Tracking the Smilodon

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Background

The great saber-toothed cats have captured the imaginations of people across the world, ranging from tiny children in their classrooms to brilliant paleontologists who have made it their life's work to study these extinct animals. While many saber-tooths have walked the earth, the most well known of these is the so-called Saber-tooth Tiger (genus *Smilodon*).

Smilodon skeleton fossilized in the La Brea tar pits. Image courtesy of the Smithsonian Institution.

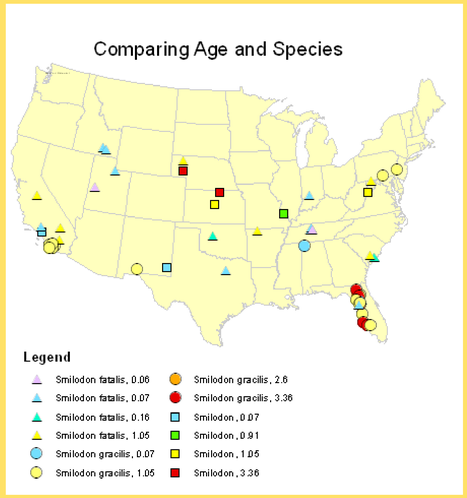
The intention of this project was to focus on the known location of *Smilodon* fossils in the continental United States and to compare this data to paleo-biome conditions for that area, thus extrapolating the preferred habitats for this mysterious, extinct mammal. Unfortunately, GIS data regarding the regional environments during the time when the *Smilodon* was alive is practically non-existent, and the resources needed to generate that data manually far exceeded the scope of this project;.

However, there is another factor that would have greatly affected where the *Smilodon* chose to live, one that is perhaps even more important than their habitat. As carnivores, the saber-tooths would have followed their primary food sources, especially that of the bison. Comparing the locations of bison and *Smilodon* fossils is a useful place with which analysis of the *Smilodon* can begin.

Methods

The first and most important step was to plot the locations where *Smilodon* fossils have been found on a base map for the continental United States. This was then sorted by using the "Unique values, many fields" function.

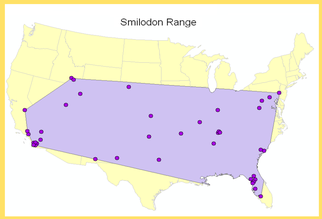
The resulting map is displayed below.

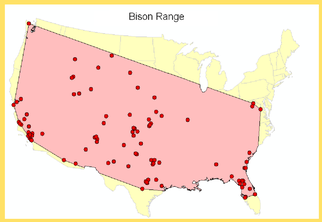


Map comparing the and species of each *Smilodon* fossil to its age in millions of years. The "Smilodon" category represents fossils whose exact species could not be identified. Dates shown represent a calculated midpoint between a range of possible ages.

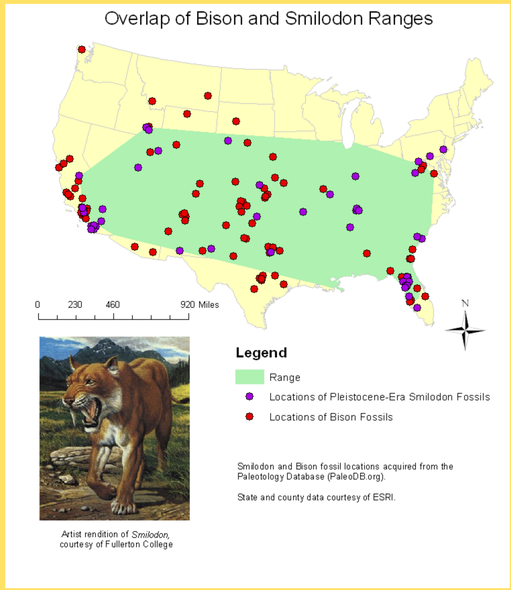
From this data, an approximate range for the *Smilodon* could be calculated. This was done using the "Minimum bounding geometry" tool, which surrounded all fossil point locations with a polygon. The same techniques were applied to the locations where bison fossils have been found.

On right:
The intersection of the polygons shown in these two range maps provides the basis for subsequent analysis. Because the bison data indicates that the animal was not present in North America prior to the late Pleistocene (1.8 million years ago) only *Smilodon* data from that period was used to generate the range.





Results



Conclusions

The first map shows that fossils belonging to the *gracilis* species are older than those of the *fatalis* species, with the oldest *gracilis* fossils being over 2 million years older than those of *fatalis*. At the same time, there does not appear to be a distinct difference between the times of disappearance for either species. Thus, whatever mechanism resulted in the extinction of the *Smilodon* genus, it seems to have had an equal affect on both the *gracilis* and the *fatalis* members.

A detailed analysis of the *Smilodon* range is extremely difficult without knowing more about the environments present there. One thing that can be seen are sizable clusters of *Smilodon* fossils in Florida and California. Given that these areas are in the southern part of what is now the United States, this may indicate that the *Smilodon* preferred warmer climates.

More telling is the fact that 83.7% of the *Smilodon* fossils date to a time when the bison was abundant. Of that number, approximately 78% fell within the overlap of the bison and *Smilodon* ranges. Furthermore, according to the ages of these fossils, there was a massive die off of the bison approximately 70,000 years ago, which is exactly when the *Smilodon* seems to have gone extinct.

Though the data is limited, the affect of the presence of bison on the *Smilodon* seems quite clear. The *Smilodon* seems to flourish in places where the bison is common. As top predators, the *Smilodon* would have been reliant on prey animals such as the bison for their survival. Thus, when the bison began to have difficulty, the *Smilodon*'s population plummeted, leading to its eventual extinction.

Further analysis is inhibited by the many unknowns in the data. Available sources of food are not the only factor that affects where an animal lives; the lack of regional environmental data from the times when the *Smilodon* were alive means that it is difficult to make more than general speculation about their preferred habitats.

Another complication is the small sample size provided by the fossil locations. Only about fifty fossilized remains from the United States have been conclusively identified as belonging to the *Smilodon*. This makes patterns extremely difficult to recognize and interpret. Unfortunately, as is the case with most extinct animals, it is quite likely that most *Smilodon* remains simply were not preserved. With luck, however, future research will reveal more *Smilodon* fossils, meaning that later attempts to categorize their preferred range will be much easier.

Finally, it bears repeating that the dates used for this map represent a midpoint within a range of possible ages for each fossil. Modern dating techniques are not capable of the resolution that would be ideal for this kind of analysis. Some of the fossils may be quite older or younger than the maps show due to the uncertainty of the exact dates.

Sources

Smilodon data acquired from the Paleotology Database (PaleoDB.org) on April 17, 2012, using their First Appearance Calculation Form with the following parameters: Scientific name = Smilodon, Continent = North America. Bison data acquired from the same source on April 29, 2010, using the parameters: Common name = Bison, Continent = North America.

State and county data published by the Environmental Systems Research Institute (ESRI) on June 30, 2010.