

The late Middle Palaeolithic occupation of Abri du Maras (Layer 1, Neronian, southeast France): integrating lithic analyses, ZooMS and radiocarbon dating to reconstruct Neanderthal hunting behaviour.

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Supplementary Information 1:

Lithic data recording attributes

A series of technological, typological and metric attributes were recorded with a purpose-specific written configuration file programmed into the E4 data entry software, which is available through www.oldstoneage.com. E4 saves the data into a Microsoft Access database. The applied lithic recording system builds upon the ones developed by Dibble and McPherron for several French Mousterian assemblages (Dibble et al., 1995; Chase et al., 2009; McPherron et al., 2018). For broken pieces it was not possible to record all attributes. All artefacts larger than 25 mm were recorded. All measurements were recorded to .01 millimeters using a digital Mitutoyo caliper with USB interface. Angles were measured with a goniometer with one-degree precision. All artefacts were weighed on electronic scales with 1 g precision.

1. General artefact characteristics

These general attributes were recorded for all artefacts.

- **Artefact dataclass**

TOOL, FLAKE, CORE, COREFRAG, BIFACE, BIFFRAG, N/A

Artefact dataclass is the most basic categorization of the artefact. Tools represent retouched pieces. Flake any detached pieces.

- **Basic flaking technology**

NORMAL, LEVAL, DISC, LAMINAR, BIFACIAL, OTHER, N/A

For each artefact the flaking technique was classified as normal, Levallois, laminar, discoidal (following the definitions of Bordes, 1961; Débenath and Dibble, 1994). If the technology cannot be identified the piece is classified as *normal* (i.e., non-diagnostic). *Levallois* flakes are relatively thin with little or no cortex and a complex scar pattern. *Discoidal* flakes come from discoidal cores and typically show flake scars from two adjacent directions (e.g. pseudo-Levallois points). *Laminar* technique is determined on the presence of parallel flake scars on the flake surface.

- **Raw material type**

FLINT, QUARTZ, OTHER

The raw material of each artefact was recorded on a very basic level, distinguishing between flint, quartz and other. Distinguishing between different types of flint was beyond the scope of this paper.

- **Cortex remnant**

0%, 1-10%, 10-40%, 40-60%, 60-90%, 90-99%, 100%, N/A

The amount of cortex remaining on the artefact was estimated visually and its relative determination recorded in the above percentage categories.

- **Alteration**

NONE, SPECKLED, LIGHT, HEAVY, WHITE, DOUBLE, DESILICIFIED, BURNED, OTHER, NA

The alteration field records any post-depositional modifications to the surface of the lithic. Valid entries for alteration include unaltered, speckled, light patina, heavy patina, white, double

patina, burned, other, and N/A. Thus patina, when present, is divided into three stages: light, heavy and white. Double patina refers to pieces that have two stages of patina due to material having been removed after the original piece had been patinated. Speckling is possibly a stage prior to light patina where patina is visible in small dots across the piece. Burned pieces should show signs of thermal alteration including crazing, pot-lid fracture, and color changes (McPherron et al., 2018).

- **Maximum length**

The maximum length of the artefact was measured following the technological axis where possible (as defined by Débenath and Dibble, 1994)

- **Maximum width**

The maximum width was measured perpendicular to the technological axis at the midwidth.

- **Maximum thickness**

Maximum thickness was measured at the intersection of length and width.

- **Weight**

All artefacts were weighed on electronic scales with 1 g precision.

2. Blank data

The following attributes were recorded for all flakes and blades (retouched and unretouched):

- **Artefact portion**

COMPLETE, PROXIMAL, MEDIAL, DISTAL, PROX-MEDIAL, MEDIAL-DISTAL, TIPMISSING, N/A

An artefact is considered complete if it is unbroken or the missing piece is so small it will not affect its measurements. For a proximal fragment the point of percussion or at least 50% of the platform should be present (cf. Hiscock, 2002). To be considered a medial fragment the piece needs to have a clear interior (ventral) face. The TIPMISSING category includes all pieces with a small distal break which does not affect the vast majority of other attributes (such as blank form or shape) to be recorded.

