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Commentary

Synanthropy of the Isturitz foxes during the Aurignacian is not proven: a reply to Hussain and Baumann (2025)

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We thank Hussain and Baumann (2025) for raising the interesting hypothesis of paleosynanthropy concerning the Isturitz foxes. However, considering the limited fox sample size isotopically studied in Isturitz (only six foxes with $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values; this is two samples per cultural period: Proto-Aurignacian, Intermediate Aurignacian, and Early Aurignacian) and the lack of isotopic data from small mammals and large carnivores (fox competitors such as wolf, dhole, hyena, etc.), we consider that it is premature to propose the paleosynanthropy argument for the following reasons.

First, in our study, we did not overlook significant isotopic variations. There is some interindividual variability, which is expected for an opportunistic species characterized by high ecological plasticity (see reviews by Soe et al., 2017; Castañeda et al., 2022). It is also necessary to recall that the two foxes from the Intermediate Aurignacian period of Isturitz probably had different geographical origins, as supported by our $\delta^{34}\text{S}$ values. Thus, we do not think that the authors can propose a significant change between periods as their argument is being proposed based on these limited data.

Second, foxes are omnivorous animals that typically hunt alone for prey no larger than a rabbit. Throughout Europe, rodents are the primary food source for foxes, followed by plants,

invertebrates, birds, lagomorphs, reptiles, and amphibians (Soe et al., 2017; Castañeda et al., 2022). Of course, we cannot rule out some scavenging on ungulate prey that humans hunted. However, the taphonomic analysis achieved by one of us (Soulier, 2013) reveals that only about <1.5% of the ungulate bones exhibit gnawing marks. Therefore, proposing that horse or bison constituted a fundamental part of the Isturitz foxes' diet and, therefore, revealing human-oriented commensalism cannot be fully supported by the current archaeozoological record.

Third, in our recent work (Vidal-Cordasco and Marín-Arroyo, 2025), we observed fluctuations in the number of positive and negative associations between sympatric species throughout MIS3 (approximately 55–30 k cal BP), accompanied by transformations in the co-occurrence patterns between carnivores, including humans (Neanderthals and *Homo sapiens*). The species with the highest number of co-occurrences with other secondary consumer species is *Canis lupus*, followed by *Vulpes vulpes* and *Crocuta crocuta*. All species underwent notable contractions in their habitat preference between 45 and 35 kyr BP. However, with the current Isturitz data presented in Berlioz et al. (2025), the changes in fox-human co-occurrence cannot be confirmed.

Hussain and Baumann propose a mobility shift, noting a stronger emphasis on residential moves in the Proto-Aurignacian, which transitions to a more logistical landscape use. While possible shifts in hunting methods are observed in the lithic (Normand, 2017) and macrofaunal assemblages, these have been interpreted as related to the season of capture and prey behavior (Soulier, 2013) as the carcass transport of ungulates remains relatively stable over time. This is supported by our sulfur isotopic data, which show remarkable homogeneity of values among the ungulates, revealing relative stability in the hunting areas over time. Together with other archaeological evidence, some paleo-economic and symbolic changes (White, 2007; Soulier, 2013; White and Normand, 2015) are visible in Isturitz during the Aurignacian occupations. However, with the available evidence, it

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is too early to propose an incipient form of synanthropy or commensalism.

In conclusion, we appreciate the interest of Hussain and Baumann in our work and find their hypothesis interesting. However, given the currently available data, we do not feel that further interpretation of the points outlined in our explanation is warranted.

Declaration of competing interest

All authors declare that they have contributed to this submission, and they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Author contributions

Emilie Berlioz: Writing – review & editing, Validation, Software, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation. **Monica Fernández-García:** Writing – review & editing, Validation, Software, Methodology, Investigation, Formal analysis. **Marie-Cecile Soulier:** Writing – review & editing,

Resources. **Lucia Agudo-Pérez:** Resources, Methodology, Formal analysis. **Gabriela Amorós:** Formal analysis. **Christian Normand:** Writing – review & editing, Resources, Investigation. **Ana B. Marín-Arroyo:** Writing – original draft, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

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