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AT THE UPPER PALAEOLITHIC - MESOLITHIC BOUNDARY: REVISION OF THE HUMAN REMAINS FROM RIPARO FREDIAN (MOLAZZANA, LUCCA, ITALY)

Alessandro Riga^{1,2}, Irene Dori^{1,3}, Stéphanie Vierin¹, Giovanni Boschian⁴, Carlo Tozzi⁵,
John C. Willman^{6,7}, Jacopo Moggi-Cecchi¹⁻⁸

¹ Department of Biology, University of Florence, Firenze, Italy

² Laboratory of Archaeoanthropology, SABAP-FI, Scandicci (FI), Italy

³ Univ. Bordeaux, CNRS, MC, PACEA, Pessac, France

⁴ Department of Biology, University of Pisa, Pisa, Italy

⁵ Department of Civilisations and Forms of Knowledge, University of Pisa, Pisa, Italy

⁶ Institut Català de Paleoecologia Humana i Evolució Social (IPHES), Tarragona, Spain

⁷ Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Tarragona, Spain

⁸ Centre for Anthropological Research, University of Johannesburg, Auckland Park, Johannesburg, South Africa

Corresponding author: J. Moggi-Cecchi <jacopo.moggicecchi@unifi.it>

ABSTRACT: Pleistocene and early Holocene human fossils in Tuscany are very few and poorly described. Any new information is thus an important contribution to our knowledge of the peopling of this region. Here we present a revision of the human fossil remains from the Riparo Fredian, a site located in Garfagnana and first published by Boschian et al., (1995). The authors described the human remains of the site pointing out the presence of 39 isolated human teeth (19 maxillary and 20 mandibular) and “fragments of one adult humerus, of a child’s femur and of a youngster’s ulna”, considered as belonging to six individuals at least. A reanalysis of the human remains indicated that several specimens were incorrectly identified. It was thus deemed important to revise the identification of each fossil and their interpretation. The revision of human remains from Riparo Fredian has led to several changes in their anatomical identification with respect to the original publications. Of the 39 teeth previously described, the analysis revealed that two of them belonged to non-human animals, and 18 were mistakenly identified. A new, correct identification is provided for each of them. Also, two human teeth not described in the original papers have been identified. The anatomical identification of the post-cranial remains has been confirmed for two out of the three specimens. The minimum number of individuals, based on the dental remains, is confirmed as at least 5, but most probably 6, although with a different allocation of teeth to individual specimens. The age at death of the six individuals has also been reassessed, indicating the presence of two infants, two young adults and two mature adults.

Keywords: Riparo Fredian, Epipalaeolithic, Late Upper Palaeolithic

1. INTRODUCTION

In central Italy, the human fossil record from Pleistocene sites in Tuscany is very scanty, and it is limited to a few remains from three sites: Buca del Tasso, Vado all’Arancio and Riparo Fredian (Alciati et al., 2005). Thus, any new information on the fossils deriving from these sites is an important contribution to our knowledge of the peopling of this region. Here we present a revision of the human fossil remains from the Riparo Fredian site, first published by Boschian et al. (1995).

Riparo Fredian (Molazzana, Lucca, Italy) is a site located in Garfagnana, a geographic region in northern Tuscany delimited by the Apuan Alps on the west and the Apennines on the east. The Serchio is the main river of the valley and among its right tributaries is the Turrîte Secca creek, which rises on the Apuan Alps. Riparo Fredian is a rock shelter on the Turrîte Secca (Fig. 1). Among the numerous Late Upper Palaeolithic (LUP) and Mesolithic sites of the valley, it is the only one with

human remains. It is considered a low-altitude camp of the Palaeolithic and Mesolithic hunter-gatherers who occupied the Turrîte Secca valley when the climatic condition allowed for it (see below).

In a paper dedicated to the site, Boschian et al. (1995), alongside the geology, stratigraphy and lithic industries, described the human remains of the site pointing out the presence of 39 isolated human teeth (19 maxillary and 20 mandibular teeth) and “fragments of one adult humerus, of a child’s femur and of a youngster’s ulna” (p.66), which were described as belonging to six individuals at least. An initial reanalysis of the human remains (Vierin, 2013), indicated that several specimens were incorrectly identified; also, a recent paper (Oxilia et al., 2017) described the evidence for dental treatment in one of the specimens (individual 5) from the site. On this background, it was deemed important to revise the identification of each fossil and their interpretation, also in the light of the limited number of human fossils recovered from this time frame in Tuscany. The results of this

revision are presented below, together with illustrations of each specimen, not present in the original publications.

