

SUPPLEMENTARY INFORMATION TO:

Combining ZooMS and zooarchaeology to study Late Pleistocene hominin behaviour at Fumane (Italy).

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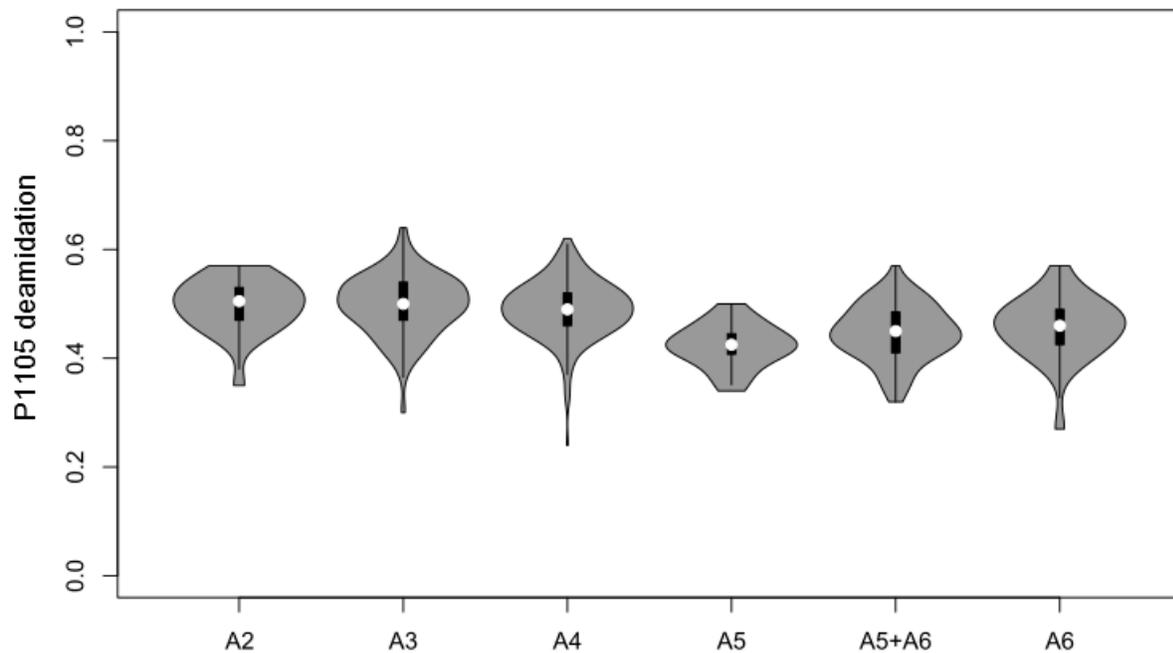
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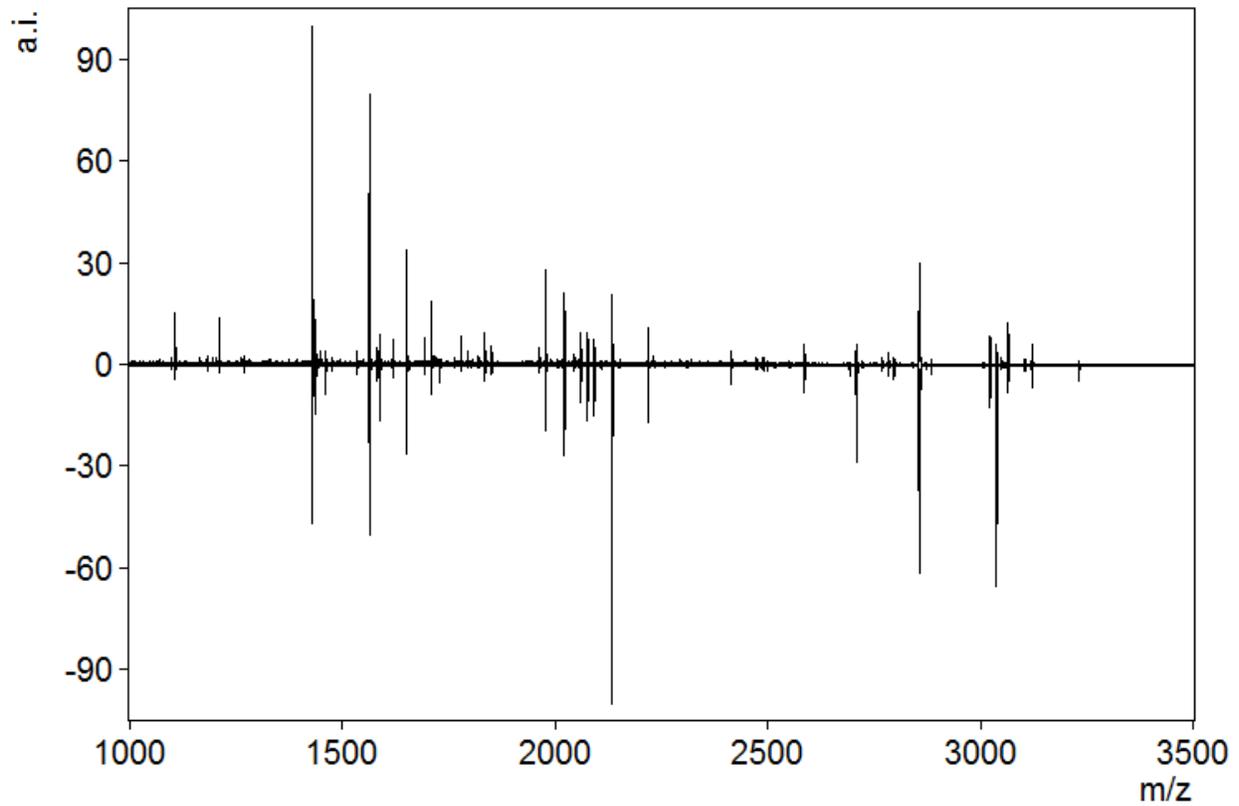
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SUPPLEMENTARY INFORMATION



