

Green Sea Turtles



By: The Ninja Turtles

- Scientific name: Chelonia mydas
- Largest turtles of Cheloniidae family (Largest found 5 ft, 871 lbs)
- Body is oval shaped, head small and blunt, no teeth jaws are serrated (suited for their diet)
- Shells consist of single pair prefrontal scales (in front of their eyes) rather than 2 pairs as found on other sea turtles
- Carapace is bony without ridges, and has large, non-overlapping, hard scales or scutes with only 4 lateral scutes. The Green sea turtles are 3-4 ft. carapace color pale to dark green & yellow, length & weight 240-420 lbs. Ectodermic body temps regulate by temperature of water around them, and the number, arrangements of these scutes can determine the species.
- Breathe air, have the ability under natural conditions, to remain submerged for hours at a time.
- Spend most of their life at sea, returning to nest in 2 yr intervals to warm climate beaches w/ seagrass beds, near coastline. Lay an average 115 eggs in each nest, they nest between 3-5 times per season.
- Alarming decline in their populations by old-stunning climate changes.



First Hypothesis

As Cold-stunning is the main cause of serious injuries for green sea turtles in Massachusetts, and as the main cause of concern is extreme temperature rises in our water, we hypothesize that reversing climate change within the Gulf of Maine by banning industrial waste within 50 miles of water can reverse ill effects of major rises in local bodies of water.

- Gulf of Maine Warming Faster than 99% of the ocean.
- Climate change and cold-stunning put pressure on sea turtles, exposing them to greater existential threats. From the day they hatched, a sea turtle life is a struggle for survival from injuries or even get pneumonia.
- 2,300 sea turtles become stranded migrating South get trapped in 50 degree waters in mid November become disoriented, too cold to eat, drink, or swim they become cold-stunned.
- Sea Turtles venture into the Gulf of Maine during warm months, become hypothermic and slow moving when colder winter waters arrive making it harder to escape.
- Hypothermic cold-stunned sea turtles experience debilitating lethargic conditions, can lead to death.

Second Hypothesis

As Cape Cod's shape makes it difficult for green sea turtles who accidentally enter Cape Cod from the Gulf of Maine to exit when temperatures cool, creating a canal to create a pathway in its hook shaped form will lessen cold-stunning based injuries from green sea turtles.

- More than 30 Years sea turtles stranded along Cape Cod from October-December.
- Sea turtles get stuck in Cape Cod's hook shape become disoriented in the currents, unable to escape cooling waters quick enough to migrate South to warmer water temperatures.
- The cycle of sea turtles being stranded and rehabilitation happens yearly. "Cold-Stunned" turtles are rescued after washing up on beaches.
- Cold stunned sea turtles are rescued, rapidly transported to the sanctuary then to the New England Aquarium for evaluation and rehabilitation.
- Kemp Ridley's (*Lepidochelys kempii*) sea turtles most common found stranded & injured from being cold-stunned on Cape Cod Beaches.
- Creating a Canal will decrease injuries & help sea turtles to migrate fast enough, by having another exit to escape the cold water temperatures.

Third Hypothesis

As shown in a study, Green Sea Turtles and tortoises can potentially pause aging processes in proper environments. This also means in less forgiving environments; the life expectancy can presume to be less. This is why we hypothesize that if we lower pollution in our water supply by 10 percent, we will have the presence of 10 percent more turtles due to extended life expectancies.

- Change from a suboptimal environment to a better environment induces accelerated turtle growth
- Turtles show their slowest growth rates while living in captivity
- Turtle environment dictates their risk of death and disease
- Risk of death shows a flat rate regardless of chronological age
- Access to food, protection from predators, and a controlled climate promote turtle longevity within their environment

Fourth Hypothesis

As turtles have essential roles in our oceans such as maintaining coral ecosystems to bringing crucial nutrients to our beach shores, we hypothesize that if we increase programming to protect turtles such as lowering speed limits of boats where turtles have been spotted by at least 10 miles per hour, the Oceans within the perimeters of the United States where these laws are passed will less polluted by 10 percent.

