Summary

Through the analysis of Palaeolithic faunal assemblages, zooarchaeology allows us to reconstruct diet and subsistence strategies. However, taphonomic processes, including both carnivore and anthropogenic activities, can lead to high bone fragmentation. This often prevents taxonomic identification based on morphology and restricts our interpretation to a relatively small proportion of identifiable remains.

The development of biomolecular methods gives, for the first time, the opportunity to identify the biological markers preserved in previously undiagnostic bone remains. Zooarchaeology by Mass Spectrometry (ZooMS) provides a taxonomic identification based on amino acid sequence variation of the protein collagen type I. Up to now, ZooMS applications have largely focused on ecological questions such as improving the faunal spectrum, documenting the spread of domesticated species, or for the identification of additional hominin specimens. However, investigating the relationship between faunal composition and bone fragmentation, especially to assess hominin behaviour during transitional periods like the Middle to Upper Palaeolithic transition, has not been explored.

This dissertation combines the analyses of bone surface modifications with biomolecular analyses in order to provide fresh insights into past human behaviour in relation to faunal species selection and carcass processing. These research questions are addressed by investigating bone assemblages from European sites spanning the arrival of *Homo sapiens* within territories occupied by the last Neanderthals. Site selections focused on recent, well documented excavations with large quantities of unidentifiable faunal fragments and for which there is a modern zooarchaeological analysis, such as Fumane Cave (Italy), Bacho Kiro Cave (Bulgaria), La Ferrassie and Les Cottés (France). This study explores the synthesis and analysis of comparable data for both the morphologically identifiable and morphologically unidentifiable portion of the same faunal assemblages, with the latter assessed using ZooMS. The results at Fumane Cave highlights quantitative differences between taxa, illustrated by a 6-fold increase in the proportion of Bos/Bison remains within the ZooMS component. This is possibly due to specific hominin behavior during food procurement, resulting in increased fragmentation of Bos/Bison remains compared to other fauna. The results for assemblages spanning the Middle to Upper Palaeolithic transiation (MUPT) at Bacho Kiro Cave, Les Cottés and La Ferrassie indicate an underepresentation of Bos/Bison and Equidae due to differential identification rates between taxa, a progressive shift in prey selection from Bos/Bison to Equidae across the MUPT, a reduction in the frequency of carnivore presence, and an increase in carnivore exploitation by Upper Palaeolithic *Homo sapiens* over the course of their dispersal across Europe.

The biomolecular analysis of rare and culturally significant organic archaeological material is often restrained by the invasiveness of the sampling strategy. Recent studies have therefore focused on developing non-destructive collagen extraction techniques. The eraser extraction method (EEM), initially applied to parchments, was developed for palaeoproteomics such as Zooarchaeology by Mass Spectrometry (ZooMS). The friction of a Polyvinyl Chloride (PVC) eraser on an organic tissue, such as a bone surface,releases a small amount of protein from the surface. This doctoral project contributes to the understanding of the impact of the eraser extraction method on ancient bone surfaces by performing a controlled sampling experiment and measuring the microtopography of the bone surface before and after erasing. The results shows that the EEM generates some alterations to the bone surface, including a flattening of the bone microtopography and the creation of microstriations comparable to ancient use-wear traces. Future applications of the EEM should therefore take these observations into account during experiment design.

By combining methods and integrating complementary datasets, this dissertation provides a more comprehensive picture of Late Pleistocene faunal assemblages and hominin subsistence behaviour and show the potential of the inclusion of palaeoproteomic analysis within the current framework of zooarchaeological analysis at Palaeolithic sites.