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Resource partitioning and interspecific interactions among Pleistocene large herbivores: a tooth wear approach

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Introduction

Niche and resource partitioning are key concepts for the understanding of interactions among species and to explain (paleo) biodiversity. It is known that differentiation of ecological niches reduces competition and promotes co-existence between species. Among the proxies used to reconstruct paleodiets in fossil large mammals, tooth mesowear and microwear are ideal to study niche partitioning because the two proxies reflect the dietary traits at the time of death i.e. the diet that each species had when they occurred in the same area.

Methods

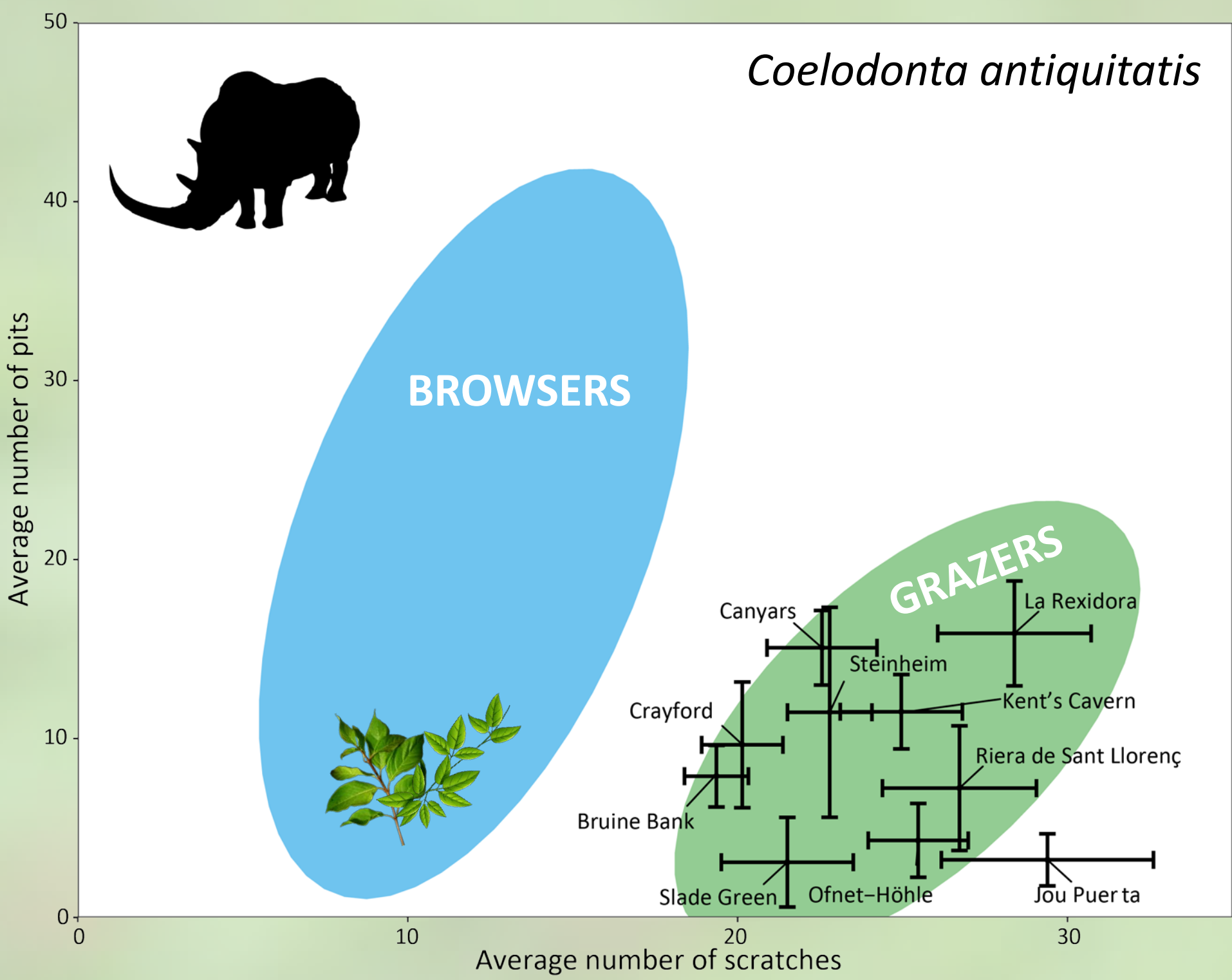
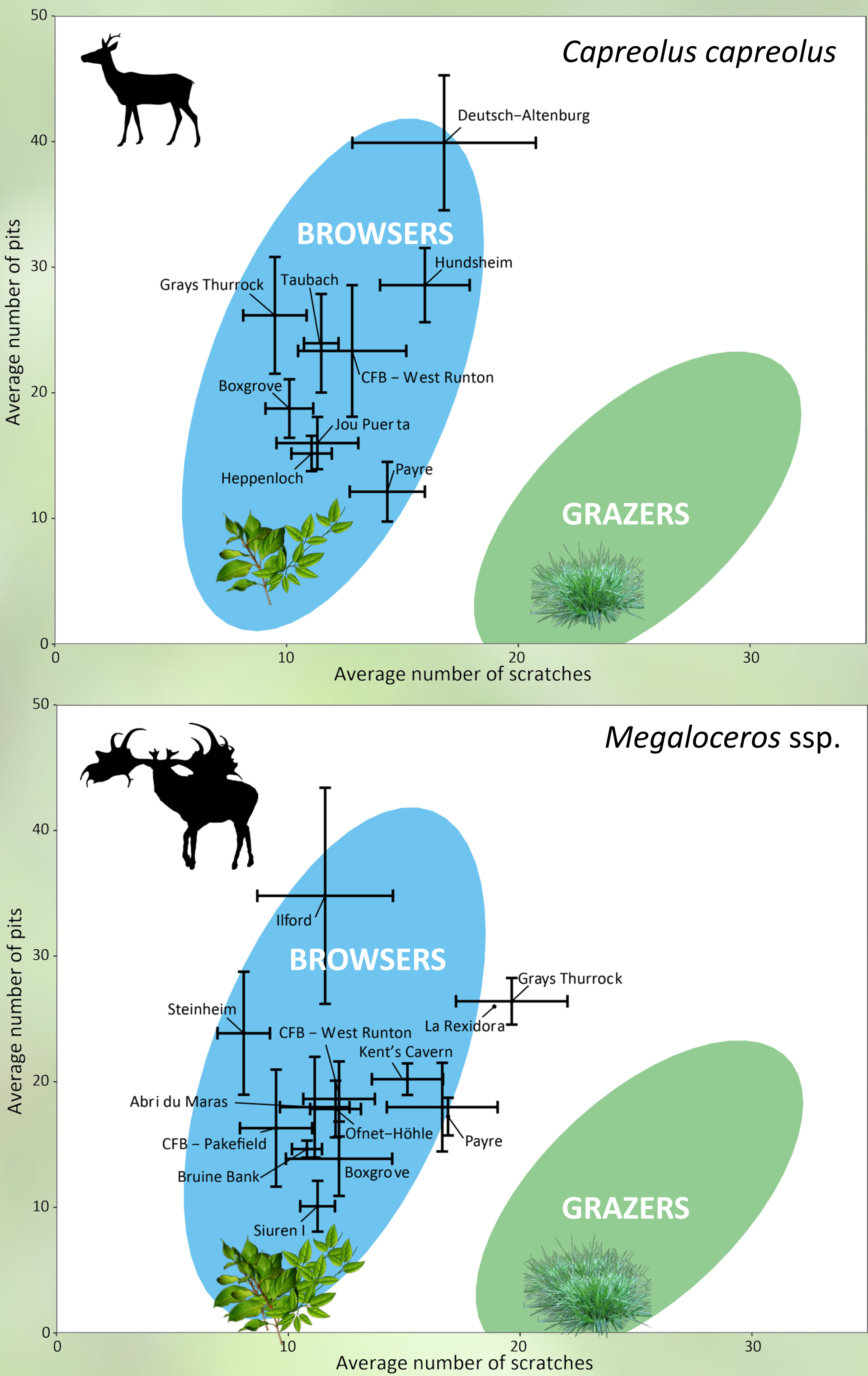
Dental mesowear and microwear analyses use data from worn tooth surfaces as proxies for feeding ecology. **Mesowear** is based on gross dental wear and provides a dietary signal integrated over several months at least. **Microwear** forms over days to weeks and provides an independent proxy that records relatively short-term diet. Combining mesowear and microwear permits robust inferences about the feeding ecology of extinct species. This combination provides a powerful tool for examining **dietary plasticity** and **resource partitioning** at different temporal scales.



