Climate Effects on Bee Biodiversity in California

**Abstract**

Bees are critical pollinator species for native plants and are fundamental to agricultural prosperity in California. Approximately 1800 unique species of bees are present across California, yet despite their importance and biodiversity, not much is known about patterns of their spatial distribution, endemism, and species richness. Using bee data from museums, collections, and other databases around the world gathered by GBIF as well as climate data from Climate Engine (climateengine.org), we estimated the spatial distribution and average of the expected number of species and endemic species for California. The average number of species in a 15 km grid was 28 and sites ranged from a low of 1 to a high of 402. There was a negative relationship between average winter rainfall (March-October) and species richness. There was also a negative relationship between average winter rainfall (March-October) and corrected weighted endemism (CWE). These results highlight the role of climatic factors, particularly winter rainfall (from March to October), in shaping the distribution and diversity of bee species in California. The insights gained from this study are crucial for developing conservation strategies aimed at protecting these essential pollinators.

Background

* ~1800 species of bees in California. Bees are critical pollinators for both native plants and agricultural plants.
* Nothing is known about patterns of distribution including species richness and patterns of endemism, those species are only found in a single defined geographic location
* Understanding how climate influences patterns will help with conservation
* No previous studies on the spatial distribution of bees in California, and no existing model on climate variables in relation to this distribution

Methods

* Using bee data from museums and collections around the world gathered by GBIF and other databases and climate data from ClimateEngine.org. We estimated the average and the distribution of the expected number of species and endemic species for California.

Results/Discussion

* The average number of species in a 15 km grid was X and sites ranged from a low of X to a high of X. There was a positive/negative relationship between average winter rainfall (March-October) and species richness. There was a positive/negative relationship between average winter rainfall (March-October) and CWE.

What this means

* Conservation
  + Native plants play a vital role in the diverse ecosystems of California

Notes

Changing (x-axis, what you control) precipitation

Responding (y-axis, how it is responding) CWE corrected weighted endemism

Look at distribution of endemism

Greek Bees

<https://resjournals.onlinelibrary.wiley.com/doi/pdfdirect/10.1111/icad.12715>

South African Bees

<https://resjournals.onlinelibrary.wiley.com/doi/pdfdirect/10.1111/icad.12715>

Butterflies (not Bees)

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0124327>

Issues with our type of data

<https://onlinelibrary.wiley.com/doi/10.1111/ddi.13551>

07/11/2024 Meeting

Items/Links for Meeting

* <https://gis.sfsu.edu/arcgis-pro-installation-instructions>
* <https://drive.google.com/drive/folders/1d_zk3aiCJG-b7MdJUsrMTE6Jc0urteoq?usp=share_link>