What is The Most Common Human Factor That Threatens Marine Species in The North Atlantic Ocean Region?

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ABSTRACT

In the North Atlantic Ocean Region, the greatest human threat to marine species is ship strikes. The many different species that reside in the ocean are affected greatly by various human factors such as pollution, ship traffic, infrastructure in the water and net entanglement. In this paper we establish that ship strikes cause the most damage to species in the North Atlantic region. We found that ship traffic affects many species greatly, from being the cause of death for 53% of the 40 Right whales autopsied between 1970 and 2006, to hundreds of sturgeons across three distinct regions killed by this method. Ship strikes are the most damaging factor, especially to the larger marine animals in the ocean such as whales and sturgeons. Our results not only show how one factor largely harms these species, but how humans, through many different forms, greatly threaten the survival of other species. We conclude that these factors will continue to harm and threaten the well-being of species unless concerted action is taken to mitigate the effects.

Introduction

According to the International Union for Conservation of Nature (2022), the number of endangered species in the world right now is 16,364(International Union for Conservation of Nature [IUCN], 2022). In the last two decades, the number of endangered species has gone from 2,614 to 16,094. Even though some of these species are endangered because of natural reasons, most of these species are being threatened by humans through factors like pollution, entanglement, hunting, poaching and commercial fishing. In the North Atlantic region, many marine species are harmed by all the threats caused by humans in this region. This region presents a demographic of different types of marine animals from small sized fish like salmon, to huge sea mammals like whales.

Research Goal and Method

By analyzing four species, the Atlantic salmon, Atlantic sturgeon, Sei whale, and Right whale, I will try to find what the most common human created threat is to marine organisms in the North Atlantic. I picked these species as they demonstrate the diversity of species in the North Atlantic region. These species, on one hand, show how huge sea mammals are affected by humans in deeper waters, and on the other, show how small fish are affected by humans more inland. In this paper, I will first list the common threats caused by humans I found in the four selected species from two agencies' websites, the International Union for Conservation and the National Oceanic and Atmospheric Administration. Then, I will explain why or why not death by ship strike the most common factor between all of the species is. The four factors that I chose to base my research on were human infrastructure, ship strikes, pollution and entanglement. To find the most common, I had to find how many species are affected by the factors and how severe these factors are to the species as a whole. Finally, I will explain the process in which I determined which factor was the most common. I will do all this to answer the question: What is the most common human factor that threatens marine species in the North Atlantic Region?

Figure 1. Map of the North Atlantic Ocean (https://besthotelshome.com/where-is-the-atlantic-ocean-located-on-the-world-map/)

Materials

In my research, I used data from one national and one international agency. The first was the International Union of Conservation of Nature. This agency focuses on threatened species. Established in 1964, The International Union for Conservation of Nature's Red List of Threatened Species (https://www.iucnredlist.org/) has evolved to become the world's most comprehensive information source on the global conservation status of animal, fungi, and plant species. The second is NOAA, also known as the National Oceanic and Atmospheric Administration (https://www.noaa.gov/), an American scientific and regulatory agency that monitors oceanic conditions, conducts deep sea exploration, and manages protection of marine mammals and endangered species in the U.S. This agency houses research about species that are threatened. By using NOAA's five-year reviews and IUCN's Red List listings, I analyzed these marine animals to find the common man-made factors that threaten them.

Infrastructure

Humans have been using dam technology to redirect water to moisten their crops for millennia. Human-kind has also been building bridges across waterways to help mobilize themselves better. Even though these structures have helped humans to overcome obstacles, the wildlife that live in these environments are harmed by them. In the North Atlantic, Atlantic salmon will migrate more inland through rivers and creeks to reach their birthplace to mate and spawn in lakes and ponds. The journey through these streams is the only route salmon can take to reach their reproduction area, and those ponds and lakes are the only place they can reproduce. These structures "continue to be a major threat to Atlantic salmon by blocking or impairing access to historic Atlantic salmon spawning and rearing habitat." (NOAA)

Figure 2: A Salmon falling off a dam in the Klamath River (https://goodmenproject.com/featured-content/indige-nous-people-in-the-us-hope-to-save-salmon-by-removing-dams/)

