

# Upper Paleolithic human remains from the Gruta do Caldeirão, Tomar, Portugal

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**A B S T R A C T** The Upper Paleolithic human remains from the Solutrean and Solutrean to Magdalenian levels of the Gruta do Caldeirão, Tomar (Portugal) are described paleontologically. The remains, which include maxillary and mandibular pieces, associated and isolated teeth, and small postcranial elements, derive from a series of individuals between childhood and early adulthood. The teeth are relatively large, similar to those of earlier Upper Paleolithic Europeans, and the postcranial elements derive from a relatively small and gracile individual. All are notable for their lack of pathological alterations.

**R E S U M O** Descrevem-se paleontologicamente os restos humanos do Paleolítico Superior (Solutrense e Magdalenense) da Gruta do Caldeirão, Tomar (Portugal). Incluindo peças dos maxilares superior e inferior, dentes a elas associados e dentes isolados, e ainda alguns elementos pós-cranianos de pequenas dimensões, os restos pertencem a uma série de indivíduos de idades compreendidas entre a infância e os primeiros anos da idade adulta. Os dentes são relativamente grandes, comparáveis aos das restantes populações europeias do Paleolítico Superior inicial, e os elementos pós-cranianos pertencem a um indivíduo relativamente pequeno e grácil. É de realçar a ausência, em todos estes restos, de quaisquer alterações patológicas.

## Introduction

Upper Paleolithic human remains are relatively rare from Iberia south of the Pyrenees (Ferembach and Roche, 1971; Aguirre et al., 1991; Zilhão, 1997), and it is therefore of interest to describe in detail those remains that are known and have reasonably reliable stratigraphic contexts. With this in mind, we describe here a series of fragmentary human remains from the Gruta do Caldeirão, Tomar, Portugal. These facial, dental and upper limb remains derive from the Solutrean levels Fa to H of the Gruta do Caldeirão (Caldeirão 1 to 9) and from a Magdalenian level (Eb) in which some upwardly displaced Solutrean items have been found (Caldeirão 10 and 11). They provide additional data on these Upper Paleolithic populations of southwestern Iberia.

## Archeological Context and Age

Gruta do Caldeirão is a south-facing cave site located a few kilometers north of the city of Tomar (39° 38' 54" N; 8° 24' 54" W). It was excavated by one of us (JZ) between 1979 and 1988 (for details, cf. Zilhão 1992, 1997). This work was carried out mainly in two contiguous areas disposed at a 90° angle, the "corridor" and the "back chamber". The majority of the human remains were recovered in the latter, where bedrock was attained, in square P11, at a depth of >6m below the original surface of the deposits. Below a ca. 2,5 m thick Holocene sequence (levels A/B/C-Ea), these deposits comprised a Pleistocene sequence made up of three main blocks.

The basal block, levels L-Q, was very poor in archeological remains of the Middle Paleolithic, but contained abundant carnivore remains, particularly hyaena. Overlying level K was dated, at the top, from ca. 28 000 BP, and the paleoclimatic work based on the magnetic susceptibility of the sediments (Ellwood et al., 1998) agrees in suggesting that the sediments in levels L-Q accumulated during Oxygen Isotope Stage 3.

The intermediate block, levels Fa-K, is separated from those above and below by marked stratigraphic discontinuities. The same radiometric and magnetic susceptibility data suggest that the accumulation of the sediments comprising this block begins with the onset of Oxygen Isotope Stage 2. Level K is still Middle Paleolithic, overlying levels Jb and Ja date to the early Upper Paleolithic, and level I contains Lower Solutrean or Proto-Solutrean material. Levels Fa-H date from the Last Glacial Maximum and contain Middle and Upper Solutrean material, including the human remains discussed below. Table 1 lists the radiocarbon dates available for this part of the sequence.

Table 1. Radiocarbon dates for the Gruta do Caldeirão levels Eb-H.

