

Paper: “Brain expansion in early hominins predicts carnivore extinctions in East Africa”

Authors: Søren Faurby, Daniele Silvestro, Lars Werdelin, and Alexandre Antonelli

Summary: Anthropogenic impact has been evident in decreasing evolutionary biodiversity as multiple populations today have disappeared to extinction. The paper examines the diversity of carnivores in East Africa between the Pliocene and Pleistocene age. The author seeks to understand the relationship between hominin brain size and the resulting diversity of East African carnivore population. The authors hypothesize that the increase in hominin brain size attributed to the development of more advanced technologies and behaviors such as direct hunting, scavenging, or kleptoparasitism that could have resulted in the East African carnivores to be less nourished and therefore go extinct. The authors predicted that if increased brain size in hominins resulted in the decrease population of East African carnivores, then through time only anthropogenic activity should be the factor of the change, and not temperature or precipitation. The authors studied 279 fossils and 88 carnivore species from East Africa of which 79 of the species are extinct and the remaining nine species are alive. The carnivore species were split into two sets depending on their body mass. Species that had their mass larger than 21 kg were assigned in the ‘large’ set, while the rest that were less than 21 kg were designated in the ‘small’ set. In conjunction, changes in hominin brain size as well as climate and vegetation were examined during the prehistoric dates of the experiment. Additionally, all environmental datasets such as climate and vegetation were derived from the location of which the carnivore fossils originated. Temporal predictors were created from both the environmental predictors and change in hominin brain size by computing the median of 1000 regressions over the prehistoric dates measured. Furthermore, different extinction models (mechanistic and non-mechanistic null models) were used to query if brain size was a significant predictor to use. The changes in extinction rates were fit to each model and were compared to see the shift in data. The experiment was aimed in determining the relationship between the change in hominin brain size and the extinction rate of carnivore species. The authors found no significance in the rate of extinction in small carnivores when fitted with hominin brain size. However, significant temporal changes in the rate of extinction of large carnivores were observed that supported the authors’ hypothesis of hominin brain size affecting the carnivore species population. Additionally, the effects of temperature, precipitation, or water were minimal that no support was found in correlation to the increased rate of extinction found in the carnivore species population. While the results supported the Anthropogenic impact on the increase extinction rate of carnivore species population, the analysis could not distinguish if the extinction was due to the direct hunting of herbivores, scavenging, or kleptoparasitism. The evidence only points to the physiological and mechanistic adaptations of hominins which played a large role in the relationship between brain size and extinction rates. In conclusion, the negative Anthropogenic impact on biodiversity could be dated to prehistoric times (Pliocene and Pleistocene ages). Hominins have evolved increasing their cognitive capacity that have resulted in advancement of technology and behavior. These advancements allowed for co-occurring biodiversity to decline such as the East African carnivore species population.

Critique: My critique on this experiment would be for the authors to include sampling of the mating populations and birth rates of the different species at that time. While climatic changes were observed, the main premise of birth rates simply declining could also prove to support the rise in extinction rates.

Additionally, comparing the behavior of different species could also provide an insight on extinction rates as some species only mate once in their lifetime. In conjunction, the number of offspring should have also been noted as species that produce only one or two offspring could be detrimental to their population size. Overall, there are still many factors left unexamined that could prove whether hominin activity is the main culprit to the decline of the carnivore species population.