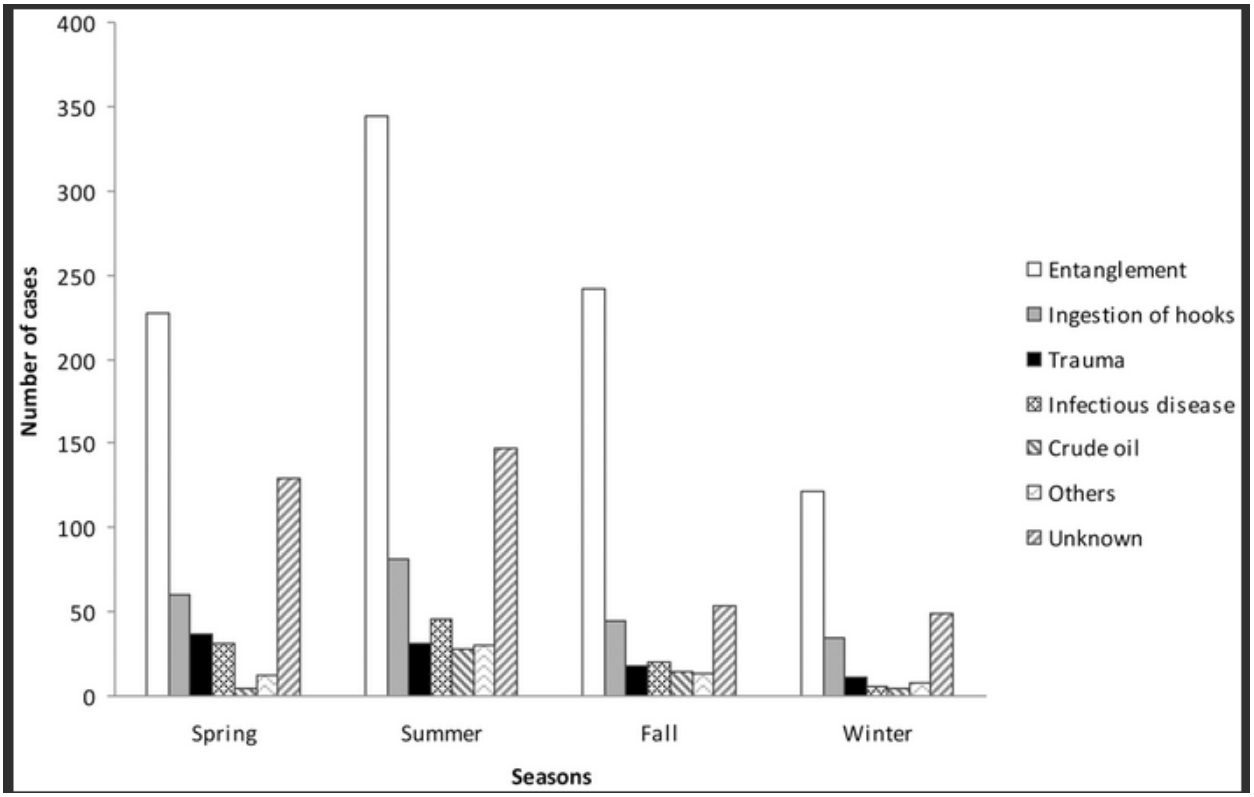

Figure 3: Seasonal variation in the causes of sea turtle admission during 1998-2014 (Oros et al., 2018).