First Project

Milestone 3

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DSC 680

**Business Problem:**

Sea turtles are endangered species, and their populations are declining rapidly. They are often victims of human activities, such as boating, fishing, and pollution. They are important members of their ecosystems by helping control sponge, jellyfish, and seagrass populations. I plan to look the growth rate of sea turtles over time and compare that to sea turtle stranding data and head-starting data to understand the effectiveness of head-starting programs, which take in eggs before hatching, and grow them up before release in hopes of increasing chances of survival.

**Background/History:**

Sea turtles are important members of ocean ecosystems, but largely due to human activity, they are endangered. Boat strikes, fishing gear, pollution, coastal construction, and climate change all have negative impacts on sea turtle survival. Freshwater endangered turtles have suffered a similar fate, but many researchers have had success in restoring their populations using head-starting. Head-starting is a process where females are tracked during nesting season, the eggs are collected and brought to a hatching facility, and the hatchlings are raised in human care for a few years until they are bigger, stronger, and theoretically have a higher chance of survival in the wild when they are released.

**Data Explanation:**

This data was collected by the National Oceanographic and Atmospheric Administration (NOAA). The data comes from the Galveston Sea Turtle Project.

**Methods:**

For this project, I started by compiling the different datasets, as there are many identical sets from different years, which will make analysis easier. To analyze this data, I first converted the categorical datapoints from text to numerical data, this allowed for graphical and statistical analysis. Next, I will look for look at individual turtles over time to get an idea of their growth rate. After that, I will compare condition upon stranding to the size (and therefore approximate age) of the turtles and see if there is a link between size/age and survival of different stranding events. Finally, I will use statistics to make sure my conclusions are statistically sound, rather than just appearing to line up with my hypothesis that head-starting is an effective management strategy. If there is enough growth rate data, I can use predictive analytics and split the data up into train and test datasets to create a model for growth rate of the turtles over time.

**Analysis:**

As you can see from the data, most of the stranded turtles have a straight carapace length (SCL) of that of juvenile sea turtles. Meaning that most of the stranded sea turtles were quite young.

**Conclusions:**

Head-starting would be beneficial for sea turtles as seen by this data. Since so many small and juvenile sea turtles are stranding each year, we can clearly see that head starting would benefit the sea turtle populations by allowing more turtles to grow beyond this stage and therefore survive in the wild. This data proves that head-starting is an effective method to help grow the sea turtle populations.

**Assumptions:**

I am assuming this data is a complete representative of sea turtle strandings, and since the dataset is from NOAA, that is very likely.

**Limitations:**

I was only able to do a certain amount of analysis on this project because much of the data is protected from the public. Furthermore, data about the adult populations and any mark and recapture data is withheld from the public to protect these species, so I was unable to look deeper into any long-term data on survival of head-started vs. wild-born sea turtles.

**Challenges:**

One challenge I faced with this project is that much of the data was difficult or impossible to access due to the sensitive nature of endangered species. Furthermore, the datasets were split up by year, so I needed to assess each year individually, which took a lot of extra effort.

**Future Uses:**

This study can help us determine the best course for sea turtle conservation in the future. By looking at sizes of stranded turtles, we can determine how successful head-starting is for these sea turtles. Furthermore, we can compare this data to long-term mark and recapture study data with adult sea turtles to compare the survival of wild-born vs. head-started individuals, to help further prove the benefits of head-starting.

**Recommendations:**

From this research, I would recommend head-starting for sea turtles. While it is a costly effort, only about one in one thousand wild-born sea turtle hatchlings make it to adulthood. According to this data, approximately half of the strandings were to sea turtles smaller than those released from head-starting, therefore this method would greatly reduce strandings and increase wild populations. Furthermore, I recommend stricter laws and regulations for fishing and pollution, to help keep the oceans cleaner and safer for sea turtles.

