Neanderthal stone-tipped spear technology: an experimental and archaeological investigation.

(Volume 2 of 2)

Submitted by Alice Oriana La Porta to the University of Exeter

as a thesis for the degree of

Doctor of Philosophy in Archaeology

In February 2019

I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature: ……..

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APPENDIX A

The register of use-wear traces of the experimental Levallois points series

A.1 Introduction

This appendix presents a detailed register of the use-wear traces observed and recorded in the experimental Levallois points used as throwing (n=26) and thrusting (n=26) hand-delivered spear-heads and butchering knives (n=8). The total of these experimental tools (n=60) forms the experimental corpus of this thesis (see Chapter 4, Volume 1).

The register of use-wear traces has been divided into three groups according to the type of the experiments performed (see Chapter 4, Volume 1), such as hand-delivered spear-throwing, hand-delivered spear-thrusting, and butchering experiments. Each experiment has been described into a two-page form, as follow.

The first page of the form includes the following information:

- The description of the experiment. It includes a detailed explanation of the experiment with reference to the employed variables, such as the hafting/handling system employed for each experiment, the trajectory of the weapon, and the impact location of the spear-head. In the case of butchering experiments, the contact material and the movement were specified as additionals variables. These variables were listed since they can influence the formation of the use-wear traces.

- The experimental form. It includes the experiment code, the video number of the experiment, two pictures of the experimental tool (dorsal and ventral faces, before utilisation) in which are mapped the use-wear traces affecting the tools, a table showing the recorded variables of the experiment, two pictures of the hafted experimental tool (dorsal and ventral face, before the performance of the experiment), and a picture of the experiment.

On the second page of the form there are listed:

- The description of macroscopic and microscopic use-wear traces affecting the experimental tools. This description is based on the

attributes listed in Chapter 3, Volume 1. The analysis of the use-wear traces is instead provided in Chapter 6, Volume 1.

- The pictures of the use-wear traces offer a visual appreciation of the tear. The pictures show the most representative use-wear traces for each experimental tool, and they were all taken after cleaning (see Section 2.4, Volume 1) unless otherwise stated in the text.

The use-wear traces affecting the tools are indicated in the figures of the dorsal and ventral face of the tool, and they are mapped according to the following drawing conventions (Figure 1):

- the letters **A, B, C, D**, (…), indicate the location where the microscopic pictures were taken (Figure 1),

- the red crosses (x) indicate the location of the traces (Figure 1).

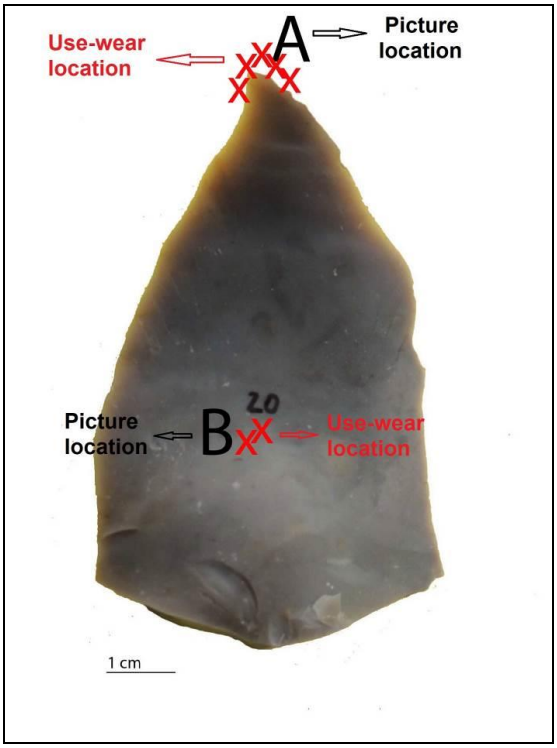


Figure 1. Drawings conventions employed for the mapping of use-wear traces of the experimental Levallois points. (Image La Porta).

- When a red arrow (-►) is present in some of the microscopic picture taken with the OLMil it indicates the location and direction of the distal tip of the experimental tool (Figure 2).

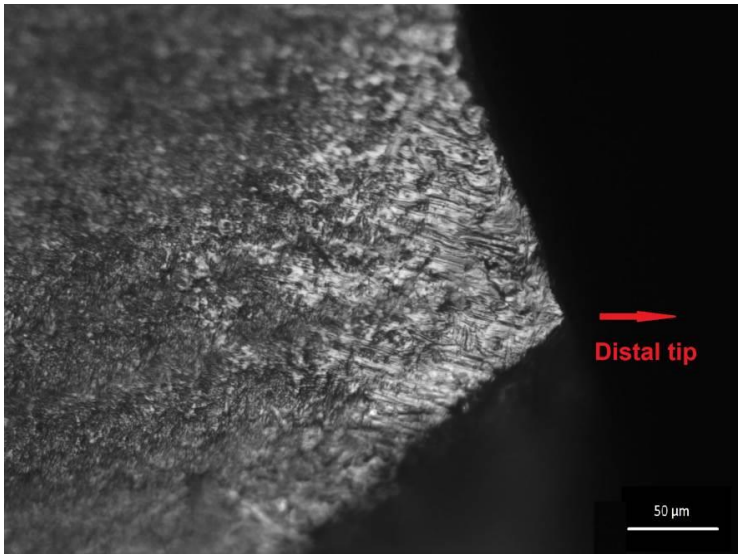


Figure 2. Drawing convention employed for the indication of the distal tip in the microscopic pictures. (Image La Porta).

Videos of the hand-delivered spear-throwing and hand-delivered spear-thrusting experiments were recorded during the experiments and their number is provided on the form. For the hand-delivered spear-throwing and spear-thrusting experiments, ten trials respectively were recorded by using a high-speed camera (200 fps, see Chapter 4). These slow-motion videos want to offer a better appreciation of the spear trajectory, movement, impact location, and the reality of the field experiment. Therefore, the slow-motion videos are bounded on the USB stick (attached to the inside back cover of this thesis),

A.2 Register of use-wear of experimental Levallois points used as throwing hand-delivered stone-tipped-spears (data from the first set of experiments, see Chapter 4).

Experiment type: spear throwing. Code: 20-TH-MSL15.

Description of the experiment: the experimental Levallois point was hafted into a wooden fore-shaft by a juxtaposed slot and was fixed with commercial tar (Form 1). The stone-tipped spear was hand thrown. It passed completely through the rib cage. It broke two ribs (4th/5th, Form 1).

Experiment type:	**Throwing (pilot exp.)**
Tool N:	**20**
Video N.	**TH-20**

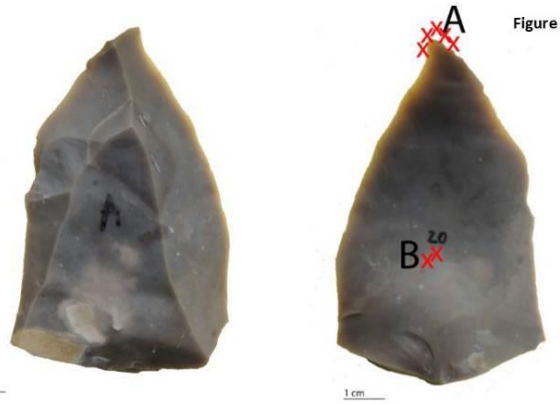


Figure 1: Tool 20

Experimental tool	Grain Size texture: **MEDIUM**	Maximum Length (mm) **74**	Maximum Width (mm): **49**	Maximum Thickness (mm): **14**	TCSA (mm): **343**	TCSP (mm): **147**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **UNIDIRECTIONAL CONVERGENT**	Retouch pres-ence: **YES**	Retouch Localiza-tion: **DISTAL LEFT**	Retouch position and extension: **DIRECT - SHORT**	

Experiment type: **PROJECTILE**	Shots: **1**	Haft presence: **YES**	Hafted Type: **JUXTAPOSED**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **ROE DEER**	Impact location: **RIB CAGE**	Impact contact material: **BONE, FLESH, SKIN**	Contact material state: **FRESH**	
	Impact velocity (m/s): **NOT RECORDED**		Penetration (cm): **46**	Wound dimension (mm): **NOT RECORDED**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 1. Experimental recording form. Experiment code: 20-TH-MSL15.

Use-wear description. Experiment code: 20-TH-MSL15.

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: a patch of polish entirely covered the extremity of the tip (Figure 3). It was located on the ventral distal tip (Locus D1v) and the immediate edges (Locus D3v and D2v; Figure 3, Figure 4). At 200x, it showed a dull aspect with a flat micro-topography (Figure 4). It was a well-developed polish (even after one throw). Deep regular-edges striations within the bounds of the polish were visible. They ran parallel to the direction of the impact (Figure 4). No edge-rounding was observed.

Other: tar bright-spots with a smooth micro-topography were located along the haft limit on the proximal ventral side (Figure 5). At 200x, they presented a greasy-oily and additive aspect appearing as very bright, almost metallic, spots.

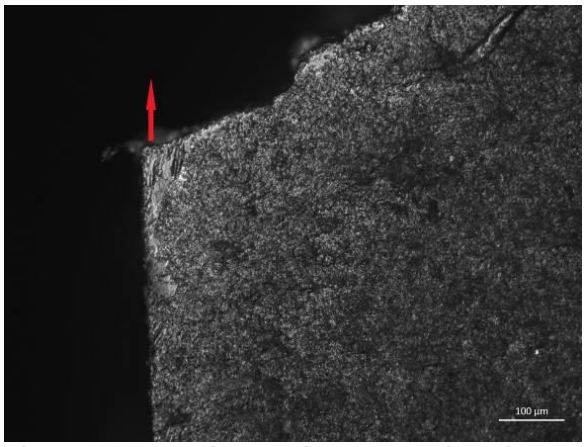


Figure 3. Location A (Form 1, Fig. 1). Locus D1v: well-developed polish with striations, OLMil/OM 100x.

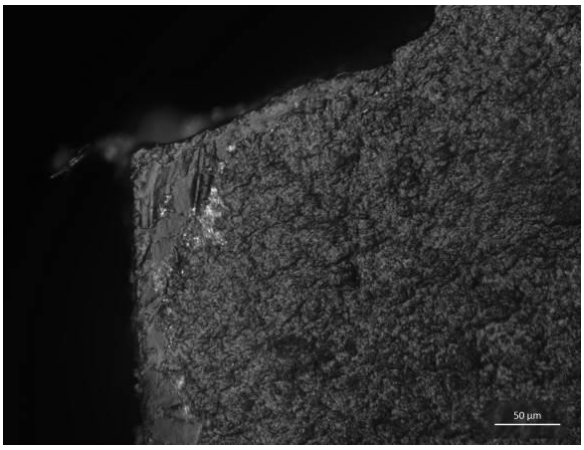


Figure 4. Location A (Form 1, Fig. 1). Locus D1v: detail at 200x. Domed-into-flat polish with deep and large striations, OLMil/OM 200x.

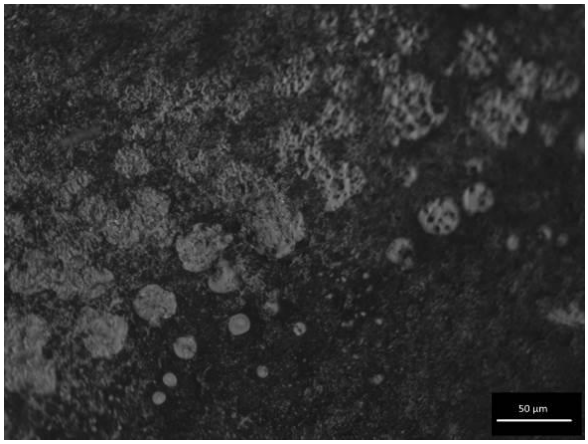


Figure 5. Location B (Form 1, Fig. 1). Locus P1v: tar bright-spots. Greasy and additive spots, OLMil/OM 200x.

Experiment type: spear throwing. Code: 23-TH-MSL15.

Description of the experiment: the Levallois point was hafted into a wooden fore-shaft using a flat slot and was fixed with commercial tar (Form 2). The stone-tipped spear was hand thrown. On the first throw, it impacted the wooden frame and landed on the ground. The point separated from the fore-shaft, so was re-hafted. The second throw went completely through the rib cage breaking one rib (6th, Form 2).

Experiment type:	Throwing
Tool N:	23
Video N.	TH-23

Figure 1: Tool 23

Experimental tool	Grain Size texture: **FINE**	Maximum Length (mm) **80**	Maximum Width (mm): **38**	Maximum Thickness (mm): **8**	TCSA (mm): **152**	TCSP (mm): **114**
	Techno-morphological type: **LEVALLOIS CONVERGENT BLADE**	Direction Negative Removals: **LONGITUDINAL UNIDIRECTIONAL**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: **2**	Haft presence: **YES**	Hafted Type: **FLAT**	Adhesive type: **TAR**	De-hafting: **YES**
	Impact target: **-GROUND -ROE DEER**	Impact location: **-GROUND -RIB CAGE**	Impact contact material: **-SOIL, STONES -BONE, FLESH, SKIN**	Contact material state: **-NA -FRESH**	
	Impact velocity (m/s): **NOT RECORDED**		Penetration (cm): **80**	Wound dimension (mm): **NOT RECORDED**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 2. Experimental recording form. Experiment code: 23-TH-MSL15

Use-wear description. Experiment code: 23-TH-MSL15

Macro-fractures and edge-damage: small half-moon and scalar cone scars were observed with a continuous distribution on the ventral distal left side (Locus D2v; Figure xx).

Polish and striations: a well-developed and intrusive polish was located on the ventral distal tip (Locus D1v; Figure 6). At 200x, it appeared very bright in sharp contrast with the unaltered surface (Figure 6, Figure 7). At 200x, it showed a domed micro-topography (Figure 6), which became flatter at higher magnifications (500x, Figure 7). Abundant regular-edges striations within the bounds of the polish ran parallel to the direction of the impact (Figure 7). No edge-rounding was observed.

Other: a very shiny polish was located along the haft limit on the proximal ventral side (Locus P2v, Figure 8). At 100x, it presented a rough aspect, and it appeared like a layer deposited on the surface (additive layer).

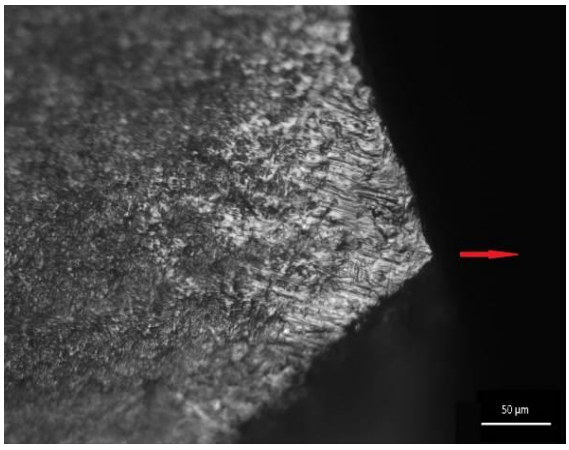


Figure 6. Location A (Form 2, Fig. 1). Locus D1v: bright domed polish, OLMil/OM 50x.

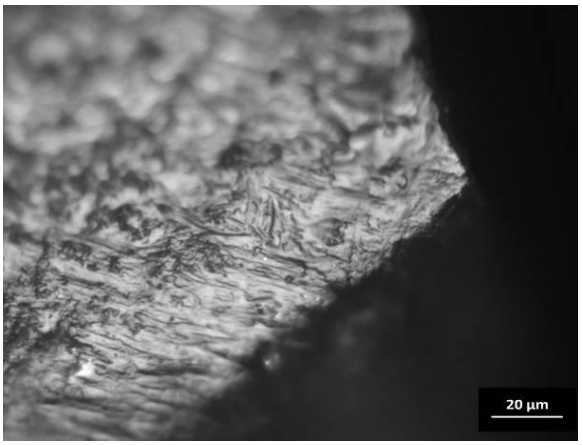


Figure 7. Location A (Form 2, Fig. 1). Locus D1v: detail at 500x. Domed-into-flat polish with regular-edges striations.

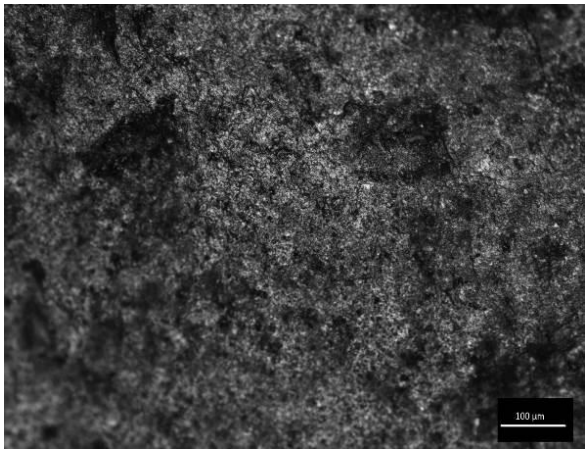


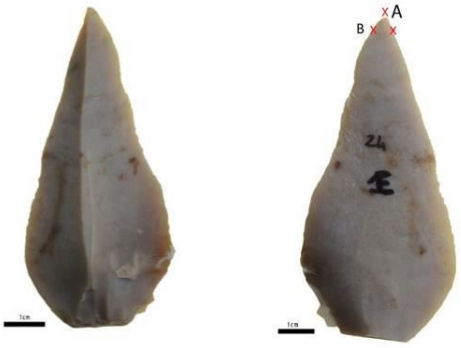
Figure 8. Location B (Form 3, Fig 1). Locus P2v: tar polish, OLMil/OM 100x

Experiment type: spear throwing. Code: 24-TH-MSL15.

Description of the experiment: the Levallois point was hafted into a wooden fore-shaft using a female slot and was fixed using commercial tar (Form 3). The first throw hit the animal target, but the spear bounced off, remaining undamaged. The second throw went completely through the rib cage breaking two ribs (8^{th}/9^{th}) and perforated the guts (Form 3).

Experiment type:	**Throwing**
Tool N:	**24**
Video N.	**TH-24**

Figure 1: Tool 24



Experimental tool	Grain Size texture: **MEDIUM**	Maximum Length (mm) **77**	Maximum Width (mm): **37**	Maximum Thickness (mm): **10**	TCSA (mm): **185**	TCSP (mm): **111**
	Techno-morphological type: **BLADE POINT**	Direction Negative Removals: **UNIDIRECTIONAL LONGITUDINAL**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: **2**	Haft presence: **YES**	Hafted Type: **FEMALE**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-GROUND -ROE DEER**	Impact location: **-GROUND -RIB CAGE**	Impact contact material: **-SOIL, STONES -BONE, FLESH, SKIN**	Contact material state: **-NA -FRESH**	
	Impact velocity (m/s): **NOT RECORDED**		Penetration (cm): **95**	Wound dimension (mm): **NOT RECORDED**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 3. Experimental recording form. Experiment code: 24-TH-MSL15

Use-wear description. Experiment code: 24-TH-MSL15.

Macro-fractures and edge-damage: a pattern of multiple fractures was observed. A snap bending fracture terminated on the distal ventral tip (Locus D1v). A small unifacial spin-off secondary fracture started from this (Figure 11). Edge-damage occurred on both left and right mesial edges (Locus M1v, M2v). It was defined as denticulated edge-damaged or edge-jagged (see section xx) (Figure 9 and Figure 10).

Polish and striations: no micro-wear traces were observed. (The distal tip completely snapped off during the impact).

Other: none.

Figure 9. Location B (Form 3, Fig. 1). Locus D2v: denticulated edge-damage, DM/OM 25x.

Figure 10. Location B (Form 3, Fig. 1). Locus D2v: denticulated edge-damage, DM/OM 25x.

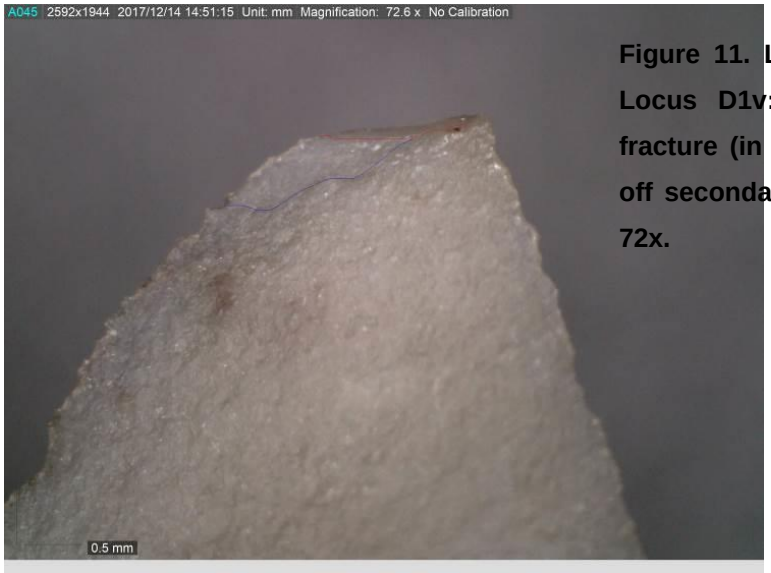


Figure 11. Location A (Form 3, Fig. 1). Locus D1v: snap-terminating bending fracture (in red) plus the unifacial spin-off secondary fracture (in blue), DM/OM 72x.

Experiment type: spear throwing. Code: 31-TH-MSL15.

Description of the experiment: the Levallois point was hafted into a wooden fore-shaft with a juxtaposed slot and was fixed using spruce resin and beeswax (Form 4). The first three throws hit the target but bounced off and landed in the ground. The point de-hafted from the fore-shaft during the second throw and was re-hafted. On the fourth and final throw, the spear hit the shoulder blade and lodged in the bone (Form 4).

Experiment type:	**Throwing**
Tool N:	**31**
Video N.	**TH-31**

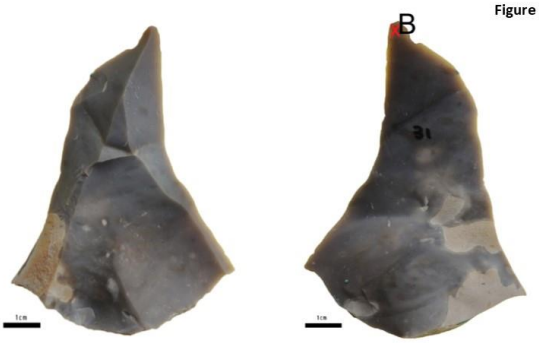


Figure 1: Tool 31

Experimental tool	Grain Size texture: **FINE**	Maximum Length (mm) **86**	Maximum Width (mm): **62**	Maximum Thickness (mm): **18**	TCSA (mm): **558**	TCSP (mm): **187**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **UNIDIRECTIONAL CONVERGENT**	Retouch pres-ence: **NO**	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: **4**	Haft presence: **YES**	Hafted Type: **JUXTAPOSED**	Adhesive type: **RESIN**	De-hafting: **YES**
	Impact target: **-3 BOUNCED OFF -1 ROE DEER**	Impact location: **-SKIN/GROUND -SHOULDER BLADE**	Impact contact material: **-SKIN, SOIL, STONES -BONES, FLESH, SKIN**	Contact material state: **-NA -FRESH**	
	Impact velocity (m/s): **NOT RECORDED**		Penetration (cm): **5**	Wound dimension (mm): **NOT RECORDED**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 4. Experimental recording form. Experiment code: 31-TH-MSL15.

Use-wear description. Experiment code: 31-TH-MSL15

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: microscopic linear impact traces (MLITs) occurred on the ventral distal tip (Locus D3v; Figure 12, Figure 13). They were already visible at low magnifications (50x, Figure 12). At 200x, they show a rather domed polish with deep and long regular-edge striations incorporated into it (Figure 13). Both MLITs and striations ran parallel to the direction of the impact.

Other: none.

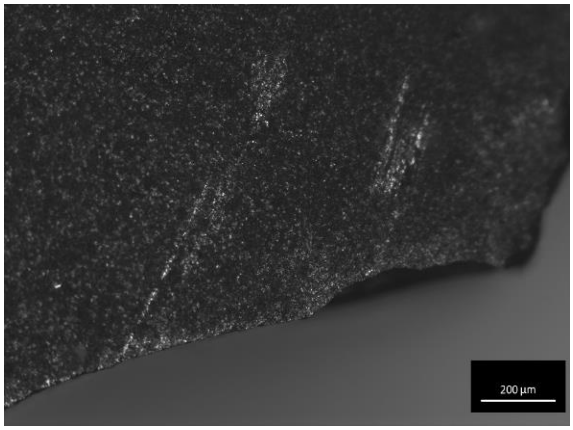


Figure 12. Location B (Form 4, Fig. 1). Locus D3v: microscopic linear impact traces, OLMil/OM 50x.

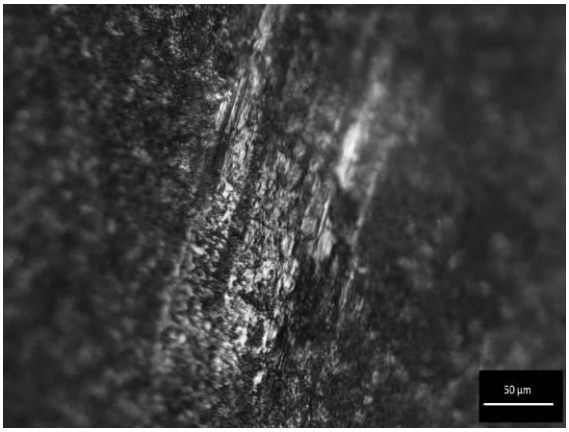


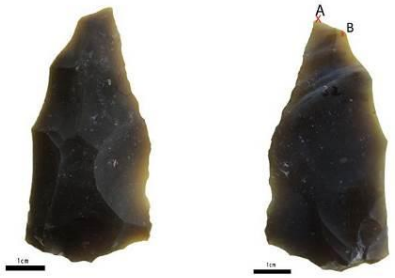
Figure 13. Location B (Form 4, Fig. 1). Locus D3v: details at 200x. MLIT with deep and large striations running parallel to the direction of the impact.

Experiment type: spear throwing. Code: 32-TH-MSL15.

Description of the experiment: the Levallois point was hafted into a flat slot on a wooden fore-shaft and was fixed using spruce resin and beeswax (Form 5). The first throw missed the target and landed horizontally on the ground. The second throw hit the target on the spine but bounced off. The point detached from the fore-shaft and was re-hafted. The third throw hit the rib cage and fell on the ground without penetrating. The point de-hafted again and was re-hafted. The fourth shot hit the rib cage and penetrated. The point detached from the fore-shaft inside the animal and stuck between two ribs (8th/9th, Form 5).

Experiment type:	Throwing
Tool N:	32
Video N.	TH-32

Figure 1: Tool 32



Experimental tool	Grain Size texture: MEDIUM	Maximum Length (mm) 62	Maximum Width (mm): 30	Maximum Thickness (mm): 4	TCSA (mm): 60	TCSP (mm): 90
	Techno-morphological type: LEVALLOIS LATERAL POINT	Direction Negative Removals: CENTRIPETAL	Retouch presence: YES	Retouch Localization: DISTAL RIGHT	Retouch position and extension: DIRECT - SHORT	

Experiment	Shots: 4	Haft presence: YES	Hafted Type: FLAT	Adhesive type: RESIN	De-hafting: YES (re-hafted)
	Impact target: -3 BOUNCED OFF -1 ROE DEER	Impact location: -SKIN/GROUND -RIB CAGE	Impact contact material: -SKIN, SOIL, STONES -BONES, FLESH, SKIN	Contact material state: -FRESH	
	Impact velocity (m/s): ND		Penetration (cm): 5	Wound dimension (mm): ND	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 5. Experimental recording form. Experiment code: 32-TH-MSL15.

Use-wear description. Experiment code: 32-TH-MSL15

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation

Polish and striations: a very faint and scattered polish was present on the distal ventral left tip (Loci D2v). It developed only on the immediate edge, and it was not a well-linked polish (Figure 14). The second patch of polish occurred on the distal ventral right tip (D3v). It was quite rough and dull, with a oblique striations (Figure 15).

Other: none.

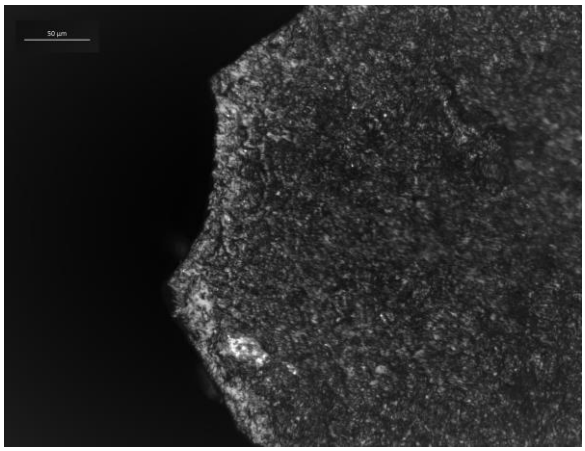


Figure 14. Location A (Form 5, Fig. 1). Locus D1v: faint, not-well-linked polish, OLMil/OM 100x.

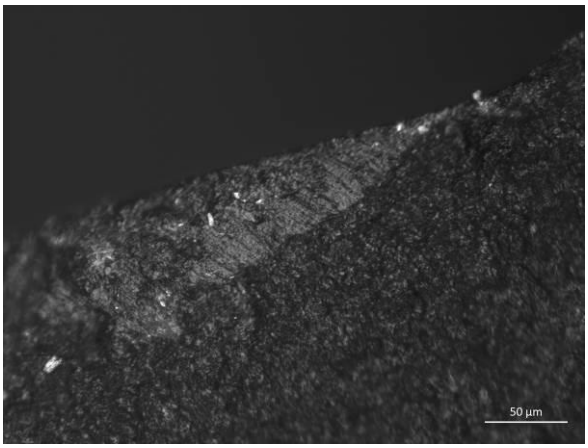


Figure 15. Location B (Form 4, Fig. 1). Locus D3v: rough of polish with striations, OLMil/OM 200x.

Experiment type: spear throwing. Code:21-TH-MSL15.

Description of the experiment: the stone-tipped spear was used as a trial projectile during the practice undertaken by the human participants. It was thrown into a hay bale ten times from a distance of 5m. Neither videos nor photos were recorded.

Experiment type:	Throwing
Tool N:	21
Video N.	ND

Figure 1: Tool 21

Experimental tool	Grain Size texture: COARSED	Maximum Length (mm) 68	Maximum Width (mm): 50	Maximum Thickness (mm): 10	TCSA (mm): 250	TCSP (mm): 150
	Techno-morphological type: LEVALLOIS POINT	Direction Negative Removals: THREE BLOWS-POINT	Retouch pres-ence: NO	Retouch Localiza-tion:	Retouch position and extension:	

Experiment type: PROJECTILE TRIAL	Shots: 10	Haft presence: YES	Hafted Type: FEMALE	Adhesive type: RESIN	De-hafting: YES
	Impact target: -HAY BALE	Impact location: -HAY BALE	Impact contact material: -HAY	Contact material state: -DRIED	
	Impact velocity (m/s): NOT RECORDED		Penetration (cm): NA	Wound dimension (mm): NA	

Form 6. Experimental recording form. Experiment code: 21-TH-MSL15.

Use-wear description. Experiment code: 21-TH-MSL15

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: a very bright but not-well-linked polish was present on the distal ventral tip (Locus D1v; Figure 16). It presented an invasive extension inside the edge, only occurring mainly on the highest micro-topographic areas. At 200x, it shows a few short regular-edges striations (Figure 17).

Other: none.

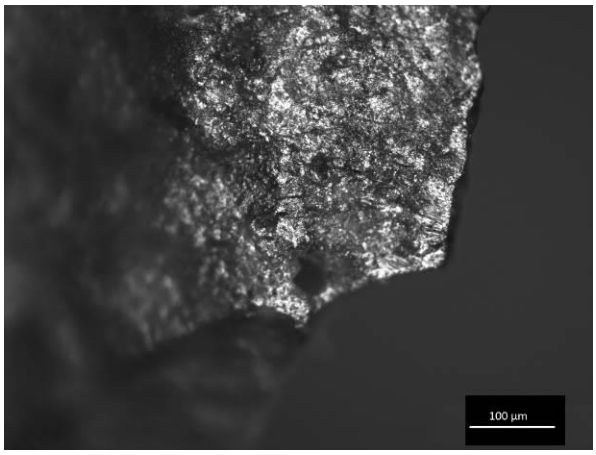


Figure 16. Location A (Form 6, Fig 1). Locus D1v: very bright and rough polish, OLMil/OM 100x.