- Marine turtles remove algae from coral reefs
- Marine turtles introduce a flow of nutrients and energy to beaches through their nests
- Human activity has altered the quantity and distribution of nutrients and energy transported by turtles
- Marine turtles help to maintain marine dune systems
- Marine turtles fertilize the roots of dune plants whose roots reduce beach erosion

Fifth Hypothesis



There are currently 6.5 million turtles around the world which is a 2/3 decrease since the turn of the 20th century. Additionally, coral reefs have gone down by 14 percent since 2008.

- This is why, we hypothesize that we could reverse the loss of coral reefs by increasing the population of green sea turtles by creating more turtle only sanctuaries within the United States.

- Coral reefs are important protect coastlines from storms and erosion and source of food and new medicines.
- Over 1.2 billion people depend on coral reefs for food, income, and protection.
- Density of endangered green sea turtles are increasing due to Pacific coral reefs so it's important to reverse the loss.
- Green sea turtles have long been endangered due to largely to destruction of coral reef habitat, but the institution of global protection efforts working on reversing this decline.
- Healthy coral reefs provide habitat to green sea turtles.
- Green sea turtles help coral reef ecosystem remain productive & healthy & play important role maintaining the food web balance transporting essential nutrients from oceans, to beaches & coastal dunes.
- Sea turtles go extinct dune vegetation will lose major sources of nutrients would not be as healthy & strong enough to maintain dunes resulting in increased erosion.

Our Chosen Hypothesis

First Hypothesis:

As Cold-stunning is the main cause of serious injuries for sea turtles in Massachusetts, and as the main cause of concern is extreme temperature rises in our water, we hypothesize that reversing climate change within the Gulf of Maine by banning industrial waste within 50 miles of water can reverse ill effects of major rises in local bodies of water.

Qualitative & Quantitative Data Analysis

Qualitative data analysis will be looked at based on the health, good will, and positive environmental impact of our research.

- If we take the numbers from a bill passed by the Environmental Protection Agency in 2011, reversing Climate change could save almost 50,000 more human lives, but also the quality of our public waters and land animals.
- Quantitative analysis that will be included is data on injured turtles once climate change is reversed, how much money will go back into the economy when there is less clean up and health risk, and data on the decrease of industrial waste.

- Independent variable: Green Sea Turtle
- Dependent variable: The ocean, as we have no control over how the ocean reacts, we can only observe and hypothesize that based on such correlations as warmer waters leading to more injured turtles, that less waste = more turtles.

We will take data that was given to us from the turtle sanctuary in Quincy Mass that says in 2011 compared to data from 2022 where the injured turtles increased 12-fold from cold stunning due to climate change, that all industrial manufacturing plants leaving coast lines will reverse damage that has been caused, we will do natural observations and believe that this can be done with positive results.