While these preexisting structures are damaging the North Atlantic population of Atlantic salmon, ongoing construction is affecting the domains where the North Atlantic population of Atlantic sturgeon reign. Construction of dams, groundwater extraction, irrigation, and flow alteration all threaten these sturgeons by displacing and destroying their habitats. Through humans erecting these structures to accommodate themselves, marine species like the North Atlantic salmon and sturgeon are being endangered through migration route destruction and habitat loss. Although these species were affected by the constructions of humans, many other species in the North Atlantic do not feel the influence of these structures. For example, the Sei and the North Atlantic whale live in deeper waters far from the shore. Since Sei whales and North Atlantic whales don't swim near the shoreline or estuaries, they are not as affected by bridges and dams as much as smaller species of marine animals, since dams and bridges are usually located further inland. This means that, even though these structures are common threats to marine animals that reside in or travel inland, most marine life that live in deeper waters aren't as affected by them.

Ship Strikes

Bridges and dams have helped people travel over water, but boats are the most effective way humans have found to travel in water. Throughout the history of civilizations, boats have been used to travel great distances while also bringing great amounts of cargo with them. Ships are often built to be larger and faster than their predecessors. Despite these advantages, these vessels can cause great amounts of damage to organisms that reside in the sea. In the North Atlantic, many sea animals were and are currently threatened by these large ships. Right whales appear to be one of the most vulnerable species of large whales to ship strikes. According to the IUCN Red List, "Ship strikes were found to be the cause of death for 53% of the 40 Right Whales necropsied between 1970 and 2006 and could have been responsible for up to 10 individual North Atlantic Right Whale deaths per year."(Cooke, 2020) Right whales continue to face the risk of being struck by vessels throughout their range.

Figure 3: A Whale corpse hanging on the bulbous bow of a Ship (https://www.savecoastalwildlife.org/collisions-with-ships)

Another species of whale that is affected by ship strikes is the Sei whale. There are records of ships striking sei whales, but it is unclear whether they account for a significant source of mortality. Because of the Sei whales' offshore distribution, most ship strikes could go unnoticed.

Another species frequently affected by ship strikes in the North Atlantic is the Atlantic sturgeon. In NOAA's five-year reviews, they analyzed the three different distinct populations of the Atlantic sturgeon(National Oceanic and Atmospheric Administration, NOAA, 2022). These distinct populations were inhabitants of three different areas such as the Chesapeake Bay, New York Bight, and the Gulf of Maine. According to the Chesapeake Bay Distinct Population Segment of Atlantic Sturgeon 5-Year Review, ship strikes are a main threat to the species. More than 100 Atlantic sturgeon carcasses have been salvaged in the James River, a Virginia river that flows into the Chesapeake Bay, since 2007, and additional carcasses were reported but could not be salvaged. Many of the salvaged carcasses had evidence of a fatal vessel strike. Also according to the New York Bight Distinct Population Segment of Atlantic Sturgeon 5-Year Review, vessel strikes were considered a primary threat to the New York bight distinct population when NMFS, National Marine Fishing Services, listed the distinct population as endangered. On the other hand, in the Gulf of Maine Distinct Population Segment of Atlantic Sturgeon 5-Year Review, new information confirms that vessel strikes are a threat to the Gulf of Maine's distinct population albeit with fewer discovered carcasses compared to the Hudson, Delaware, and James rivers. Even though ship strikes overall are a huge cause of mortality to the Atlantic sturgeon, different populations in different regions feel the effects of this threat differently. All in all, ship strikes are a very common threatening factor caused by humans in the North Atlantic.