Supplementary Figure S1. Temporal cline of bone P1105 deamidation values across the Fumane stratigraphy. Chronologically younger layers (from A2) are less deamidated than chronologically older layers (to A6). P1105 deamidation distributions between different archaeological layers are significantly different at $p < 0.05$ for all comparisons except between the layers A3 (Uluzzian) and A4 (Final Mousterian; see main text).



Supplementary Figure S2. Comparison of an AmBic (top) and Acid (bottom) extract analysed in York and Leipzig, respectively. Spectra are displayed in the m/z range of 1000-3500, and concern the same morphologically unidentifiable bone specimen (F-258; Bos/Bison). Y-axis (top) and inverted y-axis (bottom) shows relative intensity to the highest peak in either spectrum.

Supplementary Table S1. Percentage of number of identified specimens (%NISP) of herbivores for the morphologically identified (Morph.) and the ZooMS-component (ZooMS) from Les Cottés (France), Quinçay (France), Pin Hole Cave (UK), and Grotte du Renne (France). Note that the values for Pin Hole are estimates as the original publication does not provide numeric information, only graphical.

Species	Les Cottés ZooMS	Les Cottés Morph .	Quinçay ZooMS	Quinçay Morph.	Pin Hole ZooMS	Pin Hole Morph.	Grotte du Renne ZooMS	Grotte du Renne Morph.
<i>Bos/Bison</i>	32.9	26.7	21.1	13.6	7.0	6.8	5.6	4.0
<i>Capra</i> sp.	1.4	0	0	0	0	0	0.9	0
Ovis-type	0	0	0.7	1.4	0	0	0	0
Cervid/Saiga	5.7	0	1.0	2.8	2.1	0	10.2	0
<i>Capreolus capreolus</i>	0	0	0	0	0	0	0	0
<i>Rangifer tarandus</i>	32.9	54.7	33.7	42.2	60.5	62.0	45.4	55.0
Suidae	1.4	0	1.0	0	0	0	0	0
Equidae	18.6	14.7	39.8	35.2	9.2	9.3	26.9	20.0
Elephantidae	2.9	4.0	1.2	0.9	5.2	5.3	7.4	21.0
Rhinocerotidae	4.3	0	1.5	3.8	16.0	16.5	3.7	0

Supplementary Table S2. Squares, sublayers and layers studied with ZooMS. For further information see Peresani et al. ^{44,81,92}.

Layers	Sublayers	Squares
A2	A2R; A2+A2R	116; 117; 127; 128
A3	A3; A3I; A3II; A3III; A3IV; A3-A4II; A3 tetto;	56; 57; 58; 59; 66; 67; 68; 69; 76; 77; 78; 79; 86; 87; 88; 89; 97; 98
A4	A4; A4II; A4II/A5-A6; A4IV; A4V; A4V/A5-A6; A4V/A5; A4VI; A4VI/A5-A6; A4-A5	56; 57; 58; 59; 66; 67; 68; 69; 76; 77; 78; 79; 86; 87; 88; 89; 96; 97; 98; 99; 106; 107; 108; 109; 116; 117; 118
A5	A5	41; 53; 61; 62; 71; 72
A5+A6	A5+A6; A5+A6-A6	60; 65; 70; 75; 81; 90; 91; 95; 100; 101; 105; 106; 107; 108; 111; 116; 117; 118
A6	A6	51; 61; 80; 117; 118