Research Design/Ethical Considerations

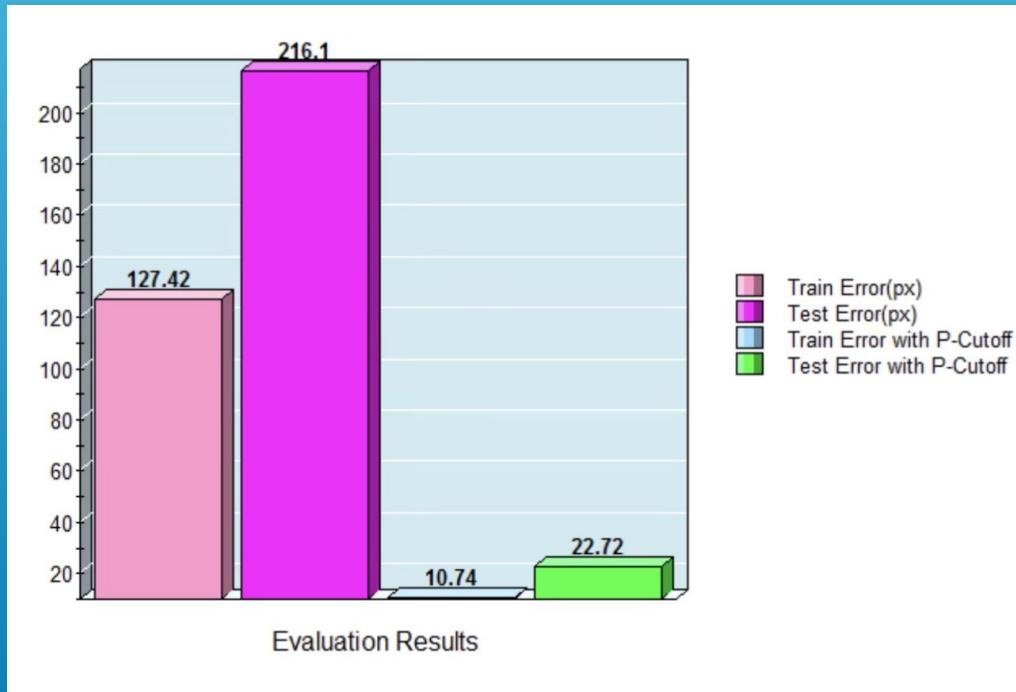
Cons	Argument
<ul style="list-style-type: none">Based on this hypothesis and the evidence gathered, we conclude the ethical issues that may arise are economical.If we are to limit industrial manufacturers near the coast, it can be argued that the ethical ramifications will be economical. In particular to the blue-collar workers holding these labour positions.	<ul style="list-style-type: none">According to research done following layoffs in 2011, positions were replaced rather than eliminated. In other words, those who lost jobs were put into an equivalent position within the realms of environmental control practically at a 1 to 1 rate.When it comes to potential job loss for existing workers in the industrial manufacturing industry, a policy will be passed that equivalent positions will be created in the environmental