- **Blank form or shape**

NORMAL, ANGULAR, BLADE, TRIANGULAR, NATBACK, EXPANDING, BROAD, DEBORDANT, OVERSHOT, BIFEDGE, BURIN, CRESTEDBLADE, SHATTER, OTHER, N/A

The outline shape of the each blank was visually assessed. *Angular* pieces are defined as those with a steep ridge or two exterior surfaces that meet at an angle of less than 90°. *Triangular* relates to flakes with margins that converge toward the distal end. *Naturally backed* pieces have a stripe of cortex along one edge, and this cortical surface is roughly perpendicular to the surface of the flake. Conversely, *débordant* is used for flakes that remove part of a core edge, and thus the perpendicular lateral surface is non-cortical; most pseudo-Levallois points are thus *débordant*. *Burin* is for burin spalls. *Overshot* flakes have a termination that includes part of the distal core from which they were removed. *Biface edge* flakes look as though they have been removed from the edge of a biface meaning usually that they have a bifacial crest. *Blades* are flakes that are

more than twice as long as they are wide whether or not they have parallel flake scars on their surface. *Expanding* flakes are narrow near the platform and expand towards the distal end. *Broad* flakes are wider than they are long. *Shatter* is a piece that shows no obvious flake characteristics (in particular, no interior surface). This category includes pieces that are sometimes referred to as chunks (McPherron et al., 2018).

- **Flake-scar orientation** (complete pieces only)

N/A, RADIAL, SUBRADIAL, UNIDIRECT, BIDIRECT, COMPLEX, PLAIN

The pattern of the dorsal flake scars were classified following illustrations in Débenath and Dibble, 1994

- **Platform type**

PLAIN, DIHEDRAL, FACETED, CHAPGEND, CONCORDE, PUNCTIFORM, CORTICAL, REMOVED, MISSING, OTHER, N/A

These categories follow the definitions of Bordes, 1961 and Débenath and Dibble, 1994. A platform is removed when it is missing because of retouch, as opposed to breakage.

- **Basal modifications**

NO, THINNING, WIDTHREDUCTION, TRUNCFAC, KOMBEWA, NOTCHES, TANGS, N/A

Modifications (incl. retouch or backing) on the basal part (closest to the platform) of the blank were recorded as absent or present because modifications of this type have been argued to indicate the mode of prehension (Harrold, 1978). Truncated-faceted: a semi-abrupt inverse truncation, serving as a faceted striking platform, and the removal of secondary flakes from that platform truncation.

- **Lateral edge crushing**

NO, RIGHT, LEFT, BOTH, N/A

Crushing relates to multiple small scars varying in orientation and initiation.

- **Platform width and thickness**

all pieces with preserved platforms with clearly defined limits. Cortical platforms on primary flakes, for instance, are often problematic for measurement because the limits are not easily identified. The width is recorded from one lateral edge of the platform to the opposite edge, where the interior and exterior surfaces meet. Platform thickness is the depth of the platform behind the point of percussion.

- **Exterior platform angle (EPA)**

Exterior platform angle is the angle between the platform surface and the exterior flake surface. It is measured with a goniometer with one-degree precision. On curving flakes, the angle is taken to the point along the exterior approximately equal to the platform thickness. If the platform surface is not flat or difficult to isolate, or if the exterior of the flake has an irregular surface, the measurement is not recorded.

Each blank was further divided into 6 zones (following Brooks et al., 2006, see Fig. s1) and 3 attributes were recorded for each zone:

- **Retouch**

NONE, DIRECT, INVERSE, ALTERNATE, ALTERNATING, BIFACIAL

The location of the retouch was determined where possible based on the direction of the individual removals. When they are struck from the ventral face they are classified as ‘direct’, from the dorsal face as ‘inverse’. Alternate when one edge is retouched direct and the other inverse. Alternating when the retouch on one edge alternates between direct and inverse. Bifacial when one edge is retouched direct and inverse in the same location.

