

3D models related to the publication: "A human skeleton from Última Esperanza, South-West Patagonia, Chile: Osteobiography, morphometric, and genetic analysis"

Thomas Schmelzle^{1*}, Gabriel Aguirre-Fernández¹, Lumila Menéndez^{2,3}

¹Department of Paleontology, University of Zurich, Switzerland

²Department of Evolutionary Biology, University of Vienna, Austria

³School of Anthropology, University of Costa Rica, Costa Rica

*Corresponding author: lumilam@gmail.com

Abstract

The present 3D Dataset contains the models analyzed in the publication: Menéndez L, Rios C, Acosta Morano C, Novellino P, Schmelzle T, Aguirre-Fernández G, Breidenstein A, Barquera R, Schuenemann VJ, Stafford TW, Sánchez-Villagra M, Barbieri C. (2025). A human skeleton from Última Esperanza, South-West Patagonia, Chile: Osteobiography, morphometric, and genetic analysis. The models include the skull, femur, and the segmented left and right inner ears of a late Holocene human skeleton from southern Patagonia. In the associated paper, we present the radiocarbon dating, an osteobiography profile evaluating some aspects of the life history of this individual, as well as genetic and morphometric analysis assessing biological relatedness to other individuals and populations.

Keywords: *Homo sapiens*, South America, bony labyrinth, skull, femur

Submitted: 10/12/2024, published online: 03/06/2025. <https://doi.org/10.18563/journal.m3.262>

INTRODUCTION

Despite the fruitful past and ongoing investigations, there are only a few ancient human skeletons found in southern Patagonia. They usually occur isolated or in multiple burials of a few individuals (Politis & Borrero, 2024). The *Provincia of Ultima Esperanza* (In English: Province of the Last Hope) in Southern Patagonia, Chile, has received special interest since the end of the 19th century, as it offered compelling paleontological and archaeological evidence from the late Pleistocene to late Holocene, although it was visited sporadically during the early and middle Holocene (Borrero & Martin, 2018). The signal for human presence intensified in the late Holocene (Perez et al., 2016). However, the archaeological sites with ancient human skeletons are rather scarce, and the human skeletons that have been found so far are mostly fragmentary. They come from the sites Cueva Chica and Cueva del Milodón and are dated to the late Holocene (Moraga et al., 2009; Borrero & Martin, 2018). The human remains studied here come from what is known today as Mylodon Cave (Figure 1). They were recovered from clandestine diggings that were conducted at the beginning of the 20th century, when the material recovered in the cave was sold in Punta Arenas (Martinic, 1996; Borrero & Martin, 2012). The biologist Theophil Studer (1845-1922) published what is probably the only article so far mentioning this human skeleton (Studer, 1905), in which he presents the human remains together with animal bones and animal soft tissue. In his work, Studer mentions that the skeleton was acquired in Punta Arenas by the sons of Mr. Piaget, who was then a federal official in Bern, and gave it to him as part of a South American collection of "bones, pieces of skin and horn claws". He sold the collection to what was then the Federal Polytechnic School in Zurich (today,

Inv nr.

PIMUZ A/V 4612

PIMUZ A/V 4612-a

PIMUZ A/V 4612-b

PIMUZ A/V 4613

Description

cranium

left inner ear

right inner ear

femur

Table 1. Summary of the 3D models presented here and their associated information. All 3D models are shared as PLY files.

the Swiss Federal Institute of Technology in Zurich). Later, they were transferred to the Zoology Museum of the University of Zurich, part of which became the Palaeontological Institute and Museum. The specimen is currently in the collections of the Department of Palaeontology of the University of Zurich (Switzerland).

