



Central Mayapan showing the K'uk'ulkan and Round temples

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## Study reveals evidence of historic climate change leading to conflict in Yucatan, Mexico

Scientists have discovered that a lengthy drought led to the collapse and abandonment of the prehistoric Mexican city of Mayapan, demonstrating evidence of a connection between climate change and civil unrest among the ancient Maya.

An extended period of turmoil in the Maya city of Mayapan between 1441-1461 was marked by population declines, political rivalries and civil conflict,

which eventually led to the complete institutional collapse and abandonment of the city in the Yucatan region of Mexico.

This period occurred during a protracted regional drought, and a transdisciplinary international team of researchers including experts in the fields of archaeology, history, geography, and earth science present new evidence that this is not a coincidence.

Their research, which is [published in Nature Communications](#) suggests that drought may in fact have stoked the civil conflict that brought about violence, which in turn led to the institutional instabilities that precipitated Mayapan's collapse.

Their innovative study examined palaeoenvironmental, archaeological and historical data from Mayapan, including isotope and microfossil records, radiocarbon data and DNA sequences from human remains. The team then used regional sources of climatic data and combined it with a new, local record of drought from cave deposits beneath the city to document an interval of unrest between 1400 and 1450.

The researchers said that this transdisciplinary work highlights the importance of understanding the complex relationships between natural and social systems.

“We found complex relationships between climate change and societal stability, or in this case instability, in the region,” said [Dr Sebastian Breitenbach](#), an Associate Professor in Northumbria University's Department of [Geography and Environmental Sciences](#) who specialises in past environmental change and its impact on human society.

The Mayans were reliant on rain-fed maize agriculture but had a lack of centralized, long-term grain storage, minimal investments in irrigation and a sociopolitical system led by elite families with competing political interests. This caused significant vulnerabilities in the region.

“Drought-induced civil conflict had a devastating local impact on the integrity of Mayapan's state institutions that were designed to keep social order,” said Dr Breitenbach.

“In this study we have one of the best ever compilations of data from independent archives which piece together a highly detailed picture of what happened during this period.

“We already had evidence of a hiatus in cave deposits. Essentially, there was no water, which meant stalagmite growth was interrupted because it was too dry. At the same time lakes became more saline due to lack of rainfall. Seeing how these different climate records fit together provided us with unique insights that help us understand what was happening, showing how climate change impacts social behaviour and society in general.”

“The evidence tells us that sustained changes to the regional climate had a huge impact on what we know was a highly organized society at that time.

“Even if Yucatan seems far from Great Britain, the ongoing drought in Europe should remind us strongly that any highly organized society today will still depend heavily on sufficient rainfall.”

Lead author Professor Douglas Kennett, an anthropologist at the [University of California, Santa Barbara](#), said: “Existing factional tensions that developed between rival groups were a key societal vulnerability in the context of extended droughts during this interval.

“Pain, suffering and death resulted from institutional instabilities at Mayapan and the population fragmented and moved back to their homelands elsewhere in the region. Long-term, climate-caused hardships provoked restive tensions that were fanned by political actors whose actions ultimately culminated in political violence more than once at Mayapan.”

Yet significantly, a network of small Maya states also proved to be resilient after the collapse at Mayapan, in part by migrating across the region to towns that were still thriving. Despite decentralization, trade impacts, political upheaval and other challenges, the paper notes, they adapted and persisted into the early 16<sup>th</sup> century. It all points to the complexity of human responses drought on the Yucatan Peninsula at that time – an important consideration for the future as well as the past.

“Our study demonstrates that the convergence of information from multiple scientific disciplines helps us explore big and highly relevant questions,” added Professor Kennett, “like the potential impact of climate change on society and other questions with enormous social implications.

“Climate change worries me, particularly here in the western U.S., but it is really the complexities of societal change in response to climatic perturbations that worry me the most.

“The archaeological and historical records provide lessons from the past, and we also have so much more information about our Earth’s climate and the potential vulnerabilities in our own sociopolitical systems.”

The paper, [Drought-induced Civil Conflict Among the Ancient Maya](#), is now available online at [Nature Communications](#).

According to results from the recent Research Excellence Framework (REF2021), Northumbria is ranked second in the UK for research power in [Geography and Environmental Studies](#). All of the University’s research in this area is rated as being either world-leading or internationally excellent.

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