<i>Layer</i>	<i>Industry</i>	<i>Lab N°</i>	<i>Sample</i>	<i>Age BP</i>
H	Solutrean	OxA-2511	Rib of a large ungulate	20 530 ± 270
H	Solutrean	OxA-1939	Naviculo-cuboid of an ibex	19 900 ± 260
Fc	Solutrean	OxA-2510	Metatarsal of a red deer	18 840 ± 200
Fa	Solutrean	OxA-1938	Metatarsal of a red deer	20 400 ± 270
Fa	Solutrean	ICEN-295	Charcoal	21 200/-1800/+2300
Eb+Fa	Magdalenian+Solutrean	ICEN-71	Bone (including rabbits)	15 170 ± 740
Eb (base)	Magdalenian	ICEN-70	Bone (including rabbits)	14 450 ± 890
Eb (top)	Magdalenian	ICEN-72	Bone (including rabbits)	10 700 ± 380

By comparison with previous times, the Solutrean occupation of the cave was much more intensive, leaving behind thousands of lithic and bone artifacts as well as faunal remains clearly accumulated by humans, not carnivores. No seasonality studies are available yet, but given its small size, it has been suggested that the cave functioned as a logistical site in the framework of hunting parties; alternatively, the remains of children and juveniles presented in this paper could also suggest that it was used as a periodic shelter for family groups during episodes of band dispersal (Zilhão, 1997).

Level Eb capped the Pleistocene sequence. A major hiatus separated it from level Fa, and, as a consequence, significant biodisturbance by burrowing animals (notably badgers) of the underlying Solutrean deposits occurred at this time, particularly in the corridor area. Level Eb accumulated throughout the Magdalenian, between 16 000 and 10 000 BP. Another sedimentation hiatus followed and, as a result, this level represented the surface of the cave at the time it was again used by humans, in the early Neolithic: in the back chamber, Cardial burials were found intrusive in the Magdalenian deposits. These human remains were the object of a separate study (Jackes and Lubell, 1992) and were easy to distinguish from the Pleistocene bone material because of their quite distinctly lesser degree of fossilization.

## Materials and Methods

The Gruta do Caldeirão human remains are described using standard paleontological approaches and measurements (e.g., Bräuer, 1988). The dental crown morphology is scored in part using the Arizona State University Dental Anthropology System (ASUDAS) (Turner et al., 1991).

In order to assess the size and proportions of the remains, the dental and postcranial remains are compared, as possible, to European Upper Paleolithic and recent human remains. The former are divided into “Early Upper Paleolithic” (EUP) and “Late Upper Paleolithic” (LUP) samples, with the division between them being the last glacial maximum. The earlier Upper Paleolithic sample is mostly Gravettian, whereas the more recent one is principally Magdalenian in association. Sample sizes vary depending upon both preservation and the current detail of publication of these comparative samples. The data derive from primary paleontological descriptions or personal study of the original material. Since the majority of these remains from Caldeirão are Solutrean in age, they fall near the end of the EUP time span. Recent European (or Euroamerican) data are included for the dental metrics; the permanent tooth metrics are from Twiesselman and Brabant (1967), the deciduous dental metrics are for the Euroamerican males from Black (1978), and the hand metrics derive from Musgrave (1970). In the calculation of sample summary statistics, right and left sides (when available) were averaged to provide a value per individual prior to the computations.

## The Human Remains

The Gruta do Caldeirão Upper Paleolithic human remains are listed in Table 2. They consist of fragmentary pieces of a maxilla and a juvenile mandible (Caldeirão 1 and 2), six isolated teeth (Caldeirão 3 to 6, 10 and 11), a piece of a proximal radius (Caldeirão 7) and two complete hand bones (Caldeirão 8 and 9).

Table 2. Human remains from the Gruta do Caldeirão.

<i>Individual</i>	<i>Anatomical Portions</i>	<i>Level</i>	<i>Field Number</i>	<i>Discovery Date</i>
Caldeirão 1	Left maxilla with M <sup>2</sup> and M <sup>3</sup>	Fc	P12.sc665b	1986
Caldeirão 2	Left mandible with dm <sub>2</sub>	H	O12.84	1986
Caldeirão 3	Left I <sub>1</sub>	Fb	M14.sc505	1986
Caldeirão 4	Left I <sub>1</sub>	Fa	O13.sc345	1984
Caldeirão 5	Right I <sub>2</sub>	Fa	P13.sc251	1984
Caldeirão 6	Right I <sub>2</sub>	Fa	P13.sc259	1984
Caldeirão 7	Right proximal radius	Fb	P12.285	1984
Caldeirão 8	Left metacarpal 4	Fb	O12.57	1986
Caldeirão 9	Manual middle phalanx 2-4	Fb	P12.251	1984
Caldeirão 10	Right I <sup>2</sup>	Eb	L17.sc148	1985
Caldeirão 11	Right dm <sub>2</sub>	Eb	L17.sc146	1985

### Caldeirão 1

Caldeirão 1 (Fig. 1) consists of an encrusted left partial maxilla with 19,5 mm of the mid-palatine suture, 38,5 mm of the lingual alveolar border, the intervening palatal surface, the alveoli of P<sup>3</sup> to M<sup>3</sup> with the M<sup>2</sup> and M<sup>3</sup> in place, all of the maxillary sinus floor, and the nasal floor to the medial maxillary sinus wall. The anterior maxilla with the incisor and canine alveoli is absent, as are any portions of the maxilla above the sinus floor. Maximum preserved length is 40 mm; estimated measurements are in Table 3.