METHODS

The individual studied here is represented by a skull and the left femur in good conditions of completeness and preservation (Figure 2a-c). It has been assessed as a female old adult (>50 years) that presents an unintentional artificial cranial modification and has been dated to the late Holocene. It presents no evidence of pathological or traumatic lesions (Menéndez et al., under review). The skull and femur (Figure 2a-c) were surfaced scanned by one of us (GAF) using an Artec Space Spider scanner. The acquisition and postprocessing was performed using the software Artec Studio 17. The skull was micro-CT-scanned during a single scanning session using the high-resolution computer tomography Nikon X TH 2255T, at the Departments of Paleontology and Anthropology of the University of Zurich. We used the same protocol than in a previous study, in which we studied an ancient human skull from the Argentinean Pampas

(Menéndez et al., 2023a, 2023b): voxel size 12 µm, Xray kV 180, Xray 298 µa, and copper filter with a thickness of 1 mm was used. The inner ear 3D surfaces presented here were created by employing the segmentation threshold selection tool in AVIZO 9.2 (FEI), in such a way that every 10th section was semi-automatically marked. The intermediate sections were then generated by Biomedisa. The actual 3D reconstruction was again generated by using Avizo (Figure 3), and Geomagic (2017.0.1.19; Lösel et al., 2020). The segmentation was performed by TS and supervised by LPM. All the 3D surface models are provided in ply format (Table 1) and can therefore be opened with a wide range of freeware for conducting further analysis.

ACKNOWLEDGEMENTS

We would like to thank Jorge D. Carrillo Briceño for CT-scanning of the human skull. This project was possible thanks to the Grant Sponsor: SNF. Grant number: IZSTZ0 208545.

BIBLIOGRAPHY

- Borrero, L. A., Martin, F. M. 2012. Ground sloths and humans in southern Fuego-Patagonia: taphonomy and archaeology. *World Archaeology* 44(1), 102-117. <https://doi.org/10.1080/00438243.2012.646145>
- Borrero, L. A., Martin, F. M. 2018. Archaeological discontinuity in Ultima Esperanza: A supra-regional overview. *Quaternary International* 473, 290-305. <https://doi.org/10.1016/j.quaint.2017.06.071>
- Lösel, P.D., van de Kamp, T., Jayme, A., Ershov, A., Faragó, T., Pichler, O., Tan Jerome, N., Aadepe, N., Bremer, S., Chilingaryan, S.A., Heethoff, M. 2020. Introducing Biomedisa as an open-source online platform for biomedical image segmentation. *Nature communications* 11(1), 5577. <https://doi.org/10.1038/s41467-020-19303-w>
- Martinic, M. 1996. La Cueva del Milodón (Última Esperanza, Patagonia chilena). Un siglo de descubrimientos y estudios referidos a la vida primitiva en el sur de América. *Journal de la Société des Américanistes* 82, 311-323.
- Menéndez, L.P., Barbieri, C., López Cruz, I.G., Schmelzle, T., Breidenstein, A., Barquera, R., Borzi, G., Schuenemann, V.J., Sánchez-Villagra, M.R. 2023a. On Roth's "human fossil" from Baradero, Buenos Aires Province, Argentina: morphological and genetic analysis. *Swiss Journal of Palaeontology* 142(1), 26. <https://doi.org/10.1186/s13358-023-00293-3>
- Menéndez, L. P., López Cruz, I. G., Schmelzle, T. 2023b. 3D model related to the publication: On Roth's "human fossil" from Baradero, Buenos Aires Province, Argentina: morphological and genetic analysis. *MorphoMuseum* 9(4), e202. <https://doi.org/10.18563/journal.m3.202>
- Menéndez, L., Rios, C., Acosta Morano, C., Novellino, P., Schmelzle, T., Breidenstein, A., Barquera, R., Schuenemann, V.J., Stafford, T.W., Sánchez-Villagra, M., Barbieri, C. 2025. A late Holocene human skeleton from Última Esperanza, South-West Patagonia, Chile. *Journal of Archaeological Science: Reports*. <https://doi.org/10.1016/j.jasrep.2025.105237>
- Moraga, M., Aspillaga, E., Mena, F. 2009. Search for founder mitochondrial lineages in Holocene human remains in Patagonia. *American Journal of Physical Anthropology* 48, 193.
- Perez, S. I., Postillone, M. B., Rindel, D., Gobbo, D., Gonzalez, P. N., Bernal, V. 2016. Peopling time, spatial occupation and demography of Late Pleistocene–Holocene human population from Patagonia. *Quaternary International* 425, 214-223. <https://doi.org/10.1016/j.quaint.2016.05.004>
- Politis, G.G., Borrero, L.A. 2024. *The archaeology of the Pampas and Patagonia*. Cambridge World Archaeology, Cambridge. <https://doi.org/10.1017/9780511993251>
- Studer, T. 1905. Ueber neue Funde von Grypotherium listai Amegh, in der Eberhardtshöhle von Ultima Esperanza. *Neue Denkschriften der allgemeinen schweizerischen Gesellschaft für die gesammten Naturwissenschaften* 40, 1–18.