1.1 The peopling of the Serchio and Turríte Secca valleys

The upper and middle Serchio and the Turríte Secca valleys have been subject of intense archaeological surveys since from the 1970s, which have led to the discovery of numerous prehistoric settlements, attributed mainly to Late Upper Palaeolithic (LUP), Mesolithic and Metal ages (Notini, 1973; Castelletti & Cremaschi, 1975; Tozzi, 1980; Biagi et al., 1981; Notini, 1983; Guidi & Rossi, 1984; Guidi et al., 1985; Boschian et al., 1995).

The first evidence of human presence in this area are a few surface findings of levallois tools suggesting a sporadic occupation during the Middle Palaeolithic, and a single tool doubtfully assigned to an early phase of Upper Palaeolithic (Notini, 1973). During the last pleniglacial, climatic conditions prevented human presence in the area, due to the expansion of the glaciers on the Apuan Alps and Apennines, which reached very low altitudes down the valleys (Castelletti et al., 1994; Boschian et al., 1995). In the Turríte Secca valley, the glacier of Mount Altissimo had his frontal moraine at Campagrina, a few kilometres from Riparo Fredian (Masini, 1949; Boschian et al., 1995); long ice tongues descended in the valley from Mount Corchia, Pania della Croce and Pania Secca, reaching 600-700 m a.s.l., less than 2 km far from Riparo Fredian (Braschi et al., 1986).

As the glaciers receded and the climate became warmer, the human frequentation of the upper and middle Serchio and the Turríte Secca valleys becomes regular. Starting from Allerod/Dryas III transition, the first sites attributable to the Final Epigravettian (LUP) appeared, with a majority of them located at low altitudes, and a few sites - mostly temporary camps - at higher altitudes (Castelletti et al., 1994). This trend continued with the Mesolithic cultures of Sauveterrian and Castelnuovian expanding their presence to higher altitudes (Castelletti et al., 1994). During the Neolithic, the human population in the valleys drastically drops to rise again in the Copper Age and Bronze Age, when this area becomes permanently occupied and new settlements appeared (Castelletti et al., 1994).

1.2. Riparo Fredian

Riparo Fredian is a rock shelter on the right bank of the Turríte Secca, situated on a terrace 2-3 m above the river, at 360 m a.s.l.. Excavations were carried out from 1987 to 1990, and their results were published in a detailed paper (Boschian et al., 1995). Here, we summarize the most significant information on the stratigraphic and archaeological context, focusing on the anthropological findings.

The sequence of the deposit (about 1.60 m) is subdivided into 8 lithologic units (Fig. 2). Units from 8 to 5b do not document any anthropic activity; units 5a, 4