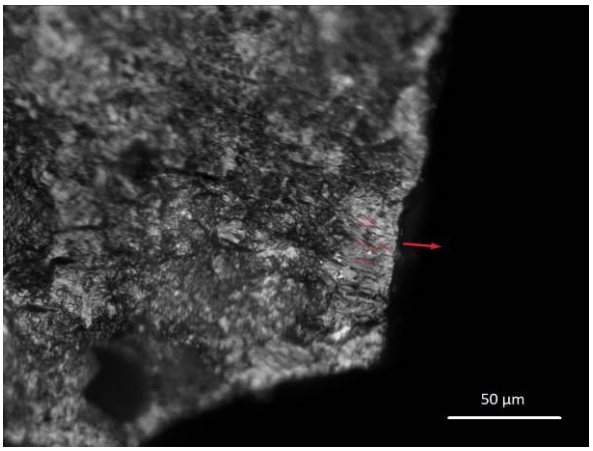
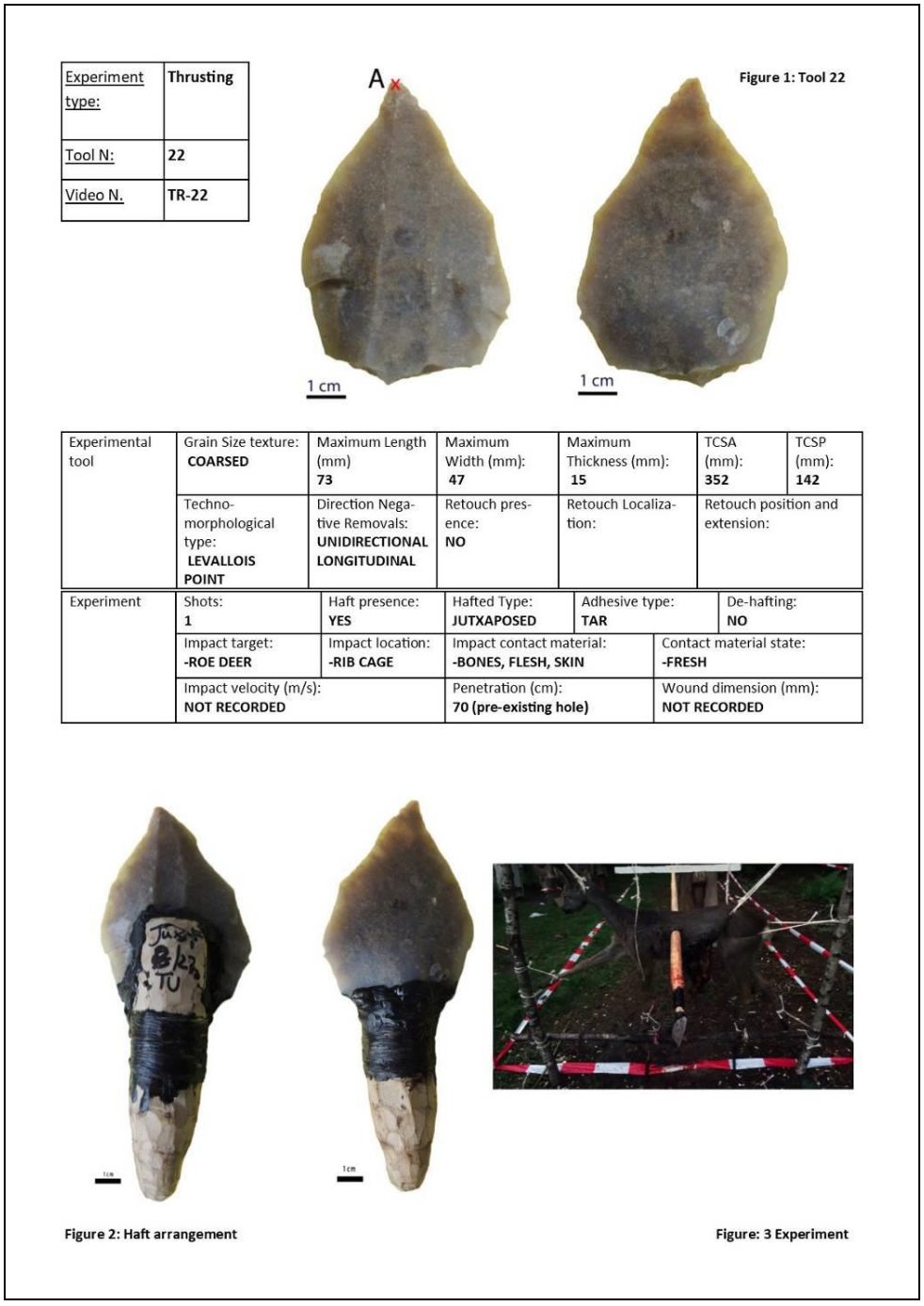


Figure 17. Location A (Form 6, Fig 1). Locus D1v: detail at 200x. Rough and not linked polish with short striations.

A.3 Register of use-wear traces of experimental Levallois points used as thrusting hand-delivered stone-tipped-spear (data from the first set of experiments, see Chapter 4).

Experiment type: spear thrusting. Code: 22-TR-MSL15.

Description of the experiment: the Levallois point was hafted into a wooden fore-shaft by a juxtaposed slot and fixed using commercial tar (Form 7). The stone-tipped-spear was thrust into the target. The tip passed completely through the rib cage. It penetrated at the location of a pre-existing hole. It clearly broke a rib (7th; Form 7).



Experiment type:	Thrusting
Tool N:	22
Video N.	TR-22

Figure 1: Tool 22

Experimental tool	Grain Size texture: **COARSED**	Maximum Length (mm) **73**	Maximum Width (mm): **47**	Maximum Thickness (mm): **15**	TCSA (mm): **352**	TCSP (mm): **142**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **UNIDIRECTIONAL LONGITUDINAL**	Retouch pres-ence: **NO**	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **JUTXAPOSED**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **-RIB CAGE**	Impact contact material: **-BONES, FLESH, SKIN**	Contact material state: **-FRESH**	
	Impact velocity (m/s): **NOT RECORDED**		Penetration (cm): **70 (pre-existing hole)**	Wound dimension (mm): **NOT RECORDED**	

Figure 2: Haft arrangement

Figure: 3 Experiment

Form 7. Experimental recording form. Experiment code: 22-TR-MSL15

Use-wear description. Experiment code: 22-TR-MSL15

Macro-fractures and edge-damage: a feather-terminating bending fracture terminated on the dorsal distal tip (Locus D1d; Figure 18). A unifacial spin-off secondary fracture started from this (Figure 18). A cone fracture with a feather termination was located on the right edge of the tip (D1d; Figure 18).

Polish and striations: no micro-wear traces were observed.

Other: none.

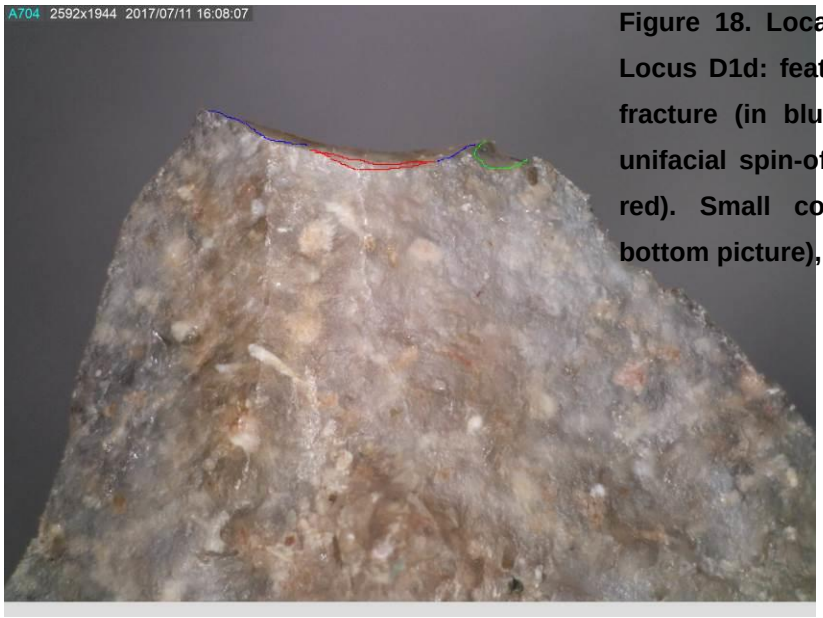


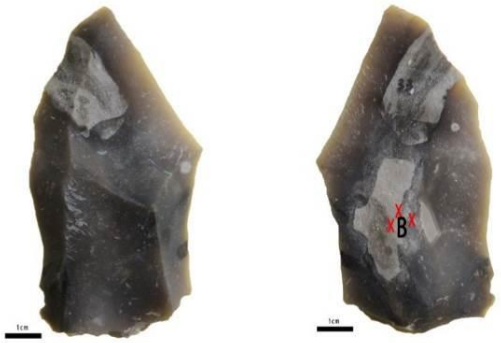
Figure 18. Location A (Form 7, Fig 1). Locus D1d: feather-terminating bending fracture (in blue, bottom picture) plus unifacial spin-off secondary fracture (in red). Small cone fracture (in green, bottom picture), DM/OM 60x.

Experiment type: spear thrusting. Code: 33-TR-MSL15.

Description of the experiment: the Levallois point was hafted into a wooden fore-shaft by a juxtaposed slot and fixed into it with spruce resin and beeswax (Form 8). The stone-tipped spear was thrust into the target. The spear impacted the humerus and the 1st rib. The point detached from the hafting arrangement and landed on the ground (Form 8).

Experiment type:	Thrusting
Tool N:	33
Video N.	TR-33

Figure 1: Tool 33



Experimental tool	Grain Size texture: MEDIUM	Maximum Length (mm) 94	Maximum Width (mm): 46	Maximum Thickness (mm): 14	TCSA (mm): 322	TCSP (mm): 139
	Techno-morphological type: LEVALLOIS POINT	Direction Nega-tive Removals: CENTRIPETAL	Retouch pres-ence: YES	Retouch Localiza-tion: DISTAL RIGHT	Retouch position and extension: DIRECT- SHORT	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: JUXTAPOSED	Adhesive type: RESIN	De-hafting: YES (AFTER IMPACT)
	Impact target: - ROE DEER	Impact location: - HUMERUS/RIB	Impact contact material: -BONES, FLESH, SKIN		Contact material state: FRESH
	Impact velocity (m/s): NOT RECORDED		Penetration (cm): 4		Wound dimension (mm): NOT RECORDED

Figure 2: Haft arrangement

Figure 3: Experiment

Form 8. Experimental recording form. Experiment code: 33-TR-MSL15.

Use-wear description. Experiment code: 33-TR-MSL15

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: no micro-wear traces were observed. No edge-rounding was observed.

Other: tar bright-spots with a smooth texture were located along the haft limit on the proximal ventral face (Locus P1v; Figure 19). At 500x, they present a very domed micro-topography (Figure 20).

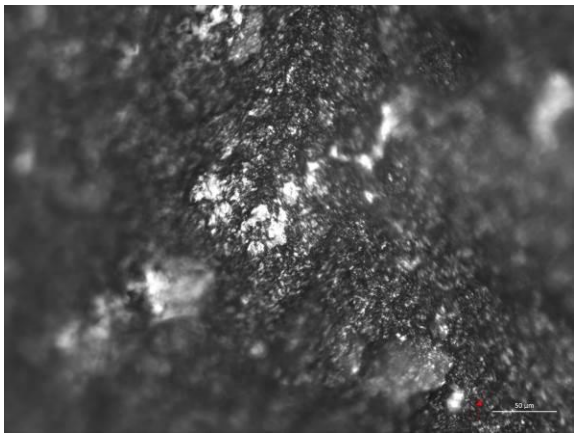


Figure 19. Location B (Form 8, Fig. 1). Locus P1v: bright spots, OLMil/OM 200x

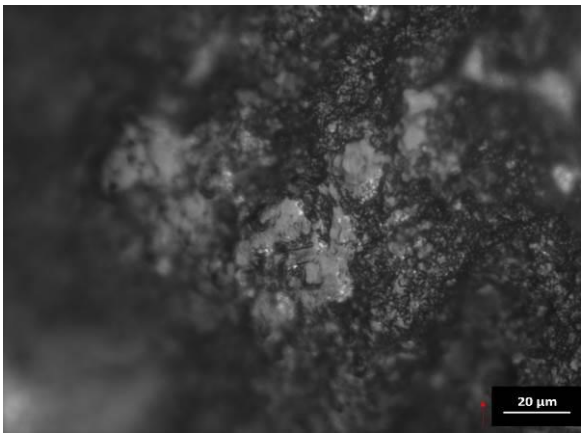


Figure 20. Location B (Form 8, Fig. 1). Locus P1v: bright spots, OLMil/OM 500x.

Experiment type: spear thrusting. Code: 34-TR-MSL15.

Description of the experiment: the Levallois point was hafted into a wooden fore-shaft with a flat slot and fixed into it with spruce resin and beeswax (Form 9). The stone-tipped spear was thrust into the target. The spear completely passed through the rib cage (Form 9).

Experiment type:	Thrusting
Tool N:	34
Video N.	TR-34

Figure 1: Tool 34

Experimental tool	Grain Size texture: MEDIUM	Maximum Length (mm) 65	Maximum Width (mm): 22	Maximum Thickness (mm): 8	TCSA (mm): 88	TCSP (mm): 66
	Techno-morphological type: BLADE POINT	Direction Negative Removals: LONGITUDINAL UNIDIRECTIONAL	Retouch presence: NO	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FLAT	Adhesive type: RESIN	De-hafting: YES (AFTER IMPACT)
	Impact target: - ROE DEER	Impact location: - RIB CAGE	Impact contact material: -BONES, FLESH, SKIN		Contact material state: F-RESH
	Impact velocity (m/s): ND		Penetration (cm): 25		Wound dimension (mm): ND

Figure 2: Haft arrangement

Figure 3: Experiment

Form 9. Experimental recording form. Experiment code: 34-TR-MSL15

Use-wear description. Experiment code: 34-TR-MSL15

Macro-fractures and edge-damage: a double fracture was observed. A snap-terminating bending fracture was located on the ventral distal tip (Locus D1v; Figure 21). A unifacial spin-off secondary fracture started from this (Figure 21)

Polish and striations: no micro-wear traces were observed.

Other: none

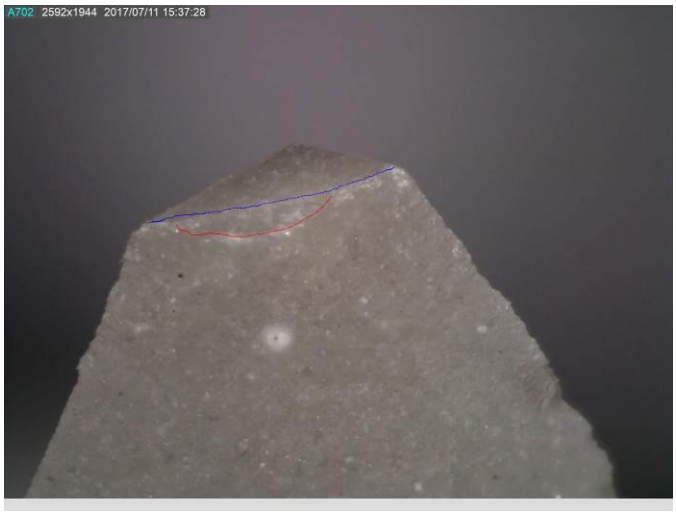


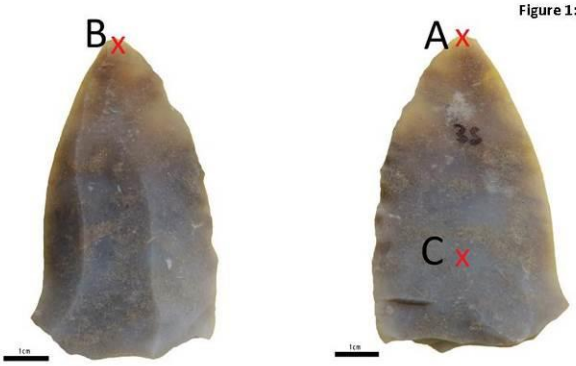
Figure 21. Location A (Form 9, Fig.1). Locus D1v: snap-terminating bending fracture (in blue) plus a unifacial spin-off secondary fracture (in red), DM/OM 50x. .

Experiment type: spear thrusting. Code: 35-TR-MSL15.

Description of the experiment: the Levallois point was hafted into a wooden shaft with a female slot and fixed using commercial tar (Form 10). The stone-tipped spear was thrust into the animal target. It fractured cervical vertebrae (Form 10).

Experiment	Thrusting
Tool N:	35
Video N.	TR-35

Figure 1: Tool 35



Experimental tool	Grain Size texture: **COARSE**	Maximum Length (mm) **65**	Maximum Width (mm): **46**	Maximum Thickness (mm): **16**	TCSA (mm): **368**	TCSP (mm): **139**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **LONGITUDINAL UNIDIRECTIONAL**	Retouch pres-ence: **YES**	Retouch Localiza-tion: **RIGHT**	Retouch position and extension: **DIRECT- CONTINOUS - SHORT**	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEMALE**	Adhesive type: **TAR**	De-hafting: **YES (AFTER IMPACT)**
	Impact target: **- ROE DEER**	Impact location: **- CERVICAL VERTEBRAE**	Impact contact material: **-BONES, FLESH, SKIN**	Contact material state: **-FRESH**	
	Impact velocity (m/s): **ND**		Penetration (cm): **4.5**	Wound dimension (mm): **ND**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 10. Experimental recording form. Experiment code: 35-TR-MSL15

Use-wear description. Experiment code: 35-TR-MSL15

Macro-fractures and edge-damage: a pattern of multiple fractures was observed. A snap-terminating bending fracture was located on the ventral distal tip (Locus D1v; Figure 22). Several bifacial spin-off secondary fractures departed from this (Figure 22, Figure 23). On the distal ventral tip (Locus D1v), two secondary fractures start from the snap-terminating bending fracture (Figure 22). This makes both of them classifiable as spin-off secondary fractures with a step and hinge termination respectively (length 141mm and 461mm, Figure 22). On the distal dorsal tip (Locus D1d), other two spin-off secondary fractures are visible (Figure 23).

Polish and striations: no micro-wear traces were observed.

Other: a tar residue was still present on the proximal ventral surface.

Figure 22. Location A (Form10, Fig.1). Locus D1v: snap-terminating bending fracture (in red) with two bifacial spin-off fractures (in blue and orange), DM/OM 30x.

Figure 23. Location B (Form10, Fig.1). Locus D1d: snap-terminating bending fracture with two bifacial spin-off secondary fractures (in orange), DM/OM 30x.

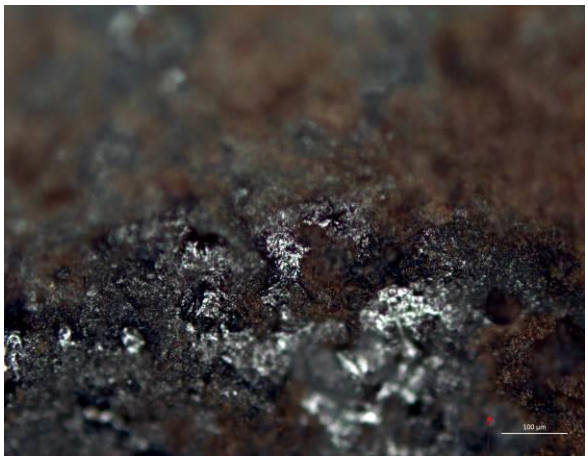


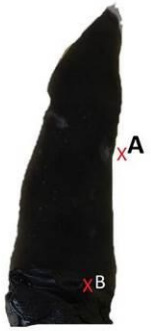
Figure 24. Location C (Form10, Fig.1). Locus P1v: tar residue, OLMil/OM 100x.

Experiment type: spear thrusting. Code: 39-TR-MSL15.

Description of the experiment: the Levallois blade was hafted into a wooden fore-shaft by a flat slot and fixed using commercial tar (Form 11). The stone-tipped spear was thrust into the target. It perforated the rib cage, but the point detached from the hafting arrangement and it lodged between the 6th and 7th ribs (Form 11).

Experiment type:	Thrusting
Tool N:	39
Video N.	TR-39

Figure 1: Tool 39



Experimental tool	Grain Size texture: FINE	Maximum Length (mm) 82	Maximum Width (mm): 28	Maximum Thickness (mm): 11	TCSA (mm): 154	TCSP (mm): 85
	Techno-morphological type: BLADE POINT	Direction Negative Removals: LONGITUDINAL UNIDIRECTIONAL	Retouch presence: NO	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FLAT	Adhesive type: TAR	De-hafting: YES
	Impact target: - ROE DEER	Impact location: - RIB CAGE	Impact contact material: -BONES, FLESH, SKIN		Contact material state: -FRESH
	Impact velocity (m/s): ND		Penetration (cm): 3		Wound dimension (mm): ND

Figure 2: Haft arrangement

Figure 3: Experiment

Form 11. Experimental recording form. Experiment code: 39-TR-MSL15

Use-wear description. Experiment code: 39-TR-MSL15

Macro-fractures and edge-damage: a cone scar with a step termination was located on the right mesial edge (Locus M2v; Figure 25).

Polish and striations: no micro-wear traces were observed.

Other: a very bright, almost metallic, polish covered the proximal ventral surface along the haft limit (P2v). It presents a rough aspect, and it appears like a layer deposited on the surface (additive layer). It incorporated black residues of tar (Figure 26).

Figure 25. Location A (Form 11, Fig. 1). Locus M2v: cone scar with step termination, DM/OM 40x.

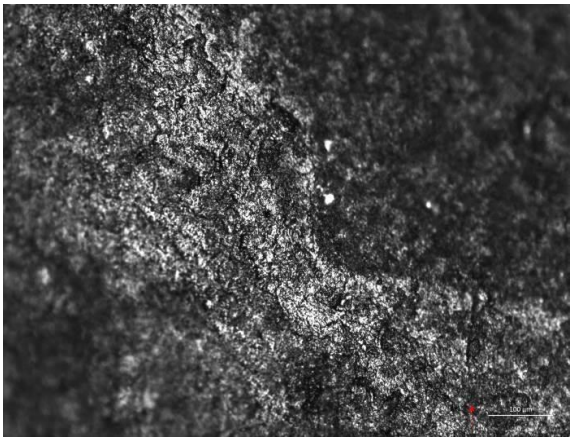


Figure 26. Location B (Form 11, Fig. 1). Locus P2v: tar polish plus tar residue, OLMil/OM 100x.

Experiment type: spear thrusting. Code: 36-TR-MSL15.

Description of the experiment: the Levallois point was hafted into a wooden fore-shaft using a female slot and fixed with spruce resin and beeswax (Form 12). The stone-tipped spear was thrust into the animal target. It hit the spine, completely passing through the animal (Form 12).

Experiment type:	Thrusting
Tool N:	36
Video N.	TR-36

Figure 1: Tool 36

Experimental tool	Grain Size texture: **FINE**	Maximum Length (mm) **67**	Maximum Width (mm): **36**	Maximum Thickness (mm): **11**	TCSA (mm): **198**	TCSP (mm): **108**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Negative Removals: **CONVERGENT UNIDIRECTIONAL**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEMALE**	Adhesive type: **RESIN**	De-hafting: **YES**
	Impact target: **- ROE DEER**	Impact location: **- SPINE**	Impact contact material: **-BONES, FLESH, SKIN**	Contact material state: **-FRESH**	
	Impact velocity (m/s): **ND**		Penetration (cm): **51**	Wound dimension (mm): **ND**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 12. Experimental recording form. Experiment code: 36-TR-MSL15

Use-wear description. Experiment code: 36-TR-MSL15

Macro-fractures and edge-damage: several patterns of multiple fractures were observed. The first pattern was located on the ventral right distal tip (Locus D3v, Figure 27). It is composed by (i) five cone initiation fractures (two with hinge termination and three with feather terminations, Figure 27 in blue), (ii) a bending fracture with feather into step termination (Figure 27 in green), (iii) and five missing initiation fractures with different terminations (Figure 27 in red). The second patter of multiple fractures was located on the dorsal left distal tip (Locus D3d, Figure 29). It counts several cone fractures with different terminations (Figure 29 in blue) and two missing initiation fractures (with a step termination and a hinge termination respectively, Figure 29 in red). Edge-damage on the mesial ventral right edge (Locus M2v) showed a cone sliced scar and a missing initiation fracture (Figure 28). Also, discontinuous cone scars (with multiple morphologies) were observed on the dorsal right distal tip (Locus D3d; Figure 30)

Polish and striations: no micro-wear traces were observed.

Other: none

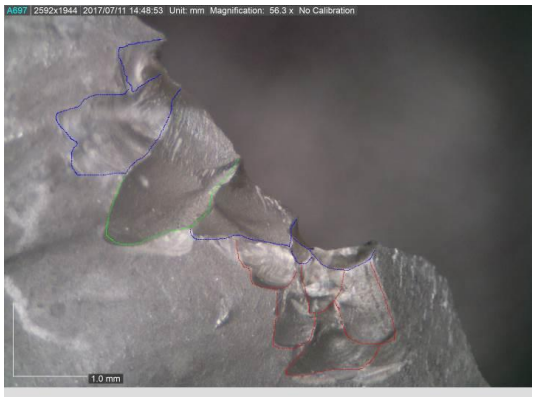


Figure 27. Location B (Form 11, Fig. 1). Locus D3v: pattern of multiple fractures, DM/OM 55x.

Figure 28. Location C (Form 11, Fig. 1). Locus D3v: edge-damage. Cone scar terminating in a step plus a missing initiation fracture, DM/OM 40x.

Figure 29. Location A (Form 11, Fig. 1). Locus D3d: pattern of multiple fractures, DM/OM 40x.

Figure 30. Location A (Form 11, Fig. 1). Locus D2d: edge-damage. Discontinuous cone scars, DM/OM 40x.

A.4 Register of use-wear traces of experimental Levallois points used as throwing hand-delivered stone-tipped-spears (data from the second set of experiments, see Chapter 4)

Experiment type: spear throwing. Code: 52-TH-AOZ16.

Description of the experiment: the experimental Levallois point was hafted into a wooden fore-shaft by a female slot and fixed using commercial tar (Form 13). The stone-tipped spear was thrown into the target. The spear completely passed through the rib cage. It broke two rib bones (5^{th}/6^{th}, Form 13).

Experiment type:	Throwing
Tool N:	52
Video N.	TH-52

Figure 1: Tool 52

Experimental tool	Grain Size texture: MEDIUM	Maximum Length (mm) 84	Maximum Width (mm): 53	Maximum Thickness (mm): 19	TCSA (mm): 503	TCSP (mm): 160
	Techno-morphological type: LEVALLOIS POINT	Direction Negative Removals: THREE BLOWS-POINT	Retouch presence: NO	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: NO
	Impact target: - ROE DEER	Impact location: - RIB CAGE	Impact contact material: -BONES, FLESH, SKIN	Contact material state: FRESH	
	Impact velocity (m/s):		Penetration (cm): 14	Wound dimension (mm): 4*2	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 13. Experimental recording form. Experiment code: 52-TH-AOZ16.

Use-wear description. Experiment code: 52-TH-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilization.

Polish and striations: a faint and rough polish was present on the ventral distal tip (Locus D1v). The polish was located on the immediate edge and it presented a domed topography with a scarce degree of linkage (Figure 33). At 100x, it showed clear directionality (Figure 31) with linear bands of polish (MLITs) that ran parallel to the direction of the impact (Figure 32).

Other: none

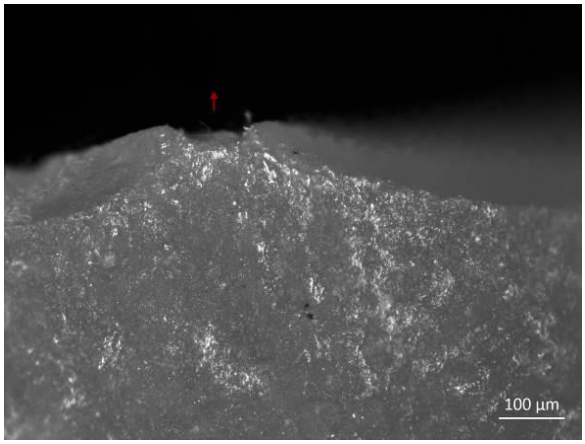


Figure 31. Location A (Form 13, Fig. 1). Locus D1v: impact polish with directionality, OLMil/OM 100x.

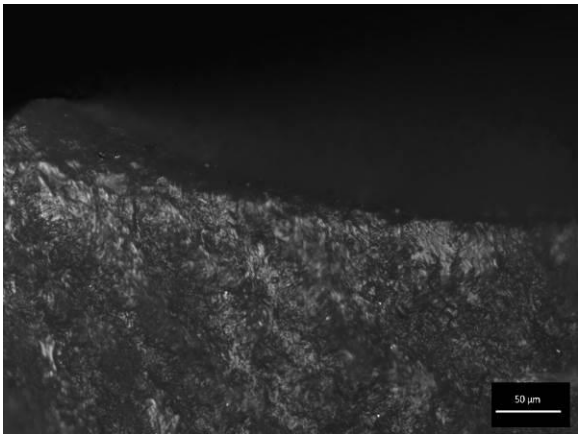


Figure 33. Location A (Form 13, Fig. 1). Locus D1v: details at 200x. Domed into flat polish on the immediate edge.

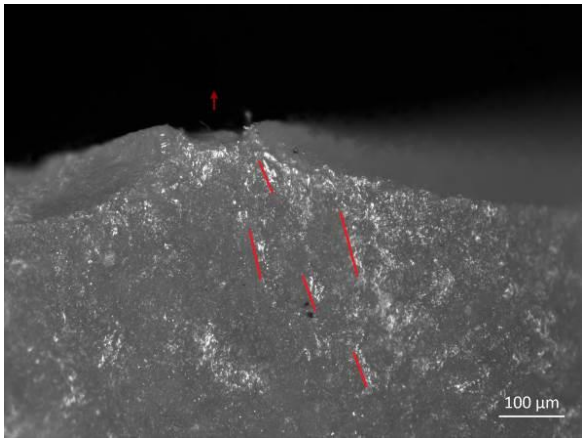


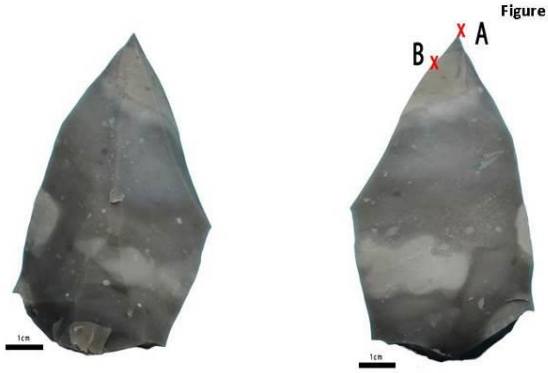
Figure 32. Location A (Form 13, Fig. 1). Locus D1v: details of the linear band of polish (or MLITs) at OLMil/OM 100x.

Experiment type: spear throwing. Code: 53-TH-AOZ16.

Description of the experiment: the experimental Levallois point was hafted into a wooden fore-shaft by a female slot and fixed using commercial tar (Form 14). The spear was thrown into the target. The spear went through the spine, making a hole in it and severed the spinal muscles and sinew (Form 14).

Experiment	Throwing
Tool N:	53
Video N.	TH-53

Figure 1: Tool 53



Experimental tool	Grain Size texture: **MEDIUM**	Maximum Length (mm) **85**	Maximum Width (mm): **50**	Maximum Thickness (mm): **17**	TCSA (mm): **425**	TCSP (mm): **151**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Negative Removals: **THREE BLOWS-POINT**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **- ROE DEER**	Impact location: **SPINE**	Impact contact material: **-BONES, FLESH, SKIN**	Contact material state: **FRESH**	
	Impact velocity (m/s):		Penetration (cm): **43**	Wound dimension (mm): **5*3.2**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 14. Experimental recording form. Experiment code: 53-TH-AOZ16.

Use-wear description. Experiment code: 53-TH-AOZ16

Macro-fractures and edge-damage: a pattern of multiple fractures was observed on the ventral distal tip (D1v). A snap-terminating bending fracture terminated on the ventral distal tip (Locus D1v; Figure 34 in red) A step-terminating with a missing initiation fracture started from this (Figure 34 in blue). It is followed by a unifacial spin-off secondary fracture (Figure 34 in orange), and two cone fractures (Fig. 53.1 in green). Continuous and overlapping scalar cone scars were located on the mesial ventral left edge (Loci D2v and M1v; Figure 35).

Polish and striations: no micro-wear traces were observed. (The distal tip completely crushed after the impact).

Other: none.

Figure 34. Location A (Form 14, Fig.1) Locus: D1v: pattern of multiple fractures, DM/OM 60x. Snap-terminating bending fracture (in red), step-terminating bending fracture (in blue), a unifacial spin-off secondary fracture (in orange), and two cone scars (in green).

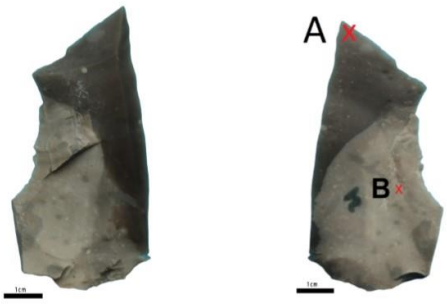
Figure 35. Location B (Form 14, Fig.1) Locus: M1v: continuous and overlapping scalar cone scars, DM/OM 40x.

Experiment type: spear throwing. Code: 56-TH-AOZ16.

Description of the experiment: the experimental Levallois point was hafted into a wooden fore-shaft by a female slot and fixed using commercial tar (Form 15). The spear was thrown at the target. It missed the target and stuck into the ground (Form 15).

Experiment type:	**Throwing**
Tool N:	**56**
Video N.	**TR-56**

Figure 1: Tool 56



Experimental tool	Grain Size texture: **MEDIUM**	Maximum Length (mm) **81**	Maximum Width (mm): **39**	Maximum Thickness (mm): **8**	TCSA (mm): **195**	TCSP (mm): **117**
	Techno-morphological type: **LEVALLOIS CONVERGENT FLAKE**	Direction Negative Removals: **CONVERGENT UNIDIRECTIONAL**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-GROUND**	Impact location: **- GROUND**	Impact contact material: **-SOIL, STONES, GRASS**	Contact material state:	
	Impact velocity (m/s):		Penetration (cm): **NA**	Wound dimension (mm): **NA**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 15. Experimental recording form. Experiment code: 56-TH-AOZ16.

Use-wear description. Experiment code: 56-TH-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: a band of linear polish, also definable as a MILT, was located on the inner surface of the ventral distal tip (D1v). However, it was clearly visible only from 100x (Figure 36). It showed a very bright aspect with clear linearity and striations. The striations ran parallel to the direction of the impact (Figure 37).

Other: on the proximal ventral surface (P1v) a black polished residue of tar was still visible (even after cleaning). It looks like a circular line of a greasy and oily layer deposited on the surface (additive layer; Figure 125).

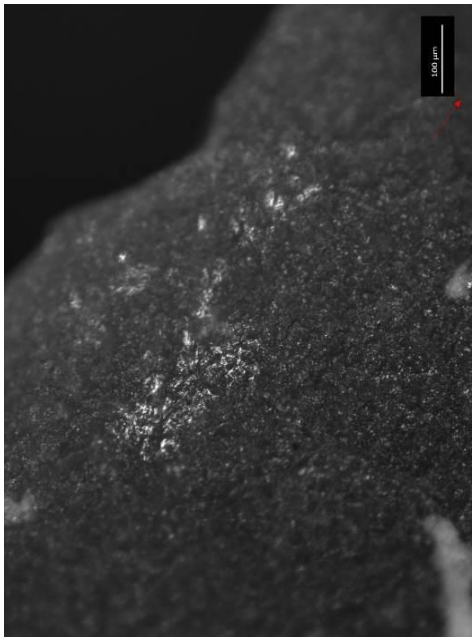


Figure 36. Location A (Form 15, Fig.1) Locus: D1v: MLIT with parallel directionality, OLMil/OM 100x.