**Implementation Plan:**

To implement this plan, I would encourage researchers to gain funding to increase the capacity of successful head-starting facilities. Paired with current studies that are in place looking at adult survival (with mark and recapture) and stranding data being collected; additional studies could be done to further prove the efficacy of these head-starting programs.

**Ethical Considerations:**

When working with any endangered species dataset, it is important to be careful about publishing locations where individuals are found or other facts that may lead to an increase in poaching. Since I am only sharing this data with our class and it is already in the public domain, I should not have any problem sharing what I find. Furthermore, the language used when discussing endangered species is very important since endangered species are hot-button topics that often have many eyes on them.

**Challenges/Issues:**

One challenge I have encountered is accessing full datasets. Since these are endangered species, much of the data, including locations, is often hidden from the public to prevent poaching. Furthermore, I will have to cross-reference many different datasets to find all the information I need for the study I wish to complete, which will be a lot of work since they will not all align easily.

**References:**

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**Appendix:**

Chart, box and whisker chart

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Figure 1: Box plot of 2011, 2012, 2013, average straight carapace lengths of released sea turtles vs. average straight carapace length of stranded turtles.

Chart, histogram

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Figure 2: histogram of straight carapace lengths of stranded sea turtles.

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Table 1: data from stranded sea turtles.

Chart, histogram

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Figure 3: Histogram of straight carapace lengths of released head-started sea turtles

Table

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Table 2: data from straight carapace length of released head-started sea turtles.

**Audience Questions:**

1. What proof is there of the success of head-starting for turtles?
   1. There have been many long-term studies with freshwater turtles that have proven the efficacy of head-starting turtles.
2. How can we continue to expand our cities and coastlines while also protecting sea turtle nesting habitats?
   1. By following regulations put forth by NOAA and other organizations we can work to protect nesting habitats and keep coastlines clean while still expanding and building.
3. Can we do anything to prevent cold stress in sea turtles?
   1. Helping protect sea grass beds where sea turtles forage and keeping the ocean clean can help turtles stay in safe environments
4. How do harmful algal blooms (HABs) influence sea turtle stranding?
   1. HABs can lead to die-offs in prey that sea turtles would consume because of the changes in dissolved oxygen in the water. Also, some of these can be toxic to sea turtles.
5. Why can head-started sea turtles be released to the wild, but sea turtles in aquariums cannot?
   1. Head-started sea turtles are raised under conditions that are more similar to the wild conditions, with fewer interactions with humans. This allows them to maintain a healthy aversion to humans to aid in their success in the wild. Sea turtles in aquariums are often cared for in a very hands-on manner because many are rescued and have injuries that do not allow them to return to the wild. Because of this high quality of care and interaction, they may lose many of the instincts required to thrive in the wild.
6. Why is sea turtle data so difficult to access?
   1. Sea turtles are endangered species and many people hunt them for their shells. Similar to poaching issues in Africa, this has led to extra protections about their data to prevent poaching.
7. I don’t live anywhere near the ocean, how can anything I do impact sea turtles?
   1. Anyone can help protect sea turtles no matter where they live. Being careful not to litter, or cleaning up any waterways helps prevent any additional trash from making its way to the ocean.
8. What role do sea turtles play in their ecosystems and why should we care about them?
   1. Sea turtles help keep a balanced ecosystem. They do this by keeping sea grass, jellyfish, and sponge populations under control. Without them, these species could overtake coral reefs and lead to mass die-offs of other species.
9. What difference can a few years of extra growth time during head-starting make?
   1. The few extra years of growth can help protect sea turtles from a number of predators. When they are small, almost anything they encounter can hurt them, but once they get larger, only humans/boats and sharks can really injure them. So the few extra years of growth can make a huge difference in their survival.
10. What is the biggest cause of sea turtle stranding?
    1. The biggest cause of sea turtle strandings has to do with humans. The combination of boat strikes, litter (either entanglement or ingestion), and climate change related illness and injuries leads to many strandings.