Vessel Strikes, Bycatch, and Plastic Pollution: Driving Forces in Loggerhead Sea Turtle Endangerment

After months in rehabilitation from a torn lung, a sea turtle named Rocky was released into the Atlantic Ocean on February 15, 2023 as hundreds of onlookers watched in keen interest. One of the few fortunate members of her species to have survived a deadly collision with a fishing boat, Rocky was discovered by the Loggerhead Marinelife Center in a state of uncontrollable buoyancy from a damaged carapace which would have likely killed her (Frisaro and Jackson). In recent decades, such hazardous run-ins between man-made structures and large marine reptiles have become more and more common, mirroring the overall trend in declining sea turtle populations. Among loggerhead turtles in particular, they face danger of extinction in the foreseeable future throughout a large portion of the Mid-Atlantic, Pacific Islands, Southeast, and West Coast regions. Since 1978, they have been listed as ‘threatened’ under the Endangered Species Act (ESA), with the fishing, tourism, and oil industries posing the most significant threat to their survival. Thus, in this essay I seek to examine the main contributors to the decline of loggerhead turtles, which include vessel strikes, bycatch in fishing gear, and pollution/marine debris, as well as impending solutions to alleviate, minimize, and rectify their damage.

Along the Florida and Gulf of Mexico coasts, vessel strikes have become increasingly prevalent in marinas and inlets as loggerhead turtles frequent the shallow shorelines during times of peak boat traffic. Unable to avoid high-speed ships, they will strike the hull, outboard motor, or propeller of various types of watercraft, resulting in injury and death. In the southeastern U.S., the expansion of coastal development, boat ownership, and recreation industries have resulted in a higher risk of collisions, as annual trends in loggerhead strandings exhibit a gradual incline. A 2020 case study on conservation interventions reported that “between 1986 and 2014, more than 10,000 stranded sea turtles had vessel-related injuries in Florida, with as many as 60% of
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stranded loggerhead turtles displaying signs of propeller-related injuries in South Florida” (Fuentes et al.). Moreover, adult female loggerheads are most vulnerable to ship strikes during nesting season while making reproductive migrations, potentially preventing them from laying eggs and leading to additional population decline.

The U.S. national recovery plan currently cites reducing watercraft-related mortality among loggerhead sea turtles as a major objective, and prioritizes the creation and execution of strategies to minimize interactions. The Sea Turtle Stranding and Salvage Network is instrumental in collating statistical reports on strandings and abnormalities, transporting marine mammals to rehabilitation facilities, and promoting public awareness. Together with international partners, the federal agency pursues two crucial routes for ecological oversight: restricting vessel speed by instituting go-slow or exclusive zones and, supplementarily, educating boaters on how to identify turtles near the surface to better avoid them. Targeted interventions have the capacity to mitigate undesirable confrontations between loggerheads and motorized ships, so long as they integrate knowledge and input from both boater communities and veterinary specialists.

Arguably the most well-researched and funded efforts to combat loggerhead endangerment, however, would pertain to the reduction of bycatch: the unintended capture of individual turtles in fishing gear “which can result in drowning or cause injuries that lead to death or debilitation” (NOAA Fisheries). Bycatch in fishing operations is the greatest continued primary danger to loggerhead turtle populations. Beginning in the 1970s, resource managers saw an increasing number of non-targeted species being caught in commercial fishing nets. Conservation and management campaigns by international organizations such as the NOAA
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focus on instituting fishery observer programs and ecologically-conscious legislation to reduce sea turtle bycatch. In the U.S., NOAA Fisheries regulate fishing practices among the Pacific pelagic longline and Atlantic gillnet fisheries; in partnership with habitat managers, they track observer information and stranding data to set area closures, teach safe handling protocols, and modify fishing gear.

