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The Monsters of 10,000BCE

The Extinction of Smilodon & Other Late Ice Age Megafauna.

The late Ice Age, which lasted from approximately 100,000 - 10,000BCE, was the period in which lived one of the most famous animals ever to walk the earth: Smilodon. This American sabre-toothed cat has become a symbol of the most recent Ice Age. It is also one of the most studied, thanks to the numerous remains found in predator traps across North and South America. It vanished abruptly about 10,000 years ago, along with hundreds of species of megafauna from around the globe, and debate continues to rage as to what caused this incredible creature's ultimate destruction. Sabre-tooth cats had been one of the most successful predators of the epoch, dominating the food chain in Africa, Asia, Europe and the Americas for millions of years and constantly spreading out and evolving. Why did Smilodon, one of the *most* successful of its species, suddenly go extinct? The answer is uncomfortable, but inescapable: Smilodon met a monster. The most advanced predator the world had ever seen, it marched across the globe heralding death and destruction, but once upon a time, the deadly monsters of 10,000BCE had themselves been on the sabre-tooth's menu. By the end of the Ice Age, however, the tables had well and truly turned.

Given that modern big cats prey on the hominids of today (e.g. chimpanzees), paleo-archeologists assume that human ancestors were also prey for big cats, including sabre-tooths.[1] Sabre-tooth cats evolved in Africa approximately sixteen million years ago and spread out across Europe and Asia, before eventually reaching the Americas.[2] The first hominid apes appeared, also in Africa, about ten million years after the sabre-tooth. In fact, sabre-tooth cats were the dominant predator across five continents before hominids had even climbed down from the trees![3] However, despite this logical conclusion, only one fossil bearing definitive proof of violent early human/sabre-tooth interaction has been found: D2280, a human skull fragment from Dmanisi, Georgia.[4] D2280 once belonged to a Homo Erectus, the first type of hominid to spread beyond Africa, and was discovered along the edge of a prehistoric lake, where paleo-archeologists also found the remains of other European Ice Age species, including prehistoric horses, woolly rhinos, mammoths and the sabre-tooth cat Megantaeron.[5] D2280 has two round holes in the base of its neck, which fit exactly the size and shape of Megantaeron sabres, although the rest of the remains show no sign of further predation by the cat.[6]

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[1] M. Nakamura, et. al., 'Wild chimpanzees deprived a leopard of its kill: Implications for the origin of hominin confrontational scavenging', *Journal of Human Evolution*, vol. 131, 2019, p. 129-138

[2] J. Paijmans et. al., 'Evolutionary History of Saber-Toothed Cats Based on Ancient Mitogenomics', *Current Biology*, vol. 27, no. 21, 2017 p. 3330 - 3336

[3] A. Gibbons, 'The Human Family's Earliest Ancestors', *Smithsonian Magazine*, Washington D.C., The Smithsonian Institute, 2010, https://www.smithsonianmag.com/science-nature/the-human-familys-earliest-ancestors, (accessed 4 May 2023)

[4] *Homo Erectus Skull Fragment*, Dmanisi, Georgia, Georgian National Museum, Accession No. D2280

[5] D. Lordkipanidze et. al., 'An ancient cranium from Dmanisi: Evidence for interpersonal violence, disease, and possible predation by carnivores on Early Pleistocene Homo', *Journal of Human Evolution*, vol. 166, 2022, p.1-17

[6] Ibid.

This does not mean sabre-tooths were not preying on early humans, but merely that *this* interaction was not an example of it. The bite which killed D2280 is believed to be a non-predatory violent interaction, i.e. a fight between predators.[7] Except in times of dire need, predators do not routinely consume the carcasses of other predatory animals they kill, even following a fight, giving weight to this idea. Further evidence that this was not a predator/prey interaction can be seen in the injuries to the skull; the cat went for the head, not the body.[8] To date, three Smilodon skulls have been found with severe facial injuries which could have only been inflicted by another Smilodon, indicating that these cats fought very differently to the way they brought down prey.[9,10] As hominids began to evolve from prey into a fellow predator, competing with a sabre-tooth for food and stealing its kills, the cat would have fought back as it would when attacking another predator.[11] While D2280 is from Europe, it is logical, based on the Smilodon skulls, to assume these interactions also occurred between humans and Smilodon in the Americas. However, the cat that killed D2280 would be long dead by the time the first humans set foot in the New World.

