North American Pleistocene Mammal Extinction Mystery

The disappearance of various genera (groups of taxonomic categories) of fauna from across the globe during the Pleistocene era remains a mystery for paleontologists. The Pleistocene era dates from about 2.58 million BP (before present) to about 12000 years BP and was characterized by episodes of great cooling, or ice ages across many continents throughout the epoche. Researchers are still trying to narrow down the exact time frame and causes of the disappearance of many species that once flourished. A revolutionary study done in 2009 by J. Tyler Faith and Todd Surovell, focusing on extinctions in North America, narrowed down the time frame of the extinction of about 35 different North American mammal genera to around 12000 to 10000 years BP. The main question of their study is whether this extinction event took place over a long period of time or was a synchronous event; they also seek to understand the underlying cause. Many others interested in the Pleistocene era, and the mystery it holds attempt to find solutions to the originator of the extinction, and point to varying possibilities including looking into the other communities affected, like the megafaunal community, to solve the conundrum.

An accumulation of terminal taxon dates - which is the period of time in which the genus disappeared or was labeled extinct - of extinct forms of fauna and animals amassed by Jim J. Hester in 1960 allowed for other scientists in the field of study to analyze by site the locations and times of extinctions and draw conclusions about the possible causes of the end of the Pleistocene vibrant life. Many paleontologists previously hypothesized that the cause of the elimination was anthropomorphic, as the extinction coincided with the appearance of humans in North America and throughout the globe. A review from 1991 by Anthony J. Stuart explored the hypothesis of over-hunting. For his analysis, he takes it head-on from the contrasting views of North America and Eurasia and reviews faunal, climate, and archeological evidence and backgrounds in regards to the cause of the extinction. His hypothesis states that overhunting when mixed with major climate and environmental changes led to the rapid disappearance of the large mammals from North America. Other studies deny the effect of human involvement in the extinction of the various mammals such as the Musk Ox. The researchers using the introduction of humans into the areas where the musk ox was prevalent deduced that they did not affect their genetic diversity. Both species expanded into Greenland insinuating that human predation had little to no effect on the population decrease of the musk ox, and their disappearance in certain locations must be as a result of some other cause, such as environmental changes .

Faith and Surovell’s revolutionary study created new parameters to the length of time of the extinction which allowed scientists to narrow down the possible causes of extinctions. The study used technological simulation of the compiled list of the various genera of mammals living during the time of extinction and calculates the probability of their simultaneous extinction. They ran two types of computer simulations divided based on continental versus biogeographic zones, using the average terminal taxon dates of the genera to find the probabilities of the terminal dates during the period. For both of the simulations, they were further tested in two subcategories using separate ratings based on the accuracy of the radiocarbon dates discovered through field research by various other scientists . In the first part of the separate subcategory simulations, they used both intermediate and reliable terminal taxon dates, and in

the second part, they used exclusively reliably scored dates. The resulting probabilities for the continental zone was 22.4% and for the biogeographic zone was 42.2%, for which “the empirical observation of 16 terminal Pleistocene genera falls comfortably within the range of taxa that we can expect to recover from that time in the event of a simultaneous extinction” . This provided evidence that the cause of extinction was a synchronous event (occurring at the same time) and thus narrowed down the list of explanations of the extinction to more violent and sudden events including climatic shifts, possible extraterrestrial impact (like asteroids), or wide-scale human predation. Faith and Surovell concluded their study with the sentiment that “Further research … could help to finally pin down the cause of North American end-Pleistocene extinctions”.

Geologist and archeologist, C. Vance Haynes Jr analyzes the possible causes of the Pleistocene extinction claiming that it must be too catastrophic, sudden and extensive for anthropogenic causes or climate alterations. He attempts to uncover the cause using “Black Mats.” Black mats are due to increased organic carbon, that forms in the ground in wet environments, and when combined with cooling and rising water tables, preserving the Clovis age landscape. His observational study discusses that this layer that covered the ground during the end of the Pleistocene epoch allows scientists to analyze the climate and the other situational factors of the time; however, there is not enough information for a succinct conclusion to be drawn of the definitive cause. He explores the extraterrestrial hypothesis and discovers magnetic fractions in the dark mat, but he attributes those to components of cosmic dust that are constantly falling to earth. Another paper further delves into the extraterrestrial impact. It discovers abundant amounts of nanodiamonds in the soil dating to the late Pleistocene era throughout North America, the formation of which is considered impossible in the Earth's surface processes but is common in cosmic impacts (Kennette et al. 2009). They claim that this discovery of possible impact with a rare form of comets, causing air shocks and surface impact, is strong evidence for the hypothesis of extraterrestrial impact, however, this remains as a hopeful solution, as there is yet to be conclusive evidence settling this debate. Extraterrestrial influence is currently a leading hypothesis, nevertheless, further exploration must be undertaken as many variables are yet to be explained with the extent of the impact and lacks solid evidence.

Another large scale extinction during the Pleistocene era, of concern, was the megafaunal communities. Their disappearance occurred in the same fashion as the large mammals of North America - in a synchronous event. In a study done in 2017, an environmental historian argued that humans were a prime factor in the disappearance, and how the pattern of human’s need to dominate nature throughout time provided enough evidence for this conclusion. His argument stands on the ground of Faith and Surovells’ discovery that the extinction was a single “geological instant” and from that, they draw upon reference to other events of humans wiping out plant families nearly instantaneously (Moore, 2017). Akin to the debate of the cause of extinction for the large mammals of North America there is debate this involvement of humans in the megafaunal disappearance. Researchers from various geological departments came together to look into this disappearance of greenery further using a chronology of the pollen record to analyze the decline in Sporormiella, which are a genus of fungi, as a marker of the size of the megafaunal community (Gill et al. 2012). They attribute this disappearance to climate change rather than the conclusion Moore came to through his research of human-caused megafaunal extinction. Both use Faith and Surovells’ research to point to the specific time period of this extinction. Their research creates a marker to base studies off of, yet much like the rest of the information known about the late Pleistocene era there is wide debate over the

cause of the extinction.

Faith and Surovells' study brought clarity to the disorganized and contradicting hypotheses regarding the time span over which the event of the extinction at the end of the Pleistocene era occurred, however for as much light as it shed on the subject it only uncovered more shadowy corners of unknowns. There continues to be debate over the cause of the extinction, particularly with the effect humans had on the decreasing populations. These unknowns will spur forth more investigations and eventually discoveries. Faith and Surovells' conclusion of a synchronous event allows for a contraction of possibilities, and opens up analysis of events such as the appearance of Clovis Hunters, various climate changes, and current leading possibilities of extraterrestrial impact during the time period of 12000 to 10000 BP and focus on those which has sudden and lasting impacts on the landscape. Their study also was primarily focused in North America and this extinction took place globally, therefore there are still questions regarding the length of time an extinction may have taken throughout Eurasia, South America, and Africa. Currently, the mystery of what killed off the variety of species that coexisted at the end of the Pleistocene epoch is unsolved however one step has been taken in the direction of resolving this enigma.

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