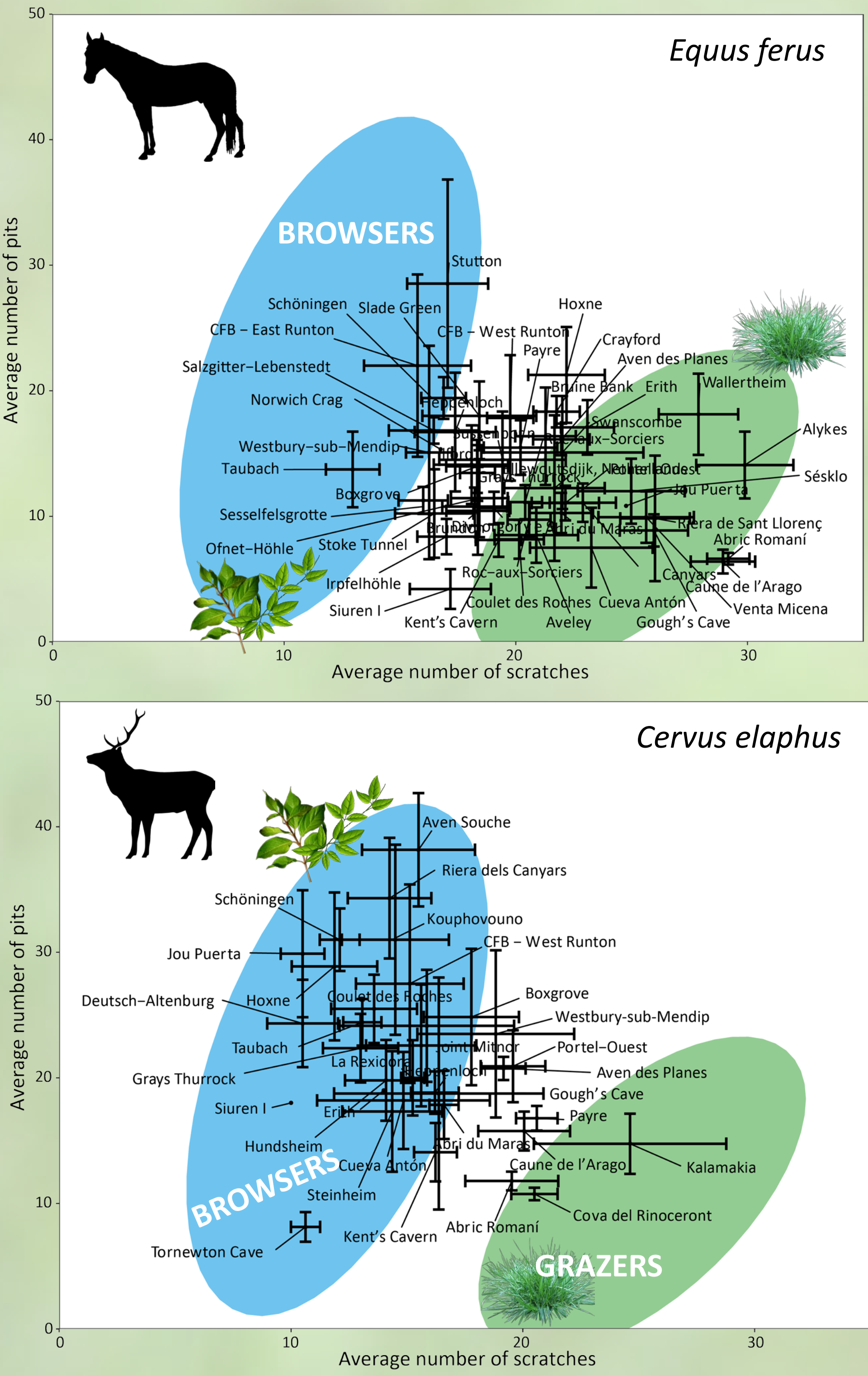
Dietary plasticity and resource partitioning will be discussed on selected archaeological and paleontological localities across Europe: Germany, Austria, Netherlands, UK, France, Spain and Greece.