Table 3. Osteometrics of the Caldeirão 1 left maxilla.

Anterior molar (lingual M <sup>1/2</sup> ) palate breadth	(28,0)
Posterior molar palate breadth (lingual M <sup>3</sup> )	(33,0)
Anterior molar (buccal M <sup>1</sup> ) dental arcade breadth	(62,0)
Posterior molar (buccal M <sup>3</sup> ) dental arcade breadth	(55,0)
Maxillary sinus floor length (anteroposterior)	23,7
Maxillary sinus floor breadth (mediolateral)	17,5

All estimated maxillary breadths are twice the measurement from the midline to the left side. Measurements in millimeters.

The left M<sup>3</sup> is fully formed and completely preserved. It is in good condition with very minor enamel fracturing. The lingual two-thirds of the M<sup>2</sup> is preserved in its alveolus. The hypocone is complete, but only portions of the remaining cusps are preserved. No M<sup>2</sup> measurements are possible due to postmortem damage.

There is little of note morphologically on the portions of the maxilla that are preserved and accessible due to encrustation. The M<sup>3</sup> is a four-cusped tooth with a reduced metacone (ASUDAS grade 3). The hypocone is very reduced (ASUDAS grade 2) taking the form of a small cusp that does not reach the occlusal surface. The tooth exhibits a moderately developed mesial marginal ridge and a weakly expressed Carabelli's trait (ASUDAS grade 3). Buccally, the tooth