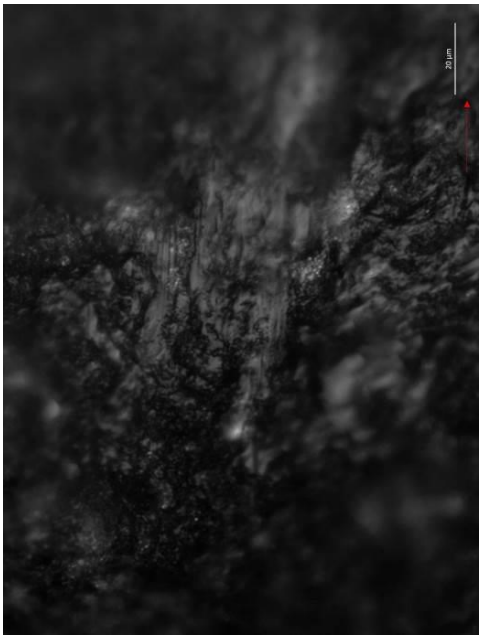


Figure 37. Location A (Form 15, Fig.1). Locus: D1v: detail at 500x. MLIT with parallel striations.

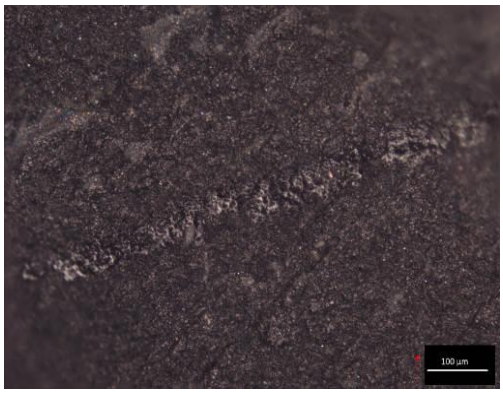


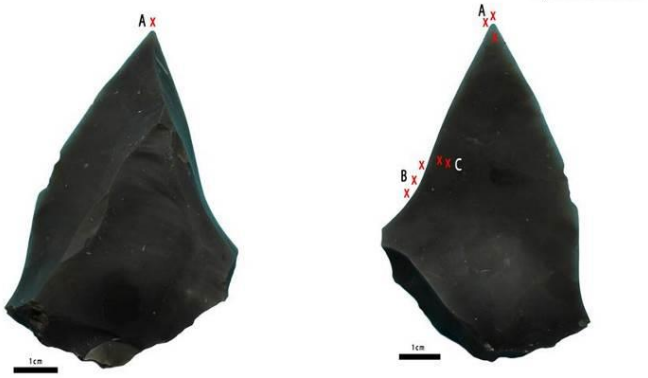
Figure 56 1. Locus P1v: tar additive layer, OLMil/OM 100x.

Experiment type: spear throwing. Code: 58-TH-AOZ16.

Description of the experiment: the experimental Levallois point was hafted into a wooden fore-shaft by a female slot and fixed using commercial tar (Form 16). The spear was thrown at the target. It hit the shoulder blade and penetrated 5cm into the joint. It then bounced out of the target and onto the ground (Form 16).

Experiment type:	Throwing
Tool N:	58
Video N.	TR-58

Figure 1: Tool 58



Experimental tool	Grain Size texture: FINE	Maximum Length (mm) 78	Maximum Width (mm): 49	Maximum Thickness (mm): 11	TCSA (mm): 269	TCSP (mm): 147
	Techno-morphological type: LEVALLOIS POINT	Direction Negative Removals: THREE BLOWS-POINT	Retouch presence: NO	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: NO
	Impact target: -ROE DEER	Impact location: - SPINE	Impact contact material: -BONE, FLESH, SKIN		Contact material state: - FRESH
	Impact velocity (m/s):		Penetration (cm): 5		Wound dimension (mm): 4*2

Figure 2: Haft arrangement

Figure 3: Experiment

Form 16. Experimental recording form. Experiment code: 58-TH-AOZ16

Use-wear description. Experiment code: 58-TH-AOZ16

Macro-fractures and edge-damage: a feather-terminating bending fracture terminated on the dorsal distal tip (Locus D1d; Figure 38).

Polish and striations: on the mesial ventral surface (Locus M1v) several bright spots were present (Figure 39). They were isolated spots of well-developed and smooth polish, with a “broken aspect” (Van Gijn 1989). They occurred mainly on the highest micro-topographic areas.

Other: lumps of tar deposit were still present (even after cleaning) on the proximal ventral surface along the haft limit (P1v; Figure 40).

Figure 38. Location A (Form 16, Fig.1) Locus D1d: feather-terminating bending fracture DM/OM 76x.

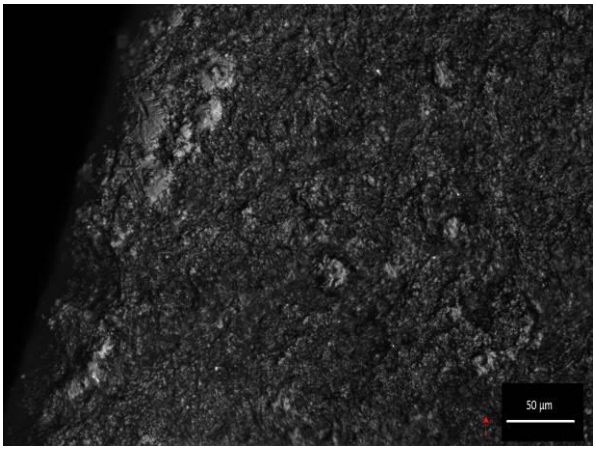


Figure 39. Location B (Form 16, Fig.1) Locus M1v: spots of “broken” polish, OLMil/OM 200x.

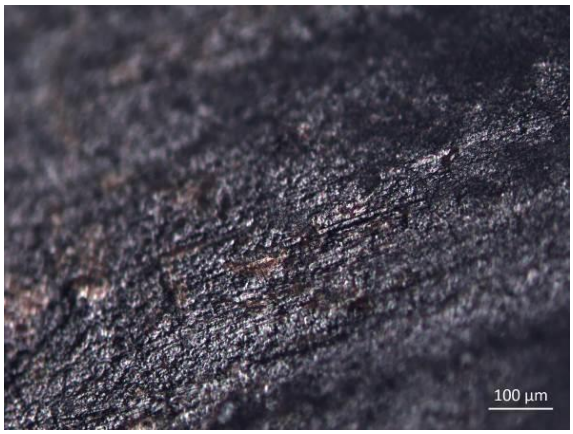


Figure 40. Location C (Form 16, Fig.1) Locus P1v; tar deposit, OLMil/OM 100x.

Experiment type: spear throwing. Code: 60-TH-AOZ16.

Description of the experiment: the experimental Levallois point was hafted into a wooden fore-shaft by a female slot and fixed using commercial tar (Form 17). The spear was thrown at the target. It penetrated the rib cage, breaking two ribs (7^{th}/6^{th}). The point and fore-shaft got stuck between the ribs. The shaft detached from the point and fore-shaft and fell onto the ground (Form 17).

Experiment type:	Throwing
Tool N:	60
Video N.	TH-60

Figure 1: Tool 60

Experimental tool	Grain Size texture: COARSED	Maximum Length (mm) 64	Maximum Width (mm): 56	Maximum Thickness (mm): 12	TCSA (mm): 336	TCSP (mm): 168
	Techno-morphological type: LEVALLOIS POINT	Direction Nega-tive Removals: THREE BLOWS-POINT	Retouch pres-ence: NO	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: YES (FORESHAFT)
	Impact target: -ROE DEER	Impact location: - RIB CAGE	Impact contact material: -BONE, FLESH, SKIN		Contact material state: - FRESH
	Impact velocity (m/s):		Penetration (cm): 11		Wound dimension (mm): 5*2.5

Figure 2: Haft arrangement

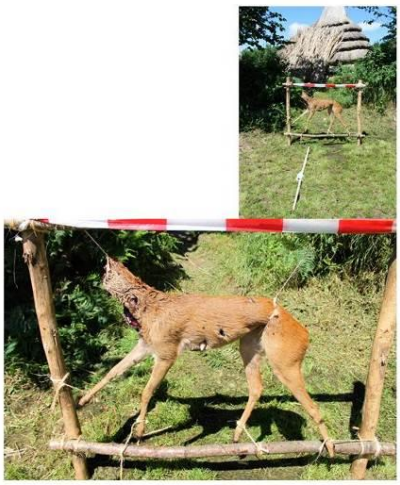


Figure 3: Experiment

Form 17. Experimental recording form. Experiment code: 60-TH-AOZ16.

Use-wear description. Experiment code: 60-TH-AOZ16

Macro-fractures and edge-damage: a hinge-terminating bending fracture was located and terminated on the ventral distal tip (D1v; Figure 41).

Polish and striations: no micro-wear traces were observed.

Other: none

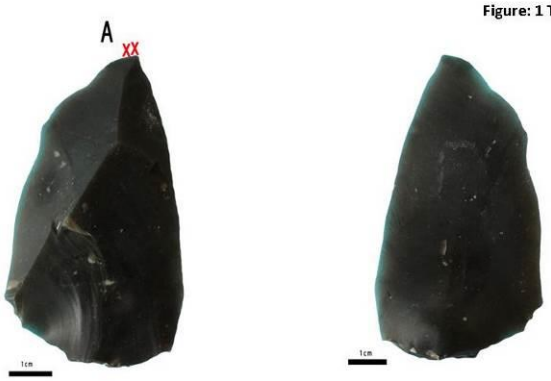
Figure 41. Location A (Form 17, Fig. 1). Locus D1v: hinge-terminating bending fracture (in red), DM/OM 50x.

Experiment type: spear throwing. Code: 61-TH-AOZ16.

Description of the experiment: the experimental Levallois point was hafted into a wooden fore-shaft by a female slot and fixed using commercial tar (Form 18). The spear was thrown at the target. It hit the shoulder blade and penetrated through a pre-existing hole (Form 18).

Experiment type:	Throwing
Tool N:	61
Video N.	TH-61

Figure: 1 Tool 61



Experimental tool	Grain Size texture: FINE	Maximum Length (mm) 72	Maximum Width (mm): 38	Maximum Thickness (mm): 10	TCSA (mm): 190	TCSP (mm): 114
	Techno-morphological type: LEVALLOIS POINT	Direction Negative Removals: THREE BLOWS-POINT	Retouch presence: NO	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: NO
	Impact target: -ROE DEER	Impact location: -SHOULDER BLATE	Impact contact material: -BONE, FLESH, SKIN		Contact material state: - FRESH
	Impact velocity (m/s):		Penetration (cm): 65 (PH)		Wound dimension (mm): NA

Figure 2: Haft arrangement

Figure 3: Experiment

Form 18. Experimental recording form. Experiment code: 61-TH-AOZ16

Use-wear description. Experiment code: 61-TH-AOZ16

Macro-fractures and edge-damage: multiple continuous half-moon cone scars occurred on the dorsal-ventral tip (D1d; Figure 42)

Polish and striations: no micro-wear traces were observed.

Other: none.

Figure 42. Location A (Form 18, Fig.1). Locus D1d: half-moon cone scars, DM/OM 45x.

Experiment type: spear throwing. Code: 62-TH-AOZ16.

Description of the experiment: the experimental Levallois point was hafted into a wooden fore-shaft by a female slot and fixed using commercial tar (Form 19). The spear was thrown at the target. The tip passed completely through the rib cage. It shattered the 7th and 8th ribs (Form 19).

Experiment type:	Throwing
Tool N:	62
Video N.	TH-62

Figure: 1 Tool 62

Experimental tool	Grain Size texture: FINE	Maximum Length (mm) 82	Maximum Width (mm): 34	Maximum Thickness (mm): 9	TCSA (mm): 153	TCSP (mm): 102
	Techno-morphological type: BLADE POINT	Direction Nega-tive Removals: LONGITUDINAL UNIDIRECTIONAL	Retouch pres-ence: NO	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: NO
	Impact target: -ROE DEER	Impact location: -RIB CAGE	Impact contact material: -BONE, FLESH, SKIN		Contact material state: - FRESH
	Impact velocity (m/s):		Penetration (cm): 29		Wound dimension (mm): 4.6*2

Figure 2: Haft arrangement

Figure 3: Experiment

Form 19. Experimental recording form. Experiment code: 62-TH-AOZ16

Use-wear description. Experiment code: 62-TH-AOZ16

Macro-fractures and edge-damage: Edge-damage occurred along the right mesial edge (Loci D2d and M1d). It was identifiable as a micro-denticulate edge-damage (Figure 43, Figure 45). The scars were scalar and elongated cone that continuously ran along the edge (Figure 45).

Polish and striations: a very faint and scattered polish was present on the ventral distal tip (Locus D1v). It was rather dull, faint and not-develop polish (Figure 44).

Other: none.

Figure 43. Location A (Form 19, Fig.1). Loci D2d and M1d: edge-crushing, DM/OM 20x

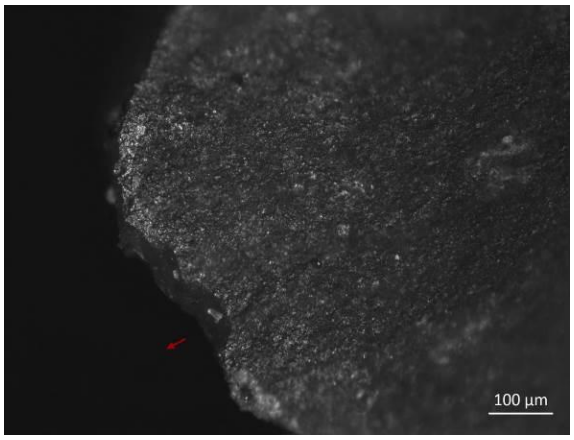


Figure 44. Location A (Form 19 Fig.1). Locus D1v: faint polish, OLMil/OM 100x

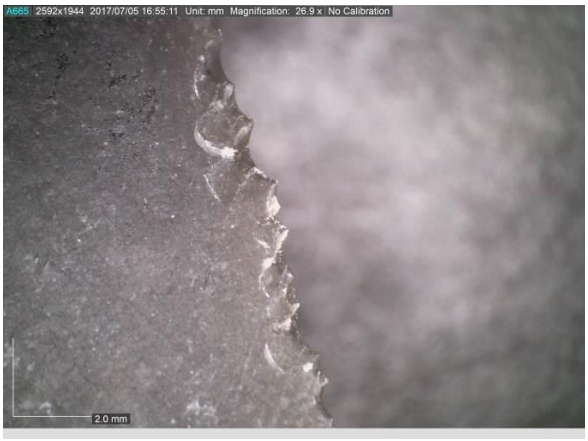


Figure 45. Location A (Form 19, Fig.1). Locus M1d: details at 40x. Micro-denticulated edge-damage (edge-jagged) composed of a scalar and elongated cone scars.

Experiment type: spear throwing. Code: 66-TH-AOZ16.

Description of the experiment: the experimental Levallois point was hafted into a wooden fore-shaft by a female slot and fixed using commercial tar (Form 20). The spear was thrown at the target. It perforated the pelvis area, but it was deflected by the target and landed on the ground behind it (Form 20).

Experiment type:	Throwing
Tool N:	66
Video N.	TH-66

Figure 1: Tool 66

Experi-mental tool	Grain Size texture: MEDIUM	Maximum Length (mm) 73	Maximum Width (mm): 57	Maximum Thickness (mm): 8	TCSA (mm): 228	TCSP (mm): 171
	Techno-morphological type: LEVALLOIS CONVER-GENT FLAKE	Direction Negative Removals: LONGITUDINAL UNI-DIRECTIONAL	Retouch pres-ence: NO	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: YES
	Impact target: -ROE DEER	Impact location: - PELVIS/GROUND	Impact contact material: -BONE, FLESH, SKIN -SOIL, STONES		Contact material state: NA
	Impact velocity (m/s):		Penetration (cm): 2		Wound dimension (mm): 3*3.8

Figure 2: Haft arrangement

Figure 3: Experiment

Form 20. Experimental recording form. Experiment code: 66-TH-AOZ16.

Use-wear description. Experiment code: 66-TH-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: multiple and well-developed linear bands of polish (MLITs) ran parallel to the direction of the impact (Figure 46, Figure 48). They were located along the entire distal ventral tip (Dv1, Dv2, Dv3)

Other: tar polish and residue are still visible on the proximal ventral surface (Locus P1v). It looks like a very greasy and oily layer deposited on the tool surface (additive polish; Figure 47, Figure 49).

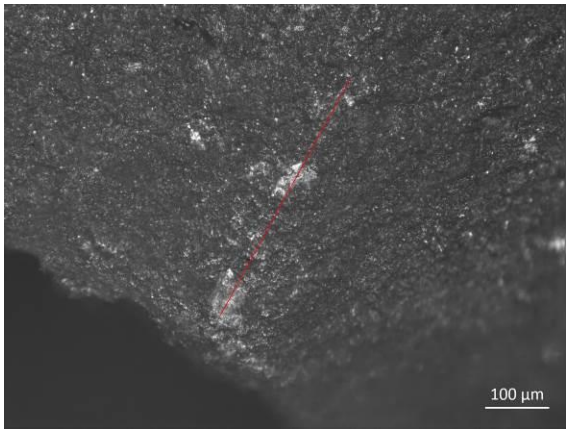


Figure 46. Location A (Form 20, Fig.1). Locus D2v: MLITs, OLMil/OM 100x.

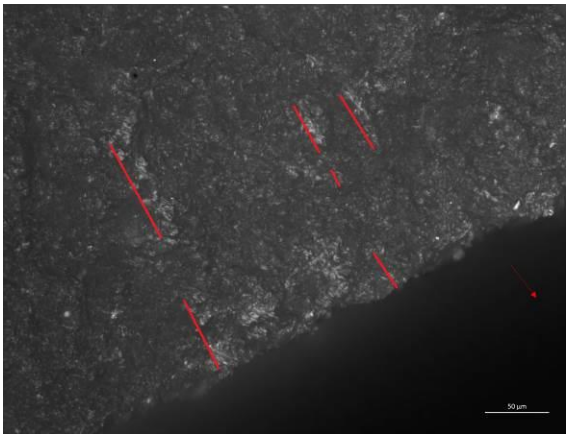


Figure 48. Location B (Form 20, Fig.1). Locus D3v: MLITs, OLMil/OM 100x.

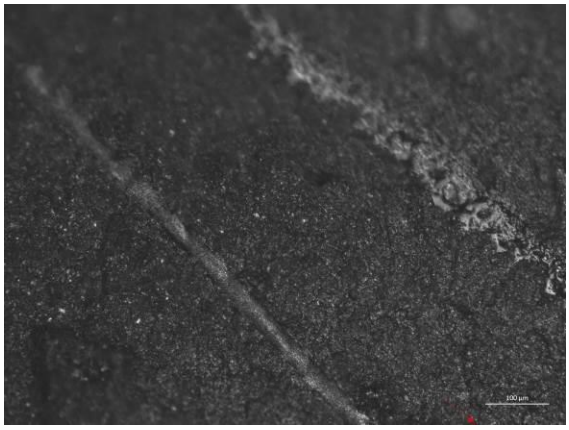


Figure 47. Location C (Form 20, Fig.1). Locus Pv1: tar deposit and tar additive layer, b/w picture OLMil/OM 100x.

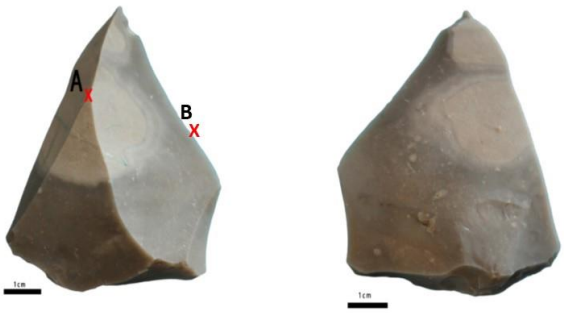
Figure 49. Location C (Form 20, Fig.1). Locus Pv1: tar deposit and tar additive layer, colour picture OLMil/OM 100x.

Experiment type: spear throwing. Code: 67-TH-AOZ16.

Description of the experiment: the experimental Levallois point was hafted into a wooden fore-shaft by a female slot and fixed using commercial tar (Form 21). The spear was thrown at the target. It perforated the shoulder blade scratching two ribs (1st/2nd; Form 21).

Experiment type:	**Throwing**
Tool N:	**67**
Video N.	**TH-67**

Figure 1: Tool 67



Experimental tool	Grain Size texture: **MEDIUM**	Maximum Length (mm) **78**	Maximum Width (mm): **51**	Maximum Thickness (mm): **13**	TCSA (mm): **331**	TCSP (mm): **153**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Negative Removals: **THREE BLOWS-POINT**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **- SHOULDER BLADE**	Impact contact material: **-BONE, FLESH, SKIN**	Contact material state: **- FRESH**	
	Impact velocity (m/s):		Penetration (cm): **14**	Wound dimension (mm): **4.5*2.5**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 21. Experimental recording form. Experiment code: 67-TH-AOZ16.

Micro-wear: experiment 67-TH-AOZ16

Macro-fractures and edge-damage: edge-damage was recorded on the mesial left edge (M1v). It presented multiple discontinuous cone scars with multiple morphologies (Figure 51).

Polish and striations: a well-developed polish was observed on the central dorsal ridge (DcR). At 200x, the polish displays a dull and rough aspect with several striations incorporated into it. These ran perpendicular to the morphological axis of the tool (Figure 50).

Other: none.

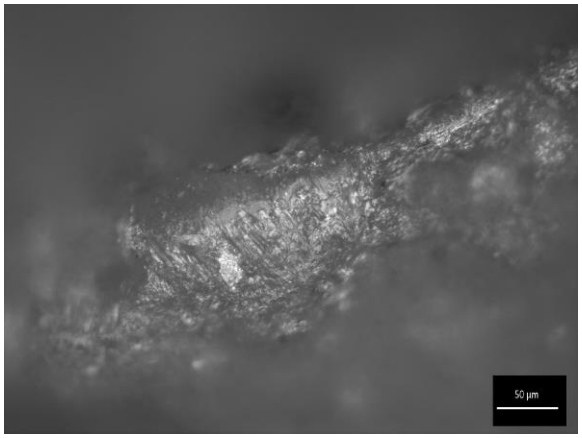


Figure 50. Location A (Form 21, Fig.1). Locus DcR: dull and rough polish with striations, OLMil/OM 200x.

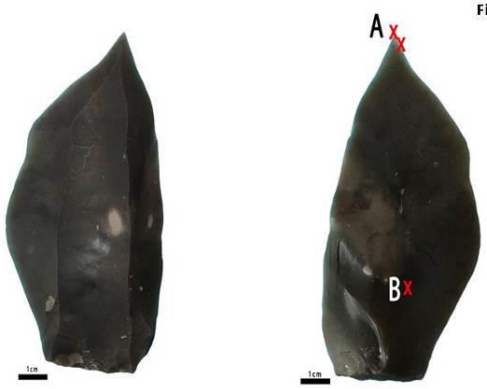
Figure 51. Location B (Form 21, Fig.1). Locus M1v: edge-damage, DM/OM 40x.

Experiment type: spear throwing. Code: 68-TH-AOZ16.

Description of the experiment: the experimental Levallois point was hafted into a wooden fore-shaft by a female slot and fixed using commercial tar (Form 22). The spear was thrown at the target. The tip passed completely through the neck (Form 22)

Experiment type:	Throwing
Tool N:	68
Video N.	TH-68

Figure 1: Tool 68



Experimental tool	Grain Size texture: FINE	Maximum Length (mm) 104	Maximum Width (mm): 57	Maximum Thickness (mm): 15	TCSA (mm): 427	TCSP (mm): 171
	Techno-morphological type: BLADE POINT	Direction Negative Removals: LONGITUDINAL UNIDIRECTIONAL	Retouch presence: NO	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: NO
	Impact target: -ROE DEER	Impact location: -NECK	Impact contact material: -FLESH, SKIN	Contact material state: - FRESH	
	Impact velocity (m/s):		Penetration (cm): 42	Wound dimension (mm): 6*1	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 22. Experimental reding form. Experiment code: 68-TH-AOZ16.

Use-wear description. Experiment code: 68-TH-AOZ16

Macro-fractures and edge-damage: a small cone scar terminating in a feather was recorded on the distal ventral tip (D1v, Figure 53).

Polish and striations: a bright and quite developed polish occurred on the ventral distal right tip (D3v). The degree of linkage between the polish was low. However, it was an extensive polish which covered the immediate edge and the highest micro-topographic areas of the inner surface (Figure 52). At 200x, it was bright with micro-pits and shallow striations, which ran parallel to the direction of the impact (Figure 54).

Other: tar polish and tar residue were visible on the proximal ventral surface (Locus P1v). The residue looked very greasy and oily layer deposited on the tool surface (additive layer; Figure 55).

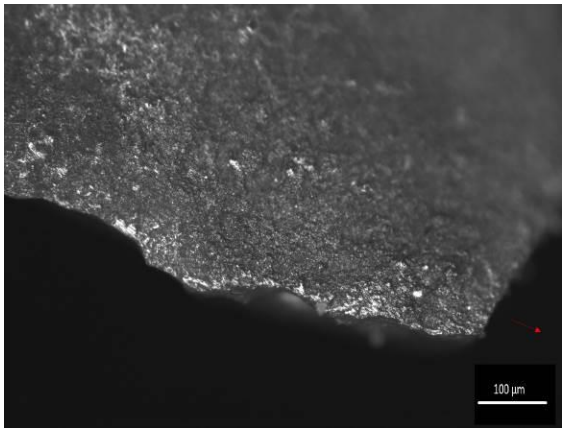


Figure 52. Location A (Form 22, Fig.1). Locus D1v: bright polish, OLMil/OM 100x.

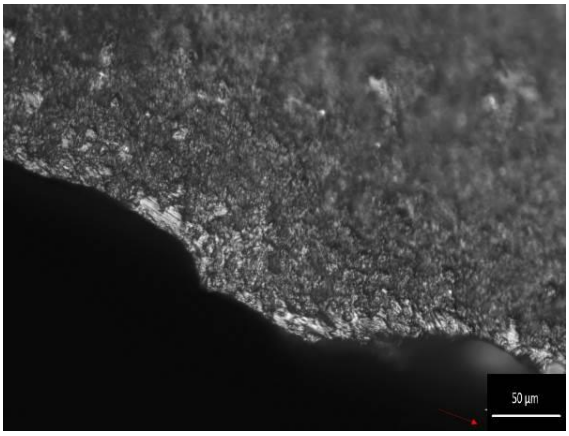


Figure 54. Location A (Form 22, Fig.1). Locus D1v: details at 200x. Domed polish with micro-pits and striations.

Figure 53. Location A (Form 22, Fig.1). Locus D1v: feather-terminating cone scar, DM/OM 100x.

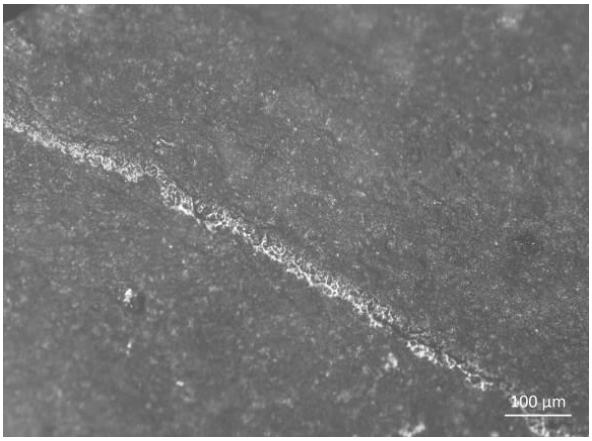


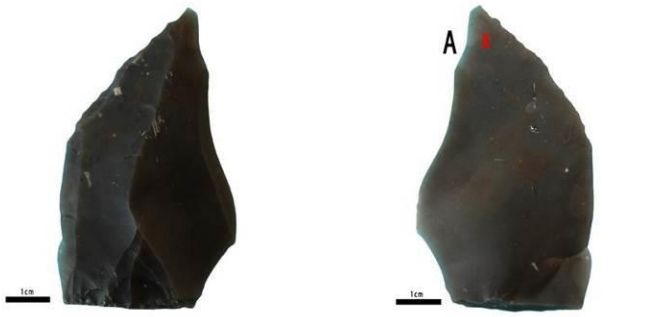
Figure 55. Location B (Form 22, Fig.1). Locus P1v: tar residue, OLMil/OM 100x.

Experiment type: spear throwing. Code: 71-TH-AOZ16.

Description of the experiment: the Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 23). The spear was thrown at the target. It missed the target. It glanced the wooden frame, landing on the ground behind it (Form 23).

Experiment type:	Throwing
Tool N:	71
Video N.	TH-71

Figure: 1 Tool 71



Experimental tool	Grain Size texture: FINE	Maximum Length (mm) 65	Maximum Width (mm): 44	Maximum Thickness (mm): 13	TCSA (mm): 286	TCSP (mm): 132
	Techno-morphological type: MOUSTERIAN POINT	Direction Negative Removals: CONVERGENT UNIDIRECTIONAL	Retouch presence: YES	Retouch Localization: DISTAL LEFT	Retouch position and extension: DIRECT-LONG	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: NO
	Impact target: -GROUND	Impact location: -SOIL	Impact contact material: -SOIL, STONES, GRASS	Contact material state: - NA	
	Impact velocity (m/s):		Penetration (cm): 6	Wound dimension (mm): NA	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 23. Experimental reding form. Experiment code: 71-TH-AOZ16.

Use-wear description. Experiment code: 71-TH-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: multiple linear narrow bands of polish (MLITs) were located on the ventral distal surface (D1v inner part). They were visible from low magnifications (50x; Figure 56). However, they become very bright, highly reflective, and with a rough texture at 100x (Figure 57). They ran parallel to the direction of impact.

Other: none

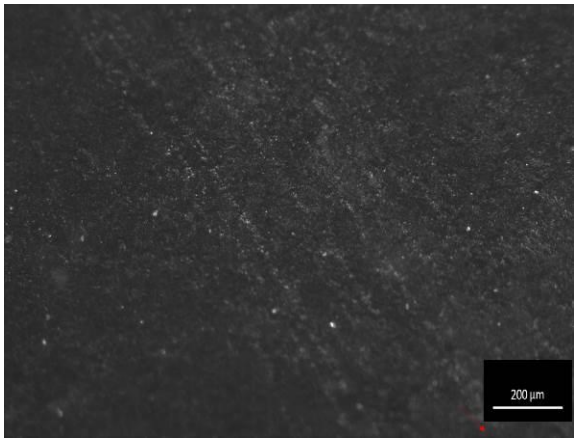


Figure 56. Location A (Form 23, Fig.1). Locus D1v inner part: MLITs, OLMil/OM 50x.

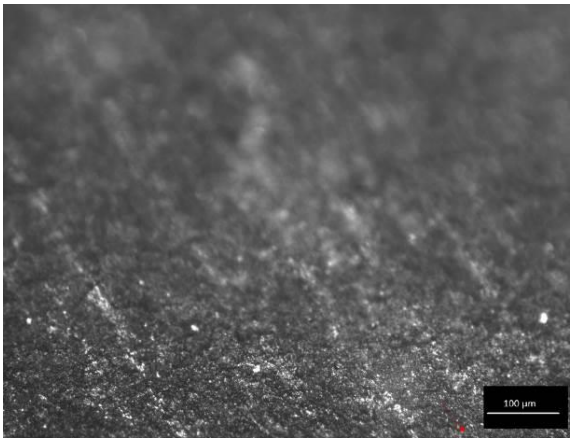


Figure 57. Location A (Form 23 Fig.1). Locus D1v: details at 100x. Very bright and rough MLITs (ground impact).

Experiment type: spear throwing. Code: 73-TH-AOZ16.

Description of the experiment: the Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 24). The spear was thrown at the target. It hit the spine of the target and penetrated 6 cm but bounced out of the target, coming to rest on the ground (Form 24).

Experiment type:	**Throwing**
Tool N:	**73**
Video N.	**TH-73**

Figure: 1 Tool 73

Experimental tool	Grain Size texture: **COARSED**	Maximum Length (mm) **85**	Maximum Width (mm): **39**	Maximum Thickness (mm): **10**	TCSA (mm): **195**	TCSP (mm): **117**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **THREE BLOWS-POINT**	Retouch pres-ence: **NO**	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **-SPINE**	Impact contact material: **-BONE, FLESH, SKIN**	Contact material state: **- FRESH**	
	Impact velocity (m/s):		Penetration (cm): **5**	Wound dimension (mm): **4.5*1**	

Figure 2: Haft arrangement

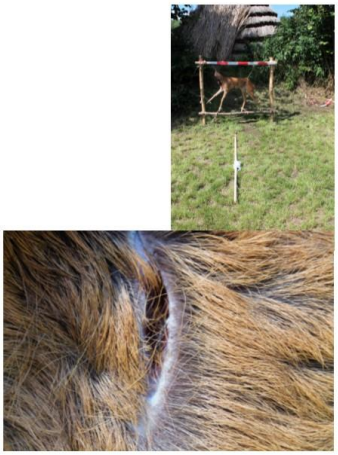


Figure: 3 Experiment

Form 24. Experimental reding form. Experiment code: 73-TH-AOZ16.

Use-wear description. Experiment code: 73-TH-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage occurred after utilisation.

Polish and striations: no polish occurred on the tool. A linear narrow band of polish (MLIT) was observed on the ventral distal surface (D1v inner part). It shows a very bright and reflective rough polish which ran parallel to the direction of impact (Figure 58).