The exact date humans arrived in the Americas is hotly contested, but is likely to have been between 30,000 and 15,000BCE.[12] Whether they walked out of the Russian Steppes and across Beringia, or came down the kelp highway on the west coast (or did both!) is unclear, but they spread quickly once they reached the continent itself.[13] Within just a few thousand years of their arrival, humans populated every part of North and South America, from the top of modern day Canada, right down to the bottom of Argentina and Chile. In fact, their spread across the Americas follows exactly the same pattern as that of an invasive species as it adapts to a new environment: an initial explosion of growth, over-consumption of local resources, then a population crash and plateau as the species adapts following the loss of plentiful resources.[14] Humans in the Americas experienced the crash-and-plateau stage around 10,000BCE, the same period in which the large megafauna, including Smilodon, disappeared from that continent. This is very significant, as it suggests that humans had used up much of the natural resources by this stage, which would have put a massive strain on the

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[7] Antón, M., 'OUCH! THAT HURTS! Human Sabertooth interaction at Dmanisi', *Chasing Sabretooths* [web blog] 19 June 2013, https://chasingsabretooths.wordpress.com/2013/06/19/ouch-that-hurts-human-sabertooth-interaction-at-dmanisi/ (accessed 4 May 2023)
[8] L. De Stantis et. al., 'Implications of Diet for the Extinction of Saber-Toothed Cats and American Lions', *PLOS ONE*, vol. 7, no. 12, 2012, https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0052453
[9] R. Black, 'Fighting Sabre-Tooth Cats Bit Each Other on the Face', *Scientific American*, USA, 2019, https://blogs.scientificamerican.com/laelaps/fighting-saber-toothed-cats-bit-each-other-on-the-face/, (accessed 4 May 2023)
[10] N. Chimento, 'Evidence of intraspecific agonistic interactions in Smilodon populator (Carnivora, Felidae)', *Comptes Rendus Palevol*, vol. 18, no. 4, 2019, p. 449-454
[11] M. Nakamura, et. al., 'Wild chimpanzees deprived a leopard of its kill: Implications for the origin of hominin confrontational scavenging', *Journal of Human Evolution*, vol. 131, 2019, p. 129-138
[12] Montaigne, F., 'The Fertile Shore', *Smithsonian Magazine*, Washington D.C., The Smithsonian Institute, 2020, https://www.smithsonianmag.com/science-nature/how-humans-came-to-americas-180973739/, (accessed 4 May 2023)
[13] Ibid.
[14] R. Jordan, 'Populations of early human settlers grew like an "invasive species," Stanford researchers find', Stanford News, California, Stanford University, https://news.stanford.edu/2016/04/05/south-america-earlyhumans-040516/, (accessed 10/05/2023)

environment as animals competed for increasingly scarce resources against the much more adaptable humans.

The extinction of Smilodon and other late Ice Age megafauna also coincides with another significant event in the timeline of human settlement in the Americas: the end of the Clovis spear. The Clovis spear was a highly effective weapon, with a tip made of flint or semi-precious stone, which allowed humans to move from hunting deer and caribou, to bringing down adult mammoths. The tip was hard enough and sharp enough to pierce the thick hide and protective fat of the large megafauna, and penetrate the vital organs.[15] However, after 10,000BCE, humans stopped making Clovis spears, and began to favour wooden spears once more. These had generally been used for hunting smaller, fast moving prey, as they were more accurate when thrown.[16] Yet, the flint and semi-precious stones humans had used to make Clovis spears were still abundant across both continents, and they had been making and favouring this type of spear for thousands of years. Why would they suddenly stop and return to using a more primitive weapon that restricted the type of prey they could hunt?

The answer: because the megafauna of the Americas were extinct. The Clovis spear, which had given humans a competitive edge and allowed them to expand across the continents at a breakneck pace, had also been the death knell for the native species. Over-hunting of mammoths and mastodon caused forests to grow where they had once been grassland, restricting the ability of other herbivores to feed.[17] This caused a deadly cascade effect as the herbivores began to die out and the carnivores competed with humans and each other for fewer and fewer resources. With little else to eat, there is evidence that some of the large carnivores began preying on *each other* before finally dying out.[18]

But this theory is not universally accepted. Some paleo-archeologists believe that it was not humans, but climate change that ultimately killed Smilodon and its contemporaries; humans, they suggest, simply happened to be there at the time and were better able to adapt.[19] While massive climate change *did* occur around 10,000BCE, American megafauna, including Smilodon, had survived this kind of extreme heating and cooling for millions of years! The earth's climate was incredibly unstable during the late Ice Age (despite the popular image of endless tundra) and I would argue it would be highly unlikely that climate change alone

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[15] *Clovis Spear Tip*, Arizona, United States of America, British Museum, Accession No. 1206.137
[16] R. Gürbüz & S. Lycett, 'Asymmetrical Palaeolithic Wooden Spear TTips: Expediency or design?', *Journal of Archaeological Science: Reports*, vol. 30, 2020, p. 1 - 10
[17] The Americas were home to a diverse range of herbivores during the last Ice Age; two species of elephant (including the mastodon), four species of horse, two species of camel, herds of giant bison (twice the size of their modern relatives today!), and the giant ground sloth, among others.
[18] L. De Stantis. et. al., 'Implications of Diet for the Extinction of Saber-Toothed Cats and American Lions', *PLOS ONE*, vol. 7, no. 12, 2012, https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0052453
[19] M. Stewart, W. Carleton & H. Groucutt, 'Climate change, not human population growth, correlates with late Quaternary megafauna declines in North America' *Nat Commun,* vol. 12, 2021, no. 965, https://www.nature.com/articles/s41467-021-21201-8

would have brought about the end of the American megafauna, given they'd already shown they could adapt to it.[20]