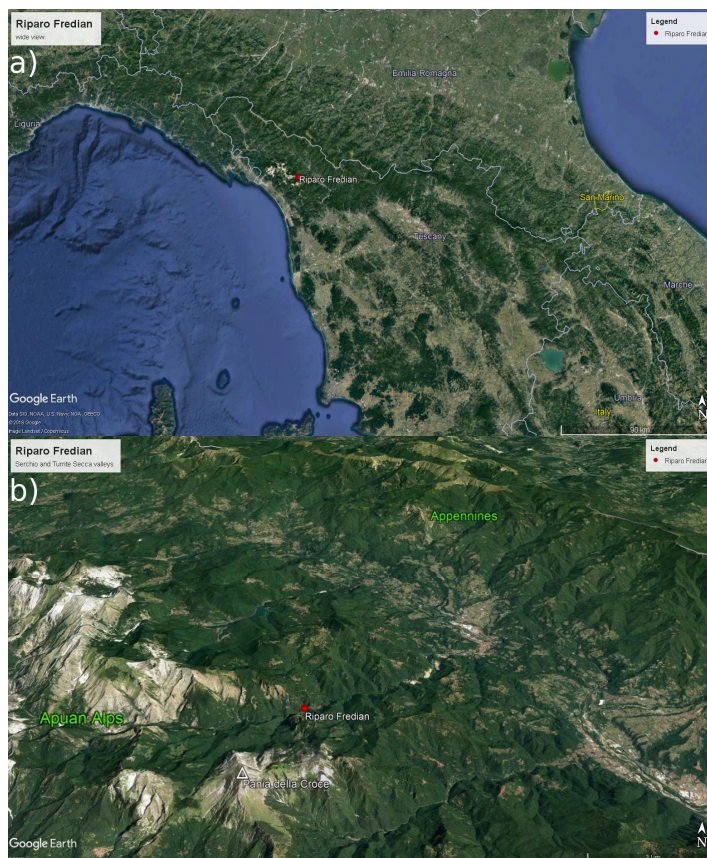


Fig. 1 - a) Position of the Riparo Fredian site in northern Tuscany (Italy). b) Position of Riparo Fredian relative to the Apuan Alps and the Apennines.

and 3 document human presence in the LUP and the Mesolithic; at the end of the sequence, unit 2 and unit 1 are composed of several thin layers with pottery remains (Boschian et al., 1995).

The archaeological record suggests that the site was intensively frequented during the deposition of layer 5: its assemblage, attributed to Final Epigravettian, is the richest of the site, with 90 cores, more than 900 tools, about 3000 lithic artefacts without retouch, and more than 8000 fragments and debris. In addition, this layer returned seven perforated shells (*Columbella* sp.), 144 pieces of ochre, four artefacts partially dyed with ochre, and three bone artefacts. Conversely, human presence at the site during the following phases (deposition of layers 4 and 3) is sporadic: lithic assemblages are far less rich and there are no bone artefacts. The scarcity of remains in layers 4 and 3 compared to layer 5 makes it more difficult to assign a typological attribution to the lithic assemblage. Nevertheless, the layer 5 assemblage can be reasonably attributed to the Sauveterrian facies of the Mesolithic industry (Boschian et al., 1995).

Faunal remains indicate a more intense human presence during the final Epigravettian. They are most abundant in layer 5, strongly diminish in layer 4 and are rare in layer 3. Mostly they are represented by ibex (*Capra ibex*) and red deer (*Cervus elaphus*), but wild