Dietary plasticity in Pleistocene ungulates

Stenotopic species



Eurytopic species



Microwear permits to evaluate inter-population **dietary plasticity** among ungulates from different localities across Europe:

The results show a clear contrast between:

- **Stenotopic** species, e.g. *Capreolus capreolus* and *Megaloceros* spp., always browsing, or *Coelodonta antiquitatis*, always grazing

and

- **Eurytopic** species, e.g. *Equus ferus* or *Cervus elaphus* with dietary traits ranging from leaf browsing to grazing.

Niche partitioning among ungulates in selected localities

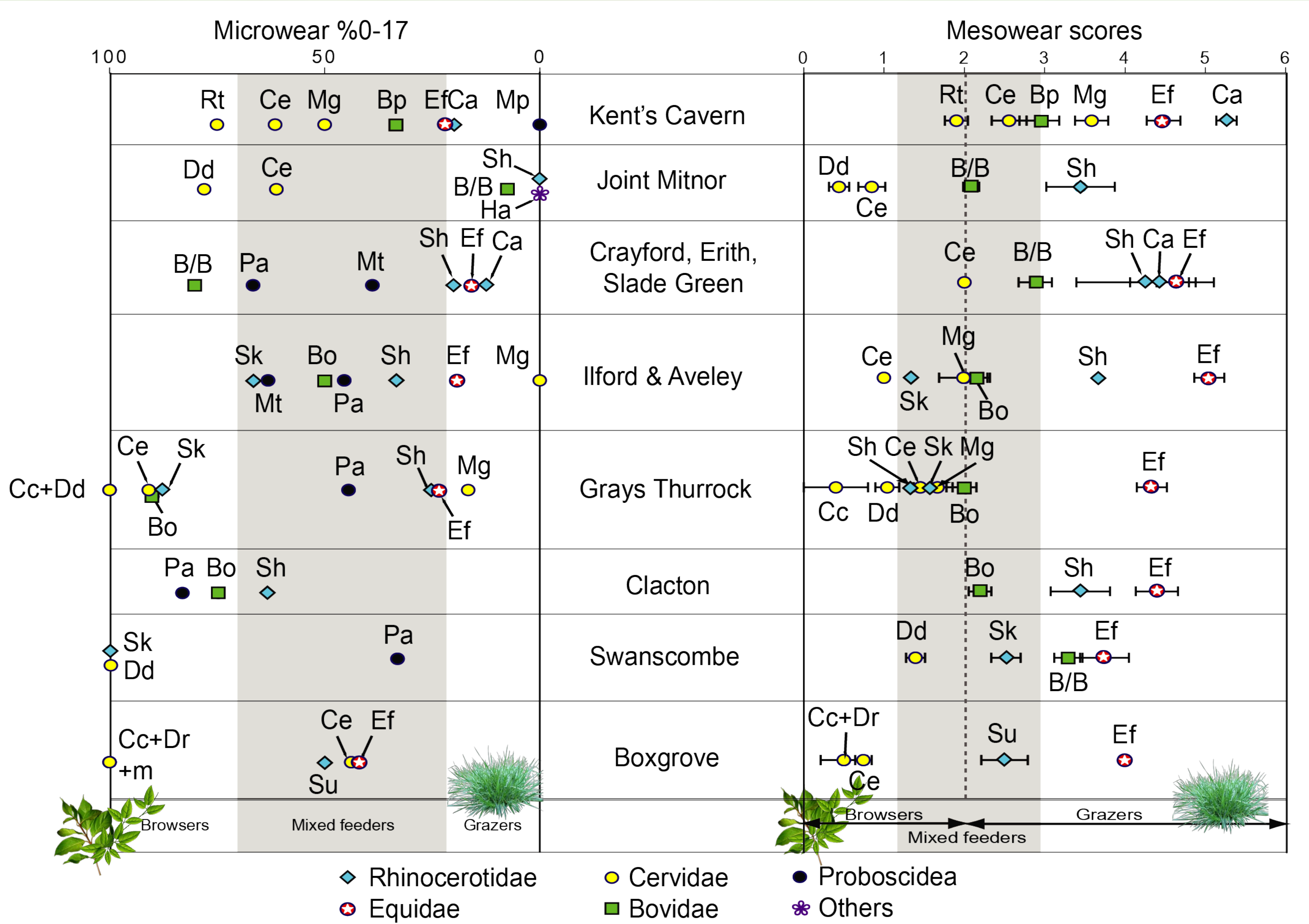
The comparison of the micro- and mesowear signals permits to evaluate the dietary traits of the same population at different temporal scales.