Those who argue for climate change as the ultimate killer point out that the Quaternary Extinction Event, as the mass extinction of 10,000BCE is officially known, was a world-wide event. Megafauna across Europe, Asia, North & South America and Australia went extinct at this time; climate change caused grasslands to become deserts, changed the course of rivers, and flooded forests. All this is true, however the rebuttal is within the argument itself: on every continent where humans had not evolved alongside the megafauna, the megafauna died out during this extinction.[21] In Africa, where hominids had first evolved alongside the large animals and had been living with them for millions of years, the megafauna were more resistant to human pressures and the extinction event was less dramatic.[22] This contrasts with Europe, Asia, the Americas and Australia, where humans had only been present for tens of thousands of years *at most* and the megafauna had not evolved to share their resources with the hominids.

The argument for climate change can also be disproven by looking to the one place on earth that continued completely unchanged by the Quaternary Extinction Event: New Zealand. Humans would not arrive in New Zealand until between 1250 - 1300CE, and the two islands were so isolated that they evolved a completely unique eco-system, unlike any other in the world.[23] It was the only place on earth where the megafauna were completely unaffected by the mass extinction of 10,000BCE, despite seeing extreme changes in its climate over this period.[24] The survival of the eleven species of Moa and the terrifying Haast's Eagle well into the early middle ages feels like definitive proof that it was humans, not climate change, which killed the megafauna across the globe, including in the Americas. The one thing all these other continents had that New Zealand didn't was *humans* - without them, the megafauna survived climate change as they had always done. But in places where humans had spread out, competition for resources during this period proved too much for species like Smilodon, already in sharp decline, and they vanished completely.

The inescapable fact is that, no matter which way you look at it, early humans were the ultimate cause of Smilodon's extinction. These cats vanished from the Americas around 10,000BCE, the same time the human population on these continents was experiencing a plateau, consistent with overpopulation and diminishing resources. Humans also stopped

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[20] H. Ritchie, 'Did humans cause the Quaternary Megafauna Extinction?', *Our World In Data*, Oxford, England, Our World In Data, 2022, https://ourworldindata.org/quaternary-megafauna-extinction, (accessed 21 May 2023)
[21] Ibid.
[22] D. Lewis, 'Ancient African Extinctions', *Cosmos*, Melbourne, Australia, The Royal Institution of Australia, 2018, https://cosmosmagazine.com/history/palaeontology/ancient-african-extinctions-humans-off-the-hook/, (accessed 21 May 2023)
[23] A. Tennyson, 'The origins and history of New Zealand's terrestrial vertebrates', *Feathers to Fur*, Wellington, New Zealand, Te Papa Tongarewa, 2009, https://www.researchgate.net/profile/Alan-Tennyson-2/publication/281253499_The_origin_and_history_of_New_Zealand's_terrestrial_vertebrates/links/5653b6be08ae4988a7afc130/The-origin-and-history-of-New-Zealands-terrestrial-vertebrates.pdf, (accessed 21 May 2023)
[24] Ibid.

using the extremely effective Clovis spear around this time, which had been designed to hunt large prey that was now also extinct. Unlike humans, who had the advantage of being highly adaptable, Smilodon relied on these large animals and could not survive without them. Humans were able to shift to a more plant-based diet, hunt smaller prey and catch fish to avoid starvation. The highly specialised Smilodon, built to hunt the large, slow-moving megafauna, did not have these advantages. Already in steep decline and facing imminent extinction, the period of warming at the end of the last Ice Age proved the final straw. Smilodon, once one the most successful predators across the globe, surrendered eternity to the monsters.

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Reference List

Primary Sources

Homo Erectus Skull Fragment, Dmanisi, Georgia, Georgian National Museum, Accession No. D2280

Clovis Spear Point, Arizona, United States of America, British Museum, Accession No. 1206.137

Smilodon Skull 1, Luján River, Argentina, Museo Carlos Ameghino, Accession No. 2046

Smilodon Skull 2, Corralito, Argentina, Museo Regional Florentino Ameghino, Accession No. 0564

Secondary Sources

Agam, A. & Barkai, R., 'Elephant and Mammoth Hunting during the Paleolithic: A Review of the Relevant Archaeological, Ethnographic and Ethno-Historical Records', *Quaternary*, vol. 1, no.1, 2018