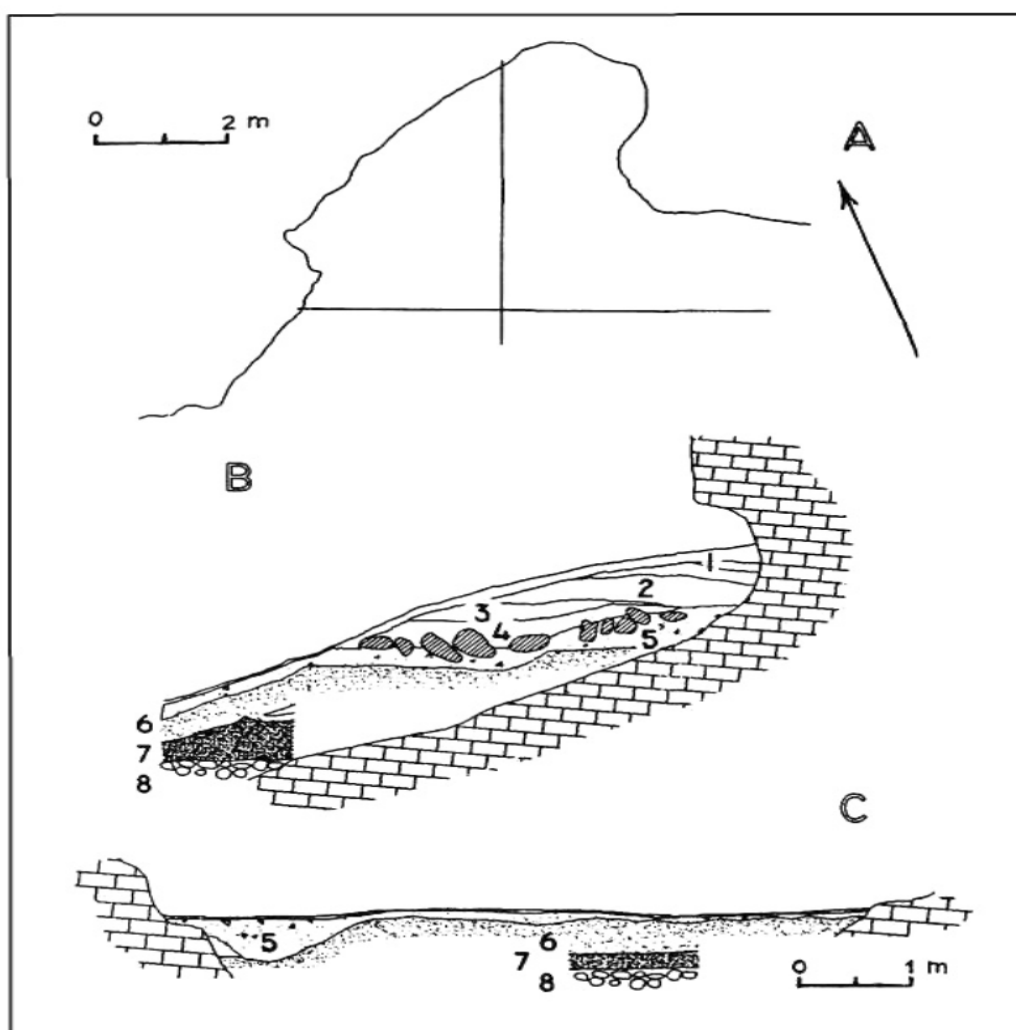


Fig. 2 - Map (A) and sections (B and C) of Riparo Fredian (from Boschian et al., 1995).

boar (*Sus scrofa*), auroch (*Bos primigenius*), and roe deer (*Capreolus capreolus*) are present as well. Carnivores remains attributable to the families of *Ursidae* (*Ursus arctos*), *Canidae*, *Mustelidae* and *Felidae* are present (Boschian et al., 1995; Cilli et al., 1998).

AMS radiocarbon dates from charcoal samples confirm this attribution. Layer 4 (sample AA10951) dates to $9,458 \pm 91$ BP (11,106-10,500 cal BP for $\pm 2\sigma$ calibrated range), and layer 5 (sample AA10952) to $10,870 \pm 119$ BP (13,040-12,600 cal BP for $\pm 2\sigma$ calibrated range) (Boschian et al., 1995).

The limit between layer 5 (Late Epigravettian) and 4 (Sauveterrian) is partially marked by a stone pavement of large rounded cobbles, whose origin is certainly anthropic (Boschian et al., 1995). This pavement extended in the inner part of the shelter, on an area of about 2 m^2 , and on its external margin there is the residue of a fire. Numerous human teeth and the remains of badly preserved human post-cranial bones have been found among the interstices of the pavement. The meaning of the cobble pavement is not fully understood: it is possi-

ble that it represented a raised platform to drain water, but the presence of numerous human remains above and below the pavement suggests that other explanations - possibly linked to particular human behaviours or symbolic intentions - are plausible.

Some of the human remains come from the lower part of layer 4, whereas others come from the top of the layer 5. Boschian et al. (1995) suggested that teeth found in layer 5 might be infiltrated between the large pebbles from layer 4, whereas Oxilia et al. (2017) suggested a different process to explain the stratigraphic position of the remains. According to this hypothesis, layer 4 largely derives from erosion and redeposition of layer 5 and most probably the teeth found in layer 4 were originally embedded in layer 5 (Oxilia et al., 2017). A recent direct AMS radiocarbon dating on the upper right canine of Fredian 5 (tooth label 133) confirmed the Epigravettian origin of teeth embedded in layer 5, suggesting a ^{14}C age of $11,000 \pm 40$ BP, with a $\pm 2\sigma$ calibrated range between 13,000-12,740 cal BP (Oxilia et al., 2017).

2. FIRST ANTHROPOLOGICAL ANALYSIS

The human remains found at Riparo Fredian were initially described by Boschian et al. (1995); another description of these findings, based on the previous paper, is reported in Mallegni (2005). In these works, the authors reported and analysed the skeletal remains found between the upper part of layer 5 and the lower part of layer 4. The human teeth represent the most abundant part of these findings, whereas only a few post-cranial bones have been found.