section at a rate of 1 job added for every 1 job loss. Those who lose their positions from these changes shall have 1st choice in equivalent positions that are created from this policy.While the control may not show an immediate change for the unemployment rate, it is undeniable that this change will be better for well-being for both humans and turtles alike.

Loss Curve



This is how well our machine was trained. You can see a lower loss, which means our machine has been well trained.

RMSE Graph



This shows how close our machine predicts where the body parts are to where the body parts were labeled. A standard way to measure the error of a model in predicting quantitative data.

Body Parts

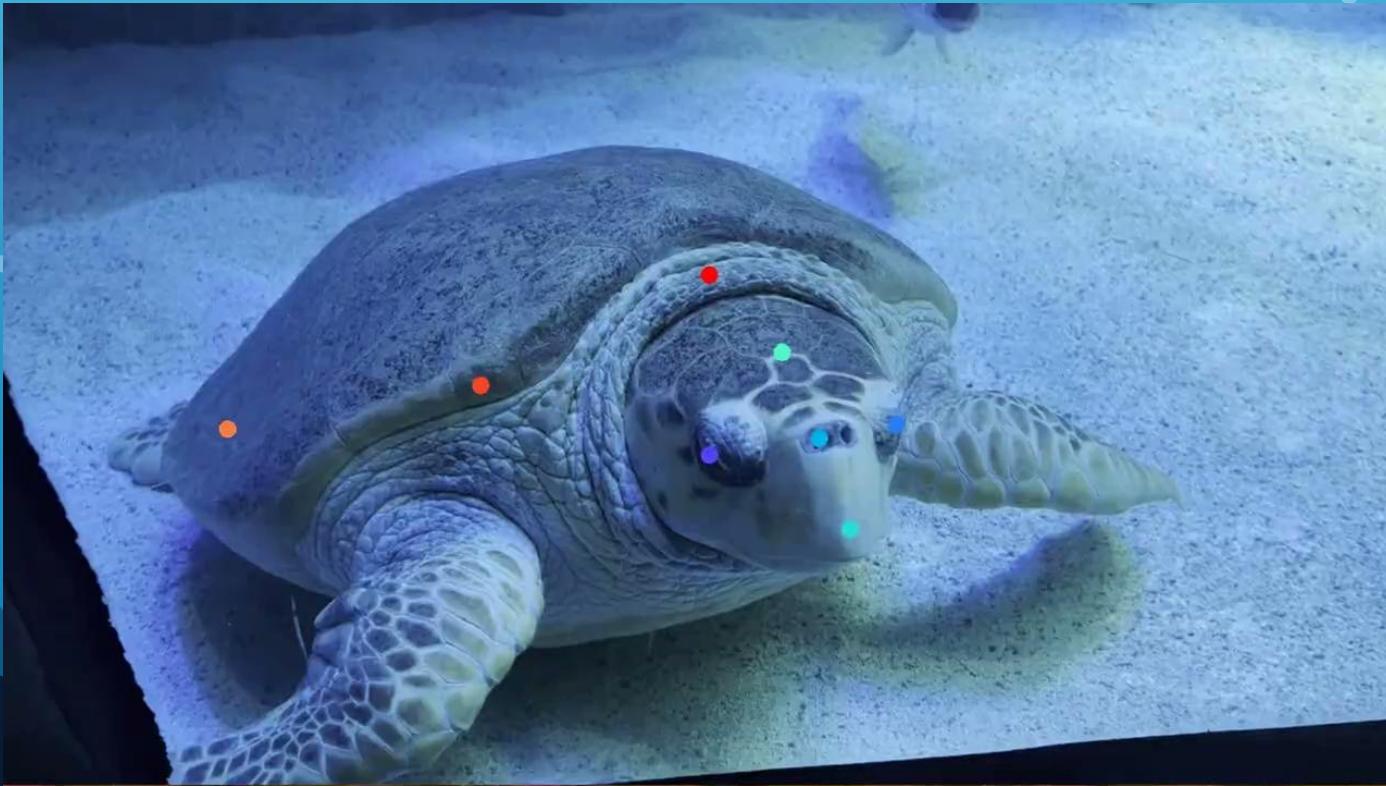
- Tail
- Right Eye
- Left Eye
- Nostrils
- Beak
- Head
- Right Flipper
- Left Flipper
- Right Hind Flipper
- Left Hind Flipper
- Scute
- Shell
- Neck



