

Molar of ancient human Denisovan species discovered in northern Laos

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29 May 2022

The recent discovery of a Denisovan tooth in Laos represents the first fossil discovery of the enigmatic hominid species outside of Russia and Tibet. Although the genetic structure of modern-day Australian Aboriginals and Pacific Islanders shows the presence of Denisovan genes, indicating the species was widely dispersed through Australia, Papua New Guinea and Oceania, no fossils had been discovered before this in the region.

Denisovans, first discovered in the Denisova cave in the Altai Mountains of Siberia, are thought to have existed from 30,000 to 500,000 years ago and have only been known from very limited fossil evidence found in Russia and Tibet. DNA analysis found that the Denisovans had split from Neanderthals 400,000 to 500,000 years ago.

The discovery was reported in a paper titled “A Middle Pleistocene Denisovan molar from the Annamite Chain of northern Laos,” published in *Nature Communications* on May 17.

“We knew that Denisovans should be here. It’s nice to have some tangible evidence of their existence in this area,” Laura Shackelford, co-author of the paper and a paleoanthropologist at the University of Illinois, told the *New York Times*.

The discovery was made in the Ngu Hao 2 cave in Huà Pan Province in the Annamese Mountains in northern Laos. Local children directed the scientists to the site at the end of their field season in 2018. The cave walls were studded with fossil bones, mostly belonging to extinct mammals such as pigs and pygmy elephants. It is thought that the bones were brought to the cave by porcupines using them to sharpen their teeth.

One of the discoveries was a lower left molar that the scientists recognized as belonging to an extinct hominid

species. The tooth was thought to have belonged to a female child aged between 3.5 to 8.5 years due to its underdeveloped root structure.

The paper stated, “the morphology of the tooth is compatible with an attribution to either a first or a second lower molar.”

Radioactive dating of minerals in the cave estimated the age of the fossil at between 131,000 and 164,000 years before the present, well before modern humans were known to have been in the area. The oldest known *Homo sapiens* fossils in the area, discovered in 2009, were dated at between 46,000 and 63,000 years ago.

A number of hominid species are known to have been in Southeast Asia. A *Homo erectus* skull and femur, known as Java man, was discovered in Indonesia in 1892. It was estimated to be between 700,000 and 1 million years old. It is thought that *H. erectus* continued in the region until about 250,000 years ago.

More recent species have been discovered, including *Homo floresiensis*, known as the Hobbit due to its diminutive size. It was discovered on the island of Flores in Indonesia and was extant from 50,000 to 190,000 years ago. *Homo luzonensis* fossils discovered on the island of Luzon in the Philippines have been established to have been extant 50,000 years ago.

Scientists have discovered evidence of Denisovan DNA in Australian Aboriginals, Papua New Guineans and Pacific Islanders, indicating that the species was widespread throughout the region. “However, there is still no fossil evidence explaining the Denisovans genetic imprint on modern southeast Asian populations and—due to the paucity of the Middle Pleistocene fossil record—it is still unknown whether one or more human lineages (co)existed in continental southern Asia,” the authors of the paper stated.

Intriguingly, scientists doing DNA analysis of the

Denisova cave's finger bone found evidence of the interbreeding of Denisovans with Neanderthals, which was published in 2018.

The researchers examined other fossils from the Laotian cave but found no traces of DNA, so the molar was considered unlikely to have any DNA, as genetic material degrades very rapidly in humid conditions. Analysis of protein extracted from the tooth enamel proved inconclusive. Protein analysis has become an increasingly important tool in recent times as it degrades less readily than DNA.

The designation of the tooth as Denisovan was finally made through a detailed examination of the tooth's surface structure. This was compared to 400 molars of living and extinct humans.

The scientists stated that “morphometric analyses of the external and internal crown structural organization allow us to reject a number of hypotheses regarding species assignment. TNH2-1 has large crown dimensions and a complex occlusal surface that differentiates it from the smaller and morphologically simpler teeth of *H. floresiensis*, *H. luzonensis* and *H. sapiens*. The ... shape shows a mixture of Neanderthal-like and *H. erectus*-like features, closely resembling the ... morphology of the Denisovan specimen from Xiahe.”

Xiahe is on the northeastern edge of the Tibetan Plateau, where a Denisovan mandible was discovered in 1980.

The researchers at first thought the tooth belonged to *H. erectus* but ruled this out as it was too complex.

“Although it (the tooth) shares some characteristics with Neanderthal teeth, it is also “large, and kind of weird”, said palaeoanthropologist at the University of Toronto Bence Viola. “Denisovans have absolutely gigantic teeth... So, it seems like a good assumption that this is likely a Denisovan.”

Some scientists have disagreed with the Denisovan classification due to the badly degraded nature of the tooth, lack of any accompanying fossils or DNA evidence.

Katerina Douka, an archaeological scientist at the University of Vienna, told *Nature* “the reality is that we cannot know whether this single and badly preserved molar belonged to a Denisovan.”

On the other hand, Bence Viola said that it was in the “right place and right time” to belong to a Denisovan.

This discovery underscores that Asia and southeast

Asia in particular may provide enormous opportunities for further discoveries that will enable deeper elucidation of the evolution of Denisovans, that are only known through a few fossils and some intriguing DNA evidence.

The study concluded that “the tooth from Tam Ngu Hao 2 Cave in Laos thus provides direct evidence of a most likely Denisovan female individual with associated fauna in mainland Southeast Asia by 164-131 thousand years ago. This discovery further attests that this region was a hotspot of diversity for the genus *Homo*, with the presence of at least five late Middle to Late Pleistocene species: *H. erectus*, Denisovans/Neanderthals, *H. floresiensis*, *H. luzonensis* and *H. sapiens*.”

“When we started looking in Laos, everyone thought we were crazy ... But if we can find things like this tooth—which we weren't even anticipating—then there are probably more hominin fossils to be found,” said Shackelford.



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