Pollution

Another threat that ships cause is pollution. According to National Public Radio (NPR), the amount of carbon dioxide released in the air by cargo ships is about 1 billion metric tons (NPR, 2021). Just by these statistics, we can see how much pollution is caused by humans. We can see pollution everywhere, from litter all over the ground, clumps of trash in the ocean, and smoke from factories. This causes a lot of problems for many land and marine animals in the world. These problems include microplastic being ingested as food, green-house gases releasing chemicals causing climate change, and the oceans becoming more acidic. In the North Atlantic, many organisms are affected by pollution from humans. One example is the Atlantic salmon. According to NOAA's Five-Year Reviews, "In 2016, a climate vulnerability analysis for 82 managed species of fish and invertebrates in the Northeast United States concluded that Atlantic salmon, along with other sea-run fish, are among the most vulnerable species to climate change."(NOAA, 2020) In the case of the Sei whale, due to the inherent uncertainties outlined above and recent research findings, it remains unclear whether reduced prey abundance due to climate change is a threat to them. The magnitude of threats from

anthropogenic noise to Sei whales is highly uncertain. Another whale in the North Atlantic that is affected by common polluting factors is the North Atlantic Right whale. According to the IUCN's Red List, "[l]ow-frequency in-water noise from shipping activity has been linked to physiological stress (increased glucocorticoid levels) in North Atlantic Right Whales." (Rolland et al. 2012) In the case of the Atlantic sturgeon, contaminants, primarily from industrial sources, contribute adversely to individual fish health and population declines. In conclusion, even though pollution causes climate change, which affects these marine animals, this effect is only minor as the research or the size of which it affects these species is minimal.

Entanglement

Fishing in the modern world also brings up a problem. The fishing industry's method of trawling does get more fish for less power, but it usually leads to some side effects. In the North Atlantic, many different species get caught and entangled in these nets, which leads to injury and sometimes death. Large animals such as sturgeons and whales usually get entangled in the nets used for trawling. For example, Sei whales may swim for long distances with gear attached, resulting in fatigue, compromised feeding ability, or severe injury. Recently, Right whale entanglement events appeared to be increasing in both frequency and severity. A further 30 deaths were recorded during 2017–19 of which 21 were in Canadian and nine in US waters (Pettis et al. 2020). Chronic entanglements are one reason scientists think that female Right whales are having fewer calves and are taking longer to have calves. Therefore, many whales in the North Atlantic are being heavily threatened by entanglement from fishing nets. Even though this is a big concern and threat for these larger animals, smaller marine animals are less affected by being entangled in these huge nets.

Discussion

In both NOAA's five-year reviews and IUCN's Red List, I found that the most common factors that threaten marine species in the North Atlantic are human structures' obstruction of migration paths, ships strikes, pollution, and entanglement. From my research, the most common factor that threatens species in the North Atlantic Ocean is ship strikes because of how many species are endangered by ship strikes and how deadly these strikes are to the population. For factor 1, human structures' obstruction of migration paths, even though this affected the Atlantic salmon and Atlantic sturgeon greatly, many species that don't migrate to fresh water like Sei and Right whales aren't affected a lot by these structures. For factor 2, ship strikes, most marine animals researched were affected. The Atlantic sturgeon, North Atlantic Right whale, and Sei whale all are greatly threatened by ships striking them, but smaller organisms like Atlantic salmon aren't as threatened by ship strikes. For factors 3 and 4, pollution and entanglement, most species were affected by this factor, but the amount that it affects the species is either small or unknown.

Conclusion

From my research, I learned about not only what factor threatens these species the worst, but I have also learned about how great other animals are threatened by humans. Even though I consolidated all these factors into a few pages, there are still thousands of ways humans harm other species' populations. The one overarching lesson I have learned is that humans cause great harm to animals. Even though humans do cause so many problems, I believe there are some ways to help these species. One way to stop obstructing migration paths of Atlantic salmon and sturgeon is to just stop building in areas where salmon and sturgeon spawn or travel to spawn. For this to work, I believe governments should step in and impose strict regulations on what can be built in these areas. For ship strikes, one way to reduce them is to have less ship traffic in areas where whales are mostly located. This means that ships that do not have to go through

areas where whales and sturgeons are most commonly found can just go around them. And finally, to be able to stop whales and fish from getting entangled into trawling nets, fishermen have to watch where they are trawling and monitor what fish are being caught in their nets. In these ways, we can preserve the populations of these species and make sure that they do not become extinct. In the end, finding the most common factor is a fundamental step, but the most important step is to make plans to combat these factors to better help the conservation of these species.

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