Other: none

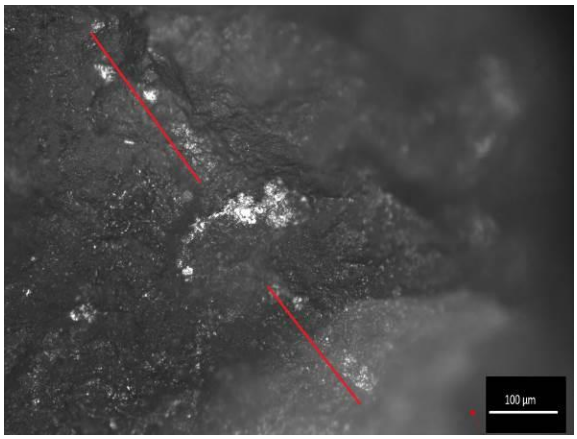


Figure 58. Location A (Form 24, Fig.1). Locus D1v: very bright and rough linear band of polish (MLIT), OLMil/OM 100x.

Experiment type: spear throwing. Code: 76-TH-AOZ16.

Description of the experiment: the Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 25). The spear was thrown at the target. It hit the spine of the animal target. The spear glanced the spine of the target, landing on the ground behind it (Form 25).

Experiment type:	Throwing
Tool N:	76
Video N.	TH-76

Figure: 1 Tool 76

Experimental tool	Grain Size texture: **FINE**	Maximum Length (mm) **90**	Maximum Width (mm): **43**	Maximum Thickness (mm): **12**	TCSA (mm): **258**	TCSP (mm): **129**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **LONGITUDiNAL UNIDIRECTIONAL**	Retouch pres-ence: **YES**	Retouch Localiza-tion: **DIRECT- LEFT**	Retouch position and extension: **MESIAL DISCON-TINOUS**	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **- SLEPT OFF**	Impact contact material:	Contact material state: **NA**	
	Impact velocity (m/s):		Penetration (cm): **ND**	Wound dimension (mm): **ND**	

Figure 2: Haft arrangement

Figure: 3 Experiment

Form 25. Experimental reding form. Experiment code: 76-TH-AOZ16.

Use-wear description. Experiment code: 76-TH-AOZ16

Macro-fractures and edge-damage: no fracture or edge-damage were observed after utilisation.

Polish and striations: a very faint polish occurred on the ventral distal tip (D1v, Figure 59). At 500x, the polish was scattered, not linked and not-well-developed (Figure 60).

Other: none

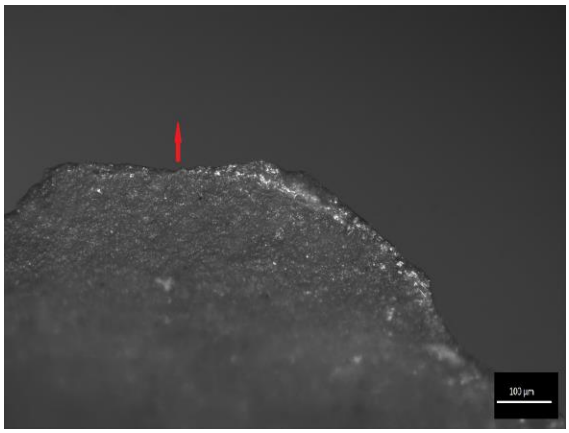


Figure 59. Location A (Form 25, Fig.1). Locus D1v: generic-faint polish, OLMil/OM 100x.

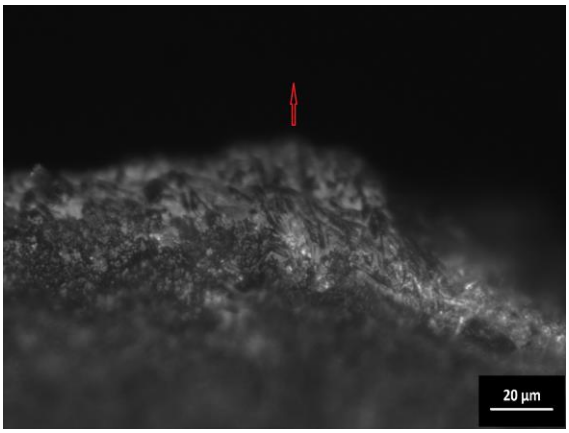


Figure 60. Location A (Form 25, Fig.1). Locus D1v: details at 500x. Not-well-developed polish.

Experiment: spear throwing. Code: 77-TH-AOZ16.

Description of the experiment: the Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 26). The spear was thrown at the target. It perforated the spine, passing completely through the target (Form 26).

Experiment type:	Throwing
Tool N:	77
Video N.	TH-77

Figure: 1 Tool 77

Experimental tool	Grain Size texture: **COARSED**	Maximum Length (mm) **94**	Maximum Width (mm): **45**	Maximum Thickness (mm): **7**	TCSA (mm): **157**	TCSP (mm): **135**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Negative Removals: **THREE BLOWS-POINT**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **- SPINE**	Impact contact material: **- BONE, FLESH, SKIN**	Contact material state: **FRESH**	
	Impact velocity (m/s):		Penetration (cm): **52 (PH)**	Wound dimension (mm): **NA**	

Figure 2: Haft arrangement

Figure: 3 Experiment

Form 26. Experimental reding form. Experiment code: 77-TH-AOZ16.

Use-wear description. Experiment code: 77-TH-AOZ16

Macro-fractures and edge-damage: a snap-terminating bending fracture was located on the ventral distal tip (Locus D1v, Fig. 77.2 in red). A small spin-off burination secondary fracture departed from this (Locus D2v, Fig. 77.2 in blue). A cone fracture and a missing fracture were located on the right part of the tip (D3v, Fig. 77.2 in red and blue).

Polish and striations: a very bright and smooth polish was located on the right and left side on the ventral distal tip (D2v and D3v). It was highly reflective and with a flat micro-topography (Fig. 77.1). At 200x, it showed some micro-pits, few random striations and a “broken aspect” (Van Gijn 1989; Fig. 77.2).

Other: none.

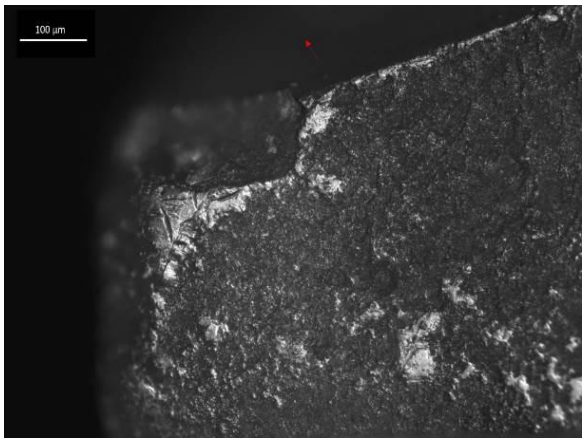


Figure 61. Location A (Form 26, Fig.1). Locus D2v: smooth polish, OLMil/OM 100x.

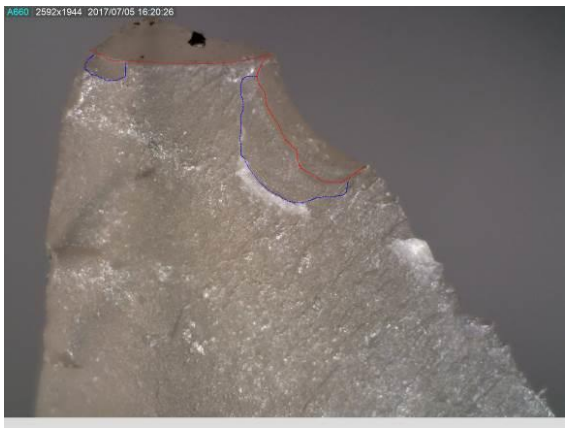


Figure 62. Location A (Form 26, Fig.1). Locus D1v: snap-terminating bending fracture (in red) plus spin-off burination secondary fracture (in blue), DM/OM 50x.

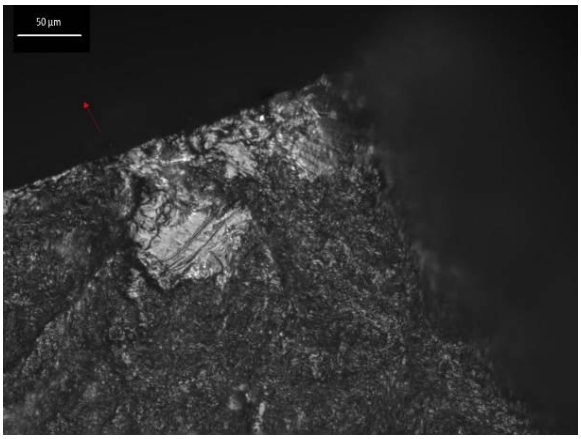


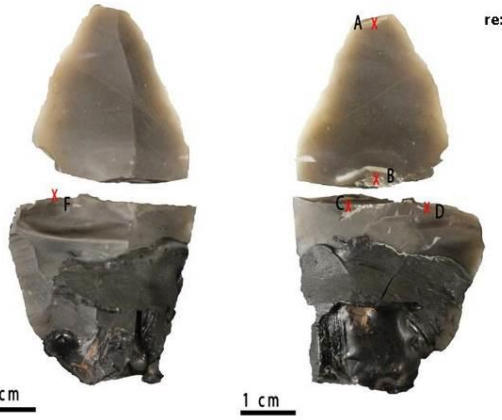
Figure 63. Location A (Form 26, Fig.1). Locus D3v: bright and flat polish with micro-pits and random striations, OLMil/OM 200x.

Experiment type: spear throwing. Code: 78-TH-AOZ16.

Description of the experiment: the Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 27). The spear was thrown at the target. It hit and perforated the spine. The stone point snapped in half (Form 27).

Experiment type:	Throwing
Tool N:	78
Video N.	TH-78

re: 1 Tool 78



Experimental tool	Grain Size texture: **MEDIUM**	Maximum Length (mm) **68**	Maximum Width (mm): **32**	Maximum Thickness (mm): **6**	TCSA (mm): **96**	TCSP (mm): **96**
	Techno-morphological type: **LEVALLOIS CONVERGENT FLAKE**	Direction Negative Removals: **UNIDIRECTIONAL LONGITUDINAL**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **- SPINE**	Impact contact material: **- BONE, FLESH, SKIN**	Contact material state: **FRESH**	
	Impact velocity (m/s):		Penetration (cm): **5**	Wound dimension (cm): **4*2**	

Figure 2: Haft arrangement

Figure: 3 Experiment

Form 27. Experimental recording form. Experiment code: 78-TH-AOZ16.

Use-wear description. Experiment code: 78-TH-AOZ16

Macro-fractures and edge-damage: no fracture or edge-damage were observed after utilisation.

Distal fragment: on the distal ventral tip (Locus D1v) a large unifacial spin-off fracture departed from a snap-terminating bending fracture (Figure 64).

Proximal fragment: a snap-bending fracture terminated on the ventral mesial left part (Locus M1v, Figure 65 in red). Several small spin-off secondary fractures started from this (Figure 65 in blue). On the ventral mesial right locus (M2v) a mesial spin-off burination fracture started from the adjacent snap-bending fracture (Figure 66 in red). Several bifacial spin-off fractures departed from this and terminated on the dorsal and ventral surface (Figure 66, Figure 67 in blue).

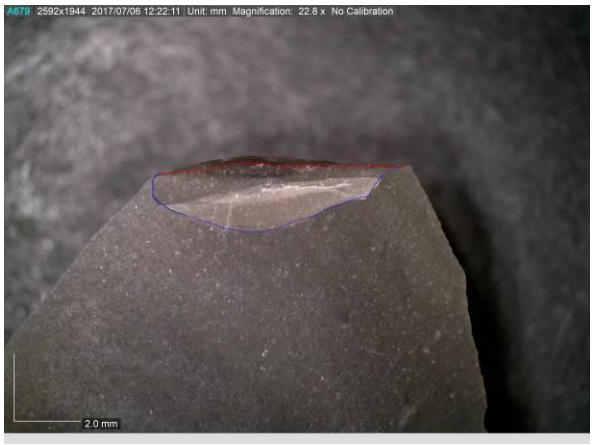


Figure 64. Location A (Form 27, Fig.1). Locus D1v: snap-terminating bending fracture (in red) plus unifacial spin-off fracture (in blue). OM/DM 50x.

Figure 65. Location C (Form 27, Fig.1). Locus M1v: snap-terminating bending fracture (in red) plus several small unifacial spin-off fractures (in blue). OM/DM 40x.

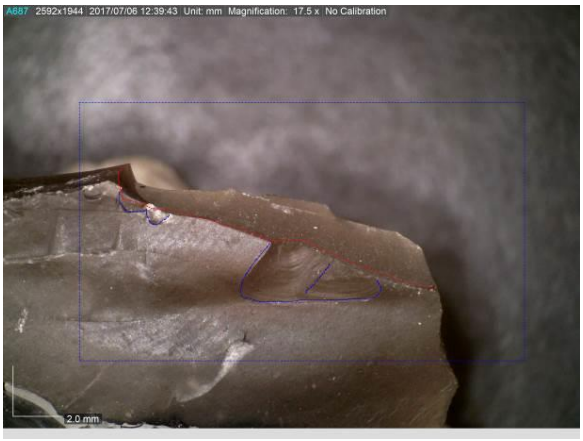


Figure 66. Location D (Form 27, Fig.1). Locus M2v: spin-off burination fracture (in red) plus several small spin-off fractures (in blue). DM/OM40x.

Figure 67. Location F (Form 27, Fig.1). Locus M2d: large spin-off fracture (in blue) starting from the spin-off burination fracture. DM/OM40x.

Polish and striations: several microscopic linear bands of polish (MLITs) were located on the ventral distal tip (Locus D1v). They started from the snap-bending fracture, and they ran parallel to the direction of the impact (Figure 68). They were formed by a rough and dull polish surrounded by several striations (Figure 70).

Other: a line residue of tar ran along the haft limit on the ventral proximal surface (Locus P1v; Figure 69). At 500x, it looked like a greasy and oily layer deposited on the surface (additive layer; Figure 71)

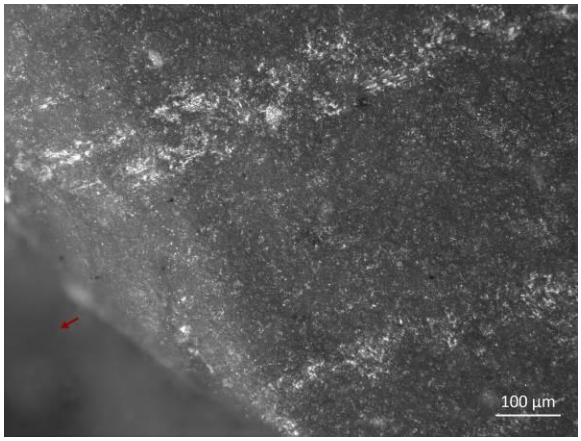


Figure 68. Location A (Form 27, Fig.1). Locus D1v: MLITs, OLMil/OM 100x.

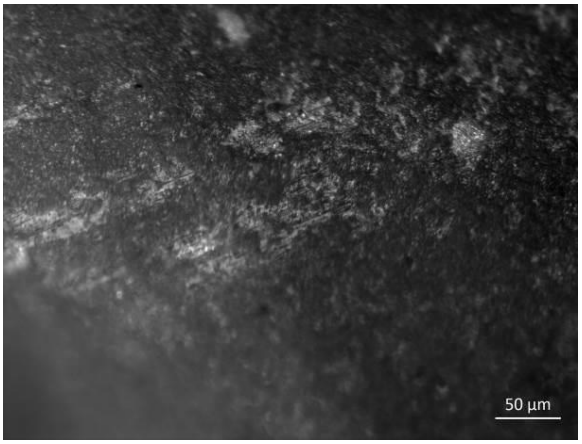


Figure 70. Location A (Form 27, Fig.1). Locus D1v: details at 200x. MLITs.

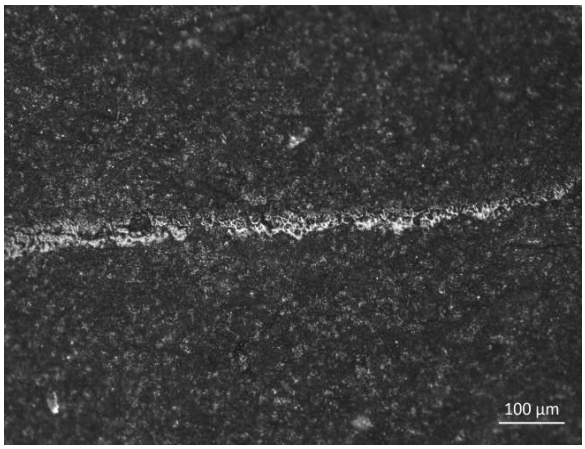


Figure 69. Locus P1v: tar residue, OLMil/OM 100x.

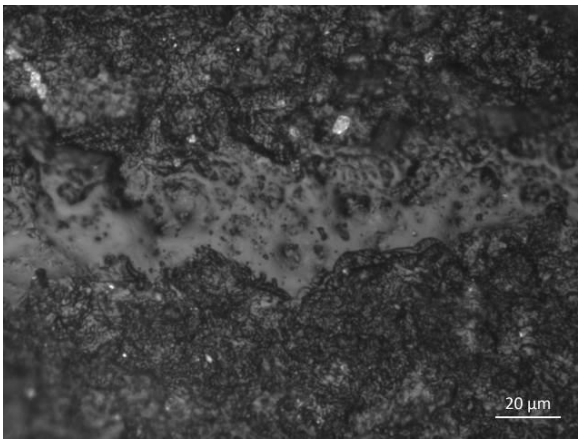


Figure 71. Locus P1v: details at 500x. Very greasy and additive layer.

Experiment type: spear throwing. Code: 79-TH-AOZ16.

Description of the experiment: the experimental Levallois point was hafted into a wooden fore-shaft by a female slot and fixed using commercial tar (Form 28). The spear was thrown at the target. It hit and perforated the spine, but the spear glanced the spine of the target, landing on the ground behind it (Form 28)

Experiment type:	Throwing
Tool N:	79
Video N.	TH-79

Figure: 1 Tool 79

Experimental tool	Grain Size texture: FINE	Maximum Length (mm) 60	Maximum Width (mm): 31	Maximum Thickness (mm): 8	TCSA (mm): 124	TCSP (mm): 93
	Techno-morphological type: LEVALLOIS CONVERGENT FLAKE	Direction Negative Removals: LONGITUDINAL UNIDIRECTIONAL	Retouch presence: NO	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: NO
	Impact target: -ROE DEER	Impact location: - SPINE	Impact contact material: - BONE, FLESH, SKIN		Contact material state: FRESH
	Impact velocity (m/s):		Penetration (cm): 4.5		Wound dimension (cm): 5*1.3

Figure 2: Haft arrangement

Figure: 3 Experiment

Form 28. Experimental recording form. Experiment code: 79-TH-AOZ16.

Use-wear description. Experiment code: 79-TH-AOZ16

Macro-fractures and edge-damage: a pattern of multiple fractures was located on the dorsal distal tip (loci D1d, D2d, D3d). A bending fracture with a step into a hinge (not detached) termination ended on the dorsal distal tip (Locus D1d, Figure 73 in blue). A unifacial spin-off secondary fracture departed from this (Figure 73 in green). On the left part (Locus D3d), a bending fracture with a not detached termination (Figure 73 in red), and three-cone scars (in orange) were observed.

Polish and striations: no micro-wear traces were observed (the distal tip completely crushed after the impact; Figure 72).

Other: none

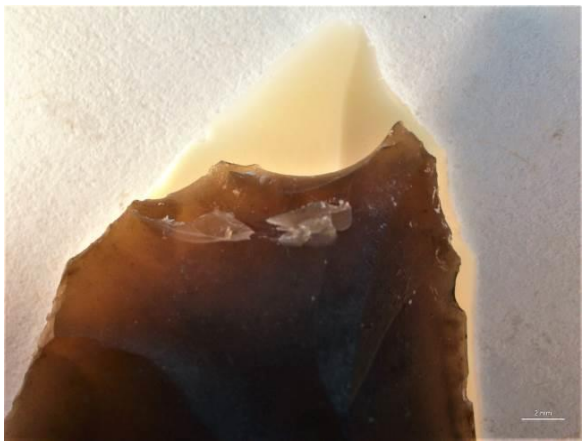


Figure 72. Comparison picture. The distal tip after impact overlapped with the high-resolution dental resin mould, DM/OM 6.7x.

Figure 73. Location A (Form 28, Fig.1) Locus: D1d: pattern of multiple fractures, DM/OM 60x. A bending fracture with a step into hinge (not totally detached) termination (in blue), plus a small unifacial spin-off secondary fracture (in green). On the left (Locus D2d) a bending fracture with a not detached termination (in red) and three-cone scars (in orange).

Experiment type: spear throwing. Code: 81-TH-AOZ16.

Description of the experiment: the experimental Levallois point was hafted into a wooden fore-shaft by a female slot and fixed using commercial tar (Form 29). The spear was thrown at the target. It missed the target and stuck in the ground (Form 29).

Experiment type:	Throwing
Tool N:	81
Video N.	TH-81

Figure: 1 Tool 81

Experimental tool	Grain Size texture: **FINE**	Maximum Length (mm) **68**	Maximum Width (mm): **38**	Maximum Thickness (mm): **9**	TCSA (mm): **171**	TCSP (mm): **114**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Negative Removals: **LONGITUDINAL UNIDIRECTIONAL**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **- GROUND**	Impact contact material: **- SOIL, STONES**	Contact material state: **NA**	
	Impact velocity (m/s):		Penetration (cm): **6**	Wound dimension (cm): **NA**	

Figure 2: Haft arrangement

Figure: 3 Experiment

Form 29. Experimental recording form. Experiment code: 81-TH-AOZ16.

Use-wear description. Experiment code: 81-TH-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: a very faint polish appeared on the ventral distal tip (Locus D1v). It looked very bright and scattered (Figure 74, Figure 76). At 200x, the polish was rough and not-well-linked, with few striations (Figure 76). At higher magnification, the polish seemed including possible mineral residues (i.e. possible grains; see section xx for details). Several linear bands of polish (MLITs) were also visible on the inner part of the ventral distal tip (Locus D1v, Figure 75).

Other: none

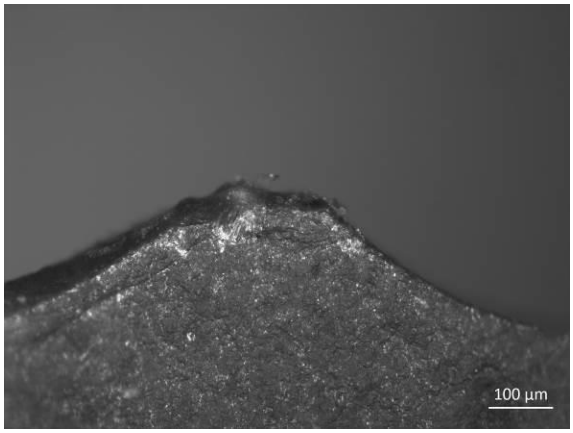


Figure 74. Location A (Form 29, Fig.1) Locus D1v: bright but not-developed polish, OLMil/OM 100x.

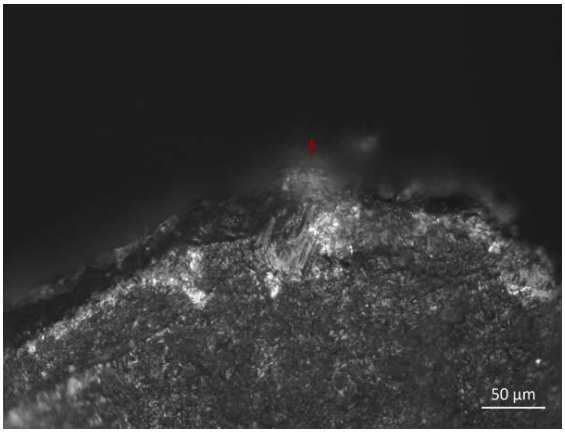


Figure 76. Location A (Form 29, Fig.1). Locus D1: details at 200x. Rough polish with striations and possible minerals inclusions.

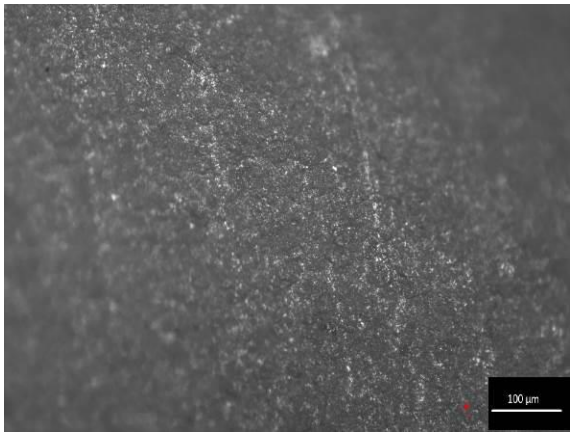


Figure 75. Location A (Form 29, Fig.1) Locus D1v: MLITs due to impact with soil, OM/OLM 100x.

Experiment type: spear throwing. Code: 82-TH-AOZ16.

Description of the experiment: the Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 30). The spear was thrown at the target. It missed the target and stuck in the ground (Form 30).

Experiment type:	Throwing
Tool N:	82
Video N.	TH-82

Figure: 1 Tool 82

Experimental tool	Grain Size texture: MEDIUM	Maximum Length (mm) 67	Maximum Width (mm): 45	Maximum Thickness (mm): 6	TCSA (mm): 135	TCSP (mm): 135
	Techno-morphological type: LEVALLOIS CONVERGENT FLAKE	Direction Negative Removals: LONGITUDINAL UNIDIRECTIONAL	Retouch presence: NO	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: NO
	Impact target: -GROUND	Impact location: - GROUND	Impact contact material: - SOIL, STONES		Contact material state: NA
	Impact velocity (m/s):		Penetration (cm): 8		Wound dimension (cm): NA

Figure 2: Haft arrangement

Figure: 3 Experiment

Form 30. Experimental recording form. Experiment code: 82-TH-AOZ16.

Use-wear description. Experiment code: 82-TH-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: a polish occurs on and around the distal ventral tip (Loci D1v, D2v, D3v). At 100x, it was bright, and it was distributed in patches of polish (Figure 77). At 200x, the polish showed a domed into flat micro-topography with a few random striations (Figure 79). At higher magnification, the polish seemed including some mineral residues (i.e. possible grains, Figure 79; see section xx for details). A microscopic linear band of polish (MLIT) started from the immediate edge of the ventral distal tip, and it continued inside the surface (Figure 78).

Other: none

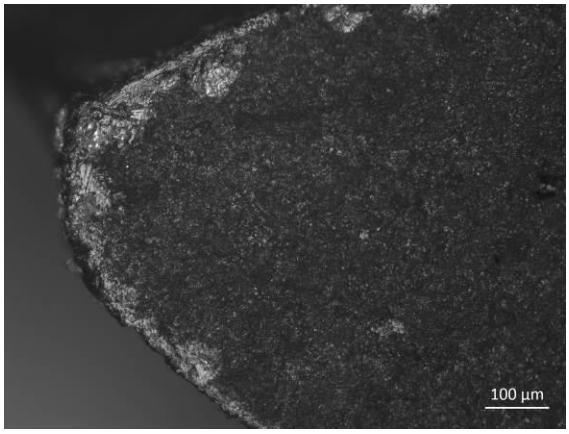


Figure 77. Location A (Form 30, Fig.1) Locus D1v: bright impact, OLMil/OM 100x.

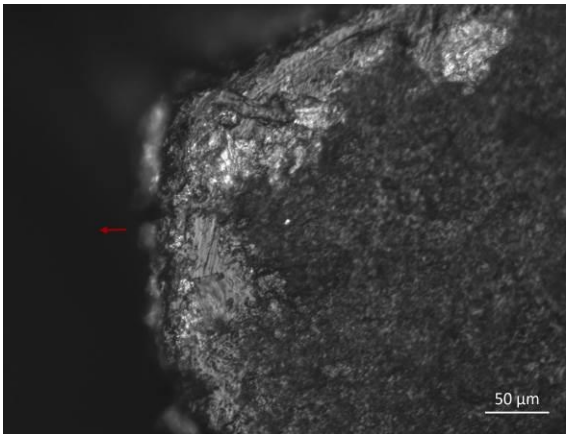


Figure 79. Location A (Form 30, Fig.1). Details at 200x: domed-into-flat polish with striations and possible mineral inclusions.

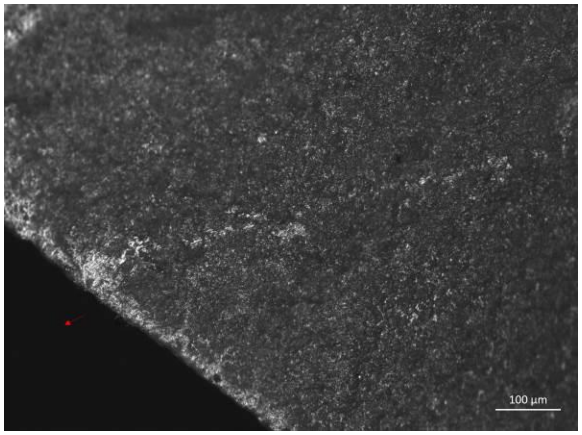


Figure 78. Location A (Form 30, Fig.1) Locus D1v: MLIT, OLMil/OM 100x

Experiment type: spear throwing. Code: 84-TH-AOZ16.

Description of the experiment: the experimental Levallois point was hafted into a wooden fore-shaft by a female slot and fixed using commercial tar (Form 31). The spear was thrown at the target. It missed the target and stuck in the ground (Form 31).

Experiment type:	**Throwing**
Tool N:	**84**
Video N.	**TH-84**

Figure: 1 Tool 84

Experimental tool	Grain Size texture: **MEDIUM**	Maximum Length (mm) **70**	Maximum Width (mm): **42**	Maximum Thickness (mm): **15**	TCSA (mm): **315**	TCSP (mm): **127**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **THREE-BLOWS POINT**	Retouch pres-ence: **NO**	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-GROUND**	Impact location: **- GROUND**	Impact contact material: **- SOIL, STONES**	Contact material state: **NA**	
	Impact velocity (m/s):		Penetration (cm): **8**	Wound dimension (cm): **NA**	

Figure 2: Haft arrangement

Figure: 3 Experiment

Form 31. Experimental recording form. Experiment code: 84-TH-AOZ16.

Use-wear description. Experiment code: 84-TH-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: a microscopic linear band of polish (MLIT) started from the immediate edge of the ventral distal tip (Locus D3v, Figure 80).

Other: none

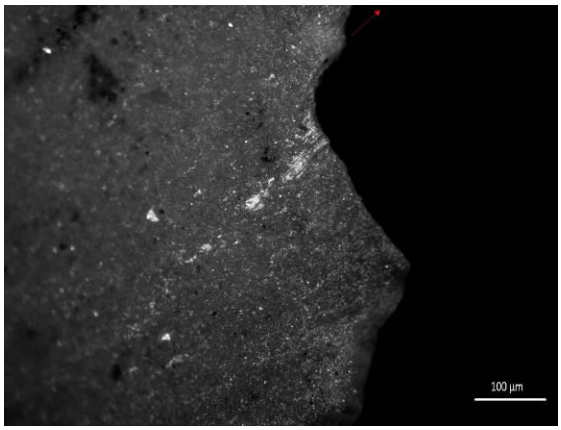


Figure 80. Location A (Form 31, Fig.1)
Locus D3v: MLIT, OLMil/OM 100x.

Experiment type: spear throwing. Code: 88-TH-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 32). The spear was thrown at the target. It missed the target and stuck in the ground (Form 32).

Experiment type:	Throwing
Tool N:	88
Video N.	TH-88

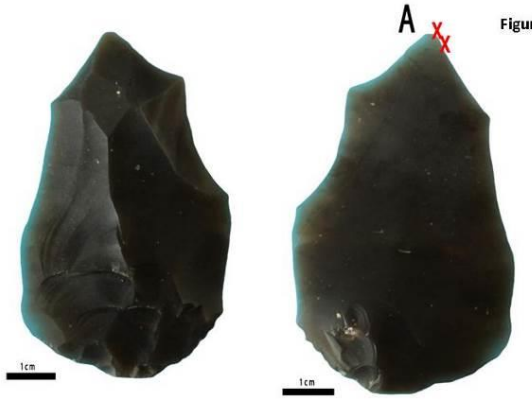


Figure: 1 Tool 88

Experimental tool	Grain Size texture: **FINE**	Maximum Length (mm) **66**	Maximum Width (mm): **39**	Maximum Thickness (mm): **6**	TCSA (mm): **117**	TCSP (mm): **117**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **CENTRIPETAL**	Retouch pres-ence: **NO**	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-GROUND**	Impact location: **- GROUND**	Impact contact material: **- SOIL, STONES**	Contact material state: **NA**	
	Impact velocity (m/s):		Penetration (cm): **8**	Wound dimension (cm): **NA**	

Figure 2: Haft arrangement

Figure: 3 Experiment

Form 32. Experimental recording form. Experiment code: 88-TH-AOZ16.

Use-wear description. Experiment code: 88-TH-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: a polish occurred on the right lateral edge of the distal tip (Locus D3v). It was a marginal polish affecting only the immediate edge (Figure 81). At 500x, it showed a smooth texture and a linked-aspect, with longitudinal striations that mostly ran parallel to the direction of the impact (Figure 82)

Other: none

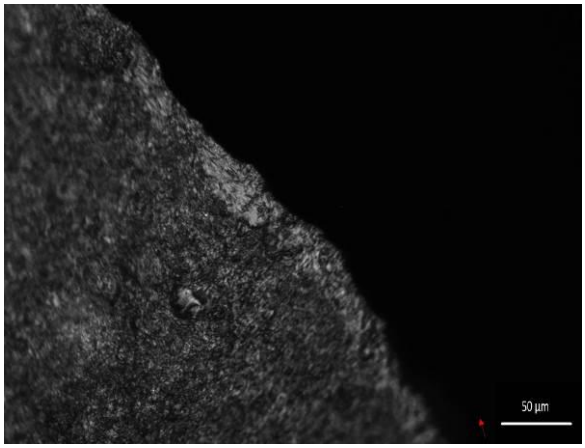


Figure 81. Location A (Form 32, Fig.1). Locus D2v: marginal polish, OLMil/OM 200x.