2.1. Dental remains

Boschian et al. (1995) recognized 39 isolated teeth, 19 maxillary and 20 mandibular. Based on the characteristics of the dental type, dental class, and wear stage, Boschian et al. (1995) suggested the occurrence of at least 5-6 individuals (most likely 6) of different age classes. Both deciduous and permanent teeth are present at Riparo Fredian and the authors identified two children (one of 12-18 months and one of 18-24 months), one adolescent (about 15 years old), and three adults (one of them described as mature adult).

The original analysis also included observations on the occurrence of dental enamel hypoplasia: two of six individuals (33% of the sample) presented the defect, although of moderate grade of expression (Boschian et al., 1995; Mallegni, 2005). For one individual (n. 6), the authors calculated the age of the occurrence of the defects, between 3 and 6 (Boschian et al., 1995, p. 73).

2.2. Post-cranial remains

The post-cranial remains are represented by the diaphysis (the distal third) of an adult left humerus, an incomplete left infant femur, and a fragment of a right ulna attributed to an adolescent. The authors posited that the few post-cranial elements belong to the individuals identified by the dental analysis (Boschian et al., 1995). On the surfaces of the humerus and ulna, the authors described the presence of marks (respectively chipping and indentations) covered by sediments interpreted as proving their antiquity, obtained probably on fresh bones and the result of an intentional human manipulation (Boschian et al., 1995; Mallegni, 2005).

Boschian et al. (1995) concluded that the skeletal remains found at Riparo Fredian were not in anatomical connection; were probably not associated with burials and were deriving from a site with limited extension. On the base of these considerations, they proposed that the occurrence of the remains was the result of some kind of cultural tradition where only selected parts of a skeleton were preserved.

3. REVISION OF THE ANTHROPOLOGICAL REMAINS

On the occasion of a recent revision (Vierin, 2013), all the anthropological remains have been reanalysed in order to check the specific attribution, the correct identification and the measurements. No significant differences were found in the metrical data (dental dimen-

sions), whereas several discrepancies in the identification of dental remains and post-cranial bones have been revealed. These are described below.

3.1. Dental remains

The results of the revision of dental remains are listed in Table 1. Of the 39 teeth described in Boschian et al. (1995) two of them (labels 10 and 205) turned out to be nonhuman fauna; however, the total number of human teeth is still 39, because two teeth (labelled 19 and 20) that were not considered in the previous study have now been recognised and included here. Below a list of the teeth whose identification has been revised is presented, together with the features indicative of the new identification.

Tooth n. 2₁ - ULI2. Originally identified as a LP(?). This tooth is very worn and the crown is completely absent.

The section of the root is relatively rounded and small in size when compared to canines (13₃ and 16₁) and central incisors (3₁ and 13₄) of the same individual (Fredian 5); comparison of root lengths with the teeth mentioned above indicates that this is an upper incisor. Siding is based on wear association between adjacent teeth (see also Oxilia et al., 2017).

Tooth n. 3₁ - URI1. Originally identified as a LP(?). It is a very worn central incisor with no crown preserved. It is identifiable by the stout and obovate section of the root; siding is based on wear association between adjacent teeth (see also Oxilia et al., 2017).

Tooth n. 4 - LRM3. Originally identified as LRM2. The absence of the distal contact facet suggests this is an M3; also, its occlusal morphology matches with tooth n. 13, an URM3.

Tooth n. 4₂ - LLdi2. Originally identified as LRdi2 but the mesial margin, higher than the distal one, indicates it is a left.

Tooth n. 5 - URI2. Originally identified as a LP(?). The same line of reasoning as for tooth n. 2₁, suggests the new identification as a URI2 (see also Oxilia et al., 2017).

Tooth n. 7 - LRP2. Originally identified as a LLP2; the mesial marginal ridge, higher than the distal marginal ridge, helps siding it as a right premolar.

Tooth n. 8 - URdm1. Originally identified as an ULdm1; the presence of a pronounced tubercle on the buccal surface of the mesio-buccal cusp clearly sides the tooth as right.