For the stenotopic species, like *Capreolus capreolus* and *Dama dama*, the two proxies tend to match.

For other species, however, there is sometime discrepancy between meso- and microwear signals that is clearly informative about the diet at the time of death. This is the case for the eurytopic species like *Cervus elaphus* or some of the *Stephanorhinus* species. The discrepancy is not systematic in direction, e.g. *M. giganteus* shows a more grazing signal in mesowear than microwear at Kent's Cavern (MIS 3), but a more browsing signal in mesowear than microwear at Ilford and Aveley (MIS 7) and Grays Thurrock (MIS 9). The differences can be extreme, e.g. *Stephanorhinus kirchbergensis* at Swanscombe shows graze-dominated mixed-feeding in mesowear but 100% browsing in microwear.

Conclusion

The combination of mesowear and microwear provides a powerful tool for examining dietary flexibility and resource partitioning at different temporal scales. Mesowear provides a dietary signal integrated over several months at least, and allows us to contrast more eurytopic to more stenotopic species. These two proxies also permit to detect broad dietary shifts in the faunas a whole are also evident between climatic phases, and result from both species turnover and dietary shifts in flexible species common to the sites.



Low scratch percentages (%0-17), mesowear scores (MWS), and dietary changes for all taxa in selected localities. Abbreviations: B/B = *Bos/Bison*; Bo = *Bos primigenius*; Bp = *Bison priscus*; Ca = *Coelodonta antiquitatis*; Cc = *Capreolus capreolus*; Ce = *Cervus elaphus*; Dd = *Dama dama*; Dr = *D. roberti*; Ef = *Equus ferus*; m = megacerine sp.; Mg = *Megaloceros giganteus*; Mp = *Mammuthus primigenius*; Mt = *M. trogontherii*; Pa = *Palaeoloxodon antiquus*; Rt = *Rangifer tarandus*; Sh = *S. hemitoechus*; Sk = *S. kirchbergensis*; Su = *S. hunsheimensis*.

Acknowledgements