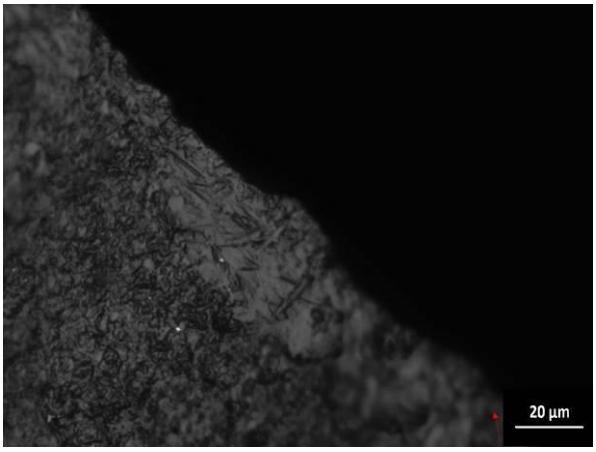


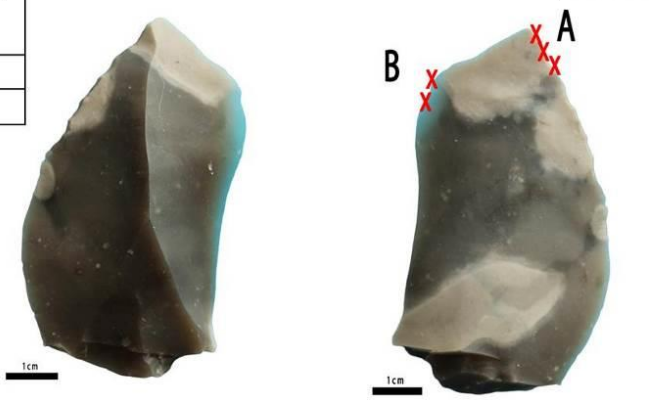
Figure 82. Location A (Form 32, Fig.1). Locus D2v: details at 500x. Smooth polish, with longitudinal striations.

Experiment type: spear throwing. Code: 91-TH-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 33). The spear was thrown at the target. The tip passed completely through the rib cage, totally shattering the 9th rib (Form 33).

Experiment type:	Throwing
Tool N:	91
Video N.	TH-91

Figure: 1 Tool 91



Experimental tool	Grain Size texture: **COARSED**	Maximum Length (mm) **69**	Maximum Width (mm): **35**	Maximum Thickness (mm): **12**	TCSA (mm): **220**	TCSP (mm): **106**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **THREE BLOWS-POINT**	Retouch pres-ence: **YES**	Retouch Localiza-tion: **LEFT - CONTINOUS**	Retouch position and extension: **DIRECT- SHORT**	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **- RIB CAGE**	Impact contact material: **- BONES, FLESH, SKIN**		Contact material state: **- FRESH**
	Impact velocity (m/s):		Penetration (cm): **3**		Wound dimension (cm): **4*1**

Figure 2: Haft arrangement

Figure: 3 Experiment

Form 33. Experimental recording form. Experiment code: 91-TH-AOZ16.

Use-wear description. Experiment code: 91-TH-AOZ16

Macro-fractures and edge-damage: edge-crushing and edge-damage occurred along the mesial ventral left and right edges (Loci M2v, M1v). Edge-damage presented half-moon and triangular scars (Figure 83). The edge-crushing was formed by micro-denticulate cone scars, also defined edge-jagged (Figure 84, Figure 85).

Polish and striations: no microscopic-wear traces were observed.

Other: none

Figure 83. Location B (Form33, Fig. 1). Locus M1v: edge-damage. Scalar and triangular cone scars, DM/OM 45x

Figure 85. Location A (Form 33, Fig. 1). Locus D3v and M2v: edge-crushing, micro-denticulated edge with microscopic scars. DM/OM 65x.

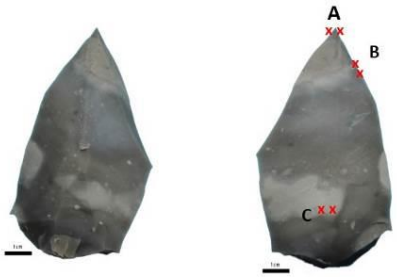
Figure 84. Location A (Form 33, Fig. 1). Locus D3v and M2v: edge-crushing, micro-denticulated edge with microscopic scars. DM/OM 40x.

Experiment type: spear throwing. Code: 92-TH-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 34). The spear was thrown at the target. It perforated the spine and severed the spinal muscles and sinew. After, it bounced out of the target, coming to rest on the ground (Form 34).

Experiment type:	Throwing
Tool N:	92
Video N.	TH-92

Figure: 1 Tool 92



Experimental tool	Grain Size texture: COARSED	Maximum Length (mm) 81	Maximum Width (mm): 49	Maximum Thickness (mm): 15	TCSA (mm): 367	TCSP (mm): 148
	Techno-morphological type: LEVALLOIS POINT	Direction Nega-tive Removals: UNIDIRECTIONAL LONGITUDINAL	Retouch pres-ence: YES	Retouch Localiza-tion: DISTAL - RIGHT	Retouch position and extension: DIRECT- SHORT	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: NO
	Impact target: -ROE DEER	Impact location: - SPINE	Impact contact material: - BONES, FLESH, SKIN	Contact material state: - FRESH	
	Impact velocity (m/s):		Penetration (cm): 3	Wound dimension (cm): 5*2	

Figure 2: Haft arrangement

Figure: 3 Experiment

Form 34. Experimental recording form. Experiment code: 92-TH-AOZ16.

Use-wear description. Experiment code: 92-TH-AOZ16

Macro-fractures and edge-damage: a primary burination fracture was observed on the ventral distal tip (Locus D3v, Figure 91).

Polish and striations: a well-developed and intrusive polish was located on the ventral distal tip (Locus D1v). At 100x, it appeared very bright in sharp contrast with the unaltered areas (Figure 86). At 200x, this polish was characterised by a flat microtopography with abundant striations (Figure 87). At higher magnification, the polish seemed including possible mineral residues (i.e. bone apatite; see section xx for details) (Figure 88). A similar polish occurred on the ventral mesial left edge (Locus M2v). It was a well-developed and well-linked polish (Figure 87). However, it presented a rough texture and many striations with a random distribution (Figure 89).

Other: a deposit of tar was present on the proximal ventral bulb surface (Figure 90, Figure 92).

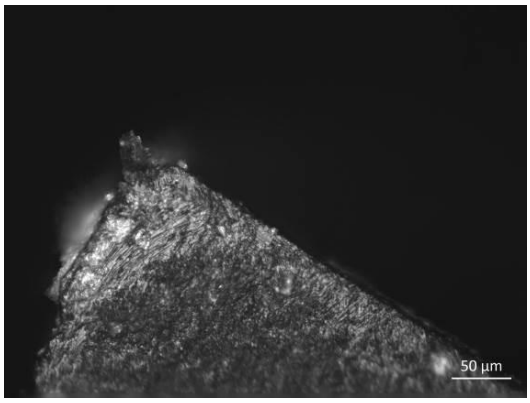


Figure 86. Location A (Form 34, Fig. 1). Locus D1v: bright polish with striations, OLMil/OM 200x.

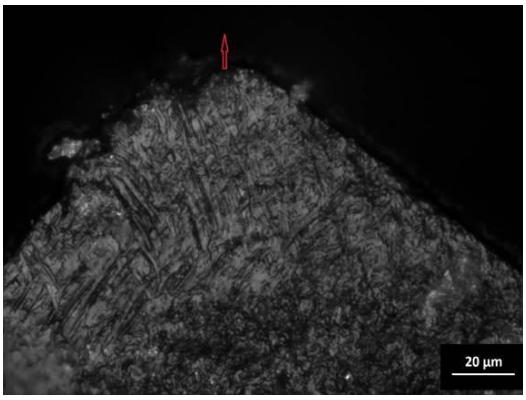


Figure 88. Location A (Form 34, Fig. 1). Locus D1v: details at 500x. Polish with random striations.

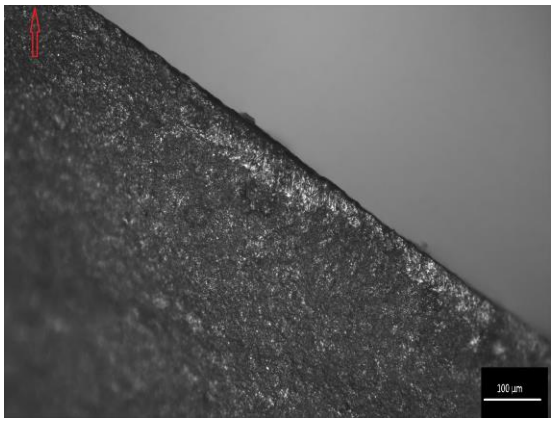


Figure 87. Location B (Form 34, Fig. 1). Locus M2v: rough polish with striations, OLMil/OM 100x.

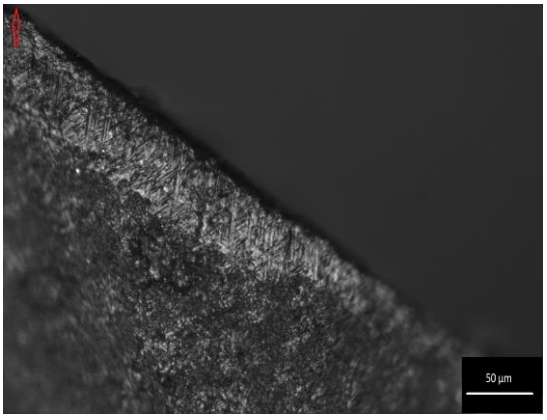


Figure 89. Location B (Form 34, Fig. 1). Locus M2v: details at 200x. Rough polish with random striations.

Figure 90. Location C (Form 34, Fig. 1). Locus P1v: tar residue, DM/OM 26x

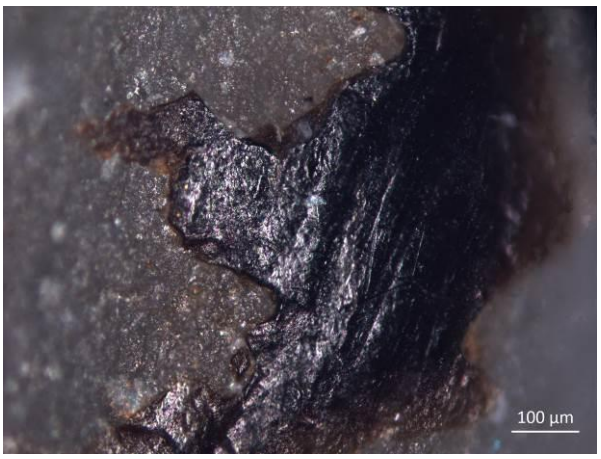


Figure 92. Location C (Form 34, Fig. 1). Locus P1v: tar residue, OLMil/OM 100x

Figure 91. Location A (Form 34, Fig. 1). Locus D1v: primary burination fracture, DM/OM 35x

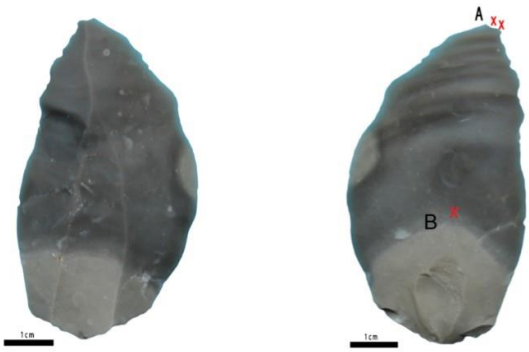
A.5 Register of use-wear traces of experimental Levallois points used as thrusting hand-delivered stone-tipped-spears (data from the second set of experiments, see Chapter 4)

Experiment type: spear thrusting. Code: 54-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 35). The spear was thrust into the target. It perforated the rib cage, breaking the 8th rib (Form 35).

Experiment type:	**Thrusting**
Tool N:	**54**
Video N.	**TR-54**

Figure 1: Tool 54



Experimental tool	Grain Size texture: **COARSED**	Maximum Length (mm) **65**	Maximum Width (mm): **35**	Maximum Thickness (mm): **8**	TCSA (mm): **140**	TCSP (mm): **105**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **THREE BLOWS-POINT**	Retouch pres-ence: **NO**	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **- ROE DEER**	Impact location: **- RIB CAGE**	Impact contact material: **-FLESH, SKIN, BONES**		Contact material state: **FRESH**
	Impact velocity (m/s):		Penetration (cm): **4.5**		Wound dimension (mm): **0.5*0.5**

Figure 2: Haft arrangement

Figure 3: Experiment

Form 35. Experimental recording form. Experiment code: 54-TR-AOZ16.

Use-wear description. Experiment code: 54-TR-AOZ16

Macro-fractures and edge-damage: the distal tip presented a crushed aspect with a snap-terminating fracture on the dorsal distal tip (Locus D1d) and abundant edge-damage on the dorsal right edge (Loci D2d and M1d) (Figure 94).

Polish and striations: no micro-wear traces were observed.

Other: a very greasy and oily layer polish was located on the ventral proximal surface along the haft limit (P1v). At 100x, it looked like a very greasy and oily layer deposited on the tool surface (additive polish) with a metallic aspect (Figure 93).

Figure 93. Location B (Form 35, Fig. 1). Locus P1v: tar polish. Very bright and greasy polish, OLMil/OM 100x.

Figure 94. Location A (Form 35, Fig. 1). Locus D1d: snap-terminating fracture (in red) plus edge-damage, DM/OM 40x.

Experiment type: spear thrusting. Code: 55-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 36). The spear was thrust into the target. It perforated the rib cage, breaking two ribs (4th/5th, Form 36).

Experiment type:	**Thrusting**
Tool N:	**55**
Video N.	**TR-55**

Figure 1: Tool 55

Experimental tool	Grain Size texture: **MEDIUM**	Maximum Length (mm) **98**	Maximum Width (mm): **46**	Maximum Thickness (mm): **12**	TCSA (mm): **276**	TCSP (mm): **138**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **CONVERGENT UNIDIRECTIONAL**	Retouch pres-ence: **NO**	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **- ROE DEER**	Impact location: **- RIB CAGE**	Impact contact material: **-FLESH, SKIN, BONES**	Contact material state: **FRESH**	
	Impact velocity (m/s):		Penetration (cm): **74**	Wound dimension (mm): **6*1.5**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 36. Experimental recording form. Experiment code: 55-TR-AOZ16

Use-wear description. Experiment code: 55-TR-AOZ16

Macro-fractures and edge-damage: edge-damage was observed along the ventral distal and mesial edges (Loci D2v, M1v, M2v). It presented a discontinuous distribution, and it was composed mostly of scalar and half-moon cone scars (Figure 95)

Polish and striations: no micro-wear traces were observed.

Other: none

Figure 95. Location B (Form 36, Fig. 1). Locus M1v: edge-damage. scalar and half-moon cone scars, DM/OM 65x

Experiment type: spear thrusting. Code: 57-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 37). The spear was thrust into the target. It passed cleanly through the target's thigh without directly impacting bone (Form 37).

Experiment type:	Thrusting
Tool N:	57
Video N.	TR-57

Figure: 1 Tool 57

Experimental tool	Grain Size texture: **COARSED**	Maximum Length (mm) **86**	Maximum Width (mm): **42**	Maximum Thickness (mm): **14**	TCSA (mm): **294**	TCSP (mm): **127**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **UNIDIRECTIONAL CONVERGENT**	Retouch pres-ence: **NO**	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **- THIGH**	Impact contact material: **-FLESH, SKIN**	Contact material state: **FRESH**	
	Impact velocity (m/s):		Penetration (cm): **45**	Wound dimension (mm): **2*4**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 37. Experimental recording form. Experiment code: 57-TR-AOZ16

Use-wear description. Experiment code: 57-TR-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: no micro-wear traces were observed.

Other: none

Experiment type: spear thrusting. Code: 63-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 38). The spear was thrust into the target. It hit the rib cage but the stone point detached from the haft and fell onto the ground (Form 38).

Experiment type:	Thrusting
Tool N:	63
Video N.	TR-63

Figure 1: Tool 63

Experimental tool	Grain Size texture: **COARSED**	Maximum Length (mm) **79**	Maximum Width (mm): **47**	Maximum Thickness (mm): **18**	TCSA (mm): **423**	TCSP (mm): **142**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **THREE BLOWS-POINT**	Retouch pres-ence: **YES**	Retouch Localiza-tion: **DISTAL LEFT**	Retouch position and extension: **DIRECT - SHORT**	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **YES**
	Impact target: **-ROE DEER**	Impact location: **-RIB CAGE**	Impact contact material: **-BONE, FLESH, SKIN**		Contact material state: **- FRESH**
	Impact velocity (m/s):		Penetration (cm): **2**		Wound dimension (mm): **2*0.3**

Figure 2: Haft arrangment

Figure 3: Experiment

Form 38. Experimental recording form. Experiment code: 63-TR-AOZ16

Use-wear description. Experiment code: 63-TR-AOZ16

Macro-fractures and edge-damage: an Indeterminate bending fracture was observed on the dorsal distal tip (Locus D1d, Figure 98). The dorsal right edge (Locus D2d) was affected by the intense degree of edge-damage (Figure 97). The scars were mainly large scalar cone that ran in a discontinuous distribution (Figure 97)

Polish and striations: a very faint polish occurred on the ventral distal tip (Locus D1v). It was a scattered and not developed polish, which differed very little from the unaltered surface (Figure 96).

Other: none

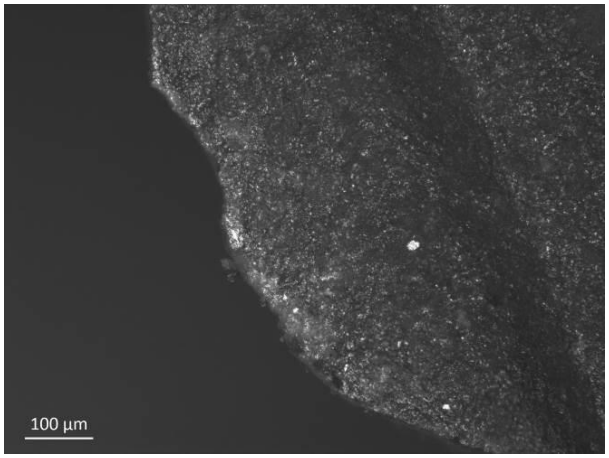


Figure 96. Location B (Form 38, Fig. 1). Locus D1v/D2v: faint and not developed polish, OLMil/OM 100x.

Figure 98. Location C (Form 38, Fig. 1). Locus D1d: bending fracture (indeterminate), DM/OM 50x.

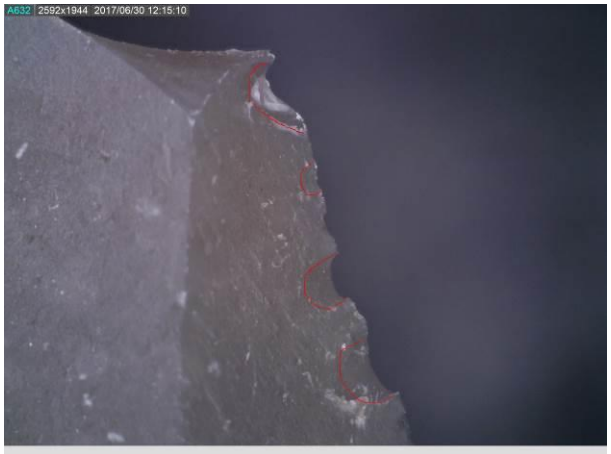


Figure 97. Location A (Form 38, Fig. 1). Locus D1d: edge-damage. Large scalar cone scars, DM/OM 50x.

Experiment type: spear thrusting. Code: 64-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 39). The spear was thrust into the target. It passed clean through the target's thigh without directly impacting bone (Form 39).

Experiment type:	Thrusting
Tool N:	64
Video N.	TR-64

Figure 1: Tool 64

Experimental tool	Grain Size texture: COARSED	Maximum Length (mm) 100	Maximum Width (mm): 43	Maximum Thickness (mm): 12	TCSA (mm): 258	TCSP (mm): 129
	Techno-morphological type: LEVALLOIS POINT	Direction Nega-tive Removals: THREE BLOWS-POINT	Retouch pres-ence: NO	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: YES
	Impact target: -ROE DEER	Impact location: - THIGH	Impact contact material: -FLESH, SKIN		Contact material state: - FRESH
	Impact velocity (m/s):		Penetration (cm): 74		Wound dimension (mm): 6*1.5

Figure 2: Haft arrangment

Figure 3: Experiment

Form 39. Experimental recording form. Experiment code: 64-TR-AOZ16

Use-wear description. Experiment code: 64-TR-AOZ16

Macro-fractures and edge-damage: a large cone hinge-terminating scar was located on the dorsal right edge (Locus D2d; Figure 99).

Polish and striations: no micro-wear traces were observed.

Other: none

Figure 99. Location A (Form 39, Fig. 1). Locus D2d: large hinge cone scar, OM 50x

Experiment type: spear thrusting. Code: 65-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 40). The spear was thrust at the target, but it missed it (Form 40).

Experiment type:	Thrusting
Tool N:	65
Video N.	TR-65

Figure 1: Tool 65

Experimental tool	Grain Size texture: **MEDIUM**	Maximum Length (mm) **67**	Maximum Width (mm): **34**	Maximum Thickness (mm): **7**	TCSA (mm): **119**	TCSP (mm): **102**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **THREE BLOWS-POINT**	Retouch pres-ence: **NO**	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **YES**
	Impact target: **-MISSED**	Impact location: -	Impact contact material: -	Contact material state: -	
	Impact velocity (m/s):		Penetration (cm): **NA**	Wound dimension (mm): **NA**	

Figure 2: Haft arrangment

Figure 3: Experiment

Form 40. Experimental recording form. Experiment code: 65-TR-AOZ16

Use-wear description. Experiment code: 65-TR-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: no microscopic wear traces were observed.

Other: a black lump of tar was observed on the proximal ventral bulb surface (P1v). It looked like a very greasy and oily layer deposited on the tool surface (additive polish) with a metallic aspect. It incorporated deep and long striations (Figure 100).

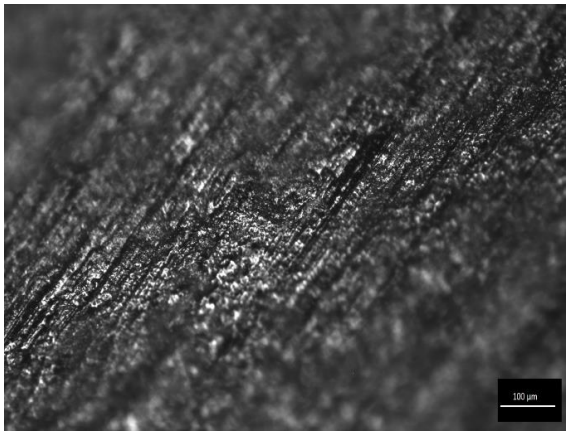


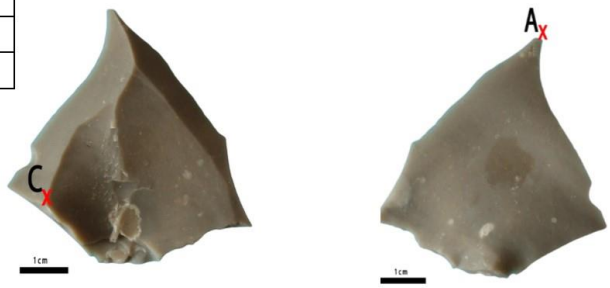
Figure 100. Location A (Form 40, Fig. 1). Locus P1v: tar deposit, greasy and oily layer with striations, OLMil/OM 100x.

Experiment type: spear thrusting. Code: 69-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 41). The spear was thrust into the target. The tip passed completely through the rib cage without directly impacting bone (Form 41).

Experiment type:	**Thrusting**
Tool N:	**69**
Video N.	**TR-69**

Figure 1: Tool 69



Experimental tool	Grain Size texture: **COARSED**	Maximum Length (mm) **50**	Maximum Width (mm): **48**	Maximum Thickness (mm): **8**	TCSA (mm): **192**	TCSP (mm): **144**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **THREE BLOWS-POINT**	Retouch pres-ence: **NO**	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **-RIB CAGE**	Impact contact material: **-FLESH, SKIN,**	Contact material state: **- FRESH**	
	Impact velocity (m/s):		Penetration (cm): **102**	Wound dimension (mm): **5*2.5**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 41. Experimental recording form. Experiment code: 69-TR-AOZ16

Use-wear description. Experiment code: 69-TR-AOZ16

Macro-fractures and edge-damage: no fractures or edge damage were observed after utilisation.

Polish and striations: a faint, not well-developed polish occurred on the ventral distal tip (Locus D1v). It presented a rough texture and a not-linked aspect (Figure 101).

Other: a black tar residue was located on the dorsal proximal area (Locus P2d). The black residue was interspersed with bright and domed spots of greasy polish (Figure 102). This polish looks like a very oily layer deposited on the tool surface (additive polish) with a metallic aspect. These bright spots show a longitudinal directionality.

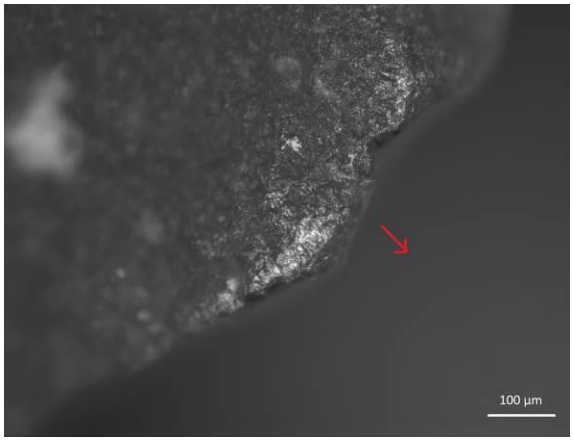


Figure 101. Location A (Form 41, Fig. 1). Locus D1v: rough and not well-developed polish, OLMil/OM 100x.

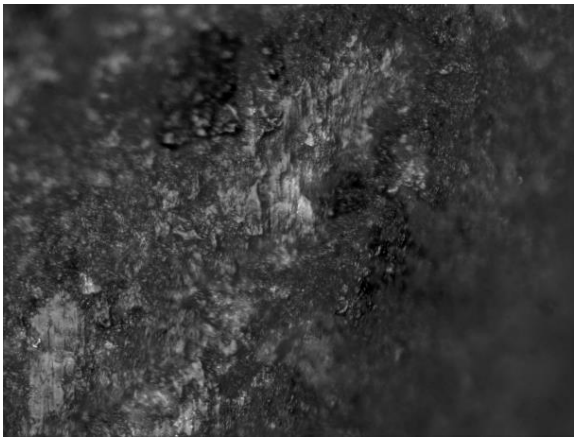


Figure 102. Location C (Form 41, Fig. 1). Locus P2d: tar bright spots and tar black residue with a longitudinal directionality. OLMil/OM 200x.

Experiment type: spear thrusting. Code: 70-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 42). The spear was thrust into the target. It hit and perforated the cervical vertebrae (neck area; Form 42).

Experiment type:	Thrusting
Tool N:	70
Video N.	TR-70

Figure 1: Tool 70

Experimental tool	Grain Size texture: **MEDIUM**	Maximum Length (mm) **66**	Maximum Width (mm): **43**	Maximum Thickness (mm): **17**	TCSA (mm): **365**	TCSP (mm): **130**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Negative Removals: **THREE BLOWS-POINT**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **- CERVICAL VERTEBRAE**	Impact contact material: **-FLESH, SKIN, BONE**	Contact material state: **- FRESH**	
	Impact velocity (m/s):		Penetration (cm): **77**	Wound dimension (mm): **4.5*2.5**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 42. Experimental recording form. Experiment code:70-TR-AOZ16

Use-wear description. Experiment code: 70-TR-AOZ16

Macro-fractures and edge-damage: a bending hinge-terminating fracture was located on the ventral distal tip (Locus D1v). On the right side of this, a feather-terminating cone fracture was observed (Figure 103).

Polish and striations: no micro-wear traces were observed.

Other: none

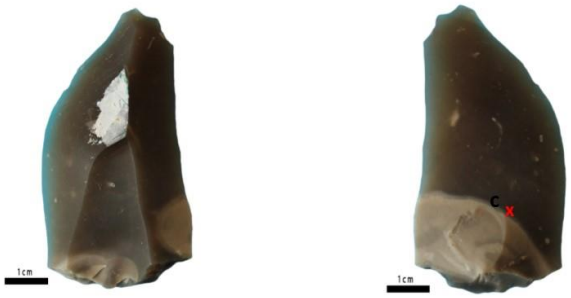
Figure 103. Location A (Form 42, Fig. 1). Locus D1v: hinge-terminating bending fracture (in red), cone fracture (in light blue) DM/OM 90x.

Experiment type: spear thrusting. Code: 72-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 43). The spear was thrust into the target. It hit and perforated the neck area without directly impacting bone (Form 43).

Experiment type:	Thrusting
Tool N:	72
Video N.	TR-72

Figure: 1 Tool 72



Experimental tool	Grain Size texture: COARSED	Maximum Length (mm) 67	Maximum Width (mm): 33	Maximum Thickness (mm): 9	TCSA (mm): 148	TCSP (mm): 99
	Techno-morphological type: LEVALLOIS POINT	Direction Negative Removals: THREE BLOWS-POINT	Retouch presence: NO	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: NO
	Impact target: -ROE DEER	Impact location: -NECK	Impact contact material: -FLESH, SKIN, (no bone)		Contact material state: - FRESH
	Impact velocity (m/s):		Penetration (cm): 2		Wound dimension (mm): 4*2

Figure 2: Haft arrangement

Figure 3: Experiment

Form 43. Experimental recording form. Experiment code: 72-TR-AOZ16

Use-wear description. Experiment code: 72-TR-AOZ16

Macro-fractures and edge-damage: no fracture or edge damage were observed after utilisation.

Polish and striations: no micro-wear traces were observed.

Other: a black lump of tar was observed in the proximal ventral area (P2v, Figure 104). Next to this, a very bright, almost metallic, additive layer is observed. It looked like a layer deposited on the tool surface (additive polish, Figure 104).

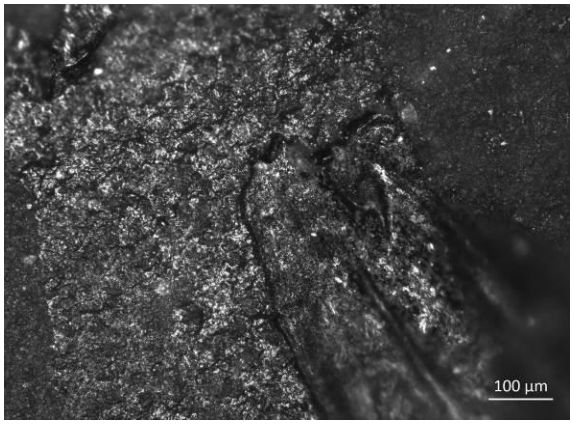


Figure 104. Location C (Form 43, Fig.1). Locus P2v: tar deposit and tar residue, OLMil/OM 100x.

Experiment type: spear thrusting. Code: 74-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 44). The spear was thrust into the target. It hit the spine with significant force and lodged in the bone (Form 44).

Experiment type:	Thrusting
Tool N:	74
Video N.	TR-74

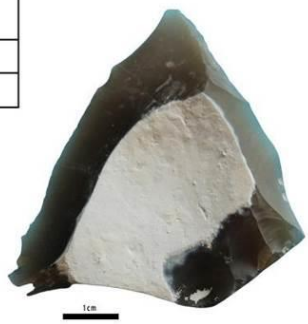
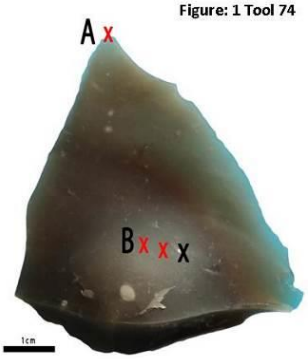


Figure: 1 Tool 74



Experimental tool	Grain Size texture: **MEDIUM**	Maximum Length (mm) **54**	Maximum Width (mm): **53**	Maximum Thickness (mm): **6**	TCSA (mm): **159**	TCSP (mm): **159**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Negative Removals: **CONVERGENT UNIDIRECTIONAL**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **-SPINE**	Impact contact material: **-FLESH, SKIN, BONE**	Contact material state: **- FRESH**	
	Impact velocity (m/s):		Penetration (cm): **4**	Wound dimension (mm): **1*0.5**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 44. Experimental recording form. Experiment code: 74-TR-AOZ16

Use-wear description. Experiment code: 74-TR-AOZ16

Macro-fractures and edge-damage: a snap-terminating bending fracture was observed on the ventral distal tip (Locus D1v). A unifacial spin-off secondary fracture started from this, ending in a double step termination (Figure 106).

Polish and striations: no microscopic wear traces were observed.

Other: bright spots of tar occurred in the proximal ventral area (Locus P2v). They were highly reflective, almost metallic, with flat topography and a greasy aspect. They looked like a greasy and oily layer deposited on the tool surface (additive polish; Figure 105).

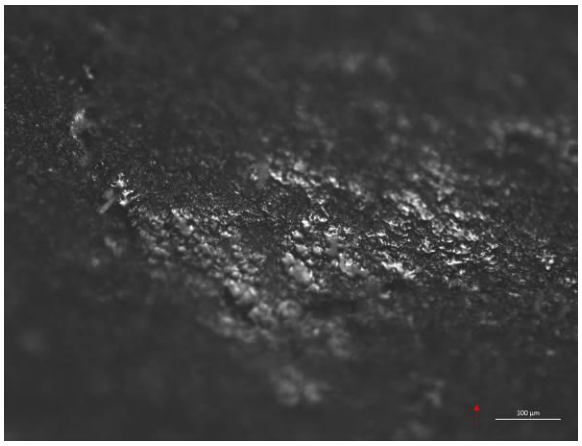


Figure 105. Location B (Form 44, Fig.1). Locus P2v: tar bright-spots, OLMil/OM 100x

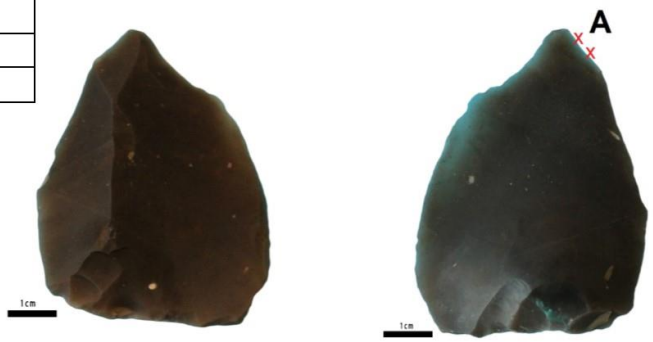
Figure 106. Location A (Form 44, Fig.1). Locus D1v: snap-terminating bending fracture plus double unifacial spin-off fracture terminating in a double step, OLMil/OM 30x

Experiment type: spear thrusting. Code: 80-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 45). The spear was thrust into the target. The tip passed completely through the rib cage. It hit the 7th rib with significant force, breaking it (Form 45).

