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New human fossil remains and contextual information about the Sima I of the Polvorín cave (Karrantza, Biscay, Northern Iberian Peninsula)

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The first stages of the evolution of the Neandertal lineage are still not well understood, thus, multiple models have been proposed [1]. The c. 430 ka fossil record from the Sima de los Huesos (SH) site provides the first clear evidence of the Neandertal lineage, but it does not present the full suite of Neandertal-derived features [2-3]. Otherwise, the MIS 12-7 human fossil record is relatively scarce, especially in postcranial remains, and the tempo and mode of evolution is unknown for certain anatomical features present in “classic” Neandertals but not yet present in SH.

We recently identified human fossil remains among the faunal record from the Sima I of El Polvorín cave extracted by speleologists in 1983 and 2000. We have also found more human fossils during our own excavations in 2021. The human remains show Neandertal-like features, though some (e.g., the radial tuberosity orientation) are primitive, similar to SH [4]. They were found mixed with faunal bones, mostly composed by cave bears (*Ursus spelaeus*) and spotted hyaenas in a sediment in a secondary position. The hyaena remains show morphometric affinities with the MIS 9-8 *Crocuta intermedia* from Lunel Viel [5] and a few bear remains show a morphology consistent with *U. deningeri*, which suggests a diachronic accumulation. The taphonomic analysis of the fossil remains from the old excavations rules out anthropogenic or carnivore activities as the cause of the bear accumulation at the site, but we are not certain yet whether it was the result of a natural trap or deaths occurred during hibernation.

The excavations in 2022 have yielded four additional human fossil remains: a cranial fragment that represents part of the right portion of a frontal bone (preserving the lateral supraorbital region, including the zygomatic process, the *trigonum supraorbitale*, the temporal line and the right lateral part of a relatively complete well-developed right frontal torus), a partial right scapula that preserves the glenoid cavity, a nearly complete coracoid process, and part of the axillary border, the sternal end of a lower rib, likely an 11th from the right side, and a complete intermediate hand phalanx. These new human remains do not replicate and are consistent (in terms of age-at-death and general size) with the fossil remains identified at the Arkeologi Museoa and recovered at the site in 2021. The preliminary observations on the frontal bone and the radius suggest that the Polvorín-Sima I individual is gracile similar to La Ferrassie 2, La Quina H5 and Cranium 7 from SH.

The 2022 excavations revealed the presence of in situ faunal fossils, composed by cave bears and hyaenas. One bear and one hyaena remains were directly dated using AMS radiocarbon and an ultrafiltration protocol, yielding results between 37485 and 34539 cal BP. These remains are located on the most recent layer of a complex sedimentary sequence that alternates siliciclastic sediments with speleothem formation, in which different fossil accumulations have been observed. Our working hypothesis is that the recovered human fossil remains likely derive from the partially dismantled lower layers of these sequence, which have been mixed with more recent sediments. This adds to previous observations of the general geology of the gallery that contains the paleontological site, with different phases of infilling and erosion, with perched sediment remnants (with fossil remains) at different heights of the gallery. In parallel, we have recovered several stalagmites that show a chronological record that spans MIS5-3 and that will help to contextualize climatically, at least, the Late Pleistocene fossil record from this site.

In summary, despite its geological complexity, the Sima I from El Polvorín cave is providing an interesting human fossil assemblage to delve into the Neandertal evolution and the Middle and Late Pleistocene paleoecology of the Northern Iberian Peninsula.

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