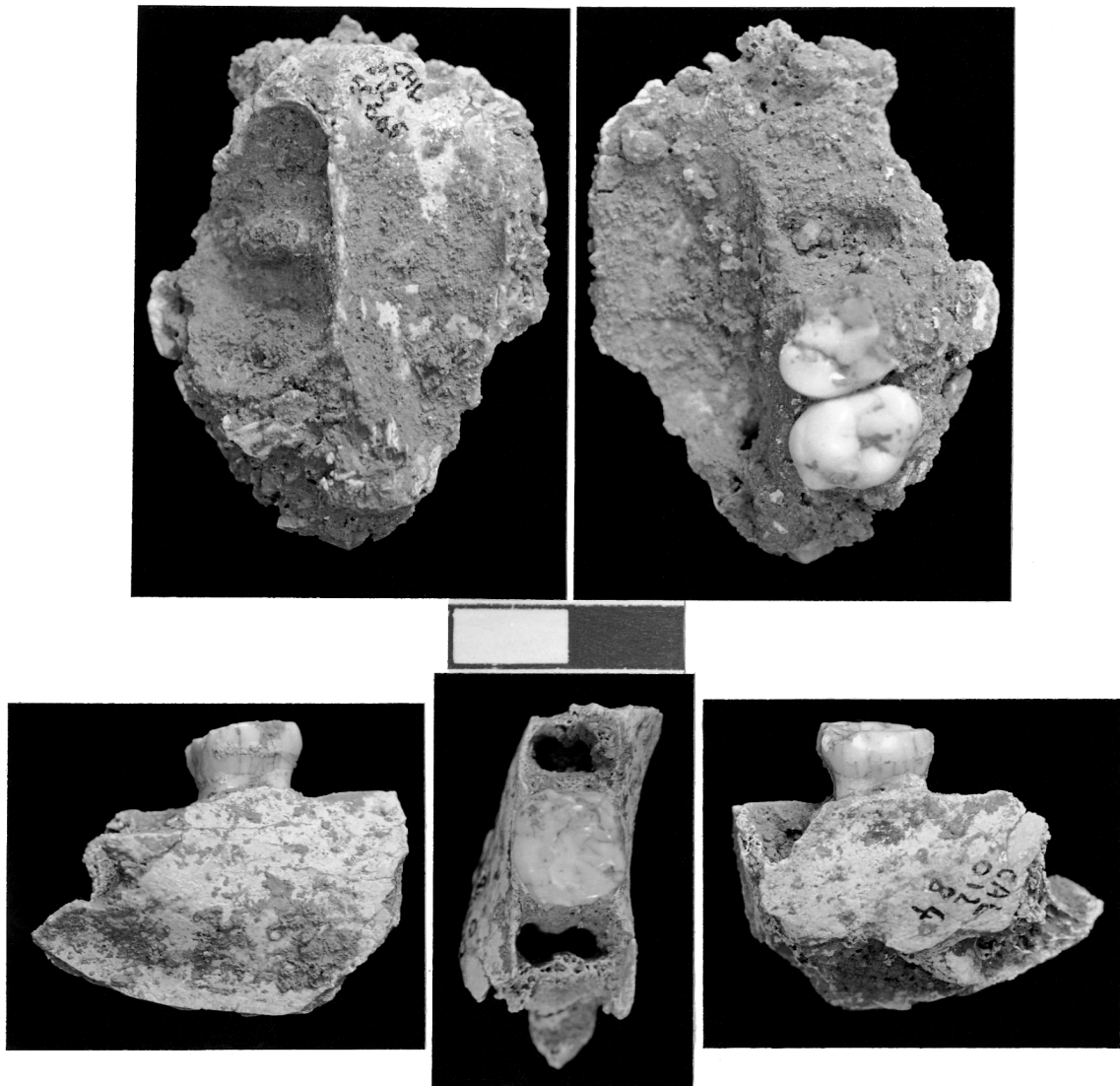


Fig 1 Caldeirão 1 and 2 maxilla and mandible. Above left: Caldeirão 1 in superior view; above right: Caldeirão 1 in occlusal view. Below left to right: Caldeirão 2 in medial, occlusal and lateral views. Scale in centimeters.

surface is featureless. The  $M^2$  is a four-cusped tooth with a well-developed hypocone (ASUDAS grade 4). Occlusally, a weak oblique ridge connecting the protocone and metacone (*crista obliqua*) is interrupted by the central interlobal groove. The buccolingual diameter of the  $M^3$  places it close to the means of both the EUP and the LUP comparative samples, above those of the recent European sample (Table 4).

The  $M^3$  is unworn and no developmental or degenerative pathological lesions are present. The hypocone of the  $M^2$  exhibits a large occlusal wear facet without dentin exposure; the other cusps also exhibit occlusal wear facets but without dentin exposure. It similarly has no pathological lesions.

Table 4. Dental metrics for the Caldeirão human teeth and comparative buccolingual diameters.

	<i>Tooth Diameter</i>	<i>Mesiodistal Diameter</i>	<i>Buccolingual Diameter</i>	<i>EUP BL Diameter</i>	<i>LUP BL Diameter</i>	<i>Recent European BL Diameter</i>
Caldeirão 1	M <sup>3</sup>	8,0	11,3	11,8 ± 1,2 (21)	11,3 ± 1,1 (13)	10,1 ± 0,9 (89)
Caldeirão 2	dm <sub>2</sub>	(10,5)	9,5	9,2 ± 0,7 (12)	9,0 ± 0,5 (19)	8,9 ± 0,4 (69)
Caldeirão 3	I <sub>1</sub>	—	(6,4)	6,3 ± 0,6 (22)	6,0 ± 0,8 (11)	6,0 ± 0,4 (102)
Caldeirão 5	I <sub>2</sub>	(6,0)	6,4	6,7 ± 0,5 (20)	6,4 ± 0,6 (14)	6,3 ± 0,4 (107)
Caldeirão 6	I <sub>2</sub>	6,1	6,5	6,7 ± 0,5 (20)	6,4 ± 0,6 (14)	6,3 ± 0,4 (107)
Caldeirão 11	dm <sub>2</sub>	11,1	9,6	9,2 ± 0,7 (12)	9,0 ± 0,5 (19)	8,9 ± 0,4 (69)

Measurements in millimeters. Mean ± standard deviation. Sample sizes are in parentheses.

### Caldeirão 2

The specimen (Fig. 1) preserves the alveolar half of the mandibular corpus from the distal C<sub>1</sub> socket to the middle of the distal M<sub>1</sub> socket, retaining the dm<sub>2</sub> in its alveolus. The root of the unerupted P<sub>4</sub> is exposed by the inferior break. The dm<sub>2</sub> is complete and in good condition with only small enamel fractures radiating up from the cervix. Maximum mandibular preserved length is 33,0 mm lingually and 26,0 mm buccally.

