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Guangxi Cave Teeth Reveal Homo erectus Survived in Closed-Canopy Rainforests Until 184,000 Years Ago

Environment * Climate Change * Atmospheric Physics

Nine fossilized hominin teeth unearthed alongside thousands of animal remains in two limestone karst caves in southern China's Guangxi province reveal that Homo erectus persisted on the East Asian mainland between 324,000 and 184,000 years ago -- and thrived inside dense, closed-canopy tropical rainforests. Published across two companion papers in Nature in November 2026 by international teams led by Wei Liao, Cl ment Zanolli, Frido Welker, Kira E. Westaway, and Renaud Joannes-Boyau, the discoveries extend the mainland survival of Homo erectus by roughly 200,000 to 300,000 years and dismantle the long-standing hypothesis that only Homo sapiens could inhabit closed-canopy rainforest ecosystems.

For decades, paleoanthropologists viewed dense tropical rainforests as "green deserts" for early hominins -- resource-patchy environments whose high-canopy fruits, toxic plant defenses, and humid disease burdens supposedly barred archaic human species prior to the arrival of modern humans. By pairing high-resolution dental morphology and ancient enamel proteomics with multi-method cave sediment dating and paleoenvironmental reconstruction, the Guangxi studies provide direct empirical proof that archaic hominins adapted to rainforest habitats long before modern human dispersals.

Nine Cave Teeth and Enamel Proteomics in Guangxi

The fossils were excavated from two karst cave systems -- Baxian and Naxian -- in Guangxi, southern China. Because humid subtropical karst environments rapidly degrade ancient DNA , recovering intact genetic sequences from Middle Pleistocene tropical fossils is rarely possible. To establish taxonomic identity with high confidence, Liao, Zanolli, Welker, and colleagues combined detailed three-dimensional geometric analysis of tooth crown and root morphology with paleoproteomics -- extracting and sequencing ancient proteins locked inside dense tooth enamel.

Of the nine hominin teeth analyzed, eight matched diagnostic morphological and proteomic signatures of Homo erectus . Multi-method geochronology applied to the surrounding cave sediments constrained the fossil-bearing layers to between 324,000 and 184,000 years ago during the late Middle Pleistocene, placing Homo erectus in southern China far later than classic mainland East Asian sites had previously indicated.

| Research Parameter | | Baxian & Naxian Caves Record | | Evolutionary Significance |

| Taxon Identified | | Homo erectus (8 of 9 hominin teeth) | | Confirmed via morphology + ancient enamel proteins |

| Dated Age Window | | ~324,000 to 184,000 years ago | | Extends mainland Asian H.

erectus by ~200-300 kyr |

| Paleoenvironment | | Dense, closed-canopy tropical rainforest | | Overturns " Homo sapiens exceptionalism" model |

| Co-Occurring Assemblage | | Thousands of forest-adapted fauna fossils | | Reconstructs humid subtropical karst ecosystem |

Overturning "Homo sapiens Exceptionalism" in Tropical Forests

In the companion Nature study led by Westaway, Joannes-Boyau, Liao, and colleagues, researchers reconstructed the local vegetation, climate, and faunal community surrounding Baxian and Naxian caves during the late Middle Pleistocene. Rather than open savanna or fragmented woodland corridors, the environmental proxies and thousands of associated animal fossils point unmistakably to a dense, closed-canopy rainforest ecosystem .

Previous evolutionary models frequently argued that expanding rainforest cover across southern China during warm interglacial cycles fragmented open habitats and helped drive mainland Homo erectus toward local extinction . The Guangxi evidence reverses that narrative: instead of being excluded by closed-canopy forests, late Middle Pleistocene Homo erectus populations adapted to them -- demonstrating ecological flexibility once assumed to be unique to Homo sapiens .

Rewriting the Middle Pleistocene Timeline of Mainland East Asia

Extending the mainland East Asian record of Homo erectus into the 324,000-to-184,000-year window also reshapes how paleoanthropologists view hominin coexistence in Asia. During the late Middle Pleistocene, Denisovans and other archaic East Asian lineages were already present across broader continental landscapes, raising new questions about ecological partitioning, cultural exchange, and potential interactions across southern China's karst refugia.

Methodologically, the twin Nature papers underscore the transformative power of enamel paleoproteomics in tropical regions where ancient DNA fails to survive. As researchers apply ancient protein sequencing to legacy museum teeth and newly excavated karst caves across Southeast Asia and southern China, additional hidden chapters of archaic human diversity and rainforest adaptation are poised to emerge.

References & Primary Sources

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