Experiment type:	Thrusting
Tool N:	80
Video N.	TR-80

Figure 1: Tool 80



Experimental tool	Grain Size texture: FINE	Maximum Length (mm) 62	Maximum Width (mm): 44	Maximum Thickness (mm): 11	TCSA (mm): 242	TCSP (mm): 132
	Techno-morphological type: LEVALLOIS POINT	Direction Negative Removals: UNIDIRECTIONAL LONGITUDINAL	Retouch presence: NO	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: NO
	Impact target: -ROE DEER	Impact location: -RIB CAGE	Impact contact material: -FLESH, SKIN,		Contact material state: - FRESH
	Impact velocity (m/s):		Penetration (cm): 122 (PH)		Wound dimension (mm): 4*2

Figure 2: Haft arrangement

Figure 3: Experiment

Form 45. Experimental recording form. Experiment code: 80-TR-AOZ16

Use-wear description. Experiment code: 80-TR-AOZ16

Macro-fractures and edge-damage: edge-damage was recorded on the ventral distal right edge (Locus D3v). It presented a discontinuous distribution with triangular and scalar cone scars (Figure 107).

Polish and striations: no micro-wear traces were observed.

Other: none.

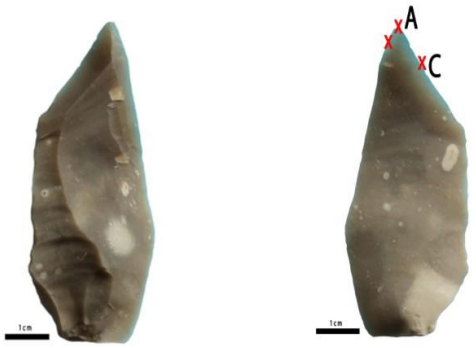
Figure 107. Location A (Form 44, Fig.1). Locus D2v: discontinuous edge-damage with triangular and scalar cone scars, DM/OM 80x.

Experiment type: spear thrusting. Code: 83-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 46). The spear was thrust into the target. It penetrated the thigh, hitting the femur and pelvis bones (Form 46).

Experiment type:	**Thrusting**
Tool N:	**83**
Video N.	**TR-83**

Figure: 1 Tool 83



Experimental tool	Grain Size texture: **MEDIUM**	Maximum Length (mm) **70**	Maximum Width (mm): **26**	Maximum Thickness (mm): **4.5**	TCSA (mm): **58**	TCSP (mm): **78**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **LONGITUDINAL UNIDIRECTIONAL**	Retouch pres-ence: **NO**	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **-PELVIS/THIGH**	Impact contact material: **-FLESH, SKIN, BONE**	Contact material state: **- FRESH**	
	Impact velocity (m/s):		Penetration (cm): **48**	Wound dimension (mm): **2.5*3**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 46. Experimental recording form. Experiment code: 83-TR-AOZ16

Use-wear description. Experiment code: 83-TR-AOZ16

Macro-fractures and edge-damage: a pattern of multiple fractures occurred on the distal ventral tip (Locus D1v). It was composed of several cone fractures with different hinge and feather terminations and two big missing initiation fractures with hinge terminations (Figure 109). Edge-damage was observed on the distal left ventral edge (Locus D2v). They were large cone fractures that overlapped with multiple terminations (mostly step and hinge; Figure 111).

Polish and striations: a very bright and smooth polish was observed on the distal ventral tip (Locus D1v). It was a highly reflective polish, well developed, and with a domed-into-flat topography (Figure 108). At 200x, it shows a good degree of linkage and a “broken aspect” (Van Gijn 1989). No striations were observed. Some spots of polish were also located on the right ventral edge (Loci D3v and M2v). At 200x, they were very bright with a rough texture, and a domed topography (Figure 110).

Other: none

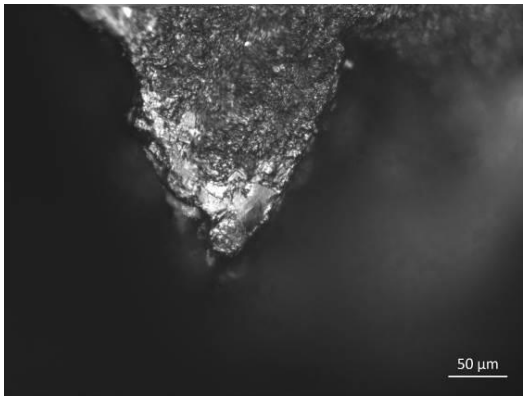


Figure 108. Location A (Form 46, Fig.1). Locus D1v: impact polish, OLMil/OM 200x

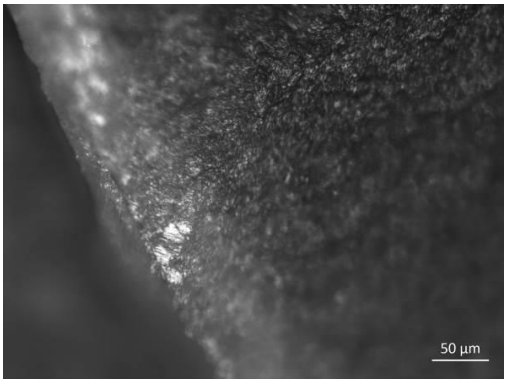


Figure 110. Location C (Form 46, Fig.1). Locus D3v: bright spots, OLMil/OM 200x

Figure 109. Location A (Form 46, Fig.1). Locus D1v: multiple fracture pattern, DM/OM 80x

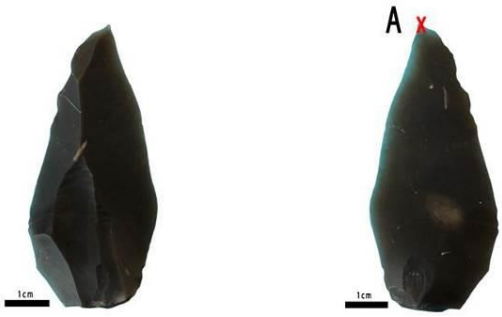
Figure 111. Location C (Form 46, Fig.1). Locus D2v: edge-damage, DM/OM 40x

Experiment type: spear thrusting. Code: 85-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 76). The spear was thrust into the target. It hit the spine. During the impact, the point detached from the shaft and became lodged in the bone (Form 47).

Experiment type:	Thrusting
Tool N:	85
Video N.	TR-85

Figure: 1 Tool 85



Experimental tool	Grain Size texture: FINE	Maximum Length (mm) 62	Maximum Width (mm): 28	Maximum Thickness (mm): 6	TCSA (mm): 84	TCSP (mm): 84
	Techno-morphological type: LEVALLOIS BLADE	Direction Nega-tive Removals: PERIPHERAL	Retouch pres-ence: YES	Retouch Localiza-tion: DISTAL LEFT	Retouch position and extension: DIRECT - SHORT	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: YES
	Impact target: -ROE DEER	Impact location: -SPINE	Impact contact material: -FLESH, SKIN, BONE		Contact material state: - FRESH
	Impact velocity (m/s):		Penetration (cm): 5		Wound dimension (mm): 0.4*3

Figure 2: Haft arrangement

Figure 3: Experiment

Form 47. Experimental recording form. Experiment code: 85-TR-AOZ16

Use-wear description. Experiment code: 85-TR-AOZ16

Macro-fractures and edge-damage: multiple fractures was recorded on the distal ventral tip (Locus D1v). It was composed of a bending fracture terminating in a double feather and of a primary burination fracture on the left edge of the tip (Figure 112).

Polish and striations: no microscopic-wear traces were observed.

Other: none

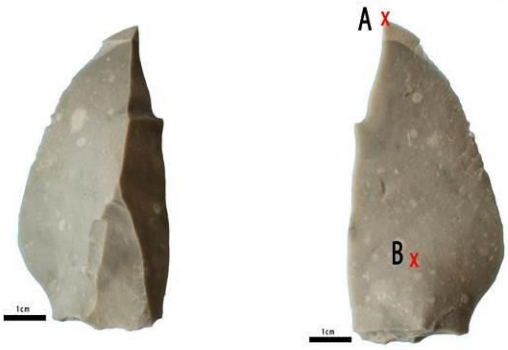
Figure 112. Location A (Form 47, Fig. 1). Locus D1v: bending fracture terminating in a double feather (in blue) plus a primary burination fracture (in red), DM/OM 50x.

Experiment type: spear thrusting. Code: 86-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 48). The spear was thrust into the target. It hit the spine. During the impact, the point detached from the shaft and became lodged in the bone (Form 48).

Experiment type:	Thrusting
Tool N:	86
Video N.	TR-86

Figure 1: Tool 86



Experimental tool	Grain Size texture: **COARSED**	Maximum Length (mm) **75**	Maximum Width (mm): **40**	Maximum Thickness (mm): **17**	TCSA (mm): **340**	TCSP (mm): **121**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **THREE BLOWS-POINT**	Retouch pres-ence: **NO**	Retouch Localiza-tion:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **YES**
	Impact target: **-ROE DEER**	Impact location: **-SPINE**	Impact contact material: **-FLESH, SKIN, BONE**	Contact material state: **- FRESH**	
	Impact velocity (m/s):		Penetration (cm): **4**	Wound dimension (mm): **1.5*3.5**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 48. Experimental recording form. Experiment code: 86-TR-AOZ16

Use-wear description. Experiment code: 86-TR-AOZ16

Macro-fractures and edge-damage: the distal ventral tip completely crushed during the impact (Figure 115). Several multiple overlapped cone fractures occurred on the distal dorsal tip (Locus D1d; Figure 115).

Polish and striations: a very faint and not developed polish affected the ventral distal surface (Locus D1v, Figure 113). It showed little contrast with the unaltered surface.

Other: an oily and greasy lump of tar was still present in the proximal ventral area (P1v, Figure 114).

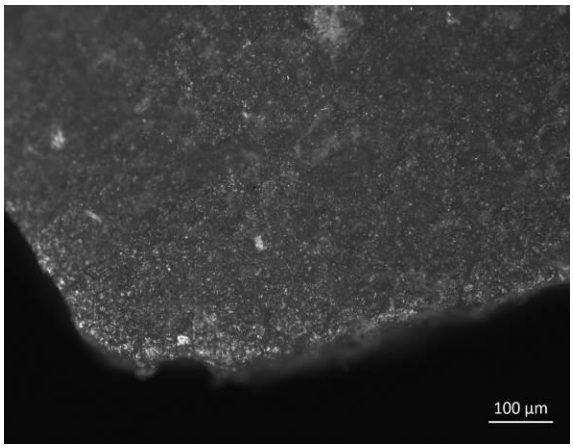


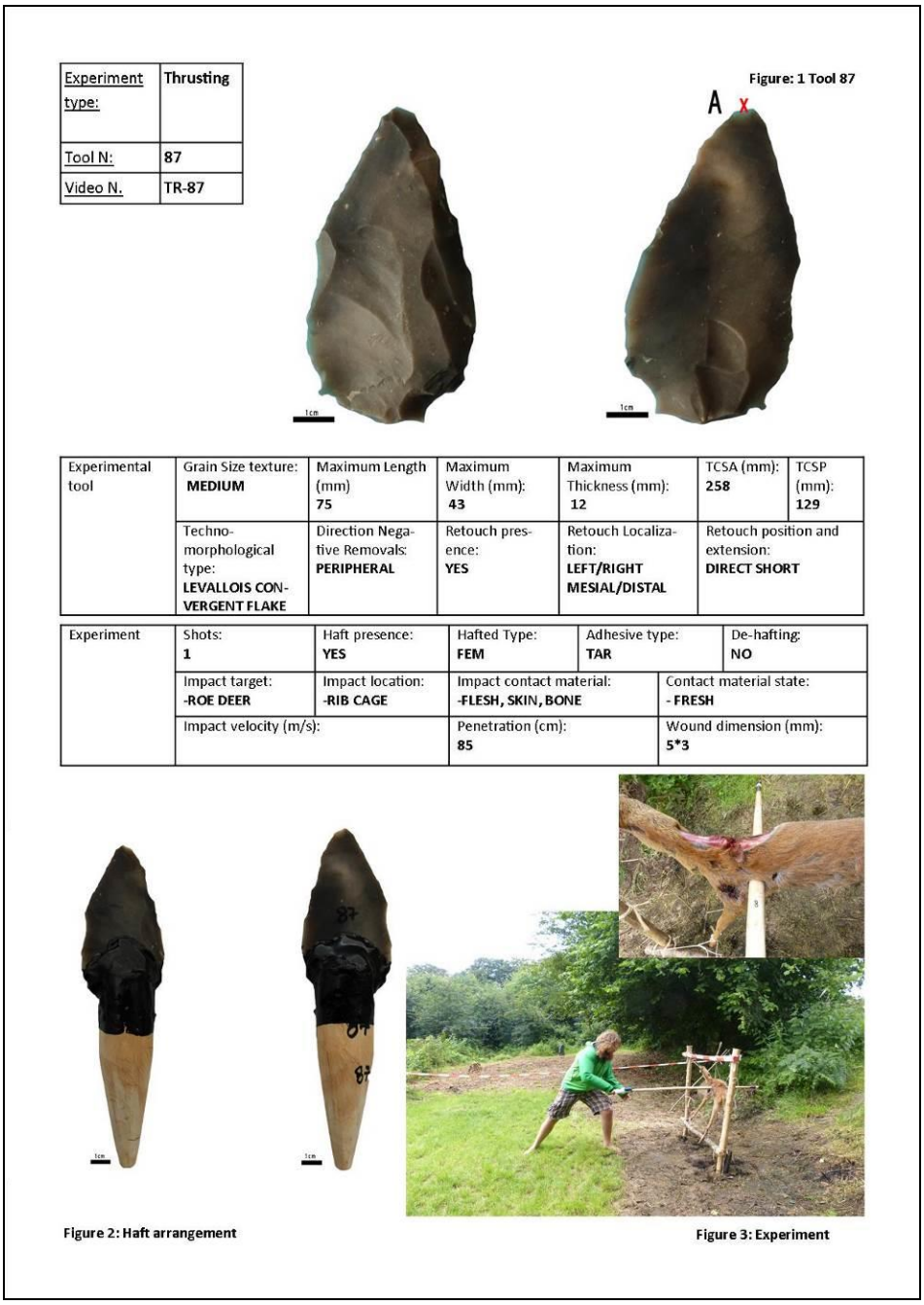
Figure 113. Location A (Form 48, Fig. 1). Locus D1v: faint polish, OM/OLM 100x

Figure 115. Location A (Form 48, Fig. 1). Locus D1v: edge-crushing, DM/OM50x.

Figure 114. Location B (Form 48, Fig. 1). Locus P2v: tar residue, OM/OLM 100x

Experiment type: spear thrusting. Code: 87-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 49). The spear was thrust into the target. The spear struck the rib cage and the tip passed completely through it (Form 49).



Experiment type:	Thrusting
Tool N:	87
Video N.	TR-87

Figure: 1 Tool 87

Experimental tool	Grain Size texture: MEDIUM	Maximum Length (mm) 75	Maximum Width (mm): 43	Maximum Thickness (mm): 12	TCSA (mm): 258	TCSP (mm): 129
	Techno-morphological type: LEVALLOIS CONVERGENT FLAKE	Direction Negative Removals: PERIPHERAL	Retouch presence: YES	Retouch Localization: LEFT/RIGHT MESIAL/DISTAL	Retouch position and extension: DIRECT SHORT	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: NO
	Impact target: -ROE DEER	Impact location: -RIB CAGE	Impact contact material: -FLESH, SKIN, BONE	Contact material state: - FRESH	
	Impact velocity (m/s):		Penetration (cm): 85	Wound dimension (mm): 5*3	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 49. Experimental recording form. Experiment code: 87-TR-AOZ16

Use-wear description. Experiment code: 87-TR-AOZ16

Macro-fractures and edge-damage: the distal ventral tip completely crushed during the impact (Figure 116). A pattern of multiple fractures was observed. It was composed of four cone fractures (Figure 116 in red) terminating on the ventral distal tip (Locus D1v), plus a missing fracture terminating in a hinge (Figure 116 in blue).
Polish and striations: no micro-wear traces were observed.
Other: none

Figure 116. Location A (Form 49, Fig. 1). Locus D1v: four cone fractures (in red) plus a missing fracture terminating in a hinge (in blue), DM/OM 50x

Experiment type: spear thrusting. Code: 89-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 50). The spear was thrust into the target. It hit the shoulder blade and punctured the bone and joint (Form 50).

Experiment type:	Thrusting
Tool N:	89
Video N.	TR-89

Figure 1: Tool 89

Experimental tool	Grain Size texture: **FINE**	Maximum Length (mm) **69**	Maximum Width (mm): **45**	Maximum Thickness (mm): **5**	TCSA (mm): **112**	TCSP (mm): **135**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Negative Removals: **UNIDIRECTIONAL LONGITUDINAL**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **-SHOULDER BLADE**	Impact contact material: **-FLESH, SKIN, BONE**	Contact material state: **- FRESH**	
	Impact velocity (m/s):		Penetration (cm): **2.5**	Wound dimension (mm): **4*4.5**	

Figure 2: Haft arrangement

Figure 3: Experiment

Form 50. Experimental recording form. Experiment code: 89-TR-AOZ16

Use-wear description. Experiment code: 89-TR-AOZ16

Macro-fractures and edge-damage: the distal ventral tip completely crushed during the impact. It showed a pattern of multiple fractures terminating on the dorsal distal tip (Locus D1v, Figure 119). A bending initiating fracture presented a double termination (hinge and step, Figure 119 in green). A small spin-off secondary fracture started from this (Figure 119 in orange). Two fractures with a missing initiation terminated in a double step and into a feather respectively (Figure 119 in blue and red). Also, another bending fracture with a not detached termination was observed on the left side (Locus D2v, Figure 119 in light blue).

Polish and striations: a linear band of polish (MLIT) was observed on the ventral distal surface (Locus D1v, Figure 117). It ran parallel to the direction of the impact. Some bright spots with rough texture were also visible on the ventral distal area (Locus D2v, Figure 118).

Other: none

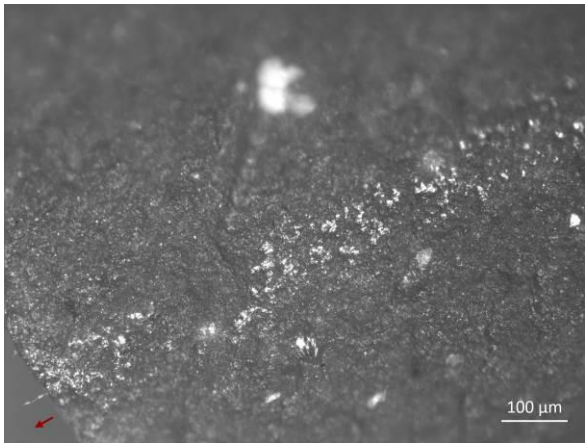


Figure 117. Location B. (Form 50, Fig. 1). Locus D1v: MLIT, OLMil/OM 100x.

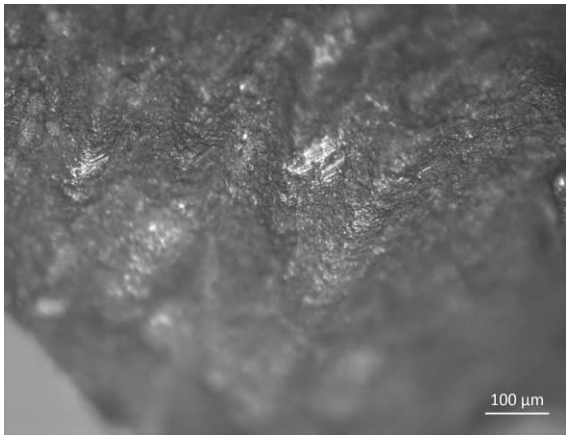


Figure 118. Location C. (Form 50, Fig. 1). Locus D1v: bright spots, OM/OLM 100x.

Figure 119. Location A. (Form 50, Fig. 1). Locus D1d: multiple fractures. Bending fracture with a double termination (in green), spin-off fracture (Figure 119in orange), two missing fractures (in blue and red), another bending fracture (in light blue).

Experiment type: spear thrusting. Code: 90-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 51). The spear was thrust into the target. The spear went completely through the rib cage, breaking two ribs (5th/6th, Form 51).

Experiment type:	**Thrusting**
Tool N:	**90**
Video N.	**TR-90**

Figure 1: Tool 90

Experimental tool	Grain Size texture: **MEDIUM**	Maximum Length (mm) **76**	Maximum Width (mm): **45**	Maximum Thickness (mm): **14**	TCSA (mm): **315**	TCSP (mm): **136**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Negative Removals: **PERIPHERAL**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: **1**	Haft presence: **YES**	Hafted Type: **FEM**	Adhesive type: **TAR**	De-hafting: **NO**
	Impact target: **-ROE DEER**	Impact location: **-RIB CAGE**	Impact contact material: **-FLESH, SKIN, BONE**		Contact material state: **- FRESH**
	Impact velocity (m/s):		Penetration (cm): **119**		Wound dimension (mm): **4*4.5**

Figure 2: Haft arrangement

Figure 3: Experiment

Form 51. Experimental recording form. Experiment code: 90-TR-AOZ16.

Use-wear description. Experiment code: 90-TR-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: a linear band of polish (MLIT) was observed on the ventral distal surface (Locus D1v, Figure 120, Figure 121). It ran parallel to the direction of the impact.

Other: none

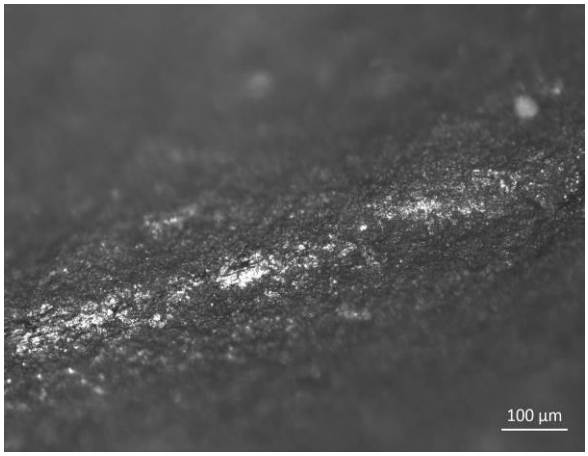


Figure 120. Location A. (Form 51, Fig. 1). Locus D1v: MLIT, OLMil/OM 100x.

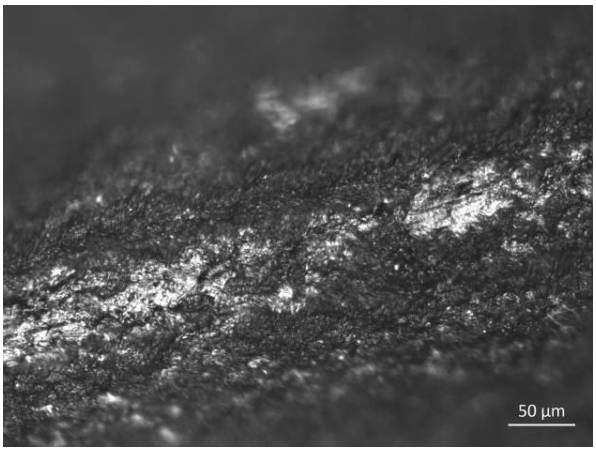


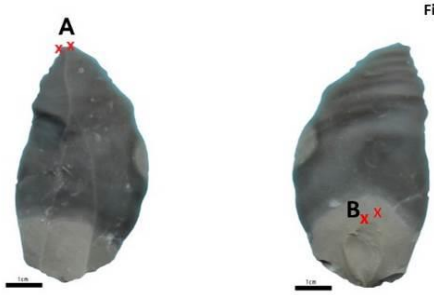
Figure 121. LocationA. (Form 51, Fig. 1). Locus D1v: details at 200x. Microscopic linear impact polish with striations.

Experiment type: spear thrusting. Code: 93-TR-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden fore-shaft and fixed with commercial tar (Form 52). The spear was thrust into the target. It hit and perforated the spine (Form 52).

Experiment type:	Thrusting
Tool N:	93
Video N.	TR-93

Figure: 1 Tool 93



Experimental tool	Grain Size texture: MEDIUM	Maximum Length (mm) 75	Maximum Width (mm): 39	Maximum Thickness (mm): 10	TCSA (mm): 195	TCSP (mm): 117
	Point Weight (gr): 38	Spear total Weight (gr): 648	Tip Angle (°):	Left edge Angle (°):	Right edge Angle (°):	
	Techno-morphological type: LEVALLOIS BLADE	Direction Negative Removals: UNIDIRECTIONAL LONGITUDINAL	Retouch presence: NO	Retouch Localization:	Retouch position and extension:	

Experiment	Shots: 1	Haft presence: YES	Hafted Type: FEM	Adhesive type: TAR	De-hafting: NO
	Impact target: -ROE DEER	Impact location: -SPINE	Impact contact material: -FLESH, SKIN, BONE		Contact material state: - FRESH
	Impact velocity (m/s):		Penetration (cm): 6.5		Wound dimension (mm): 4*0.5

Figure 2: Haft arrangement

Form 52. Experimental recording form. Experiment code: 90-TR-AOZ16.

Use-wear description. Experiment code: 93-TR-AOZ16

Macro-fractures and edge-damage: a pattern of multiple fractures was located on the dorsal distal tip (D1d). It was composed by a bending initiating fracture that terminated in a step (Figure 122 in blue). A unifacial spin-off secondary fracture started from this (Figure 122.1 in red). On the right side (Locus D2d), a bending fracture terminated in a hinge with a spin-off initiating from it (Figure 124).

Polish and striations: no micro-wear traces were observed

Other: a very bright layer of tar, almost metallic, covered the proximal ventral surface (P1v). It looks like a very greasy and oily layer deposited on the surface (Figure 123).

Figure 122. Location A. (Form 52, Fig. 1). Locus D1d: step bending fracture plus spin-off, DM/OM40x.

Figure 124. Location A. (Form 52, Fig. 1). Locus D2d: hinge bending fracture plus spin-off, DM/OM70x.

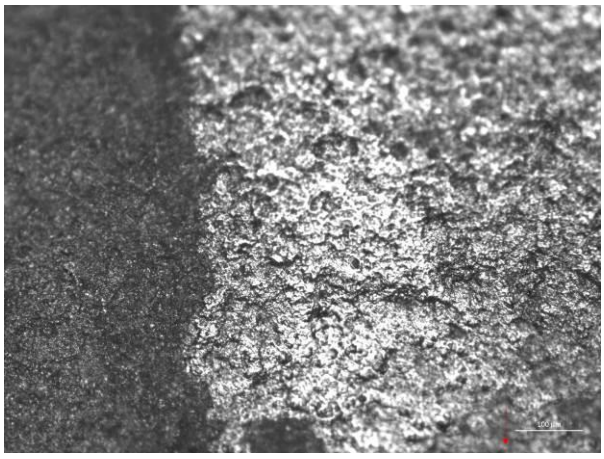


Figure 123. Location B. (Form 52, Fig. 1). Locus P1v: tar polish, OM/OLM 100x.

A.6 Register of use-wear traces of experimental Levallois points used as butchering knives (data from the third set of experiments, see Chapter 4)

Experiment type: butchering knife. Code: 101-BK-AOZ16.

Description of the experiment: the experimental Levallois point was held with bare hands (and, occasionally, held with a leather band for protection). It was used as a knife for butchering an entire wild boar carcass (57kg). It was deployed in multiple motions (cutting, sawing, and shaving) and actions (skinning, meat-cutting and dismembering) for a total of 140 minutes (Form 53).

Experiment type:	Butchering knife
Tool N:	101

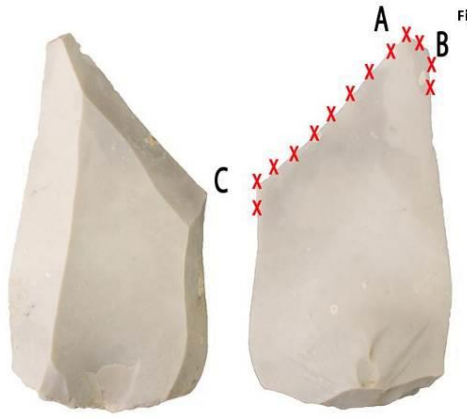


Figure 1: Tool 101

Experimental tool	Grain Size texture: **COARSED**	Maximum Length (mm) **79**	Maximum Width (mm): **41**	Maximum Thickness (mm): **10**	TCSA (mm): **205**	TCSP (mm): **123**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Negative Removals: **THREE BLOWS POINT**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Haft presence: **NO**	Hafted Type: **NA**	Adhesive type: **NA**	Hand-hold: **YES (naked hands and leather band)**	Time (minutes): **- 140**
	Contact material: **-WILD BOAR**	Material specification: **- SKIN, FLESH, MEAT, BONE**	Contact material state: **- FRESH (entire carcass with organs and head)**		Contact Angle: **- 35°-80°**
	Motion: **-CUTTING, SHAVING**	Action: **- SKINNING, MEAT-CUTTING, DISMEMBERING**	Purpose: **-BUTCHERING**		

Figure 2: Experiment (entire carcass, skinning process, dismembering and meat cutting)

Form 53. Experimental recording form. Experiment code: 101- BK-AOZ16.

Use-wear description. Experiment code: 101-BK-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: the distal ventral tip (Locus D1v) presents patches of smooth polish located on the immediate edge (Figure 125). At 200x, the very tip showed a linked polish with flat micro-topography (Figure 125). This extensive polish became very scattered on the inner surface (Figure 125). On the left side of the ventral tip (Locus D2v), another not-linked polish affected the highest topographic spots (Figure 126). It showed a very bright aspect, with a domed almost “bumpy” topography (Figure 126). On the mesial left edge (M1v) a smooth polish with few micro-pits was located at the immediate edge (Figure 127). It became rough and scattered polish on the inner surface (Figure 127).

Other: edge-rounding is observed on the tip and the mesial edges (D1v and M1v).

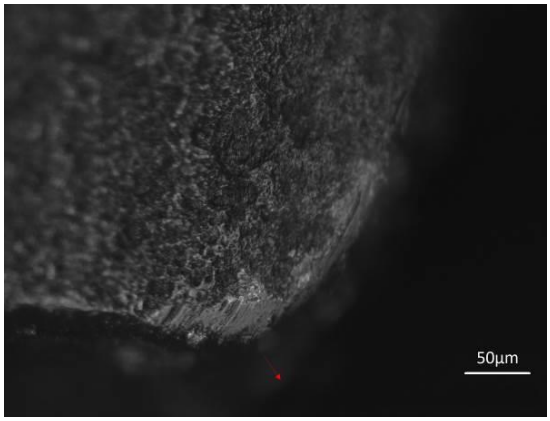


Figure 125. Location A (Form 53, Fig.1). Locus D1v: smooth and extensive polish, OLMil/OM 200x.

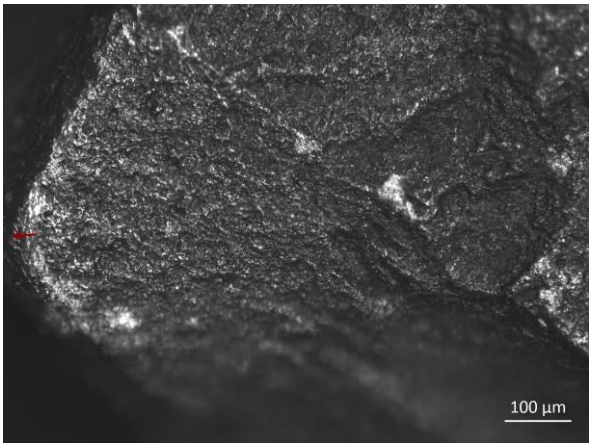


Figure 126. Location B (Form 53, Fig.1). Locus D2v: domed not-linked polish, OLMil/OM 100x.

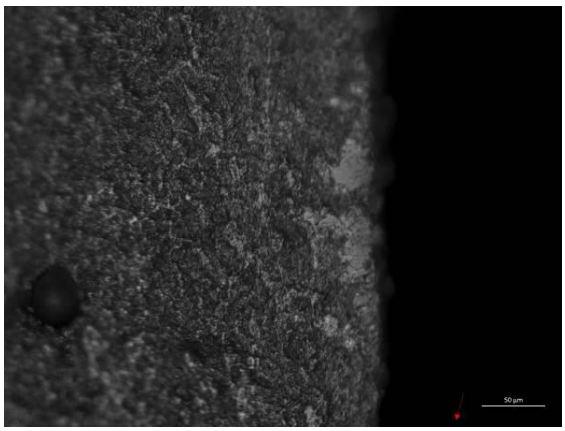


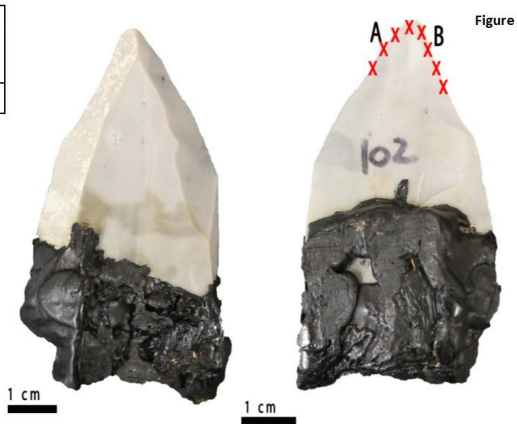
Figure 127. Location C (Form 53, Fig.1). Locus M1v: smooth polish with few micro-pits (plus a second scattered polish on the inner surface), OLMil/OM 200x.