Tooth n. 9 - URP2. Originally identified as an ULP1; the absence of the developmental groove and the mesially placed lingual cusp suggests it is a URP2.

Tooth n. 12₁ - LLP2. Originally identified as a LRP2; the mesial marginal ridge, higher than the distal marginal ridge, helps siding it as a left premolar.

Tooth n. 13₃ - URC. Originally identified as a LRP2(?). Root length and morphology suggest it is an upper canine (see also Oxilia et al., 2017).

Tooth n. 13₄ - ULI1. Originally identified as LP or LI (?). The same line of reasoning as for tooth n. 3₁, suggests the new identification as a ULI1 (see also Oxilia et al., 2017).

Tooth n. 16 - LLM3. Originally identified as a LRM3. The expression of protostylid as a groove on the buccal

	est. Age	Square	Layer	label	Tooth		Wear stage (1)	original individual
					original id	revised id		
Individual 1	18-24 months	12	4	14	ULdi2	-	0	-
		11	4	6	URdi2	-	1	-
Individual 2	18-24 months	12	4	4.3	ULdi1	-	2	-
		11	4	11	URdi1	-	2	-
		23	5	12	ULdi2	-	1	-
		13	5	13.2	URdi2	-	1	-
		23	*	8	ULdm2	URdm1	1	-
		12	4	4.2	LRdi2	LLdi2	2	-
Individual 3	young adult	21	4	3	LLi2	-	4	-
Individual 4	mature adult	12	4	4.1	ULM3	-	4	-
		13	5	13	URM3	-	3	-
		12	4	4	LRM2	LRM3	4	-
Individual 5	mature adult	13	5	13.4	LP o LI(?)	ULI1	8	-
		21	4	3.1	LP(?)	URI1	7	-
		13	4	2.1	LP(?)	ULI2	8	-
		12	5	5	LP(?)	URI2	7	-
		12	4	16.1	LLP2	ULC	7	-
		13	5	13.3	LRP2(?)	URC	7	-
Individual 6	young adult	23	*	12.2	ULI1	-	4	-
		13-14	4	9.1	URI1	-	4	-
		-	5	13.1	ULI2	-	3	3
		22	4	20.3	ULC	-	3	-
		13	4	2	URP1	-	2	-
		12	4	16.2	URP1	ULP2	0	3
		13-14	4	9	ULP1	URP2	1	-
		22	4	20.1	ULM2	URM1	3	-
		24	3	19	none	ULM3	1	none
		22	4	20.7	LRI1	-	4	-
		11	4	17	LRI2	LLI2	3	-
		22	4	20.6	LLI2	LRI2	3	-
		22	4	20	none	LLC	3	none
		22	4	20.2	ULI2	LRC	3	-
		10	*	15	LLP1	-	2	3
		22	4	1	LRP1	-	2	3
		23	5	12.1	LRP2	LLP2	1	-
22	4	7	LLP2	LRP2	1	-		
22	4	20.4	LLM1	-	3	-		
32	4	18	LLM2	-	2	-		
12	4	16	LRM3	LLM3	1	-		
Other		22	4	20.5	URC	non human	-	5
		11	4	10	LLI1	non human	-	3

Tab. 1 - New identification and individual attribution of the dental remains from Riparo Fredian.

* Found in the reddish soil between the cobbles. (1) Wear stage calculated on the basis of Smith (1984).



Fig. 3 - Post-cranial remains from Riparo Fredian. a) and b) fragments of a distal humerus; c) fragment of a diaphysis of an ulna; d) fragment of a posterior limb of a small ruminant, previously considered to be a sub-adult human femur.

surface of cusp 1 clearly indicates it is a left molar.

Tooth n. 16₁ - ULC. Originally identified as a LLP2. Root length and morphology suggest it is an upper canine (see also Oxilia et al., 2017).

Tooth n. 16₂ - ULP2. Originally identified as an URP1; the absence of the developmental groove on the mesial side, and the mesially placed apex of the lingual cusp suggest it is an ULP2.

Tooth n. 17 - LLI2. Originally identified as a LRI2. The relative position of the mesial and distal contact facets suggests it is a left incisor.