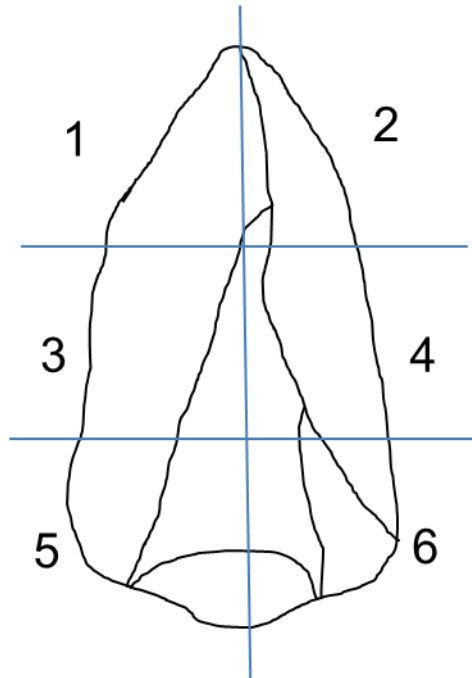


Fig. s1: Location of the six zones used to record edge shape and modifications.

- **Macroscopic edge damage**

NONE, INTERIOR, EXTERIOR, 2-SIDED

The presence of edge damage was assessed for each blank taking into account the presence of pits, chips or more recent scars (e.g. recognizable through double patination) (Tringham et al., 1974; McBrearty et al., 1998; McPherron et al., 2014).

- **Edge morphology**

N/A, STRAIGHT, CONVEX, CONCAVE, SINUOUS, NATURAL, CORTICAL

Following definitions in Bordes, 1961.

3. Tool characteristics

The tools were classified following Bordes' typology (Table s1; Bordes, 1961):

Nr	Bordes' type	Nr	Bordes' type
1	Typical Levallois flake	33	Atypical burin
2	Atypical Levallois flake	34	Typical awl or perforator
3	Levallois point	35	Atypical awl or perforator
4	Retouched Levallois point	36	Typical backed knife
5	Pseudo-Levallois point	37	Atypical backed knife
6	Mousterian point	38	Naturally backed knife
7	Elongated Mousterian point	39	Raclette
8	Limace	40	Truncation
9	Single straight scraper	41	Mousterian tranchet
10	Single convex scraper	42	Notch
11	Single concave scraper	43	Denticulate
12	Double straight scraper	44	Alternate retouched bec
13	Double straight scraper	45	Flake with irregular ventral retouch
14	Double straight-convex scraper	46	Thick flake or blade with abrupt retouch
15	Double straight-concave scraper	47	Thick flake or blade with alternating retouch
16	Double convex scraper	48	Thin flake or blade with abrupt retouch
17	Double convex-concave scraper	49	Thin flake or blade with alternating retouch
18	Straight convergent scraper	50	Bifacially retouched flake
19	Convex convergent scraper	51	Tayac point
20	Concave convergent scraper	52	Notched triangle
21	Dejete scraper	53	Pseudo-microburin
22	Straight transverse scraper	54	End-notched flake
23	Convex transverse scraper	55	Hachoir
24	Concave transverse scraper	56	Rabot
25	Scraper on interior face	57	Stemmed point
26	Abrupt scraper	58	Stemmed tool
27	Scraper with thinned back	59	Chopper
28	Bifacial scraper	60	Inverse chopper
29	Alternate scraper	61	Chopping tool
30	Typical end scraper	62	Miscellaneous
31	Atypical end scraper	63	Bifacial foliate
32	Typical burin	64	Truncated-facetted piece

Table s1: Overview of the tool categories as defined by Bordes (1961).

4. Point characteristics

If a blank was triangular in form, an extra series of attributes were recorded:

- Point type**
UNRETLEV, RETLEV, PSEUDOLEV, MOUPOINT, ELONMOUPOINT, CONVERGSCR, DEJSCR, SOYONS, TAYACP, TANGEDP
 Following definitions of Bordes 1961. Soyons points have ventral retouch along one or more lateral edges (Combier, 1955).
- Point position**
N/A, CENTRED, OFFSETRIGHT, OFFSETLEFT
 The position of the point in relation to its lateral axis was recorded.
- Penetrating angle of tip**
 the tip angle seen in plan view was measured with a goniometer in degrees.

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