One particular technology that has served as the fulcrum for lowering mortality rates is the turtle excluder device (TED), a grid of bars fitted into the neck of a trawl to keep shellfish inside while allowing turtles to escape through a separate opening. In 1992, Title 50, Section 223 of the ESA enforced the incorporation of TEDs in shrimp trawl fisheries nationwide. Since then, the process of catch and release has allowed gear teams to perfect and update these statutes as more information is uncovered. Considering the severity and ubiquity of this worldwide problem, the investment is apt. A 2009 paper by the Northeast Fisheries Science Center exploring bycatch in sink gillnet gear throughout the mid-Atlantic shelf water found that “the estimated average annual bycatch was ~350 loggerheads in gillnet fisheries from 1995 to 2006. About 40% of the observed loggerheads were dead, and ~80% of observed loggerheads were immature animals” (Murray). Various ecological journals and adjacent academic institutions have also pored over the relative population-level effects of bycatch, citing their correlation with specific stages of life, the frequency of biological interactions, and the lethality of fishing gear (Wallace et al.). Therefore, management strategies should identify relative demographic impacts of gillnet, hook and line, and poundnet strandings to safeguard effective prioritization of current available management resources.
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Similarly, a comprehensive study in 2022 conducted an investigation into 85% of the boats and more than 20% of the fishermen registered in small-scale fisheries on the Cabo Verde archipelago to find that, among those who reported bycatch, handline gear was responsible for the highest number of captures (69.7%) due to accidental bait swallowing or foul–hooking (Martins, et al.). They argued for the minimization of local industries’ fishing activity with an emphasis on limiting the utilization of passive gears during the nesting season. Overall, to shield loggerhead turtles from incidental run-ins with fishing gear, trawls, longlines, and dredge fisheries, they recommended the immediate implementation of a vigilance program at each port in tandem with resurgent efforts to collect technical and biological data on population parameters and common gear characteristics. In this way, through the actualization of a baseline for impending regulatory, recovery-based, and monitoring measures, officials may cooperate with scientific stakeholders to advance and inform conservation management techniques.

Finally, plastic pollution in marine habitats have produced overwhelming detriment to the physiological health and longevity of loggerhead turtles as they accumulate exponentially on beaches. Due to chemical additives, these inorganic pollutants are resistant and durable, and “approximately 50% of the known floating plastic resides in the subtropical gyres” (Eastman, et al.) where loggerheads primarily inhabit. Getting trapped in oceanic debris has been shown to heighten morbidity and mortality, and turtles who ingest fishing line, tar, oil, or plastic waste may choke or get fragments lodged in their GI tract. Due to the downward facing spines in their throats, they are unable to regurgitate the debris, meaning if plastic bags or nylon lines are consumed those materials will be trapped in their stomach permanently. The deleterious gas that expands within the turtle’s body following artificial decomposition causes “bubble butt”, a
Vessel Strikes, Bycatch, and Plastic Pollution: Driving Forces in Loggerhead Sea Turtle Endangerment

Floating disorder that increases the likelihood of predation and starvation. Hatchlings are especially susceptible to the effects of litter consumption because plastic contamination decreases emergence success and synchrony, both being crucial for juvenile survival (Sousa-Guedes, et al.).

Without a concerted multinational endeavor to remedy the anthropogenic hazards brought about by marine debris, the negative health consequences will continue to plague loggerhead populations. Individually, limiting synthetic consumption and avoiding single-use or micro-plastics is advantageous to cleaner environments; so is preserving their nesting and foraging habitats through beach cleanups. Collectively, the EPA recently unveiled key objectives for their draft national strategy that augments the Save Our Seas 2.0 Act by targeting post-consumer materials through interventions to improve the wastewater capture system, conducting life cycle assessments, fund community composting, etc. Alongside the ride of climate action movements, many are also petitioning the U.N. to enact a plastics treaty that would establish regulations on polyethylene products; already, various cities have had success in adopting similar policies by limiting, taxing, or banning exorbitant single use items.

In conclusion, the time has come to shift the discussions around loggerhead turtle protection from merely postulatory to immediately pragmatic; gauging progress towards species stabilization, however, requires incorporating state institutions, nongovernmental organizations, the private sector, and academia under a shared umbrella of mitigation. These actions include enforcing anti-debris protocol, providing incentives to reduce abandoned gear, encouraging foreign nations to minimize bycatch, promulgating domestic fishery regulations, fostering manual beach cleaning, standardizing evaluative health indices, and more (National Marine
Vessel Strikes, Bycatch, and Plastic Pollution: Driving Forces in Loggerhead Sea Turtle Endangerment

Fisheries Service). Balancing environmental considerations with the economic interests of national and commercial fishing industries requires marine biologists to partner with engineers and fishermen to generate revolutionary change. From a scholarly standpoint, public agencies may also gain significant insight through monitoring fisheries, archiving life histories, mark-recapture studies, aerial surveys, etc. Hence, to better address the unique needs of loggerhead populations around the world, community and municipal bodies must adhere to guidelines put forth by marine and wildlife experts on research, conservation, and recovery measures for this imperiled species.
Vessel Strikes, Bycatch, and Plastic Pollution: Driving Forces in Loggerhead Sea Turtle Endangerment

Works Cited


Vessel Strikes, Bycatch, and Plastic Pollution: Driving Forces in Loggerhead Sea Turtle Endangerment