Tooth n. 20₁ - URM1. Originally identified as an ULM2; all the four cusps are well defined, thus the tooth is most probably an M1. Also, the position of the cusps and the occlusal wear indicate it is right.

Tooth n. 20₂ - LRC. Originally identified as an ULI2; the general morphology and the dental wear are typical of a lower canine.

Tooth n. 20₆ - LRI2. Originally identified as a LLI2; the apex of the root is mesially tilted, as in a right incisor.

3.2. Post-cranial remains

The fragments of post-cranial bones (Fig. 3) were originally identified as the distal diaphysis of an adult left humerus, a fragment of a right ulna attributed to an adolescent, and an incomplete left infant femur (Boschian et

al., 1995). The identification of the humerus (Fig. 3 a, b) and the ulna (Fig. 3 c) is confirmed whereas the fragment referred to as a femur (Fig 3 d) is probably a fragment of the diaphysis of the posterior limb of a small ruminant; the reduced dimensions of the fragment prevent a more precise identification. As far as the interpretation of the markings on the bones is concerned, it is reasonable to consider them of an ancient origin, but there are no firm clues possibly linking them to some kind of intentional manipulation rather than to taphonomic damages.

3.3. Individuals and ageing

Following the revision of the dental remains, the minimum number of individuals was also reconsidered, on the basis of wear, developmental and dimensional similarities of the teeth (Tab. 1). As pointed out in the original paper (Boschian et al., 1995), dental remains can be referred to 5 or 6 individuals at least (Figs. 4-6). However, due to similarities in wear and morphology, most of the teeth originally assigned to individual 3 have been assigned to individual 6. The only exception is the lower left lateral incisor (tooth label n. 3), which is not compatible with individual 6; therefore it represents the only tooth assigned to individual 3. The two teeth not described in Boschian et al. (1995), labelled 19 and 20,



Fig. 4 - Dental remains assigned to individual 1 (a), to individual 2 (b), and to individual 3 (c).



Fig. 5 - a) Dental remains assigned to individual 4; b) dental remains assigned to individual 5. Modified after Oxilia et al. (2017).



Fig. 6 - Dental remains assigned to individual 6.

have been assigned to individual 6. Individual 4 and 5 are considered separate individuals, but it is reasonable to assume that they are from the same individual on the basis of dental wear since anterior tooth wear is generally far more advanced than molar wear in hunter-gatherers (Willman, 2016). Nonetheless, we cannot securely attribute these remains to the same individual due to the high level of fragmentation.

The age of the six individuals was also revised on the base of tooth mineralization (AlQahtani et al., 2010). Both individual 1 and 2 have the apex of Udi2 almost complete, and the differences between them are not significant. Therefore, both individuals have been assigned an age of 18-24 months, whereas previous age estimate for individual 1 was between 12 and 18 months. As for the other individuals, wear stage is moderate on the LLI2 (tooth label 3) of individual 3, suggesting a young adult. Conversely, individual 4 and individual 5 heavily worn teeth suggest they belonged to mature adults. Individual 6, with the root of the lower M3 half complete, and a moderate wear stage on anterior teeth and M1 is probably a young adult.

4. CONCLUSIONS

The revision of human remains from Riparo Fredian has led to several changes in their anatomical identification with respect to the original publications (Boschian et al., 1995; Mallegni, 2005). Of the 39 teeth previously described, the analysis revealed that two of them belonged

to animals, and 18 were mistakenly identified. A new, correct identification has been provided for each of them. Also, two human teeth not described in the original papers have been identified. The anatomical identification of the post-cranial remains has been confirmed, except for the supposed sub-adult femur, which is actually a fragment of the posterior limb of a small ruminant. The minimum number of individuals, based on the dental remains, is confirmed as 5 or 6, although some teeth from individual 3 have been re-attributed to individual 6. The new identifications and the revised attribution of the teeth to the individuals led also to a reassessment of the age at death of the six individuals: the sample now is considered to represent two infants of 18-24 months (individual 1 and individual 2), two young adults (individual 3 and individual 6) and two mature adults (individual 4 and individual 5). The revision of the human fossils from Riparo Fredian is the first step in a more detailed analysis currently in progress, to reconstruct elements of the palaeobiology of this human group and to compare it with other contemporary Italian populations.

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