The degree to which the P<sub>4</sub> root is formed indicates that dm<sub>2</sub> was about to be lost. The socket for the tooth mesial of dm<sub>2</sub> (mesiodistal: 3,8 mm; buccolingual: 8,7 mm) conforms better to that of a P<sub>3</sub> than a dm<sub>1</sub>, indicating that the P<sub>3</sub> was already in full occlusion. Similarly, the preserved portion of the canine socket appears to be too large for the dc<sub>1</sub>, indicating that the C<sub>1</sub> was also almost certainly in occlusion. Since the dm<sub>2</sub> presents a clear distal interproximal facet, the M<sub>1</sub> had been in full occlusion for some time. Together these indicate that the Caldeirão 2 mandible derives from an individual about 10-12 years of age.

The mandibular corpus presents a prominent lateral eminence by M<sub>1</sub>. The corpus breadth at P<sub>3</sub> is 11,6 mm, at the dm<sub>2</sub>/M<sub>1</sub> is 13,0 mm, and at M<sub>1</sub> is 15,0 mm. A clear mental foramen is not apparent, but it is likely represented by a depression and a notch along the buccal break margin. This occurs 12,3 mm below the alveolar margin and under the mesial root of the dm<sub>2</sub>, a position that is relatively posterior for both Upper Paleolithic (18,2%, N = 11) and recent European (8,3%, N = 360) adolescents (Coqueugniot, 1999). The occlusal wear of the dm<sub>2</sub> obscures most of the tooth morphology; however, under 10x magnification, a Y-groove pattern can be observed. The buccolingual diameter of the dm<sub>2</sub> falls slightly above the means of the EUP and LUP samples, but within one standard deviation of each sample; it is nonetheless more than two standard deviations from the recent Euroamerican sample mean (Table 4).

Occlusally the dm<sub>2</sub> is moderately worn with dentin exposed on the distobuccal and dislingual cusps. Well developed interproximal facets (4,2 mm wide mesially and 5,9 mm wide distally) are present and result in a significant loss of the tooth surface. No pathological alterations are noted. A clear calculus line at mid-crown height is present lingually and buccally, but no alveolar resorption is present.

### Caldeirão 3

The partial crown and nearly complete root (the apex is not yet developed) of a left  $I_1$  are preserved (Fig. 2). Labially, the crown is sheared off obliquely from the occlusal edge to the cervix. Where broken, the tooth crown is darkly stained. The crown exhibits root etching in the form of fine fractures filled with a dark colored matrix. The state of development of the root suggests an age close to the time of eruption of the  $I_1$ , about seven years of age (Smith, 1991).

