The State of Western North American Monarch Butterflies

By

Rahwa Woldeyesus, Karen Warburton, Katherine Dudzinsky

Introduction

The Monarch butterfly (*Danaus plexippus*) has captured the interest and inspiration of many people. It’s beautiful orange, black, and white wings are notably recognizable to the eye, easy to identify, and their presence generally indicates signs of a change in the weather in the State of California.

Monarchs have also captivated the attention of the scientific and environmentalist communities for decades because of their annual migration from areas along the west coast of California down to the region of Baja California, Mexico, and back again. The migration has fascinated the public so much, that hundreds of people go to places where Monarchs fly from 500 km to 1600 km, stopping in large numbers along California Coastal regions such as Monterey, San Luis Obispo, and San Diego. There are actually six different species of the *Danaus* that migrate in this fashion, and some travel even further than the Western species (Reppert, S.M. & de Roode, J.C., 2018).

Monarchs typically breed in one specific type of plant, they metamorphize and begin their journey in North America, overwinter in Mexico, and make their way North again in the Spring, where they lay eggs in the plant. The plant serves as a feeding source for caterpillars. The metamorphized butterflies are important pollinators for trees and wildflowers, providing food to other animals (including humans), and are hearty weed eaters themselves (Korpella, R., March 2021).

However, recently, news of *D. plexippus* and other species of Monarch butterflies have indicated an alarming reduction in populations. Scientists have expressed concern that this catastrophic reduction in Monarchs may be directly connected to climate change (Conservation of Migratory Species of Wild Animals, 2020). Many scientific groups are racing against the clock to prove this hypothesis. For our project, we wanted to see if we could determine if climate change is really to blame for the loss of migratory *D. plexippus* populations.

The hypothesis we are putting forth for our project is that as climate temperatures increase, *D. plexippus* populations will continue to decrease or even become extinct.

Data Sources

We have identified the following sources for *D. plexippus* population counts, climate data, and global climate temperature changes.

westernmonarchcount.org

noaa.gov

We plan to capture data from these sources that provide *D. plexippus* population data from 2000-2020, global climate temperature changes from 2000-2020, and climate data from sixteen specific city weather stations, where the city has been identified as a migratory location from November through April during the years 2000-2020.

Storage

We will store our data into Postgres SQL and conduct any calculations or additional data wrangling in the database itself, Pandas/Python, and Tableau.

Machine Learning Model

We will measure model performance with linear regression and try to determine what the fate of *D. plexippus* might be if temperatures continue to trend toward the current climate temperatures. We will use this model after determination of its accuracy.

Deployment

We will develop a number of visualizations, such as:

* An average temperature graph for the appropriate months from 2000 to 2020.
* An average temperature graph for the appropriate months in the select cities from 2000 to 2020.
* A map of California cities with *D. plexippus* sightings with a pop-up of average counts from 2000 to 2020.

We will deploy our visualizations on a static Github web page.

References

Korpella, Robert. "What do Butterflies do for the Environment?" *sciencing.com*, https://sciencing.com/what-do-butterflies-do-environment-4580181.html. 20 March 2021.

Reppert, Steven M. and de Roode, Jacobus C. “Demystifying Monarch Butterfly Migration” Current Biology 28, R1009-1022, 10 September 2018