Alex, B., 'Why we're closer than ever to a timeline for human evolution', *The Guardian*, 23 December 2016, https://www.theguardian.com/science/blog/2016/dec/22/why-were-closer-than-ever-to-a-timeline-for-human-evolution (accessed 4 May 2023)

Antón, M., 'OUCH! THAT HURTS! Human Sabertooth interaction at Dmanisi', *Chasing Sabretooths* [web blog] 19 June 2013, https://chasingsabretooths.wordpress.com/2013/06/19/ouch-that-hurts-human-sabertooth-interaction-at-dmanisi/ (accessed 4 May 2023)

Black, R., 'Fighting Sabre-Tooth Cats Bit Each Other on the Face', *Scientific American*, USA, 2019, https://blogs.scientificamerican.com/laelaps/fighting-saber-toothed-cats-bit-each-other-on-the-face/, (accessed 4 May 2023)

Chimento, N., 'Evidence of intraspecific agonistic interactions in Smilodon populator (Carnivora, Felidae)', *Comptes Rendus Palevol*, vol. 18, no. 4, 2019, p. 449-454

De Stantis, L. et. al., 'Implications of Diet for the Extinction of Saber-Toothed Cats and American Lions', *PLOS ONE*, vol. 7, no. 12, 2012, https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0052453

Gibbons, A., 'The Human Family's Earliest Ancestors', *Smithsonian Magazine*, Washington D.C., The Smithsonian Institute, 2010, https://www.smithsonianmag.com/science-nature/the-human-familys-earliest-ancestors-73729974/, (accessed 4 May 2023)

Gürbüz, R. & Lycett, S., 'Asymmetrical Paleolithic wooden spear tips: Expediency or design?', *Journal of Archaeological Science: Reports*, vol. 30, 2020

Hubbe, A., Hubbe, M. & Neves, W., 'The Brazilian megamastofauna of the Pleistocene/Holocene transition and its relationship with the early human settlement of the continent', Earth-Science Reviews, vol. 118, 2013

Jordan, R., 'Populations of early human settlers grew like an "invasive species," Stanford researchers find', Stanford News, California, Stanford University, https://news.stanford.edu/2016/04/05/south-america-earlyhumans-040516/, (accessed 10 May 2023)

Kurtén, B., & Werdelin, L., 'Relationships between North and South American Smilodon', *Journal of Vertebrate Paleontology*, vol. 10, no. 2, 1990

Lewis, D., 'Ancient African Extinctions', *Cosmos*, Melbourne, Australia, The Royal Institution of Australia, 2018, https://cosmosmagazine.com/history/palaeontology/ancient-african-extinctions-humans-off-the-hook/, (accessed 21 May 2023)

Lordkipanidze, D. et. al., 'An ancient cranium from Dmanisi: Evidence for interpersonal violence, disease, and possible predation by carnivores on Early Pleistocene Homo', *Journal of Human Evolution*, Volume 166, 2022

Montaigne, F., 'The Fertile Shore', *Smithsonian Magazine*, Washington D.C., The Smithsonian Institute, 2020, https://www.smithsonianmag.com/science-nature/how-humans-came-to-americas-180973739/, (accessed 4 May 2023)

Nakamura, M. et. al., 'Wild chimpanzees deprived a leopard of its kill: Implications for the origin of hominin confrontational scavenging', *Journal of Human Evolution*, vol. 131, 2019, p. 129-138

Paijmans, J. et. al., 'Evolutionary History of Saber-Toothed Cats Based on Ancient Mitogenomics', *Current Biology*, vol. 27, no. 21, 2017

Randall, K., 'New Clues Revealed About Clovis People', *Texas A&M Today*, Dallas, Texas A&M, 2020, https://today.tamu.edu/2020/10/23/texas-am-expert-new-clues-revealed-about-clovis-people/, (accessed 6 May 2023)

Ritchie, H., 'Did humans cause the Quaternary Megafauna Extinction?', *Our World In Data*, Oxford, England, Our World In Data, 2022, https://ourworldindata.org/quaternary-megafauna-extinction, (accessed 21 May 2023)

Stewart, M., Carleton, W. & Groucutt, H., 'Climate change, not human population growth, correlates with late Quaternary megafauna declines in North America' *Nat Commun,* vol. 12, 2021, no. 965, https://www.nature.com/articles/s41467-021-21201-8

Tennyson, A., ‘The origins and history of New Zealand’s terrestrial vertebrates’, *Feathers to Fur*, Wellington, New Zealand, Te Papa Tongarewa, 2009, https://www.researchgate.net/profile/Alan-Tennyson-2/publication/281253499_The_origin_and_history_of_New_Zealand's_terrestrial_vertebrates/links/5653b6be08ae4988a7afc130/The-origin-and-history-of-New-Zealands-terrestrial-vertebrates.pdf, (accessed 21 May 2023)