Experiment type: butchering knife. Code: 102-BK-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden handle and fixed with commercial tar. It was employed as a knife for butchering an entire salmon (4 kg). It was deployed in multiple motions (cutting and scraping) and actions (scaling, meat-cutting and filleting) for 40 minutes (Form 54). The tool de-hafted after 2.35" of utilisation. After that, it was not re-hafted but it was used with bare hands.

Experiment type:	**Butchering knife**
Tool N:	**102**

Figure 1: Tool 102



Experimental tool	Grain Size texture: **COARSED**	Maximum Length (mm) **68**	Maximum Width (mm): **35**	Maximum Thickness (mm): **8**	TCSA (mm): **140**	TCSP (mm): **105**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Negative Removals: **UNIDIRECTIONAL CONVERGENT**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Haft presence: **YES**	Hafted Type: **FEMALE**	Adhesive type: **TAR**	Hand-held: **NO**	Time (minutes): **- 40**
	Contact material: **-SALMON**	Material specification: **- FISH SKIN, FLESH, MEAT, SCALES, BONE**	Contact material state: **- FRESH (entire fish with organs and head)**		Contact Angle: **- 70°-45°**
	Motion: **-CUTTING, SCRAPING**	Action: **- SCALING, FISH-CUTTING, FILETTING**	Purpose: **-BUTCHERING**		

Figure 2: Experiment

Form 54. Experimental recording form. Experiment code: 102- BK-AOZ16.

Use-wear description. Experiment code: 102-BK-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.

Polish and striations: a very faint, greasy and bright polish was located on the ventral tip (Loci D1v and D2v) and along the ventral mesial edge (Locus M1v). It was marginal to the very edge and mostly scattered (Figure 129). Narrow striations filled with polish (very similar to MLITs) were present on the ventral right mesial locus (Locus M2v; Figure 130). They ran obliquely to the edge (Figure 130). Edge rounding was not observed.

Other: fish scales were still present on the mesial right ventral locus (M2v). They diffract the light showing a multicolour (rainbow) aspect (Figure 128).

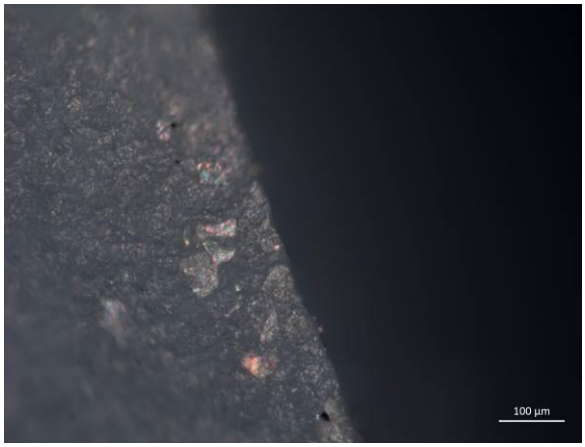


Figure 128. Location B (Form 54, Fig.1). Locus M2v: fish scale, OLMil/OM 100x.

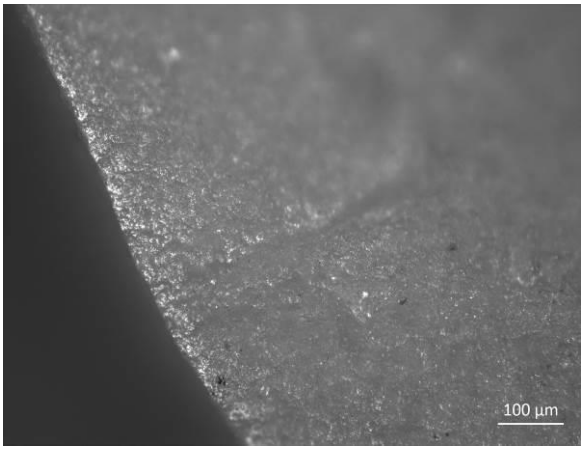


Figure 129. Location A (Form 54, Fig.1). Loci D2v and M1v: greasy and faint polish, OLMil/OM 100x

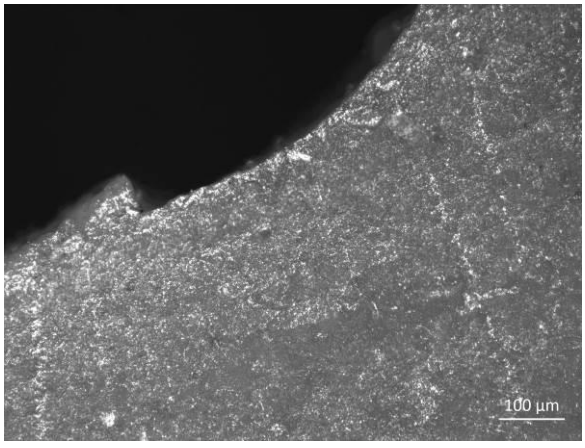


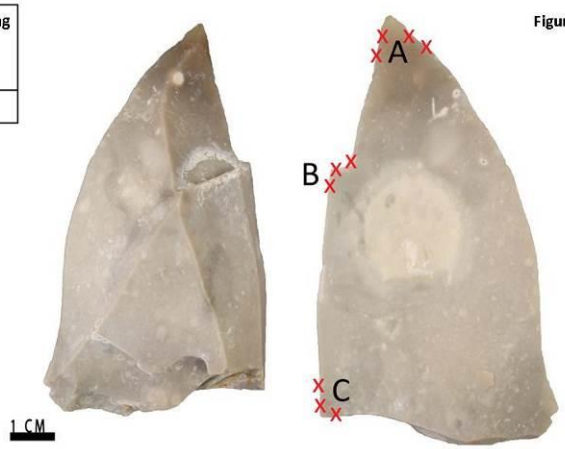
Figure 130. Location B (Form 54, Fig.1). Locus M2v: greasy and faint polish plus narrow striation filled with polish (very similar to MLITs), OLMil/OM 100x

Experiment type: butchering knife. Code: 100-BK-AOZ16.

Description of the experiment: the experimental Levallois point was held with bare hands. It was employed as a knife for butchering an entire wild boar carcass. It was deployed in multiple motions (cutting, sawing, and shaving) and actions (skinning, meat-cutting and dismembering) for 100 minutes (Form 55).

Experiment type:	Butchering knife
Tool N:	100

Figure 1: Tool 100



Experimental tool	Grain Size texture: COARSED	Maximum Length (mm) 84	Maximum Width (mm): 47	Maximum Thickness (mm): 12	TCSA (mm): 282	TCSP (mm): 141
	Techno-morphological type: LEVALLOIS POINT	Direction Negative Removals: CENTRIPETAL	Retouch presence: NO	Retouch Localization:	Retouch position and extension:	

Experiment	Haft presence: NO	Hafted Type: NA	Adhesive type: NA	Hand-hold: YES (naked hands)	Time (minutes): - 100
	Contact material: -WILD BOAR	Material specification: - SKIN, FLESH, MEAT, BONE	Contact material state: - FRESH (entire carcass with organs and head)	Contact Angle: - 60°-90°	
	Motion: -CUTTING, SHAVING	Action: -SKINNING, MEAT-CUTTING, DISMEMBERING	Purpose: -BUTCHERING		

Figure 2: Experiment (skinning process, dismembering and meat cutting)

Form 55. Experimental recording form. Experiment code: 100- BK-AOZ16.

Use-wear description. Experiment code: 100-BK-AOZ16

Macro-fractures and edge-damage: no macro-fractures were observed. Sporadic half-moon cone scars were recorded on the mesial edges (Loci M1v and M2v).
Polish and striations: the distal ventral surface was affected by a very greasy and bright polish. On the inner surface, this polish was intrusive and not well-linked (Figure 131). However, it became domed and well-developed on the immediate edge (Figure 131).
Other: edge-rounding was developed on the mesial edges (Loci M1v and M2v).

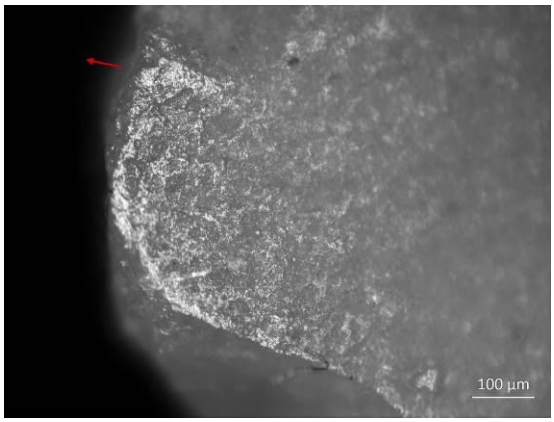


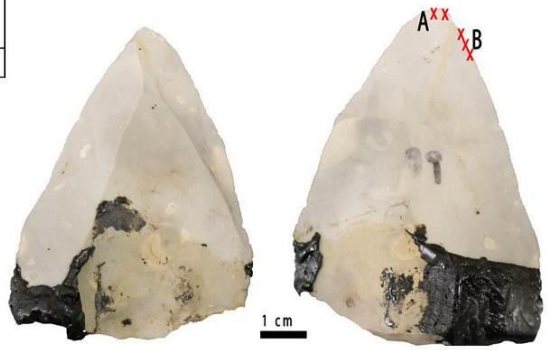
Figure 131. Location A (Form 55, Fig.1). Locus Dv1, Dv2: greasy and bright polish, OLMil/OM 100x.

Experiment type: butchering knife. Code: 99-BK-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden handle and fixed with commercial tar. It was employed as a knife for butchering an entire salmon (Form 56). It was deployed in multiple motions (cutting and sawing) and actions (meat-cutting and dismembering) for 20 minutes. The tool de-hafted after 8.47” of utilisation. After that, it was not re-hafted but it was used with bare hands.

Experiment type:	Butchering knife
Tool N:	99

Figure 1: Tool 99



Experimental tool	Grain Size texture: COARSED	Maximum Length (mm) 71	Maximum Width (mm): 56	Maximum Thickness (mm): 10	TCSA (mm): 280	TCSP (mm): 160
	Techno-morphological type: LEVALLOIS POINT	Direction Negative Removals: THREE BLOWS POINT	Retouch presence: NO	Retouch Localization:	Retouch position and extension:	

Experiment	Haft presence: YES	Hafted Type: FEMALE	Adhesive type: TAR	Hand-hold: NO	Time (minutes): - 20
	Contact material: -CHICKEN	Material specification: - MEAT, SPORADIC BONE	Contact material state: - FRESH (without hair, head and organs)	Contact Angle: - 60°-90°	
	Motion: -CUTTING	Action: - MEAT-CUTTING, DISMEMBERING	Purpose: -BUTCHERING		

Figure 2: Experiment

Form 56. Experimental recording form. Experiment code: 99-BK-AOZ16.

Use-wear description. Experiment code: 99-BK-AOZ16

Macro-fractures and edge-damage: a pattern of multiple fractures was observed on the ventral distal tip (Locus D1v). It was composed by a bending fracture terminating in a step into a feather (Figure 134 in red), and two cone feather fractures (Figure 134 in blue). Half-moon cone scars were observed on the left edge (Loci D3v and M2v, Figure 133).

Polish and striations: a very rough and bright polish occurred on the ventral distal tip and along the mesial edges (Loci D1v, D2v, D3v and M1v). It was very scattered and greasy, and there was little contrast with the unaltered surface (Figure 132).

Other: edge-rounding is poorly developed.

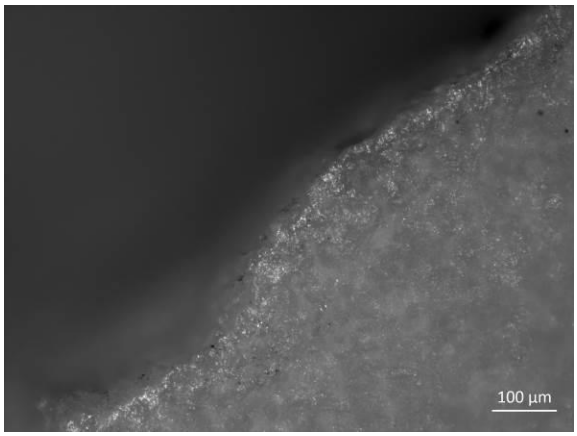


Figure 132. Location A (Form 56, Fig.1). Faint and greasy polish, OLMil/OM 100x.

Figure 133. Location B (Form 56, Fig.1). Locus D3v: edge-damage half-moon cone scars, DM/OM 40x.

Figure 134. Location A (Form 56, Fig.1). Locus D1v: step/feather-terminating bending fracture (in red) plus two cone fractures (in blue), DM/OM 56x.

Experiment type: butchering knife. Code: 97-BK-AOZ16.

Description of the experiment: The experimental Levallois point was held with bare hands. It was employed as a knife for butchering an entire roe deer, minus head and organs. It was deployed in multiple motions (cutting, sawing, and shaving) and actions (skinning, meat/sinew-cutting and dismembering) for 30 minutes (Form 57).

Experiment type:	Butchering knife
Tool N:	97

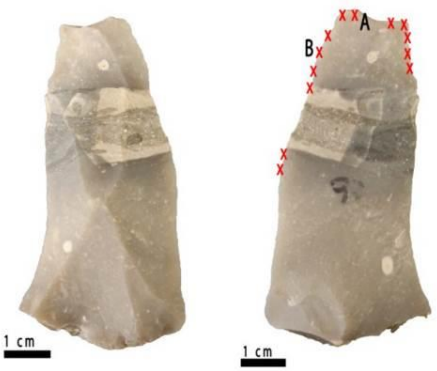


Figure 1: Tool 97

Experimental tool	Grain Size texture: **COARSED**	Maximum Length (mm) **70**	Maximum Width (mm): **33**	Maximum Thickness (mm): **8**	TCSA (mm): **132**	TCSP (mm): **99**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Negative Removals: **CENTRIPETAL**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Haft presence: **NO**	Hafted Type: **NA**	Adhesive type: **NA**	Hand-hold: **YES (naked hands)**	Time (minutes): **- 30**
	Contact material: **- ROE DEER**	Material specification: **- SKIN, FLESH, BONE**	Contact material state: **- FRESH (entire carcass without organs and head)**	Contact Angle: **- 45°-90°**	
	Motion: **-CUTTING, SHAVING**	Action: **- SKINNING, MEAT/SINEW CUTTING, DISMEMBERING**	Purpose: **-BUTCHERING**		

Figure 2: Experiment (skinning process, meat/sinew cutting, dismembering)

Form 57. Experimental recording form. Experiment code: 97-BK-AOZ16.

Use-wear description. Experiment code: 97-BK-AOZ16

Macro-fractures and edge-damage: no fractures were observed. Edge-damage was sporadically recorded on the mesial edges (Loci M1v and M2v) with discontinuous scalar cone scars.

Polish and striations: a faint and scattered polish affected the immediate mesial edges (Loci M1v and M2v; Figure 136). It shows little contrast with the unaltered surface (Figure 136). An extensive polish was located on the ventral distal tip and left mesial edge (D1v, M1v; Figure 137). At 200x, it was very greasy, rough and not-linked polish with a rather domed micro-topography. It stretched out in the inner part with streaks of polish and striations that ran perpendicular to the edge (Figure 135).

Other: edge-rounding is poorly developed.

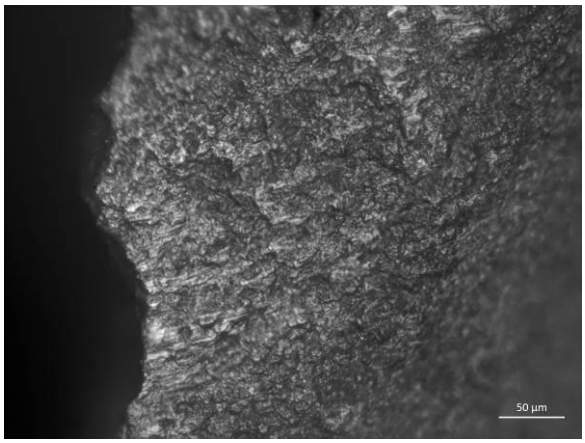


Figure 135. Location A (Form 57, Fig.1). Locus D1v: details at 200x. Domed "bumpy" polish with directionality.

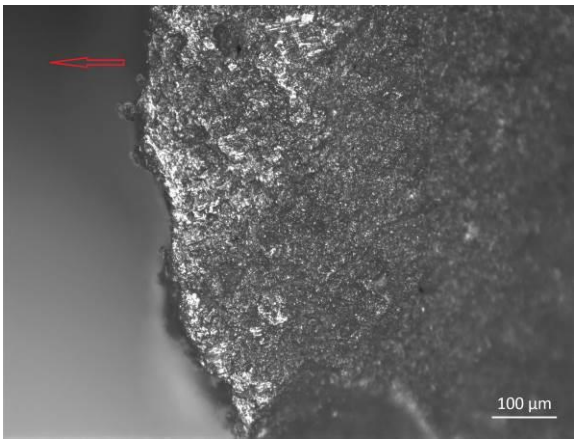


Figure 137. Location A (Form 57, Fig.1). Locus D1v: greasy and intrusive polish, OLMil/OM 100x.

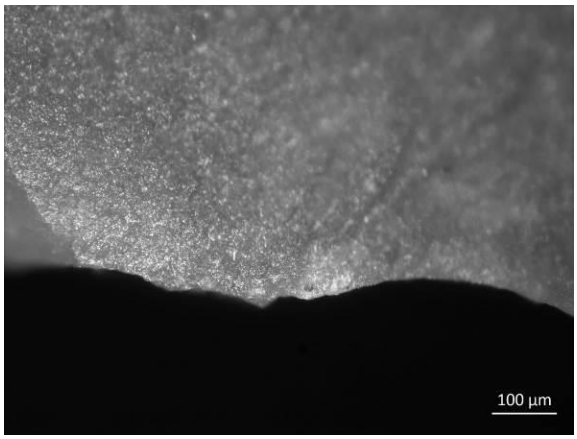


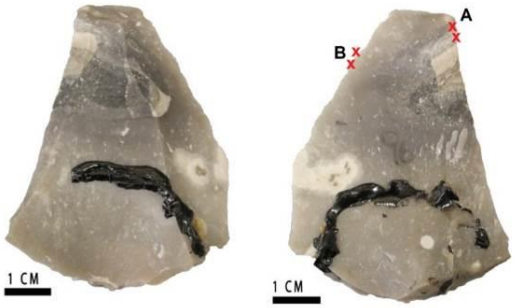
Figure 136. Location B (Form 57, Fig.1). Locus M1v: faint and scattered polish, OMLil OM 100x.

Experiment type: butchering knife. Code: 96-BK-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden handle and fixed with commercial tar. It was employed as a knife for butchering an entire roe deer, minus head and organs. It was deployed in multiple motions (cutting, sawing, and shaving) and actions (skinning, meat/sinew-cutting and dismembering) for 30 minutes (Form 58). The tool did not de-haft during utilisation.

Experiment type:	Butchering knife
Tool N:	96

Figure 1: Tool 96



Experimental tool	Grain Size texture: **COARSED**	Maximum Length (mm) **57**	Maximum Width (mm): **42**	Maximum Thickness (mm): **7**	TCSA (mm): **147**	TCSP (mm): **127**
	Techno-morphological type: **LEVALLOIS POINT**	Direction Nega-tive Removals: **CONVERGENT UNIDIRECTIONAL**	Retouch pres-ence: **NO**	Retouch Localiza-tion:	Retouch position and extension:	

Experi-ment	Haft presence: **YES**	Hafted Type: **FEMALE**	Adhesive type: **TAR**	Hand-hold: **NO**	Time (minutes): **- 40**
	Contact material: **- ROE DEER**	Material specification: **- SKIN, FLESH, MEAT, BONE**	Contact material state: **- FRESH (entire carcass with-out organs and head)**		Contact Angle: **- 45°-90°**
	Motion: **-CUTTING, SHAVING**	Action: **- Skinning, meat-cutting, dis-membering**	Purpose: **-BUTCHERING**		

Figure 2: Experiment

Form 58. Experimental recording form. Experiment code: 96-BK-AOZ16.

Use-wear description. Experiment code: 96-BK-AOZ16

Macro-fractures and edge-damage: no fractures were observed. Multiple discontinuous cone scars were located on the ventral distal right tip (Locus D3v; Figure 139). They showed different morphologies (e.g. scalar, rectangular and trapezoidal; Figure 139).
Polish and striations: a very faint polish occurred on the ventral surface. It was bright and very scattered with little contrast with the unaltered surface (Figure 138).
Other: edge-rounding was poorly developed.

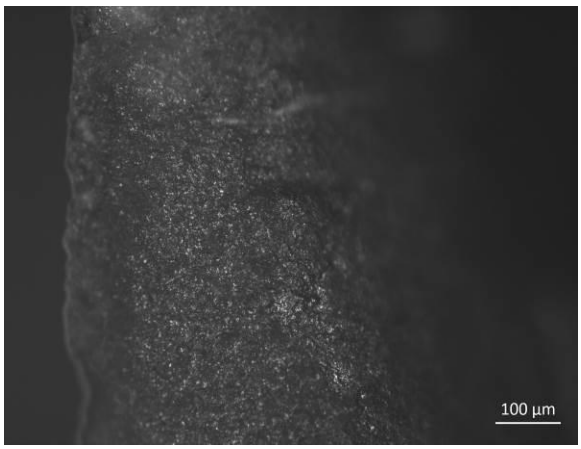


Figure 138. Location B (Form 58, Fig.1). Locus Mv1: faint polish, OM/OLM 100x.

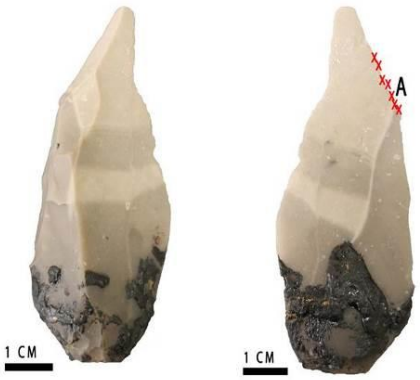
Figure 139. Location A (Form 58, Fig.1). Locus D3v: edge-damage, cone scars. OM 40x.

Experiment type: butchering knife. Code: 75-BK-AOZ16.

Description of the experiment: The experimental Levallois point was hafted into a female slot on a wooden handle and fixed with commercial tar. It was employed as a knife for butchering an entire roe deer, minus head and organs. It was deployed in multiple motions (cutting, sawing, and shaving) and actions (skinning, meat/sinew-cutting and dismembering) for 42 minutes (Form 59). The tool did not de-haft during the utilisation.

Experiment type:	Butchering knife
Tool N:	75

Figure 1: Tool 75



Experimental tool	Grain Size texture: **COARSED**	Maximum Length (mm) **79**	Maximum Width (mm): **28**	Maximum Thickness (mm): **12**	TCSA (mm): **168**	TCSP (mm): **85**
	Techno-morphological type: **LEVALLOIS LATERAL POINT**	Direction Negative Removals: **LONGITUDINAL UNIDIRECTIONAL**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Haft presence: **YES**	Hafted Type: **FEMALE**	Adhesive type: **TAR**	Hand-hold: **NO**	Time (minutes): **- 42**
	Contact material: **- ROE DEER**	Material specification: **- SKIN, FLESH, MEAT, BONE**	Contact material state: **- FRESH (entire carcass without organs and head)**	Contact Angle: **- 60°-90°**	
	Motion: **-CUTTING**	Action: **- Skinning, meat/sinew-cutting, dismembering**	Purpose: **-BUTCHERING**		

Figure 2: Experiment (skinning, meat/sinew cutting, dismembering)

Form 59. Experimental recording form. Experiment code: 75-BK-AOZ16

Use-wear description. Experiment code: 75-BK-AOZ16

Macro-fractures and edge-damage: no fractures or edge-damage were observed after utilisation.
Polish and striations: a very faint polish occurred on the ventral surface. It showed little contrast with the unaltered surface unless its brightness (Figure 140).
Other: edge-rounding was present (medium degree of edge-rounding).

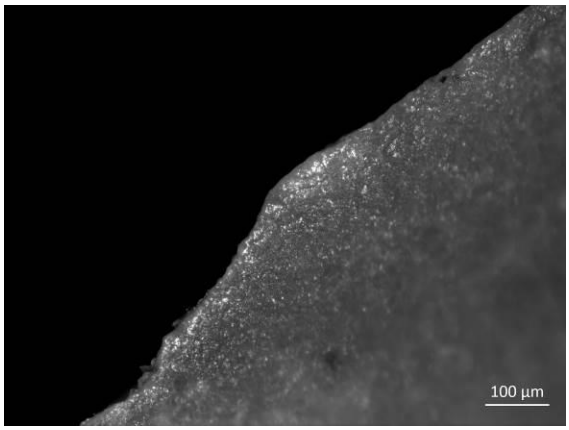


Figure 140. Location A (Form 59, Fig.1): faint and greasy polish, OLMil/OM 100x.

Experiment type: butchering knife. Code: 59-BK-AOZ16.

Description of the experiment: the experimental Levallois point was held with bared hands (and, occasionally, held with a leather band for hands protection). It was employed as a knife for butchering an entire roe deer, minus head and organs. It was deployed in multiple motions (cutting, sawing, and shaving) and actions (skinning, meat/sinew-cutting and dismembering) for 45 minutes (Form 60).

Experiment type:	Butchering knife
Tool N:	59

Figure 1: Tool 59

Experimental tool	Grain Size texture: **MEDIUM**	Maximum Length (mm) **74**	Maximum Width (mm): **48**	Maximum Thickness (mm): **13**	TCSA (mm): **312**	TCSP (mm): **144**
	Techno-morphological type: **LEVALLOIS CONVERGENT FLAKE**	Direction Negative Removals: **CENTRIPETAL**	Retouch presence: **NO**	Retouch Localization:	Retouch position and extension:	

Experiment	Haft presence: **NO**	Hafted Type: **NA**	Adhesive type: **NA**	Hand-hold: **YES (naked hands and leather band)**	Time (minutes): **- 45**
	Contact material: **- ROE DEER**	Material specification: **-SKIN, FLESH, BONE**	Contact material state: **- FRESH (entire carcass without organs and head)**		Contact Angle: **- 60°-90°**
	Motion: **-CUTTING**	Action: **- Skinning, meat-cutting, dismembering**	Purpose: **-BUTCHERING**		

Figure 2: Experiment (skinning, meat-sinew cutting, dismembering)

Form 60. Experimental recording form. Experiment code: 59-BK-AOZ16

Use-wear description. Experiment code: 59-BK-AOZ16

Macro-fractures and edge-damage: no fractures were observed. Multiple but overlapping cone scars were observed on the dorsal mesial edge (Locus M1d; Figure 143)

Polish and striations: a very faint polish occurred on the ventral surface. It was bright and very scattered with little contrast with the unaltered surface (Figure 141). Bright and domed spots of polish occurred on the mesial left edge (Locus M1v, Figure 142). They affected the highest micro-topographic spots. At 200x, they appeared rather smooth and very bevelled (Figure 144).

Other: edge-rounding was present (medium degree of edge-rounding).

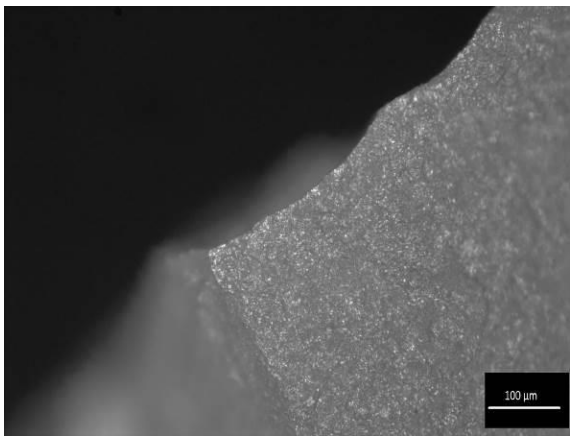


Figure 141. Location A (Form 60, Fig.1). Along the edges: faint and greasy polish, OLMil/OM 100x.

Figure 143. Location A (Form 60, Fig.1). Locus M1d: edge-damage, cone scars. DM/OM 50x.

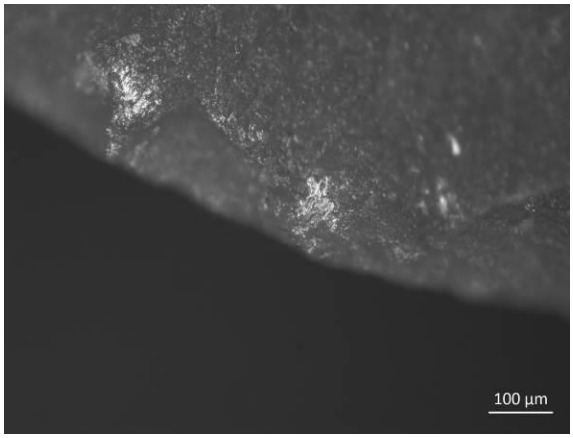


Figure 142. Location B (Form 60, Fig.1). Locus M1v: bright domed polish, OLMil/OM 100x

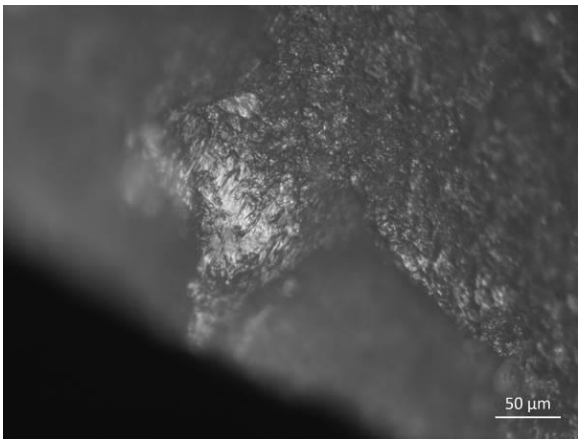


Figure 144. Location B (Form 60, Fig.1). Details at 200x, domed polish with short striations.

APPENDIX B

Levallois points and Levallois technology: definition and technological introduction

B.1 Levallois methods and variability

Levallois methods have been extensively debated by stone tool technologists (Bordes, 1953a, 1953b, 1951; Bourgon, 1957; Dibble and Bar Yosef, 1995; Boëda, 1982, 1994, 1995; Schlanger, 1996; Scott, 2011; White et al., 2011; Eren and Lycett, 2012). Bordes was the first to propose the hypothesis that Levallois tools included a preparation of the core (Bordes, 1947, p, 25). However, the first technological descriptions of Levallois technology was advanced only in 1982 by Boëda (Boëda, 1982, 1994, 1995). He proposed the identification of Levallois methods based on six distinctive criteria (Boëda, 1982, 1994) (Figure 145):

1. The volume of the core is included in two surfaces that meet at a plane of intersection.

2. The two surfaces are hierarchically related, one is the (striking) platform surface and the other is the production (or débitage) surface.

3. The production surface is organized such that the morphology of products is predetermined. The predetermination is based on the management of lateral and distal convexities.

4. The plane of fracture for the detachment of predetermined flakes is sub-parallel to the plane of intersection between the two faces.

5. The striking platform is organized in manner to allow the removal of the predetermined flakes from the production surface. Thus, the intersection of the striking platform surface and the production surface must be perpendicular to the flaking axis of the predetermined flakes.

6. Levallois method is used only with a direct percussion hard hammer technique.

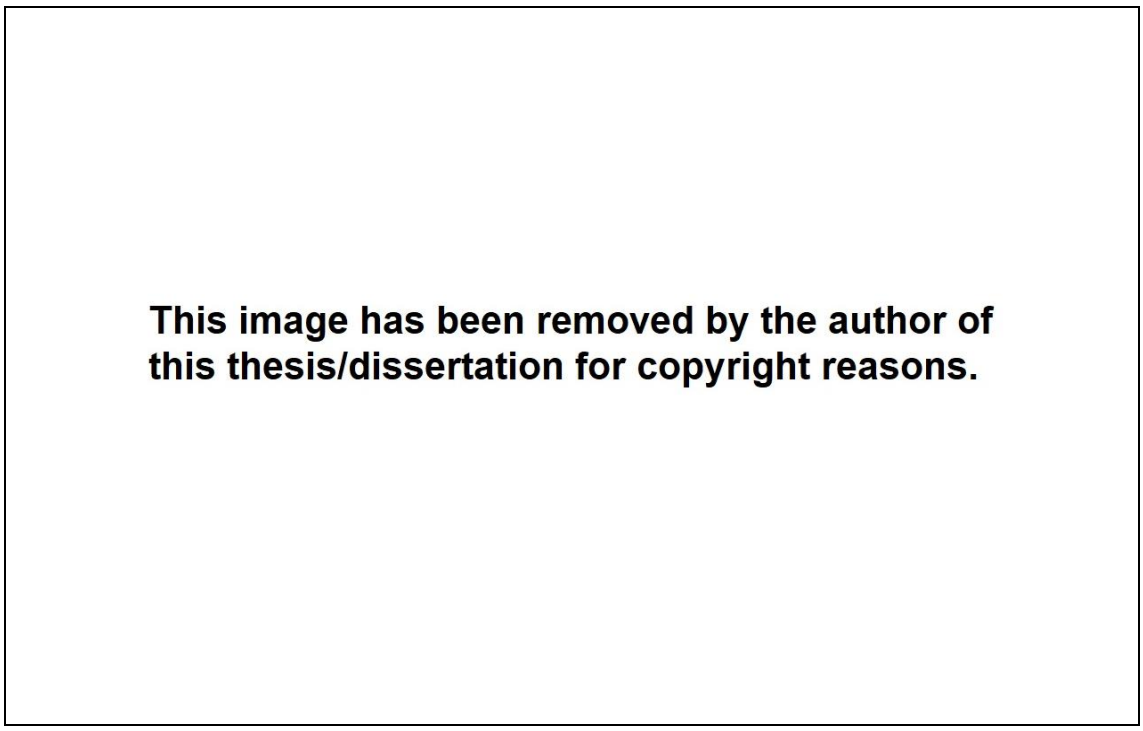


Figure 145. Six criteria of Levallois technology (Boëda, 1994).

