Recent Chinese fossil studies highlight evolution of Denisovan species of hominins

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In recent studies published in September and October researchers examined Denisovan fossils found at Bianfu Cave in the Yunnan Province and Xujiayao in North China's Hebei Province in the Nihewan Basin. They provide an unprecedented glimpse into the elusive hominin species.

Previously Denisovans were only known through a tiny finger bone fragment, scattered individual teeth and small skull or jaw segments. Most of what was known about them was through DNA and protein analysis of material extracted from the bones. This enabled scientists to determine that they had interbred with modern humans, *Homo sapiens*, particularly in the Asia Pacific and Oceania regions. In 2025 Denisovans were given a species classification as *H. longi*,known as Dragon Man.

Two studies, both published in *Nature* in September, analysed fossils, animal remains and tools found in the Bianfu Cave in the Yunnan Province, giving a very rich account of Denisovan morphology and life. The first was authored by palaeolithic archaeologist from the Yunnan Provincial Institute of Cultural Relics and Archaeology Qijun Ruan and his team: "Denisovans from southwestern China and their subsistence strategies." The second study, by geneticist Qiaomei Fu and her team at the Institute of Vertebrate Paleontology and Paleoanthropology in Beijing, was titled: "Ancient proteins identify various Denisovan remains from Southwest China." The cave had been discovered in 2019 at a limestone quarry by local workers who found fossilised bones.

The hominins are thought to have inhabited the cave for roughly 120,000 years, spanning from 190,000 to 70,000 years ago, giving a critical insight over an extended period. Other sites where Denisovans have been found, such as the Denisova Cave in Siberia, also had modern human and Neanderthal fossils there, making it difficult to attribute tools and other objects to a particular species.

Over 64,000 bone fragments were found at the Bianfu cave. With so many bones, the scientists had to adopt a very meticulous process to analyse them efficiently. They were pre-screened by shape to separate animal remains from hominin bones. The likely bones were scanned using mass spectrometry to detect collagen. This was then sequenced, enabling the scientists to definitively identify the hominin bones as Denisovan.

The seven Denisovan fossils found included a forearm radius running from the elbow to the thumb side of the wrist, four teeth and two skull fragments. The skull fragments were 0.76 to 1.02 cm thick, resembling the skull thickness of *H. erectus* or Neanderthals.

The forearm fragment is the first and only confirmed Denisovan radius ever discovered, giving an insight into the hominin's physical build below the neck. Although the radius shared similarities with Neanderthals, its overall shape corresponded to modern humans.

It "likely provided functional advantages for lightweight, precise manipulation," Fu told *Live Science*.

As well as the human remains, there were also 1,600 bone fragments belonging to large herbivores that inhabited the surrounding conifer forests and steppes. These include deer, water buffalo and gaur (large wild cattle). The bones also include primitive sheep and goats, rhinoceroses and hyenas. Many specimens show clear cut marks from stone tools used to strip meat and scrape hides.

"The fossils are directly associated with stone tools, bone tools, animal remains and environmental evidence, allowing us to study Denisovan biology, technology, diet and adaptation together. [This] indicates the animals were brought to the cave or processed there for meat, marrow and grease," co-author and archaeologist at the University of Wollongong Professor Bo Li told the Australian Broadcasting Corporation (ABC).

Numerous stone and bone tools were discovered, including flakes used for cutting meat off the bone. Cores

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were also found that are hammerstones used to knock off sharp edged flakes used for slicing, scraping hides and woodworking.

'This site is significant because it brings fossils, technology, subsistence and environment together in one long, stratified record. It moves us beyond isolated discoveries and genetically inferred distributions, showing how Denisovans actually adapted to their surroundings. It is evidence of just how diverse the technology of ancient human populations in eastern Asia really was,' Li told the University of Wollongong online.

The presence of Denisovans in Yunnan is very important, as it shows the presence of the hominin across the whole Chinese mainland, and it bridges the geographic and ecological gap between northern Denisovan sites and the DNA of modern populations in Southeast Asia and Oceania. Fu and her team consider that this places Denisovans much closer to the tropical regions, where they later interbred with modern humans, explaining why Indigenous Australians, Papua New Guineans, and island Southeast Asians carry Denisovan DNA today.

The Xujiayao remains excavated from 1976 to 1979 consist of 20 human fossils, including cranial portions, mandibles, and teeth alongside animal remains and tools that were dated to 199,000 to 138,000 years ago. The fossils are considered to be from 16 individuals of various ages.

From the outset the fossils' classification was problematic. It was originally classified as an archaic *H. sapiens* but was compared to *H. erectus* or *H. sapiens neanderthalensis*. Over time, the species designation was debated between *H. erectus*, Neanderthals or some intermediate group. In 2024 researchers proposed a new species *H. juluensis* or large-headed people.

Fu and her team carried out an analysis on protein fragments known as peptides from two Xujiayao bones and compared them with peptides found in humans and Neanderthals. The researchers found a single amino acid change in several peptides in the Xujiayao bones that is also found in other East Asian fossils known to be a marker for Denisovans. This marker wasn't found in the human or Neanderthal samples.

The peptide analysis accompanied by a phylogenetic analysis enabled Fu's team to definitively classify the remains as Denisovans.

Fu and her team published their findings in October in *Nature*, titled, "The proteome of Middle Pleistocene Xujiayao and common Denisovan morphology." A proteome is the entire set of proteins found in the fossils. Proteins are known to survive for a longer time than DNA in ancient fossil specimens where DNA has denatured.

Fu and her team conducted a systematic comparison of the Xujiayao fossils with other Asian fossils.

They state in their paper, "[W]e conducted a systematic morphological comparison between Xujiayao and other members of East Asian late Middle Pleistocene within a broader evolutionary framework of genus Homo to investigate their morphological affinities to the Xujiayao population."

The Pleistocene, commonly known as the Ice Age. started 2.58 million years ago and concluded 11,700 years ago. The researchers considered that Denisovans could have lived in East Asia from at least 300,000 to 45,000 years ago, paralleling the time range of Siberian Denisovans of 250,000 to 55,000 years ago. They adapted to diverse ecological zones, including the high-altitude plateau, subtropical forest and island environments, across Siberia, East Asia and Southeast Asia.

Fu and her team conducted a morphological examination of the Xujiayao fossils, consisting of skull fragments, jaws and teeth. They found that the upper and back part of the skull was low and wide similar to *H. erectus*. They shared traits with Neanderthals, modern humans and other later hominin species. Features uniquely Denisovan were the flattened and elongated shape of the skull and a nearly vertical plate-like bone at the back of the skull. Fu considers that this understanding of Denisovan features could assist in classifying unnamed fossils as Denisovans.

Palaeoanthropologist at the University of Copenhagen Fabrice Demeter told *Nature* that the findings add to growing evidence that Denisovans were a widespread and potentially diverse group of humans. "The study represents a major step forward" in our understanding of what these humans could have looked like and where they lived.

These studies have enabled scientists to extend what we know about this recently identified hominin that made a decisive contribution to the evolution of our species.



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