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Paleobiology

Niche Conservatism Above the Species Level (2009)

**Article Summary**

The authors’ goal was to conclude if niche conservatism appears at the genera level and if changes can be seen between two contrasting climates in recent Earth history: the Late Pleistocene and the Late Holocene. The theory stems from modern species, and the differences between their realized niche (where the species lives now) and their fundamental niche (all environments where the species could live). The authors clarify two different niche-defining variables: environment based interactions and trait based for inherited physiological and morphological traits. Also addressed are the types of ecological niches that have been conserved while experiencing the effects of climate change. Specifically, environmental-based or trait-based. The authors predict that the trait-based controls on niches define the range size of different mammilla genera, and that they will remain fairly constant between the Late Pleistocene and Late Holocene. They began by using range size of mammals in North America in proportion to land mass available to the mammals, in order to make up for the retreat of the glaciers of the Late Pleistocene. In their research, the authors found that extinctions during the Late Pleistocene did not significantly influence changes in geographic rank in either of the time periods. Furthermore, they found an increase in distribution of most mammals in North America. This leads to the conclusion that genera are conserved over at least 100 million years. The ecological niches that were occupied by mammals that went extinct were taken over by close relatives of the extinct species. Meaning that over short geologic time periods, the trait-based controls have a much larger impact than environment-based controls on ecological niches.

**Things you liked about the paper**

I liked that the authors’ recognized that their results only apply to mammals, and that other groups may have different patterns. They also note that this data does not account for any human interaction with the environmental or traits in mammals that could have been selected due to human interference. I thought it was good that the authors made to sure account for the increase of land mass available when the glaciers began receding, what they called standardizing continental area.

**Things you did not like about the paper**

Since there is not adequate data for Canada and Mexico, their results are only true for the lower 48 states. When the glaciers receded and more land mass became available, many mammals traveled north to Canada. More research needs to be done on these mammals in order to see if the results of this paper stay consistent with the new data.

**Evaluate the graphs and figures**

The first table listed North American mammalian genera that was used for their research. Most notably, it showed the number of species per genus, range size of Late Pleistocene and Late Holocene, as well as the average body size of each genera. As a novice to Paleobiology, I would have appreciated some examples of each genera in order to become more familiar with the genus names.

Figure one showed the change in range sizes between the two time periods. It was meant to easily convey the vast differences between the different genera, but I did not find the figure to be helpful for understanding or clarification purposes. I don’t think it needed to be included in the paper.

The second figure was five example North American maps of range sizes for different genera. I thought this was very helpful as a tool to be able to visualize the change in range size between time periods.

Figure three was a graph showing the correlation between Late Pleistocene range sizes and Late Holocene range sizes. I found this helpful to see how linearly the range sizes grew for the majority of each genera. I think it would have been helpful to explain or attempt to explain some of the outliers in the graph.

The last figure was two maps of North America, the first in the Late Pleistocene and the second in the Late Holocene. It shows the differences in the number of species within a genus, and how the extinction of one species affects (or in this case, does not affect) the range size at the end of the Late Holocene. I think they needed to say the actual number of animals per dot on the map. A dot that represents 10 animals implies different results when compared to a dot that represents 1,000 animals.