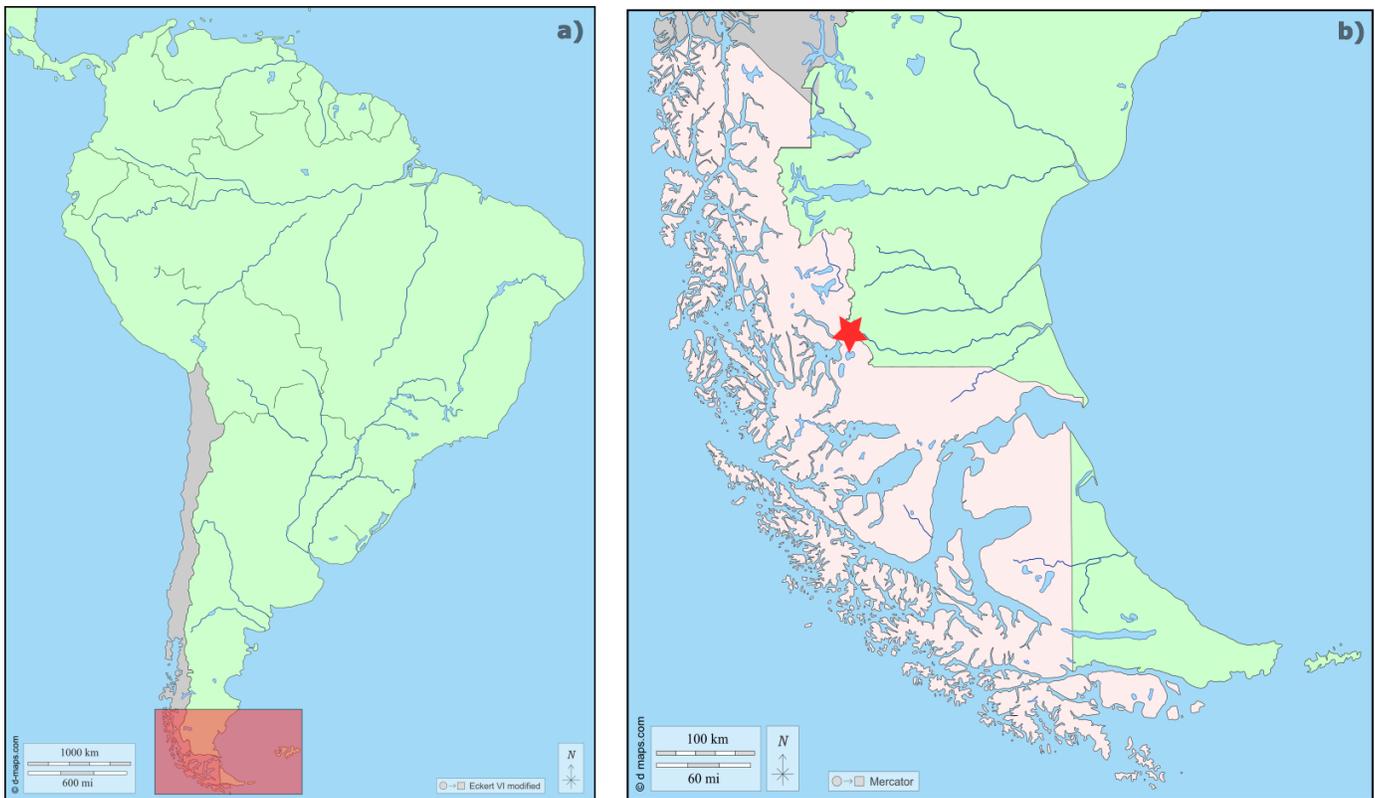


Figure 1. Map of South America (a) showing Chile (grey), and a detail of South Patagonia (red rectangle); Map of South Patagonia (b) showing the location of the region of Ultima Esperanza in South-West Patagonia (pink) and Mylodon Cave (red star).

