**Final Report**

**Whales vs. World**

**Team number:** 40

**Melrose High School and House High School**

**Area of science:** Oceanography and Ecology

**Team Members:** Evelyn Garrett and Madison Garrett

**Sponsor:** Alan Daugherty

**Executive Summary**

This year our team decided to branch off of our past projects, and to focus on the bigger marine life of Killer/Orca whales, and Humpback whales. Through our research we have found that the Orca and Humpback whales are endangered species, and we believe that the ocean pollution is part of the cause. Our team has made a model that runs two separate codes at the same time to help show what is going on in the ocean. We have one side that shows the migration patterns of the Orca and Humpback whales and how they pass through trash islands. Trash islands are large masses of trash floating in the ocean that create what to look like islands. The other half of our model shows how the pollution is effecting the whale’s population.

While coding the migration patterns, we have learned that the Humpback go directly through a Pacific trash island, while the Californian Orcas seem to go around the trash islands. We want to show people how these whales are affected yearly through their migration patterns. And no, these animals cannot just take different paths or learn to go around them. Because these animals don’t understand it is harmful to them before it is too late. After completing our model, we feel that we have done our best to represent what goes on in the ocean and how the ecology works.

**Problem Statement**

The problem we are trying to solve is how pollution effects the Orca and Humpback whales. Over 100,000 marine animals died due to pollution in the year of 2018. We are wanting to find out how many of those deaths are from casualties among the whales. Through are research we have found many sources saying that Orcas are the most affected whales. Our sources have also stated that they are also affected by a more limited amount of food. Because of the fishing, hunting, and pollution, their preferred prey is being affected as well. We decided to add on the Humpback whales, because through further research we have learned that their migration leads them through one of the largest trash islands in the Pacific Ocean.

We have been interested in ocean biology for a couple of years. Our past projects were also about the oceans and each year we evolve off of our last project and work towards increasing awareness for the ocean ecology. Next year we plan to work with oceans once again. We hope to make our oceans a cleaner and safer place for animals and the coral reefs. We hope to see people helping even more and working towards downsizing the trash islands. This problem seems to be turned away from and ignored because there are un-informed people that don’t want to admit that their lifestyles are harmful and destroying local and international ecosystems. We feel that educating people is key to making a first step in getting people to help change personal lifestyles. We think our model helps this process by showing just how devastating the trash is to these majestic giants of the ocean.

**Problem Solution**

Understanding ocean ecology is a complex topic. However, to help us find the answer to our problem we have used NetLogo as our model. We have been able to take coding from two different aspects of our problem and code them into one easily understood representation of our problem.

 On the left side of our model we have the migration of the Orca and Humpback whales. The model shows a map of the Pacific as well as where in the Pacific the trash islands are located. Then we have the Orcas and Humpback’s starting point before and after migration. The Orcas run on the East and West side of the ocean, mainly missing the trash islands, while the Humpback go straight through the middle of a trash island. For our sliders we have pod-size. This lets us decide how many whales exists in each pod. For our buttons we have; ‘set up’, ‘trash islands’, ‘make whales’, ‘migrate-north’, ‘migrate-south’, ‘repro’, ‘1 year’, ‘view oriental orcas’, ‘view humpbacks’, ‘view California orcas’, and ‘clear’. The ‘set up’ button allows us to set up the model of the Pacific map, as well as the right side of our model. The ‘trash island’ button places the trash islands on our Pacific map. The ‘make whales’ button will add on the amount of whales we have on our slider. The ‘migrate-north’ button tells the whales to migrate from their starting point, to their migration point. The ‘migrate-south’ button tells the whales to migrate back to their starting point. The ‘Repro’ button is repopulating, and will increase the size of the existing whale population. The ‘1-year’ button shows the migration path and reproduction values of the whales for one year. ‘View oriental orcas’ allows you to view an orca within the oriental group. ‘View humpbacks’ allows you to view a humpback within the group. ‘View California orcas’ allows you to view an orca within the California group. Finally, the ‘clear’ button will clear the model completely.

For our monitors we have oriental orcas, humpbacks, and California orcas. The monitors allow us to see the amount of orcas and humpbacks within each pod. When you click the view button it will transfer the information from the location of the whales at the time you have clicked the buttons to the right side of our model. It will show the amount of trash they are encountering depending on their location relative to the islands.

On the right side of the model we have the model showing the layers of the ocean. We have the top layer, middle layer, and the floor layer of the ocean shown in lighter to darker blue/green colors. We have the Orca and Humpback whales, and plastic particles. The plastic particles are there to show what the ratios were when they travel through the trash islands. We have a button called swim and that animates the whales and trash in the display.

**Results**

When we ran the migration code we found that the Orcas travel along the sides of Asia and North America, while the Humpback go straight through the center of the trash island in the Mid-Pacific. Because of this the Orca population grows, while, the Humpback population slowly dies off.

We feel much of this die of is due to the amounts of trash these islands contain. And where they are located. These islands are smack down in the middle of their migration patterns.

**Validation**

We validate that this project resembles what goes on in the real world. Due to our research and heavy studying we have made sure that we got as close as we could as real world occurrences. Though our numbers are a worldwide estimate, we can assure you this is a good representation of how the whales are affected by the trash we have thrown in our oceans.

**Conclusion**

In conclusion to our research, we have found that both these species of whales are affected by the pollution. We hope to one-day help clean our waters and help our ocean ecosystems thrive once again. We want to help society learn about how our oceans are dying and teach them how to help. In the future we want our children and grandchildren to be able to know what these animals are and to be able to actually see them in the wild. We don’t want these creatures to disappear like how other animals have.

**Achievements**

Our achievements are that we were able to create a realistic model. We are satisfied with what we have done and we hope that this will teach others.

**References**

<https://whalemuseum.org/>

<http://killerwhalemuseum.com.au/>

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