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Editorial: Neanderthal complex behaviour through the lens of faunal resources

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Editorial on the Research Topic

Neanderthal complex behaviour through the lens of faunal resources

The longstanding view of Neanderthals as ecologically inflexible and behaviourally limited hominins has been challenged in recent decades. Modern zooarchaeological and taphonomic research has revealed a variety of complex behaviours among Neanderthal populations across Europe and the Levant, decisively overturning the notion that advanced subsistence and technological strategies were exclusive to Anatomically Modern Humans (AMH). This Research Topic, *Neanderthal complex behaviour through the lens of faunal resources*, assembles innovative research that sheds light on the sophisticated ways Neanderthals procured, processed and used faunal resources. Collectively, these studies contribute to reframing Neanderthals as cognitively and behaviourally comparable to their African contemporaries, through the perspective of faunal exploitation.

[Solano-García and Moigne's](#) research at Cueva del Ángel in southern Spain focuses on the systematic exploitation of large ungulates across a long Middle Pleistocene sequence. Their evidence for targeted hunting, intensive marrow extraction and minimal carnivore interference supports a persistent pattern of high-yield, large-game hunting. This pattern, coupled with strategic carcass processing, places Neanderthals within a broader Eurasian tradition of flexible but large-game-focused subsistence, reiterating their sophisticated ecological adaptability.

[Nabais and Zilhão's](#) study of Gruta da Figueira Brava (Portugal) highlights Neanderthals' exploitation of diverse resources from a mosaic coastal and inland environment during the Last Interglacial. Their faunal analysis indicates a systematic, contextually flexible approach to red deer, ibex and larger species, such as aurochs and horses. The patterns of carcass transport and processing further suggest a strategic, adaptive use of local ecotones, reinforcing Neanderthals' capacity to integrate varied habitats and prey types into their subsistence systems.

[Westbury et al.](#) examine Neanderthal occupation of the Abric Pizarro site in the Pre-Pyrenees (Spain) during MIS 4, a period of pronounced climatic instability. Their zooarchaeological and taphonomic data reveal a diverse prey spectrum, systematic butchery practices and extensive evidence of fire use. These finds challenge entrenched ideas of Neanderthal ecological vulnerability, instead portraying them as resilient, organised and capable of sustaining long-term occupations in marginal environments through strategic planning and technological competence.

This is also clear in [Carvalho et al.](#) case-study from Lapa do Picareiro cave in Portuguese Estremadura, demonstrating Neanderthals' consistent targeting of red deer across multiple occupational phases. Despite environmental fluctuations during Heinrich Stadial 5, these communities maintained a remarkably stable, regionally adapted subsistence strategy, focused on predictable resources within a defined territory. Such evidence undermines any residual perception of Neanderthal ecological rigidity, instead highlighting their resilience and behavioural stability in the face of climatic perturbations.

[Crezzini et al.](#) take a nutritional and genetic perspective, revealing how Neanderthals in arid Late Mousterian Italy relied intensively on animal fats and proteins, notably from aurochs and horses. This work highlights the interplay between environmental stressors, genetic adaptations and subsistence practices. The authors suggest Neanderthals' ancestral FADS1/FADS2 haplotype constrained their endogenous fatty acid synthesis, necessitating dietary reliance on lipid-rich faunal resources and demonstrating a subtle, metabolically informed adaptive strategy.

[Goffette et al.](#) expand the faunal narrative beyond mammals, analysing avian remains from Scladina Cave in Belgium. They document anthropogenic modifications on several bird bones, suggesting consumption, tool use and potentially symbolic practices involving birds. These results decisively challenge the stereotype of Neanderthals as exclusively large-game hunters, revealing a broader and more complex subsistence and cultural repertoire than previously acknowledged in north-western Europe.

In a related vein, [Nabais et al.](#) employ experimental archaeology to replicate Neanderthal bird butchery and cooking practices. Their experiments reveal how cooking dramatically alters the archaeological visibility of avian remains, reducing cut-mark prevalence while increasing thermal damage and skeletal loss. This study provides a critical interpretive framework for evaluating bird exploitation in Palaeolithic contexts, cautioning that traditional zooarchaeological assemblages may underestimate the full extent of Neanderthal avian resource use.

[Jallon et al.](#) present a comparative study of faunal processing at Amud and Kebara caves in the Levant. Their microscopic and macroscopic cut-mark analyses uncover culturally distinct butchery strategies despite comparable faunal compositions and lithic technologies. Amud Neanderthals appear to have favoured an intensive butchery strategy that broke bones into many fragments and left dense cut-mark concentrations on small ungulates; while Kebara Neanderthals displayed more standardised, systematic carcass processing. These differences are best interpreted as evidence for cultural traditions and socially transmitted practices, rather than purely ecological responses, highlighting the social and cognitive complexity of these groups.

Finally, the contribution by [Cobo-Sánchez et al.](#) at Escoural Cave, located in Portugal, employs an innovative blend of traditional taphonomic methods and machine learning approaches to disentangle human from carnivore agency in faunal assemblages. Their analysis of leporid remains points convincingly to lynxes and other small carnivores as the primary accumulators, finding no clear evidence of Neanderthal small-game exploitation at this site. Beyond its finds, the study exemplifies how advanced computational models can enhance our understanding of complex site-formation processes, setting new methodological standards for zooarchaeological investigations.

Taken together, the papers assembled in this Research Topic demonstrate the rich potential of zooarchaeological research for better revealing the complex behavioural signatures of Neanderthals. From experimental archaeology to genetic dietary inferences and advanced computational modelling, the breadth of methodological innovation on display here reaffirms the central role of faunal studies in Palaeolithic archaeology. Crucially, the contributions show that Neanderthals were neither ecologically naïve nor behaviourally impoverished. Rather, they emerge as sophisticated, adaptable hominins whose interactions with faunal resources rivalled, and in some cases anticipated, patterns seen in their AMH contemporaries.

This Research Topic challenges us to transcend outdated evolutionary hierarchies that diminish Neanderthal capacities. It advocates instead for a perspective that recognises them as creative, resilient and contextually responsive members of the human lineage. We hope that this Research Topic stimulates further dialogue and research, encouraging scholars to continue exploring the zooarchaeological record as a window onto the subtle, diverse and complex worlds inhabited by Neanderthals.

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Conflict of interest

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