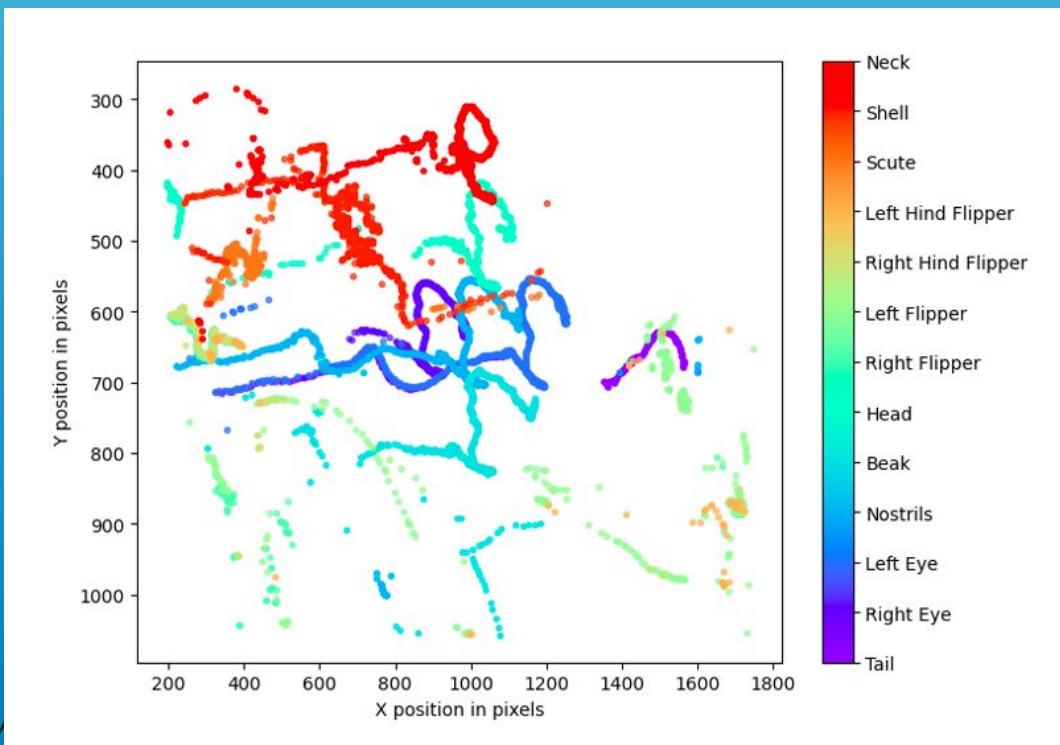
Labeled DLC Video



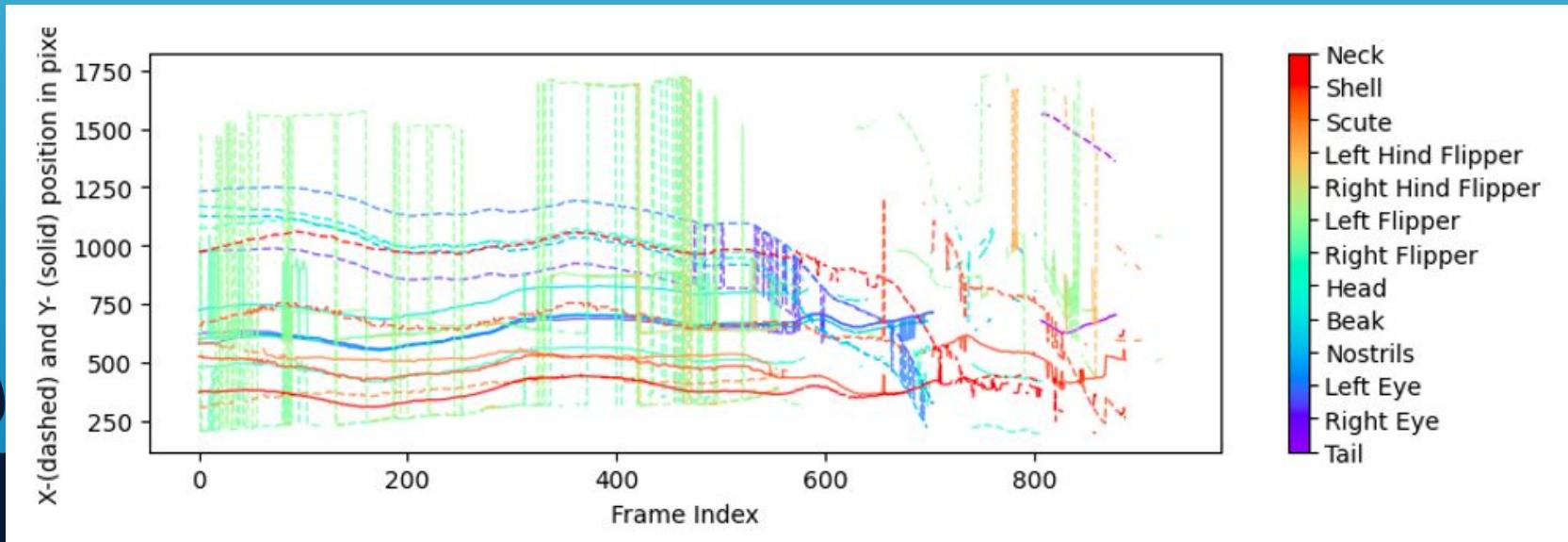
Another Labeled DLC Video



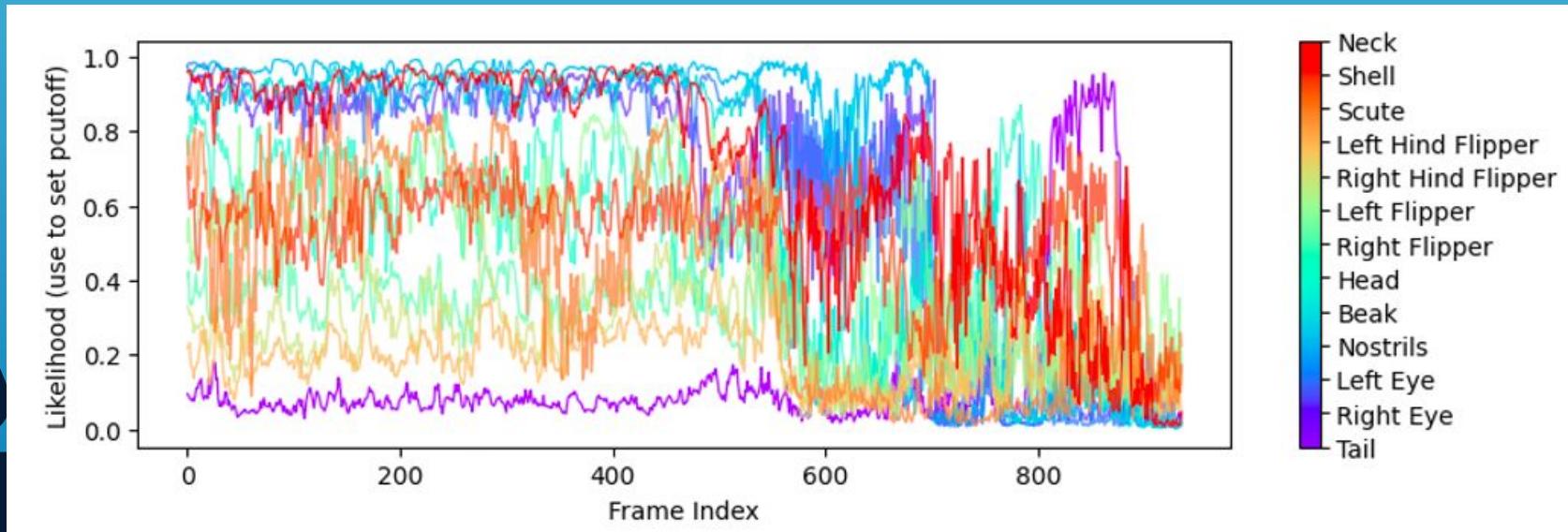
Body Parts Plotted In Space



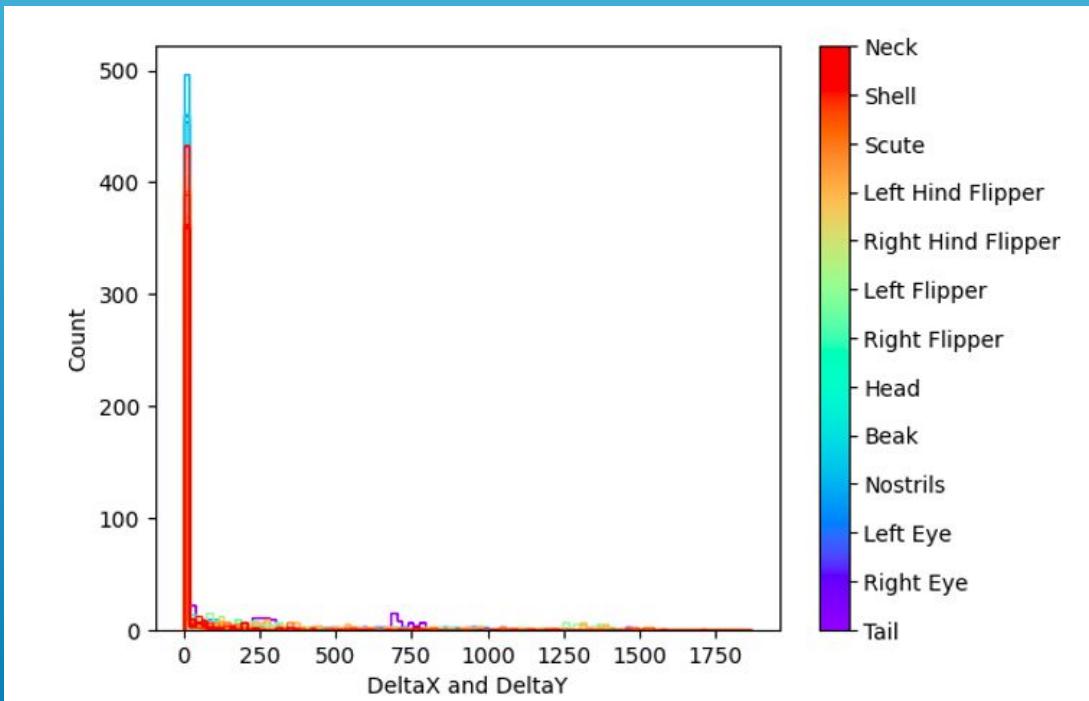
Body Parts Across Time



Body Parts Likelihood Over Time



Consecutive Coordinate Differences



References

Griffin, L. P., Griffin, C. R., Finn, J. T., Prescott, R. L., Faherty, M., Still, B. M., & Danylchuk, A. J. (2019). Warming seas increase cold-stunning events for Kemp's ridley sea turtles in the northwest Atlantic. *PLOS ONE*, 14(1), e0211503.