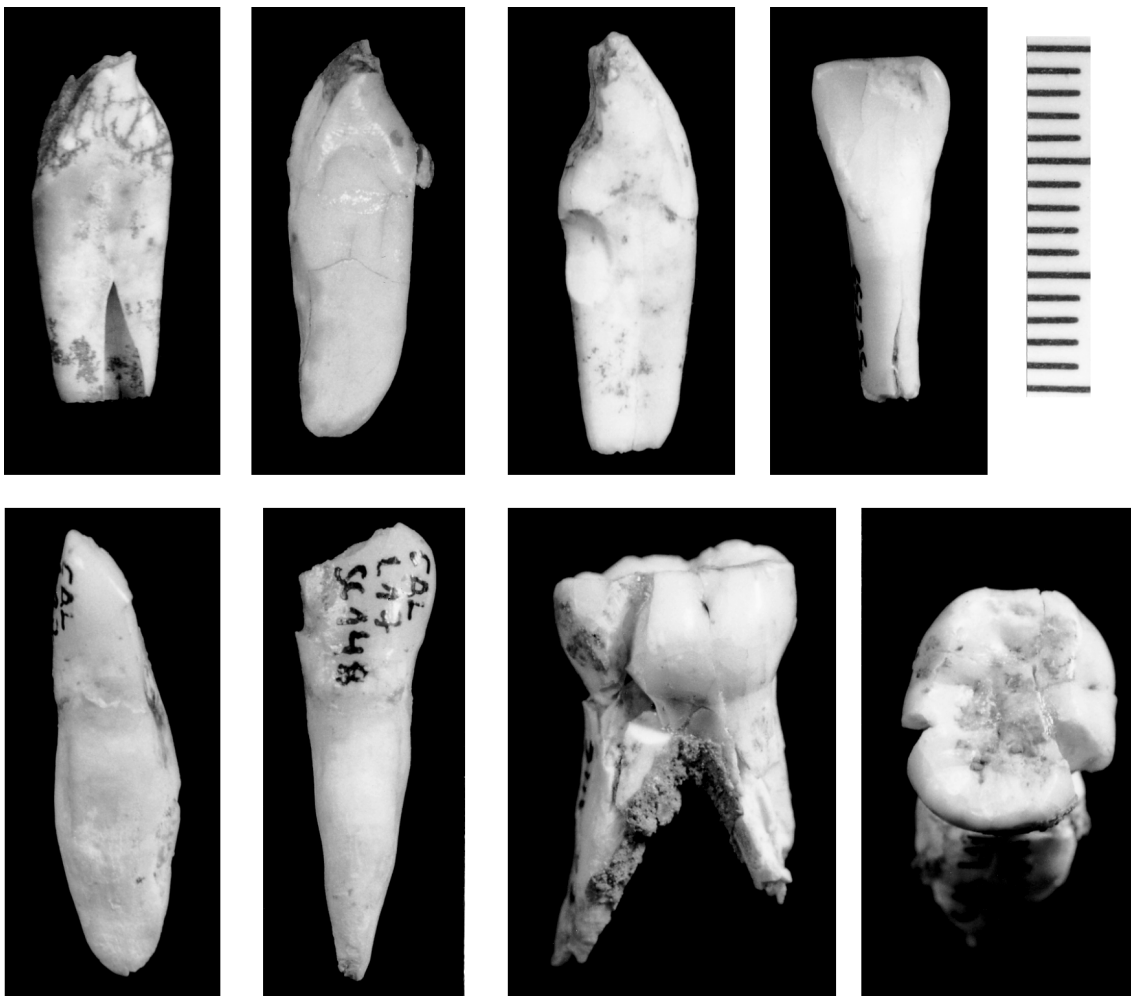


Fig 2 Caldeirão isolated teeth. Top row from left to right: Caldeirão 3 left  $I_1$  distal; Caldeirão 4 left  $I_1$  distal; Caldeirão 5 right  $I_2$  distal; Caldeirão 6 right  $I_2$  lingual. Bottom row left to right: Caldeirão 10 right  $I_2$  distal and labial; Caldeirão 11 right  $dm_2$  buccal and occlusal. Scale in millimeters.

Lingually, the tooth exhibits slight gingival swelling, but it is otherwise featureless. A wide and somewhat deep ( $\approx 1$  mm) developmental groove runs along the root. A small pulp chamber is exposed occlusally. The estimated labiolingual diameter of  $\approx 6,4$  mm is above the means of the comparative samples, but it remains within one standard deviation of each one (Table 4).

Wear cannot be assessed because of the pattern of breakage. No lesions are present on what is preserved of the crown.

#### Caldeirão 4

The complete root and a partial crown of a left I<sub>1</sub> are preserved (Fig. 2). The labial surface of the crown was sheared off from the incisal edge to the cervix leaving only the inferior half of the lingual surface. The tooth is brittle and not well preserved. A sagittal fracture runs along the root and inferior portion of the crown. The root is bleached above the apical end.

The only observable portion of the crown is the lingual surface, which is featureless. The root is small and thin. The preservation does not permit metric comparisons. The lingual surface is worn smooth. Wear cannot be recorded for the incisal edge because of damage to the tooth crown. No lesions were noted.

#### Caldeirão 5

The nearly complete crown and root of a right I<sub>2</sub> are preserved (Fig. 2). The crown is chipped occlusally, and it is missing its distal corner. The root apex had not yet formed. In addition, a distolingual piece (measuring 4,0 x 2,4 mm) of the root is missing just below the cervix. The state of development of the root indicates an age at or just prior to the time of eruption of the tooth, approximately eight years of age (Smith, 1991).

The labial and lingual crown surfaces are featureless. The labiolingual diameter of 6,4 mm is modest for an Upper Paleolithic I<sub>2</sub> but well within the ranges of variation of the comparative samples (Table 4).

There is minimal wear present on the portion of the incisal edge that is preserved. There is no evidence of developmental or other lesions on the tooth.

#### Caldeirão 6

The nearly complete crown and partial root (≈6 mm) of a right I<sub>2</sub> are preserved (Fig. 2). Post-mortem damage has resulted in the loss of the apical half of the root. The tooth crown is in good condition. It has a small sagittal fracture and a small chip along the distolingual occlusal edge.

The labial and lingual surfaces are featureless. Its labiolingual diameter of 6,5 mm is on the LUP mean but well within the range of variation of the EUP and recent samples (Table 4). The occlusal surface is only slightly worn with a thin line of exposed dentine. No pathological lesions were noted.

#### Caldeirão 7

The bone preserves the proximal end of a right radius, with the medial three-fifths of the head lacking the lateral ulnar surface plus the lateral one-third to one-half of the neck to the proximal end of the tuberosity (Fig. 3). The preserved length is 30 mm. The side is based on the shape of the neck, which projects anteromedially for the tuberosity at the distal break.

