Illuminating Neanderthal Resilience and Adaptability through Cutting-Edge Zooarchaeology

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Neanderthals, our closest extinct human relatives, have often been portrayed as brutish and primitive compared to modern humans. But new research is shedding light on their true capabilities. Eboni Westbury from the Australian National University is part of a team investigating how Neanderthals adapted and thrived in challenging Ice Age environments. Their work at the Abric Pizarro rock shelter in Spain reveals new insights into the complex behaviours and survival skills of these ancient people.

Abric Pizarro: A Window into Neanderthal Resilience

Nestled in the foothills of the Spanish Pre-Pyrenees mountains lies the Abric Pizarro rock shelter. This site, which is 35 metres long and over six metres deep, contains a rich record of Neanderthal occupation dating back to a climatically turbulent period known as Marine Isotope Stage 4 (MIS 4), approximately 71,000 to 57,000 years ago. It has emerged as a key site for understanding Neanderthal life during this period, traditionally considered inhospitable for Neanderthal habitation due to the cold, extreme aridity, and shifting landscapes.

However, the archaeological record at Abric Pizarro tells a very different story, suggesting that Neanderthals were surprisingly resilient to these environmental challenges. As part of an international research team, Eboni Westbury is studying the animal remains left behind by Neanderthals to understand how they survived and even thrived during this time.

Test excavations were conducted in 2009. Also, another field season was undertaken in 2024. Using three-dimensional recording techniques, the researchers identified four discrete layers of Neanderthal occupation, labelled M, P, Q and S, separated by culturally sterile sediments. Radiocarbon and optically stimulated luminescence dating place the main occupation layers M and P firmly within MIS 4. Westbury meticulously examined over 246,000 animal bone fragments from levels M and P, which correspond to MIS 4 occupations of the site.

Diverse Diets and Adaptable Behaviours

To investigate Neanderthal subsistence strategies, Westbury conducted a comprehensive analysis of the large vertebrate remains from layers M and P. Over 10,000 bone fragments were studied, with the team identifying the species present, age at death, and any marks left by Neanderthal butchery or carnivore scavenging.

The results portray Neanderthals as adaptable and skilled hunters, exploiting a wide variety of animals from small prey like rabbits up to massive herbivores including bison, rhinoceros and extinct cattle called aurochs. Deer and other medium-sized game were the most common, but the Neanderthals clearly adjusted their diet to what was available in the rugged mountain landscape.

As Westbury explains, the diverse fauna, methodical hunting practices, and deliberate butchery behaviours offer a comprehensive understanding of Neanderthal subsistence during the Middle Palaeolithic in the southeast Pre-Pyrenees region. Crucially, the evidence suggests Neanderthals were deliberately targeting prime-aged adult animals, which would have provided the maximum return of meat, marrow and fat to sustain them. This implies sophisticated knowledge of animal behaviour and selective hunting strategies.

Putting the Pieces Together

While Abric Pizarro provides a wealth of zooarchaeological data, fully interpreting the results requires putting all the pieces together. Westbury is currently undertaking studies to understand how the bones accumulated and preserved over time, as well as innovative spatial analyses to map precisely where each fragment was recovered within the rock shelter.

As well as the large vertebrates, the layers contain tantalising evidence of small game exploitation including rabbits and tortoises, which the team are subjecting to detailed study. Integrating all these faunal components will allow the team to reconstruct a vivid picture of Neanderthal life in the rugged Pre-Pyrenees. Westbury suggests that, far from the harsh landscape previously imagined, the warm, stable environment and abundance of temperate species like deer and tortoises at the Abric Pizarro site likely made the region attractive to Neanderthals.

Decoding Neanderthal Subsistence Strategies

The Abric Pizarro bones also preserve a detailed record of intensive Neanderthal carcass processing, aimed at extracting every last calorie. The long bones of the prey animals showed frequent spiral fracturing, which is associated with breaking open fresh bones to access the marrow inside.

Detailed microscopic studies revealed cut marks from stone tools used to strip meat off the bones, as well as percussive impact marks from smashing them open. Some bones had been so heavily fragmented that they showed a distinctive 'stepped' breakage pattern. According to Westbury, this intensive processing may suggest the Neanderthals were under nutritional stress, even if they were successfully hunting large game.

Similar 'intensive processing' has been observed at other Neanderthal sites during both warm and cold periods.

Westbury notes that the pronounced intensity of butchery activities at Abric Pizarro, aimed at maximising caloric extraction from prey, even during periods of relative climatic stability, suggests that Neanderthals regularly engaged in intensive processing of carcasses. This possibly indicates that nutritional stress commonly affected Neanderthals throughout glacial and interglacial periods.

The placement of the cut marks and percussion marks also points to systematic butchery practices, with the Neanderthals selectively removing the most meat-rich elements like the hind limbs to bring back to the shelter. This strategy may have been necessary, given the challenging terrain around the site.

A New Open-Access Method for Analysing Butchery Marks

In addition to her work at Abric Pizarro, Westbury has developed an innovative open-access method for spatially analysing butchery marks using QGIS software. This approach, recently published in the *International Journal of Osteoarchaeology*, allows researchers to map and interpret the distribution of slicing, scraping, and tooth marks on bones in unprecedented detail.

By applying this spatial analysis to the Abric Pizarro assemblage, Westbury aims to gain even deeper insights into Neanderthal butchery sequences and decision-making. The method also has broad applicability for zooarchaeological research worldwide, democratising access to powerful analytical tools.

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Connecting Continents, Illuminating Human Origins

For Westbury, the thread connecting her Neanderthal research in Europe with her work on ancient Aboriginal sites in Australia is a fascination with the diversity and ingenuity of early human populations. It is remarkable to think that while Neanderthals were thriving in the challenging environments of Ice Age Europe, modern humans were establishing themselves in the vast landscapes of Australia. Both populations were adapting to their unique circumstances, developing complex cultures and technologies to do so. Studying these parallel journeys enriches our understanding of the human story.

As Westbury continues her groundbreaking research, integrating cutting-edge spatial analysis with traditional zooarchaeological methods, she is helping to rewrite the narrative of Neanderthal life and abilities. Her work underscores the resilience and adaptability of our ancient relatives, even in the face of dramatic environmental change. By connecting the dots between continents and species, Westbury is shedding new light on the complex tapestry of human origins and adaptation..

MEET THE RESEARCHER

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Eboni Westbury is a PhD candidate in Archaeology at the Australian National University (ANU). She completed her Bachelor of Arts at ANU, majoring in Archaeology and Biological Anthropology, and her Advanced Master in Archaeological and Evolutionary Science, also at the same institution. Her PhD research focuses on investigating complex Neanderthal behaviour in the Middle Palaeolithic Pre-Pyrenees. Westbury has substantial field experience from archaeological projects in Australia, Spain, Vanuatu, Germany, and the Philippines. Her research specialisations include zooarchaeology, taphonomy, Geographical Information Systems (GIS), and Middle Palaeolithic archaeology. She has authored several peer-reviewed publications providing new insights into Neanderthal adaptations and the application of GIS methods to the study of anthropogenic bone surface modifications. She also has professional experience as a consulting archaeologist working on Aboriginal Australian archaeology projects.

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