<https://doi.org/10.1371/journal.pone.0211503>

Information About Sea Turtles: An Introduction – Sea Turtle Conservancy. (2019). Conserveturtles.org.

<https://conserveturtles.org/information-about-sea-turtles-an-introduction/>

Information about sea turtles: Green Sea Turtle. Sea Turtle Conservancy. (n.d.).

<https://conserveturtles.org/information-sea-turtles-green-sea-turtle/>

Kobilinsky, D. (2019, February 19). *Why are so many sea turtles being stranded in Cape Cod?* The Wildlife Society.

<https://wildlife.org/why-are-so-many-sea-turtles-being-stranded-in-cape-cod/>

Poppick, L. (2018, November 12). *Why Is the Gulf of Maine Warming Faster Than 99% of the Ocean?* Eos.

<https://eos.org/features/why-is-the-gulf-of-maine-warming-faster-than-99-of-the-ocean>

Sea Turtles on Cape Cod. (2023). Mass Audubon.

<https://www.massaudubon.org/get-outdoors/wildlife-sanctuaries/wellfleet-bay/about/our-conservation-work/sea-turtles>

References

- Bjorndal, K. A., Bolten, A. B., Dellinger, T., Delgado, C., & Martins, H. R. (2003, May 1). *Compensatory growth in oceanic loggerhead sea ... - wiley online library.*
<https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1890/0012-9658%282003%29084%5B1237%3ACGIOLS%5D2.0.CO%3B>
- Miller, K. (2022, July 18). *What turtles can teach humans about the science of slow aging.* Wired.
<https://www.wired.com/story/what-turtles-can-teach-humans-about-the-science-of-slow-aging/>
- Goatley, C. H. R., Hoey, A. S., & Bellwood, D. R. (2012, June 29). *The role of turtles as Coral Reef macroherbivores.* PLOS ONE. <https://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0039979>
- Bouchard, S. S., & Bjorndal, K. A. (2000, August 1). SEA TURTLES AS BIOLOGICAL TRANSPORTERS OF NUTRIENTS AND ENERGY FROM MARINE TO TERRESTRIAL ECOSYSTEMS.
https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1890/0012-9658%282000%29081%5B2305%3ASTABTO%5D2.0.CO%3B2?casa_token=q0sqOm_pt8AAAAA%3AWl5bKuxMIPwsuPkuhn20QV8NmKc2WmeHihxwmwj0eiR6xDi-vp-I5hfOKJ4nQf
- Hannan, L. B., Roth, J. D., Ehrhart, L. M., & Weishample, J. F. (2007). *DUNE VEGETATION FERTILIZATION BY NESTING SEA TURTLES.* Sciences.ucf.edu. <https://sciences.ucf.edu/biology/games/wp-content/uploads/sites/13/2012/09/Ecology07.pdf>
- Information About Sea Turtles: An Introduction – Sea Turtle Conservancy. (2019). Conserveturtles.org.
<https://conserveturtles.org/information-about-sea-turtles-an-introduction/>

References

PLoS. (2019, April 25). Immense Pacific Coral Reef Survey Shows Green Sea Turtle Populations Increasing. ECO Magazine.

<https://www.ecomagazine.com/news/coasts/immense-pacific-coral-reef-survey-shows-green-sea-turtle-populations-increasing>

“What’s Love Got to Do with Green Sea Turtles and Fish?” Pewtrusts.org, 9 Feb. 2016,

www.pewtrusts.org/en/research-and-analysis/articles/2016/02/09/msa-40-whats-love-got-to-do-with-green-sea-turtles-and-fish.