The bone presents little of morphological interest; osteometrics are in Table 5. The only proportion that can be estimated, its relative neck versus head diameters (index of neck to head antero-posterior diameters: 51,6), places it towards the lower end of an EUP range of variation



( $60,1 \pm 6,3$ ,  $N = 7$ ) and below those of two LUP specimens (55,9 and 59,2). Its overall size, as indicated by its head diameter (21,3 mm), is moderately small (EUP:  $23,1 \pm 1,6$  mm,  $N = 12$ ; LUP: 23,6 and 21,1), similar to those of female specimens such as La Madeleine 1, Pataud 230, and Předmostí 4.

Table 5. Osteometrics of the Caldeirão 7 proximal right radius.

Head anteroposterior diameter	21,3
Neck anteroposterior diameter	(11,0)
Proximal ulnar facet proximodistal diameter	9,0
Capitular fossa depth	2,2

Measurements in millimeters.



Fig 3 Caldeirão 7 to 9 postcrania. Top: Caldeirão 7 right proximal radius in lateral view. Middle left to right: Caldeirão 8 left metacarpal 4 in radial, palmar and ulnar views. Bottom left to right: Caldeirão 9 middle hand phalanx in right lateral, palmar and left lateral views. Scale in centimeters.

### Caldeirão 8

Caldeirão 8 is a complete and undamaged mature left fourth metacarpal bone (Fig. 3). There are no pathological alterations of the bone, and no postmortem damage. Osteometrics are in Table 6.

The diaphysis is smooth, especially dorsally with slight indications of the interosseus lines palmarly, especially proximally. The hamate facet is on the radial side of the base only, as is indicated by its breadth of only half of the epiphyseal breadth. The hamate facet rounds onto the metacarpal 3 facet, especially dorsally. There is a distinct and separate metacarpal 5 facet on the dorsal ulnar side of the base. The whole proximal epiphysis is strongly turned radially, as is indicated by its horizontal angle of 17°. The head is largely symmetrical, being only slightly larger on the radiopalmar side. There are smooth but projecting dorsal tubercles, across which the distal maximum breadth is measured.

As an assessment of diaphyseal hypertrophy, an index of robusticity (shaft height x shaft breadth)<sup>1/2</sup>/articular length) was computed (Caldeirão 8: 12,2). This value is in the middle of the range of variation of a small EUP sample (12,3 ± 1,0, N = 6), all of which are similar to a recent European sample (12,6 ± 1,1, N = 38). The overall length of the bone is modest, being similar to those of female specimens such as Dolní Věstonice 3, Pataud 227 and Předmostí 9.

Table 6. Osteometrics of the Caldeirão 8 and 9 manual remains.

	<i>Caldeirão 8 Metacarpal 4</i>	<i>Caldeirão 9 Middle Phalanx 2-4</i>
Maximum length	54,4	27,1
Articular length	53,9	25,0
Midshaft height	7,4	5,0
Midshaft breadth	5,8	8,1
Proximal maximum height	11,8	9,3
Proximal maximum breadth	11,0	14,0
Hamate facet height	10,9	7,3
Hamate facet breadth	5,5	12,1
Metacarpal 3 facet height	7,4	
Metacarpal 3 facet breadth	5,6	
Metacarpal 5 facet height	5,4	
Metacarpal 5 facet breadth	6,4	
Distal maximum height	12,7	(6,0)
Distal maximum breadth	12,5	10,1
Distal articular breadth	11,4	9,0
Horizontal angle	21° radial	1° (left)
Torsion angle	17°	4° dorsal 9° palmar

Measurements in millimeters and degrees.

### Caldeirão 9

Caldeirão 9 is a complete middle hand phalanx with trivial abrasion to the middle of the palmar base and a chip absent from the right dorsal base (Fig. 3). Side is indeterminant. Based on its general morphology, it is unlikely to be from the fifth digit, but it is difficult to assign it to a specific one of the middle three digits. Osteometrics are in Table 6.

The diaphysis has a clear palmar insertion for the tendon of the flexor digitorum superficialis muscle on the left side, with the rugosity up to 3,0 mm wide. There is almost no marking for the tendon on the right side. The base has symmetrical facets for the proximal phalangeal trochlea. The marginal tubercles for the collateral ligaments are prominent, projecting  $\approx 1,8$  mm on the right and  $\approx 1,0$  mm on the left. There is a clear dorsal proximal beak along the middle 7,0 mm of the base, but the surfaces adjacent to it remain smooth. The head is smooth, with a deeper trochlea on the right and more flaring of the trochlea on the left.