Supplementary Table S3. ZooMS species IDs for all studied levels. Percentages in the bottom row indicate the identification success rate per level. In the context of Fumane, Cervid/Saiga can be attributed to either *Cervus elaphus* (red deer), *Megaloceros giganteus* (giant deer) or *Alces alces* (elk), as an attribution to *Saiga* sp. or *Dama* sp. can be excluded based on our knowledge of the fauna in this region for this period. Ovis-type includes non-*Capra* sp. members of the Caprinae. In the context of Fumane an attribution to *Rupicapra rupicapra* (chamois) is possible. Canidae includes members of *Canis* sp. and *Vulpes alopex* (arctic fox), both of which are known morphologically at Fumane, but based on the ZooMS marker series an attribution to *Vulpes vulpes* can be excluded. Felinae is represented morphologically by *Lynx lynx* at the site for the stratigraphic portion considered in this study, and is the most likely species candidate for this taxonomic group in the ZooMS component.

Species	A2	A3	A4	A5	A5+A6	A6
Canidae (not red fox)	0	1	4	0	0	0
Red fox	0	1	3	0	0	0
Felinae	0	2	1	0	0	0
Ursidae	0	0	7	0	5	1
<i>Bos/Bison</i>	7	88	76	1	7	1
<i>Capra</i> sp.	5	23	12	0	8	1
Ovis-type	1	13	21	2	3	1
Cervid/Saiga	11	80	141	15	86	22
<i>Capreolus</i> sp.	0	8	3	1	2	0
Rhinocerotidae	0	1	1	0	0	0
Elephantidae	0	0	3	0	0	0
Pantherinae/Hyaenidae	0	1	0	0	0	0
Cervidae/Bovidae	0	1	0	0	0	0
Cervid/Saiga/Roe deer	0	3	3	1	0	0
Indeterminate	0	0	2	0	4	0
Total	24 (100%)	222 (98%)	277 (98%)	20 (95%)	115 (97%)	26 (100%)

Supplementary Table S4. A3 and A4 surface modification frequencies for the three main species groups per identification method. All agents of surface modification presented in the table below relate to the frequency of presence for each of these attributes. Data for all studied squares for both ZooMS and morphological analysis are included. Dental remains and burned specimens are not included in the calculation of the shown percentages. See Supplementary Table S5 for similar frequencies derived from a restricted set of squares. Numbers listed are percentages of occurrence and those in parentheses are number of specimens. ZooMS: bone component identified through ZooMS analysis. Morph.: bone component identified through morphology.

		Cervid/Saiga		Capra sp.		Bos/Bison	
		ZooMS	Morph.	ZooMS	Morph.	ZooMS	Morph.
Weathering	A3	27.4 (14)	15.6 (25)	21.4 (3)	15.6 (13)	20.7 (11)	40.0 (8)
	A4	43.0 (40)	21.9 (40)	25.0 (1)	24.0 (12)	15.5 (7)	52.9 (9)
Concretion	A3	33.3 (17)	26.8 (43)	14.2 (2)	32.5 (27)	24.5 (13)	60.0 (12)
	A4	20.4 (19)	39.0 (71)	50.0 (2)	22.0 (11)	17.7 (8)	52.9 (9)
Corrosion	A3	15.6 (8)	5.6 (9)	42.8 (6)	24.0 (20)	20.7 (11)	30.0 (6)
	A4	10.7 (10)	9.9 (18)	50.0 (2)	18.0 (9)	20.0 (9)	17.6 (3)
Exfoliation	A3	5.9 (3)	25.6 (41)	0.0 (0)	15.6 (13)	16.9 (9)	35.0 (7)
	A4	10.7 (10)	22.5 (41)	0.0 (0)	18.0 (9)	11.1 (5)	23.5 (4)
Mineral staining	A3	29.4 (15)	16.8 (27)	21.4 (3)	16.8 (14)	9.4 (5)	15.0 (3)
	A4	25.8 (24)	32.4 (59)	25.0 (1)	34.0 (17)	13.3 (6)	5.9 (1)
Root etching	A3	64.7 (33)	59.3 (95)	50.0 (7)	44.5 (37)	49.0 (26)	60.0 (12)
	A4	69.8 (65)	53.2 (97)	75.0 (3)	46.0 (23)	57.7 (26)	47.0 (8)
Carnivore and/or Rodent marks	A3	5.9 (3)	1.9 (3)	14.2 (2)	15.6 (13)	1.9 (1)	25.0 (5)
	A4	3.2 (3)	3.8 (7)	0.0 (0)	4.0 (2)	8.9 (4)	0.0 (0)
Cut marks	A3	58.8 (30)	36.8 (59)	35.7 (5)	24.0 (20)	32.0 (17)	50.0 (10)
	A4	44.0 (41)	48.9 (89)	25.0 (1)	16.0 (8)	13.3 (6)	41.1 (7)
Impact points	A3	7.8 (4)	21.8 (35)	7.14 (1)	4.81 (4)	15.0 (8)	10.0 (2)
	A4	13.9 (13)	19.7 (36)	0.0 (0)	6.0 (3)	24.4 (11)	35.2 (6)
Percussion Marks	A3	3.9 (2)	4.4 (7)	0.0 (0)	0.0 (0)	30.1 (16)	0.0 (0)
	A4	2.2 (2)	3.3 (6)	0.0 (0)	0.0 (0)	11.1 (5)	0.0 (0)
Total NISP	A3	51	160	14	83	53	20
	A4	93	182	4	50	45	17