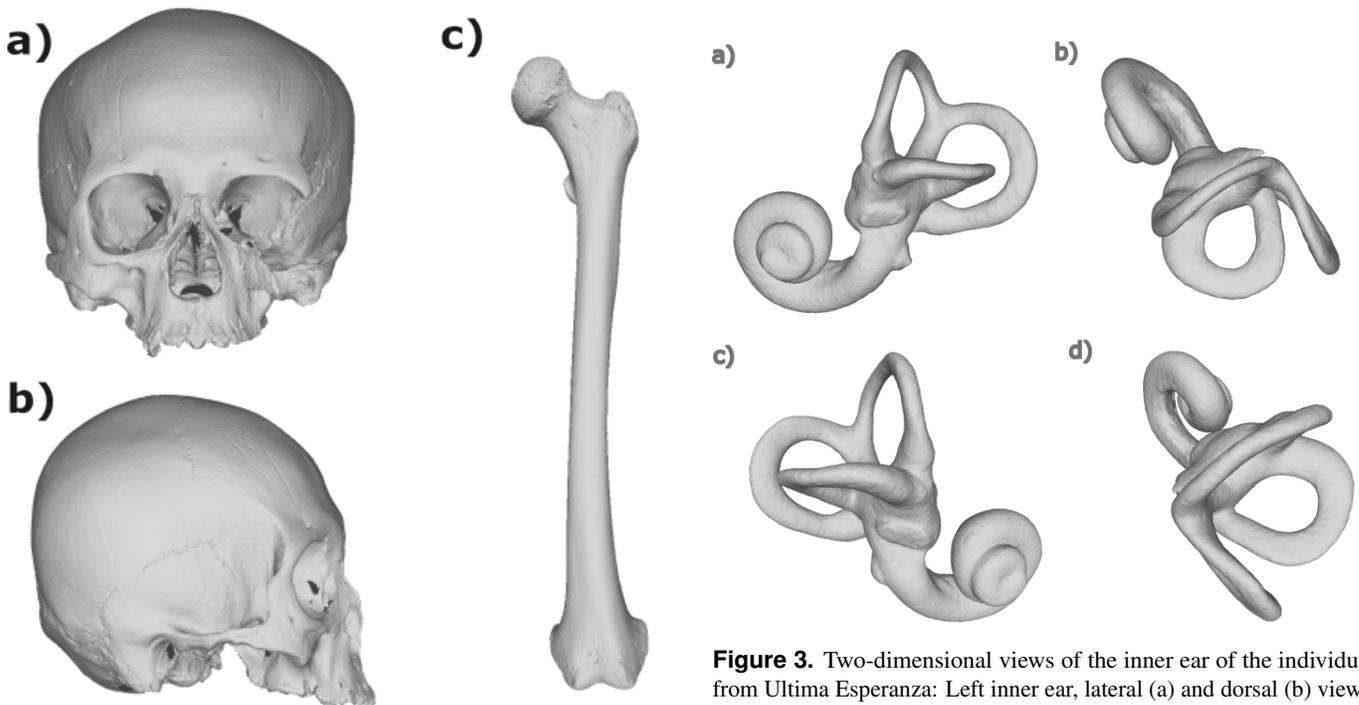


Figure 2. Two-dimensional views of the skull and femur. Anterior (a) and lateral (b) views of the skull and anterior view of the femur (c).

Figure 3. Two-dimensional views of the inner ear of the individual from Ultima Esperanza: Left inner ear, lateral (a) and dorsal (b) views; Right inner ear, lateral (c) and dorsal (d) views.