A similar robusticity index for the Caldeirão 9 phalanx (25,4), comparing it to a pooled sample of Upper Paleolithic second, third and fourth middle hand phalanges, places it close to the middle of an EUP sample ( $24,7 \pm 2,0$ , N = 13 bones, 7 individuals) and slightly above one LUP specimen (23,3). A recent European sample, however, provides similar values ( $25,0 \pm 3,0$ , N = 66 bones, 22 individuals). Its length is similar to those of the shorter fourth middle phalanges of the larger male EUP individuals but close to those of the second middle phalanges for the smaller female specimens. If this bone derives from the same individual(s) as Caldeirão 7 and/or 8, it is likely that it derives from second digit given the smaller dimensions of those bones.

### Caldeirão 10

The complete root and partial crown (labial surface with the distal occlusal corner of incisive edge) of a right I<sup>2</sup> are preserved (Fig. 2). The lingual surface of the crown has been sliced off obliquely from the occlusal surface to  $\approx 4$  mm past the cervix.

No morphology can be observed on the lingual surface, which is missing. The labial surface is featureless. The single root is short but otherwise unremarkable. Only minimal occlusal wear is observed on what is preserved of the crown. The root is abraded. No pathological lesions were noted on what is preserved of the crown and root.

### Caldeirão 11

The nearly complete crown and roots of a right dm<sub>2</sub> are preserved (Fig. 2). The crown is damaged, and the roots are dry and brittle. Distally, the crown is missing enamel from both buccal and lingual cusps. Postmortem damage has resulted in the mesial root missing its apical third and the distal root missing its apex. Most of the crown and root have been glued together from fragments. Small radiating fractures emanate from the cervix.

This is a five-cusped tooth with a medium-sized cusp 5 (ASUDAS grade 3). Buccally, the protoconid exhibits the combination of a buccal pit and 'V' shaped groove (ASUDAS grade 3 proto-stylid). Occlusally, the anterior fovea takes the form of a large pit (ASUDAS grade 1). It is bordered mesially by the mesial marginal ridge and distally by a crest connecting the protoconid and metaconid (the mid-trigonid crest). Lingually, the broken tooth exposes a small pulp chamber.

The buccolingual diameter of the tooth is moderately large, being above the means of all three comparative samples and between one and two standard deviations above the means of the two more recent samples (Table 4).

Occlusal wear is minimal and is limited to the buccal cusps, indicating the tooth had recently erupted. The presence of a mesial interproximal facet (breadth: 3,8 mm) but no distal interproximal facet indicates that  $M_1$  had not yet erupted. It therefore represents an individual between ca. 2 and 6 years of age, possibly toward the older end of that range given the size of the mesial interproximal facet. The pattern of wear indicates slow occlusal wear and faster interproximal wear. No pathological lesions were noted.

### **Number of Individuals Represented**

On the basis of developmental age and stratigraphic positioning, assuming that no post-depositional mixing of remains occurred between levels Fa to H, the Caldeirão human remains represent a series of individuals. These include one child (Caldeirão 11, Level Eb), two juveniles (Caldeirão 3 and 5, from Levels Fb and Fa), an early adolescent (Caldeirão 2, Level H), a young adult (Caldeirão 1, Level Fc), at least two juvenile or older individuals (Caldeirão 4, 6 and 10, Levels Fa and Eb), and at least one adolescent or older individual (Caldeirão 7 to 9, Level Fb). In this, it is possible that Caldeirão 4 and 6 derive from the same individual, given their derivation from the same level. Alternatively, Caldeirão 4 might be associated with Caldeirão 5, given the minimal wear on the former. The three postcranial elements could belong to the upper limbs of one adolescent or adult. They derive from the same level as the Caldeirão 3  $I_1$ , but the younger age of Caldeirão 3 indicates that the postcrania derive from a different individual or individuals.

### **Summary**

These fragmentary human remains from the Upper Paleolithic of the Gruta do Caldeirão provide additional data on the biology of these early modern human populations. The dental remains, although within the ranges of variation of both Upper Paleolithic and recent European samples, remain closer to the larger Upper Paleolithic dental remains. The postcranial remains (particularly the radius and metacarpal) indicate a relatively small and gracile individual. All of the remains are notable for their lack of pathological alterations. They derive from individuals between childhood and maturity, although (based on dental attrition) none of the mature remains are likely to be advanced in age.

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