Supplementary Table S5. A3 and A4 surface modification frequencies for the three main species groups per identification method, derived from the squares also covered by ZooMS sampling. All agents of surface modification presented in the table below relate to the frequency of presence for each of these attributes. Data for all studied squares for both ZooMS and morphological analysis are included. Dental remains and burned specimens are not included in the calculation of the shown percentages. Numbers listed are percentages of occurrence and those in parentheses are number of specimens. ZooMS: bone component identified through ZooMS analysis. Morph.: bone component identified through morphology.

		Cervid/Saiga		Capra sp.		Bos/Bison	
		ZooMS	Morph.	ZooMS	Morph.	ZooMS	Morph.
Weathering	A3	27.4 (14)	35.0 (7)	21.4 (3)	23.0 (3)	20.7 (11)	50.0 (3)
	A4	43.0 (40)	37.2 (19)	25.0 (1)	63.6 (7)	15.5 (7)	85.7 (6)
Concretion	A3	33.3 (17)	15.0 (3)	14.2 (2)	15.3 (2)	24.5 (13)	50.0 (3)
	A4	20.4 (19)	21.5 (11)	50.0 (2)	9.1 (1)	17.7 (8)	57.1 (4)
Corrosion	A3	15.6 (8)	20.0 (4)	42.8 (6)	38.4 (5)	20.7 (11)	33.3 (2)
	A4	10.7 (10)	11.7 (6)	50.0 (2)	27.2 (3)	20.0 (9)	14.2 (1)
Exfoliation	A3	5.88 (3)	15.0 (3)	0.0 (0)	7.7 (1)	16.9 (9)	16.6 (1)
	A4	10.7 (10)	25.4 (13)	0.0 (0)	9.1 (1)	11.1 (5)	28.5 (2)
Mineral staining	A3	29.4 (15)	15.0 (3)	21.4 (3)	7.7 (1)	9.4 (5)	0.0 (0)
	A4	25.8 (24)	47.0 (24)	25.0 (1)	27.2 (3)	13.3 (6)	0.0 (0)
Root etching	A3	64.7 (33)	65 (13)	50.0 (7)	61.5 (8)	49.0 (26)	50.0 (3)
	A4	69.8 (65)	43.1 (22)	75.0 (3)	45.4 (5)	57.7 (26)	57.1 (4)
Carnivore and/or rodent marks	A3	5.88 (3)	10.0 (2)	14.2 (2)	15.3 (2)	1.88 (1)	16.6 (1)
	A4	3.22 (3)	1.96 (1)	0.0 (0)	0.0 (0)	8.9 (4)	0.0 (0)
Cut marks	A3	58.8 (30)	55.0 (11)	35.7 (5)	15.3 (2)	32.0 (17)	33.3 (2)
	A4	44.0 (41)	52.9 (27)	25.0 (1)	18.1 (2)	13.3 (6)	71.4 (5)
Impact points	A3	7.8 (4)	15.0 (3)	7.1 (1)	7.7 (1)	15.0 (8)	33.3 (2)
	A4	13.9 (13)	19.6 (10)	0.0 (0)	27.2 (3)	24.4 (11)	57.1 (4)
Percussion Marks	A3	3.9 (2)	0.0 (0)	0.0 (0)	0.0 (0)	30.1 (16)	0.0 (0)
	A4	2.2 (2)	0.0 (0)	0.0 (0)	0.0 (0)	11.1 (5)	0.0 (0)
Total NISP	A3	51	20	14	13	53	6
	A4	93	51	4	11	45	7