Moreover, several Levallois reduction sequences have indeed been identified (Boëda, 1982; Boëda et al., 1990; Boëda, 1993;), such as:

1. Levallois unipolar sequences,
2. Levallois bipolar sequences,
3. Levallois centripetal sequences.

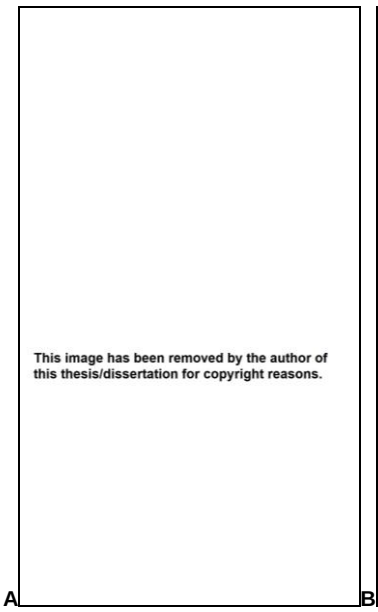
These reduction sequences can be employed as preferential or linear methods and/or recurrent methods (Figure 146). Preferential methods achieve the detachment of only one of the preferential flakes, also called ‘first order flake’ (Boëda, 2013), from the central part of the core, mainly exploiting distal and lateral convexities. Recurrent methods produce a series of end-products from the same phase of core preparation (Boëda, 1993) (Figure 146).

Figure 146. Different Levallois reduction sequences and methods (modified from Delagnes and Meignen, 2006).

B.1.1 Levallois points and convergent tools: definition

The Levallois point has been defined in previous literature by the presence, on the dorsal face, of a central triangle on the proximal part and two lateral convergent negative removals on the edges (Figure 147). "*Une partie centrale ou triangle de base et de deux parties latérales à bord rectiligne créant une nervure au niveau de la partie distale. Chacune de ces parties est obtenue par des enlèvements s'inscrivant dans des schémas opératoires précis et spécifiques*" (Boëda, 1982, p. 24).

Although Boëda's (1982) definition (presented above) is straightforward, it does not cover the great morphological variability within the Levallois points category. Levallois points may present more than two later negative-of-removals, and/or cannot have a triangle at their base. For instance, Figure 147 clearly shows that not every archaeological Levallois point has a triangle at its base.

A 

B 

Figure 147. A: Classic Levallois points with a central triangle (modified from Boëda, 1982, figure 5). B: archaeological Levallois points from Abri du Maras site (France). Only 3 points present a clear triangle at the base (in a red triangle), (Image La Porta).

Definitions of Levallois points, convergent tools, and retouched convergent tools are presented below (Figure 148).

- Levallois points, in this study, were defined as predetermined tools featuring two convergent edges and a tip end produced by employing Levallois methods, following the criteria listed in Section B.1. If the tip of the point is not in line with the morphological axis, the points is a *déjeté* Levallois point (Figure 149). If a Levallois point has a short and non-invasive retouch (Initial et al., 1999), it is defined as a retouched Levallois point (Figure 148).

- Triangular Levallois flakes, in this study, were defined as flakes produced for the maintenance of the distal and/or lateral convexities of a Levallois core (i.e. predetermining or predetermined flakes; Boëda et al., 1990, Boëda, 1994), presenting a convergence of the two lateral edges (Figure 148).

- Retouched convergent tools, in this study, were defined as flakes created by using different débitage methods, reaching a triangular morphology

through retouch, such as Mousterian points and convergent scrapers (Figure 148).

Figure 148. Example of pointed tools (modified from Bordes, 1960, figure 3; Bonilauri, 2010, figure 5.25).

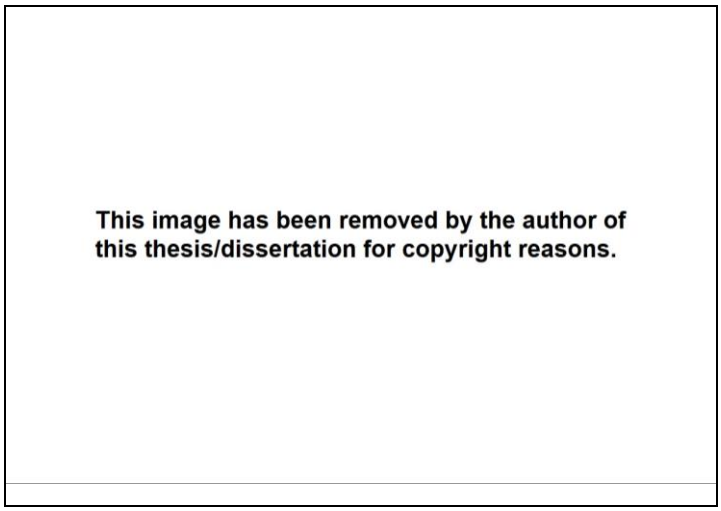


Figure 149. Example of archaeological Levallois points (modified from Bordes, 1961, figure 18). The red line with a hyphen at the bottom of each point indicated the butt position.

APPENDIX C

Experiments and experimental data

Tool ID	Exp. type	No. of shot Time	Impact location-Contact material	Location of impact	Hafted	Hafting slot type	Adhesive type	Impact velocity	Penetration (cm)	Wound dimension (cm)	De-hafting
20	Throwing	1	Entire animal	rib cage	Yes	Juxtaposed	Tar	ND	75	NA	No
21	Throwing	10	Hay Bail	hay bail	Yes	Female	Resin	ND	NA	NA	Yes
22	Thrusting	1	Entire animal	rib cage	Yes	Juxtaposed	Tar	ND	PH	NA	No
23	Throwing	2	Frame; Roe deer	frame/ground/rib cage	Yes	Flat	Tar	ND	80	NA	Yes
24	Throwing	2	Ground; Roe deer	ground/rib cage	Yes	Female	Tar	ND	95	NA	No
31	Throwing	4	Ground; Roe deer	skin/ground/rib cage	Yes	Juxtaposed	Resin	ND	85	NA	No
32	Throwing	4	Ground; Roe deer	gut/ground/spine	Yes	Flat	Resin	ND	45	NA	No
33	Thrusting	1	Entire animal	rib cage	Yes	Juxtaposed	Resin	ND	9	NA	No
34	Thrusting	1	Entire animal	rib cage	Yes	Flat	Resin	ND	10	NA	No
35	Thrusting	2	Entire animal	neck/rib cage	Yes	Female	Tar	ND	2	Na	No
36	Thrusting	1	Entire animal	spine	Yes	Female	Resin	ND	30	NA	No
39	Thrusting	1	Entire animal	rib cage	Yes	Flat	Tar	ND	30	Na	No
52	Throwing	1	Entire animal	rib cage	Yes	Female	Tar	11.17	14	4*2	No
53	Throwing	1	Entire animal	rib cage	Yes	Female	Tar	11.91	43	5*3.2	No
54	Thrusting	1	Skin	skin, rib cage	Yes	Female	Tar	4.66	0.5	0.5*0.5	No
55	Thrusting	1	Entire animal	rib cage	Yes	Female	Tar	3.01	74	6*1.5	No
56	Throwing	1	Ground	soil	Yes	Female	Tar	12.00	missed	missed	No
57	Thrusting	1	Entire animal	leg, meat only	Yes	Female	Tar	5.13	45	2*4	No

58	Throwing	1	Entire animal	spine	Yes	Female	Tar	11.30	5	4*2	No
60	Throwing	1	Entire animal	rib cage	Yes	Female	Tar	11.61	11	5*2.5	No
61	Throwing	1	Entire animal	shoulder blade	Yes	Female	Tar	11.76	45(PH)	NA	No
62	Throwing	1	Entire animal	rib cage	Yes	Female	Tar	10.06	29	4.6*2	No
63	Thrusting	1	Entire animal	rib cage	Yes	Female	Tar	4.68	2	2*0.3	No
64	Thrusting	1	Entire animal	rib cage, meat only	Yes	Female	Tar	3.38	74	6*1.5	No
65	Thrusting	1	Entire animal	skin/ground	Yes	Female	Tar	4.2	bounced off	bounced off	Yes
66	Throwing	1	Entire animal	sacrum vertebra	Yes	Female	Tar	11.71	2	3.0*3.8	No
67	Throwing	1	Entire animal	spine	Yes	Female	Tar	11.62	14	4.5*2.5	No
68	Throwing	1	Entire animal	neck (only meat)	Yes	Female	Tar	12.00	42	6*1	No
69	Thrusting	1	Entire animal	rib cage, meat only	Yes	Female	Tar	6.78	102	5*2.5	No
70	Thrusting	1	Entire animal	neck vertebra	Yes	Female	Tar	4.28	77	2.5*4.5	No
71	Throwing	1	Ground	soil	Yes	Female	Tar	11.05	missed	missed	No
72	Thrusting	1	Entire animal	neck, only meat	Yes	Female	Tar	5.85	PH	4*2	No
73	Throwing	1	Entire animal	spine	Yes	Female	Tar	11.69	5	4.5*1	No
74	Thrusting	1	Entire animal	spine	Yes	Female	Tar	3.31	4	0.5*1	No
76	Throwing	1	Entire animal	spine and bounced off to ground	Yes	Female	Tar	12.02	bounced off	bounced off	Yes
77	Throwing	1	Entire animal	spine	Yes	Female	Tar	11.70	51 (PH)	NA	No
78	Throwing	1	Entire animal	neck vertebra, bounced off	Yes	Female	Tar	12.20	hit and bounced off	4*0.2	No
79	Throwing	1	Entire animal	spine	Yes	Female	Tar	12.76	4.5	5*1.3	Yes
80	Thrusting	1	Entire animal	leg, meat only	Yes	Female	Tar	4.5	122	4*2	No

81	Throwing	1	Ground	soil	Yes	Female	Tar	12.12	missed	missed	No
82	Throwing	1	Ground	skin/ground/rib cage	Yes	Female	Tar	9.59	missed	missed	No
83	Thrusting	1	Entire animal	sacrum, vertebra broken	Yes	Female	Tar	6.92	48 cm	2.5*3	No
84	Throwing	1	Ground	soil	Yes	Female	Tar	8.78	missed	missed	No
85	Thrusting	1	Entire animal	spine	Yes	Female	Tar	5.82	5	0.4*3	No
86	Thrusting	1	Entire animal	spine	Yes	Female	Tar	4.44	4	1.5*3.3	No
87	Thrusting	1	Entire animal	rib cage	Yes	Female	Tar	4.5	85	5*3	No
88	Throwing	1	Ground	soil	Yes	Female	Tar	8.45	missed	missed	No
89	Thrusting	1	Entire animal	shoulder blade	Yes	Female	Tar	6.42	2.5	2.5*0.4	No
90	Thrusting	1	Entire animal	rib cage, 2 ribs broken	Yes	Female	Tar	5.17	119 PH	4*4.5	No
91	Throwing	1	Entire animal	rib cage	Yes	Female	Tar	13.40	3 cm	4*1	No
92	Throwing	1	Entire animal	spine	Yes	Female	Tar	11.61	2.8	6*2	No
93	Thrusting	1	Entire animal	spine	Yes	Female	Tar	5.82	6.5	4.4*0.4	No
96	Butchering knife	1.40H	Entire animal	roe deer	Yes	Female	Tar	NA	NA	NA	No
97	Butchering knife	30 m	Entire animal	roe deer	No	NA	NA	NA	NA	NA	NA
99	Butchering knife	20	Entire animal	salmon	Yes	Female	Tar	NA	NA	NA	Yes
100	Butchering knife	2.2 h	Entire animal	wild boar	No	NA	NA	NA	NA	NA	NA
101	Butchering knife	2.2 h	Entire animal	wild boar	No	NA	NA	NA	NA	NA	NA
102	Butchering knife	2.40h	Entire animal	salmon	Yes	Female	Tar	NA	NA	NA	No
75	Butchering knife	40 m	Entire animal	roe deer	Yes	Female	Tar	NA	NA	NA	Yes
59	Butchering knife	45 m	Entire animal	roe deer	No	NA	NA	NA	NA	NA	NA

APPENDIX D

Techno-morphometric data of the experimental Levallois points

Tool ID	Raw Mat.	Grain Size	Exp. type	Max Length (mm)	Max Width (mm)	Max thickness(mm)	Tip thickness	Weight	T1/T2 (mm)	TCSA (mm)	TCSP (mm)	Retouch	R. localisation	Direction negative of removal	Techno-morphological type
20	Grey Chert	medium	Throwing	74	49	14	4	43	3.5	343	147.9949	Yes	direct distal left	Three blows-point	Levallois P
21	Grey Chert	medium	Throwing	68	50	10	3.5	39	2.857	250	150.4988	No		Three blows-point	Levallois P
22	coarse	coarse	Thrusting	73	47	15	2	45	7.5	352.5	142.1893	No		Unidirectional longitudinal	Levallois P
23	Black flint	fine	Throwing	80	38	8	3.5	26	2.285	152	114.4199	No		Unidirectional longitudinal	Levallois P
24	Grey Chert	coarse	Throwing	77	37	10	8	21	1.25	185	111.6726	Yes	direct proximal right	Unidirectional longitudinal	Elongated point
31	Grey Chert	coarse	Throwing	86	62	18	7.5	41	2.4	558	187.2996	No		Three blows-point	Levallois P
32	Grey Chert	medium	Throwing	62	30	4	2	15	2	60	90.13319	Yes	direct distal/mesial right	Centripetal	Levallois lateral P
33	Grey Chert	medium	Thrusting	94	46	14	8	43	1.75	322	139.0591	Yes	direct distal right (tip)	Peripheral	Levallois P
34	Grey Chert	medium	Thrusting	65	22	8	3	17	2.66	88	66.72136	No		Unidirectional longitudinal	Elongated point
35	Grey Chert	coarse	Thrusting	65	46	16	6	30	2.66	368	139.3809	Yes	direct continuous right	Unidirectional longitudinal	Levallois P
36	Black flint	fine	Thrusting	67	36	11	3	31	3.66	198	108.8354	No		Centripetal	Levallois P
39	Black flint	fine	Thrusting	82	28	11	9	30	1.22	154	85.07013	No		Unidirectional convergent	Elongated point
52	Grey Chert	coarse	Throwing	84	53	19	5	73	3.8	503.5	160.6894	No		Three blows-point	Levallois P
53	Grey Chert	coarse	Throwing	85	50	17	11	60	1.54	425	151.4347	No		Three blow-point constructed	Levallois P
54	Grey Chert	coarse	Thrusting	65	35	8	4	22	2	140	105.4557	No		Three blows-point	Levallois P
55	Grey Chert	medium	Thrusting	98	46	12	2	60	6	276	138.7793	No		Unidirectional convergent	Levallois P
56	Grey Chert	medium	Throwing	81	39	10	8	20	1.25	195	117.6384	No		Three blow-point constructed	Levallois convergent flake
57	Grey Chert	medium	Thrusting	86	42	14	7	28	2	294	127.1587	No		Unidirectional convergent	Levallois P
58	Black flint	medium	Throwing	78	49	11	6	51	1.83	269.5	147.6154	No		Three blows-point	Levallois P

60	Grey Chert	medium	Throwing	64	56	12	4	36	3	336	168.641	No		Three blows-point	Levallois P
61	Black flint	fine	Throwing	72	38	10	2	32	5	190	114.6551	No		Three blow-point constructed	Levallois P
62	Black flint	fine	Throwing	82	34	9	2	31	4.5	153	102.593	No		Unidirectional longitudinal	Elongated point
63	Grey Chert	medium	Thrusting	79	47	18	14	35	1.28	423	142.7079	Yes	direct distal/mesial left	Three blows-point	Levallois P
64	Grey Chert	medium	Thrusting	100	43	12	4	63	3	258	129.8332	No		Three blows-point	Levallois P
65	Grey Chert	medium	Thrusting	67	34	7	7	20	1	119	102.3593	No		Three blows-point	Levallois P
66	Grey Chert	coarse	Throwing	73	57	8	5	29	1.6	228	171.2804	No		Unidirectional longitudinal	Levallois convergent flake
67	Grey Chert	medium	Throwing	78	51	13	6	56	2.166	331.5	153.8251	No		Three blows-point	Levallois P
68	Black flint	fine	Throwing	104	57	15	8	60	1.875	427.5	171.9826	No		Unidirectional longitudinal	Blade point
69	Grey Chert	medium	Thrusting	50	48	8	3	15	2.66	192	144.3328	No		Three blows-point	Levallois P
70	Grey Chert	medium	Thrusting	66	43	17	1.2	45	14.16	365.5	130.6641	No		Three blows-point	Levallois P
71	Black flint	fine	Throwing	65	44	13	9	31	1.44	286	132.955	Yes	direct distal left	Unidirectional convergent	Mousterian point
72	Grey Chert	medium	Thrusting	67	33	9	6.5	27	1.38	148.5	99.61081	No		Three blows-point	Levallois P
73	Grey Chert	coarse	Throwing	85	39	10	3.5	38	2.85	195	117.6384	No		Three blows-point	Levallois P
74	Grey Chert	medium	Thrusting	54	53	6	2	30	3	159	159.1697	No		Unidirectional convergent	Levallois convergent flake
76	Black flint	fine	Throwing	90	43	12	4	35	3	258	129.8332	Yes	direct mesial discontinuous left	Unidirectional longitudinal	Blade point
77	Grey Chert	coarse	Throwing	94	45	7	3	41	2.33	157.5	135.2718	No		Three blows-point	Levallois P
78	Black flint	fine	Throwing	68	32	6	1.5	17	4	96	96.28063	No		Unidirectional longitudinal	Levallois P
79	Black flint	fine	Throwing	60	31	8	4	18	2	124	93.514	No		Unidirectional longitudinal	Levallois convergent flake
80	Black flint	fine	Thrusting	62	44	11	3	29	3.66	242	132.6848	No		Unidirectional longitudinal	Levallois P
81	Black flint	fine	Throwing	68	38	9	5	19	1.8	171	114.531	No		Unidirectional longitudinal	Levallois P

82	Grey Chert	medium	Throwing	67	45	6	2	19	3	135	135.1998	No		Unidirectional longitudinal	Levallois convergent flake
83	Grey Chert	medium	Thrusting	70	26	4.5	0.5	12	9	58.5	78.19435	No		Unidirectional longitudinal	Levallois blade
84	Grey Chert	medium	Throwing	70	42	15	8	22	1.87	315	127.3288	No		Three blows-point	Levallois P
85	Black flint	fine	Thrusting	62	28	6	2	15	3	84	84.32051	Yes	direct distal left (only tip)	Peripheral	Levallois blade
86	Grey Chert	coarse	Thrusting	75	40	17	8	27	2.12	340	121.7863	No		Three blows-point	Levallois P
87	Grey Chert	medium	Thrusting	75	43	12	9	27	1.33	258	129.8332	Yes	direct distal/mesial left and right	Peripheral	Levallois convergent flake
88	Black flint	fine	Throwing	66	39	6	1	27	6	117	117.2304	No		Centripetal	Levallois P
89	Black flint	fine	Thrusting	69	45	5	1.5	30	3.3	112.5	135.1388	No		Unidirectional longitudinal	Levallois P
90	Black flint	medium	Thrusting	76	45	14	5.5	42	2.54	315	136.0824	No		Peripheral	Levallois P
91	Grey Chert	medium	Throwing	69	35	12	3	34	4	210	106.0211	Yes	direct left continuous	Three blows-point	Retouched Levallois P
92	Grey Chert	medium	Throwing	81	49	15	8	44	1.87	367.5	148.1413	Yes	direct distal right	Unidirectional longitudinal	Levallois P
93	Grey Chert	medium	Thrusting	75	39	10	6	38	1.66	195	117.6384	No		Peripheral	Levallois blade
96	Grey Chert	medium	Butchering knife	57	42	7	3.5	22	2	147	126.2912	No		Unidirectional convergent	Levallois P
97	Grey Chert	medium	Butchering knife	70	33	8	2.5	20	3.2	132	99.48308	No		Centripetal	Levallois P
99	Grey Chert	medium	Butchering knife	71	56	10	2.5	45	4	280	168.4455	No		Three blows-point	Levallois P
100	Grey Chert	medium	Butchering knife	84	47	12	5	63	2.4	282	141.7629	No		Centripetal	Levallois P
101	Grey Chert	medium	Butchering knife	79	41	10	5	50	2	205	123.6075	No		Three blow-point constructed	Levallois P
102	Grey Chert	medium	Butchering knife	68	35	8	5	25	1.6	140	105.4557	No		Three blows-point	Levallois P
75	Grey	mediu	Butcher	79	28	12	3	25.3	4	168	85.271	No		Unidirectional	Levallois lateral P

	Chert	m	ing knife								28			longitudinal	
59	Grey Chert	mediu m	Butcher ing knife	74	48	13	3	62.5	4.33	312	144.87 62	No		Centripetal	Levallois convergent flake

APPENDIX E

Recorded ballistic parameters

Exp. ID	Exp Type	Velocity (m/s)	*KE* (J)	*P* (kgm/s)	Max deceleration (m/s2)	Penetration depth (cm)	Spear Mass (g)	Wound (mm) Length*width
52	TH	11.17	43.170	7.730	38.61	14	692	40*20
53	TH	11.91	47.873	8.039	29.52	43	675	50*32
56	TH	12	45.432	7.572	NA	NA	631	Missed
58	TH	11.3	42.073	7.447	46.92	5	659	40*20
60	TH	11.61	43.874	7.558	35.32	11	651	50*25
61	TH	11.76	44.255	7.526	34.5	45	640	45*30
62	TH	10.06	32.435	6.448	29.8	39	641	46*20
66	TH	11.71	43.811	7.483	31.08	4	639	30*38
67	TH	11.62	44.963	7.739	66.33	14	666	45*25
68	TH	12	48.240	8.040	21.19	42	670	60*10
71	TH	11.05	39.133	7.083	NA	NA	641	Missed
73	TH	11.69	44.344	7.587	64.14	2	649	05*10
76	TH	12.02	46.233	7.693	NA	NA	640	Bounced off
77	TH	11.7	44.557	7.617	28.42	51	651	30*35
78	TH	12.2	46.512	7.625	56.48	2	625	40*02
79	TH	12.76	50.961	7.988	105.09	4.5	626	50*13

81	TH	12.12	46.124	7.611	NA	NA	628	Missed
82	TH	9.59	29.015	6.051	NA	NA	631	Missed
84	TH	8.78	24.475	5.575	NA	NA	635	Missed
88	TH	8.45	22.563	5.340	NA	NA	632	Missed
91	TH	13.4	57.818	8.630	65	4	644	04*30
92	TH	11.61	44.414	7.651	57.82	2.8	659	15*33
54	TR	4.66	14.245	6.114	10.65	2	632	05*05
55	TR	3.01	6.115	4.064	15.63	74	670	
57	TR	5.13	17.369	6.772	6.71	45	640	20*40
63	TR	4.65	14.324	6.161	11.21	2	645	20*03
64	TR	3.38	7.728	4.573	11.18	74	673	60*15
65	TR	4.26	11.886	5.581	21.51	0	630	30*38
69	TR	6.78	30.109	8.882	10.38	102	630	50*25
70	TR	4.28	12.227	5.714	19.23	77	655	40*35
72	TR	5.85	22.569	7.716	21.28	1	639	05*05
74	TR	3.31	7.231	4.369	5.8	4	640	05*10
80	TR	4.5	13.405	5.958	NA	NA	644	Missed
83	TR	6.92	31.054	8.975	22.17	48	617	30*35

85	TR	5.82	22.169	7.618	26.35	5	629	04*30
86	TR	4.44	12.981	5.847	NA	NA	637	Missed
87	TR	4.5	13.334	5.927	NA	85	637	50*30
89	TR	6.42	27.202	8.474	31.88	2.5	640	60*20
90	TR	5.17	17.801	6.886	26.49	119	652	44*04
93	TR	5.82	22.491	7.729	17.01	6.5	648	10*20

APPENDIX F

Techno-morphometric data of the convergent tools of Arma Delle Manie (Italy).

Tool Id	Raw Mat	M length	M width	M thickness	Tip thickness	TCSA (mm)	TCSP (mm)	Tip angle	Flaking angle	Techno type	Cortex %	Cortex loc.	Back presence	Talon	Negative dir.	Retouch	R. location	R. delineation	R. morphology	R. extension	Typological type
2014 VII G	dolomite	65	36	10	/	180	108.6	/	102	Levallois point	-25%	Cortical mepla t	Yes (meplat)	facetted	Unidirectional longitudinal	NO					
552 IVII	dolomite	43	25	5	2	62.5	75.2	42	92	Levallois point				En-chapeau	Unidirectional convergent	NO					
552 A VII ?	limestone	51	36	6	3.5	108	108.2	62	95	Levallois point				facetted	Unidirectional convergent	NO					
89 L51VII	limestone	43	24	6	2	72	72.3	58		point				flat	Centripetal	NO					
509 L51 VII	micro-quartzite	60	30	10	2.7	150	90.8	42	89	Levallois/blade point				flat	Unidirectional convergent	YES	direct continuous left	rectilinear	sub-parallel	long	
329 L1 VII	limestone	81	35	12	4	210	106.0	45	101	Levallois lateral point				flat	Peripheral	NO					
897 M1 VII	limestone	43	41	/	/			/	/	mesial fragm				missing	Unidirectional convergent	NO					
726 O6 VII	micro-quartzite	45	23	2.5	/	28.75	69.0	55	102	Mousterian point				dihedral	Unidirectional longitudinal	YES	direct left/right	denticulated	scaled	long	
826 F VII	micro-quartz	50	25	7	1.5	87.5	75.4	/	102	Levallois	-25%	lateral back		facetted	Unidirection	NO					

	ite									point		right (meplat)			al longitudinal					
1880 G VII	jasper	46	27	11	/	148.5	82.1	/	98	Mousterian point				facetted	Bidirectional longitudinal	YES	direct left/ right	shoulder	stepped (Quina)	invasive	
2067 G VII	limestone	44	29	10	1.5	145	87.8	48	/	Levallois point	-25%	lateral left		missing	Unidirectional longitudinal	NO					
1738 G VI	dolomite	53	33	14	/	231	100.4	/		Levallois point				facetted	Unidirectional convergent	YES	direct right distal	denticulated	scaled	long	
1721 G VI	limestone	31	22	6	/	66	66.4	/		Levallois triangular flake				facetted	Unidirectional longitudinal	YES	indirect partial right	notch	sub-parallel	short	
595 O4 V	quartzite	28	33	11	/	181.5	99.9	/		proximal fragment	-25%	cortical butt		cortical	Indet	NO					
540 N5 IV	calcarenite	52	30	7	3	105	90.4	65	97	Levallois point				facetted	Centripetal	NO					
416 O5 IV	limestone	68	27	5	/	67.5	81.2	/		Levallois point fragm			meplat	facetted	Unidirectional convergent	NO					
492 G IV	dolomite	34	40	11	/	220	120.7	/	/	mesial fragm				missing	Indet	NO					
92 P6 III	limestone	34	43	8	/	172	129.3	/		proximal fragm				facetted	Indet	NO					
175 A II	dolomite	37	31	11	/	170.5	93.9	/		Levallois point				flat	Centripetal	NO					

23-1967 AI	dolomite	61	30	5.5	4.5	82.5	90.2	53	96	Levallois point			meplat	facetted	Unidirectional longitudinal	NO				
68m1 L1 Indet	micro-quartzite	54	34	9	3.8	153	102.5	58	100	Levallois triangular flake				cortical	Unidirectional longitudinal	YES	direct right continuous/ indirect left continuous	denticulated	semi-abrupt	short
51/70 C Indet	micro-quartzite	42	27	11	2.7	148.5	82.1	37	105	Levallois point				dihedral	Unidirectional convergent	NO				
77/3 indet	micro-quartzite	59	32	11	/	176	96.9	/	86	Levallois point				flat	Unidirectional longitudinal	NO				
80 Q6I	quartzite	59	41	9	/	184.5	123.4	/	105	Levallois point				winged	Unidirectional convergent	NO				
14r L1 Indet	dolomite	44	41	9	/	184.5	123.4	/	94	proximal fragm				winged	Unidirectional longitudinal	NO				
78/358 indet	limestone	52	30	3.5	2.5	52.5	90.1	45	89	Levallois point				facetted	Centripetal	NO				
1 L51 Indet	limestone	65	28	6.6	1.7	92.4	84.3	45	100	Levallois point	-50%	lateral left		facetted	Unidirectional convergent	NO				
279 O6 Indet	limestone	52	25	8	4.5	100	75.6	49	93	Levallois				facetted	Unidirectional	NO				

										point					longitudinal					
600r indet	ophiolite	60	30	5.5	4	82.5	90.2	50	86	Mousterian point				facetted	Unidirectional convergent	YES	direct left/right continuous	cocave	semi-abrupt	long	
27 J indet	quartzite	56	32	10	4	160	96.7	56	97	Levallois lateral point				facetted	Peripheral	NO					

APPENDIX G

Techno-morphometric data of the analysed convergent tools of Abri du Maras (France).

Tool ID	M. length	M. width	M. Thickness	Tip thickness	TCSA (mm)	TCSP (mm)mm	TIP ANGLE	R angle	L. angle	Chase angle	Flaking angle	Cortex%	Cortex loc.	Backpresence	Talon	Technotype	Negative dir.	Retouch	R. location	R. delineation	R. morphology	R. extension	Typological type
3942 F6	59	37	10	1.5	185	111.6726	45s	28	16	58	94	NO			FACETTED	Levallois lateral P	Peripheral	NO					
26 R4 H6	62	35	9	3	157.5	105.5762	65	17	22		85	NO			FACETTED	Levallois triangular flake	Unidirectional convergent	NO					
281 R4 I5	46	41	5	NA	102.5	123.1523	NA	12	20	NA	93	NO			FACETTED	Levallois triangular flake	Indet	NO					
400.1 I6	95	53	9	2.5	238.5	159.3814	55	16	22	72	94	NO			ENCHAPEAU	Levallois P	Three blows	NO					
336 R4.1 I6	65	34	7	0.5	119	102.3593	68	18	14	102	94	NO			FACETTED	Levallois P	Unidirectional convergent	NO					
455 R4.1 I6	46	24	5	4	60	72.25971	60	20	17		91	NO			DIHEDRAL	Levallois triangular flake	Three blows	NO					
5 4.1 I8	52	26	7.5	1.4	97.5	78.53808	42s	50	12	63	87	NO		YES	FLAT	point	Unidirectional convergent	NO					
45	50	28	4	1.3	56	84.1	37	18	23	77	96	NO			FAC	Leval	Thre	NO					

4.1 J6						4268								ETTED	lois P	e blows						
1114.1 J7	62	31	6	3	93	93.28965	56	28	35	NA	89	NO		NO	FACETTED	Leval lois P	Unidirectional longitudinal	YES	direct distal left	RECTILINEAR	SUB-PARALLEL	SHORT	Retouched Leval lois point
1214.1 J7	44	33	13	1.3	214.5	100.2681	37	30	15	77	77	NO			FLAT	point	Unidirectional longitudinal	NO					
354.1 J7	54	36	6.5	2	117	108.2928	NA	17	13	73	92	NO			FACETTED	Leval lois triangular flake	Peripheral	NO					
354.1 J7	54	32	7	1.3																			
3514.1 K6	46	32	5	4	80	96.19502	42s	45	15	NA	92	NO		NO	FACETTED	Leval lois P	Three blows	NO					
3794.1 K6	56	42	15	1.5	315	127.3288	54	15	25	78	97	NO		NO	FACETTED	Leval lois P	Three blows	NO					
3714.1 K6	62	26	8.5	1.5	110.5	78.69013	28	29	30	difficult	75	NO			FACETTED	Leval lois P	Unidirectional convergent	NO					
3464.1 L6	32				/		32	NA	NA	NA	NA	NO		Yes (meplat)	MISSING	Leval lois P	Unidirectional longitudinal	NO					

5984.1 L6	53	24	5.5	2.5	66	72.31408	53	18	25	73	83	NO			FACETTED	Levallois lateral P	Unidirectional longitudinal	NO					
824.2 M10	75	30	15	5	225	91.84658	40s	46	21	60	98	50%	right	YES cortical	INDET	Point	Bidirectional longitudinal	NO					
1114.2 M10	41	37	2.5	5	46.25	111.0422	63	30	15	61	95	NO		NO	DIHEDRAL	Levallois triangular flake	Bidirectional longitudinal	NO					
8944.2 M6	42	33	9	NA	148.5	99.61081	NA	15	39	46	122	NO		NO	DIHEDRAL	Levallois triangular flake	Unidirectional longitudinal	YES	direct right	CONCAVE	SCALED	SHORT	
10334.3 M6	48	32	7	1.8	112	96.38167	43s	15	12	62	96	NO		NO	FACETTED	Levallois triangular flake	Peripheral	NO					
4734.1 M6	60	34	12	4	204	103.0507	57	25	40	76	86	NO		NO	FACETTED	Levallois triangular flake	Unidirectional longitudinal	YES	direct bilateral continuous	DENTICULATED	STEPPED	SHORT	Mousterian point
7944.1 M6	47	26	12	5	156	79.36666	50	42	50	66	94	NO			FLAT	Point	Peripheral	NO					
6914.1 M6	73	35	7.8	2	136.5	105.4332	51	16	22	79	62	20%	distal right	NO	ENCHAPEAU	Point	Unidirectional longitudinal	YES	indirect distal right	DENTICULATED	SCALED	SHORT	Retouched Levallois point

368 r.6 M6	64	30	10	4	150	90.8 2763	54	40	20		94	NO			FAC ETT ED	Leval lois P	Unidi rectio nal longit udina l	YES	direct left disco ntinu ous	NOT CHE D			Reto uche d Leval lois point
192 4.2 M7	59	36	7	3	126	108. 3395	63f	78	38	66	95	NO		YES mepl at	FLAT	Leval lois later al P	Unidi rectio nal longit udina l	YES (thin ning)	direct mesi al	REC TILIN EAR	SCA LED	LON G	
62 4.2 M8	34	32	0	4.5			79	20	22	NA	NA	NO		NO	MISS ING	Frag ment	Indet	YES	direct right	CON CAV E	SCA LED	LON G	
54 4.1 M8	62	33	6.5	3	107. 25	99.3 193	42	36	22	NA	93	NO			FAC ETT ED	Leval lois P	Thre e blow s	YES	direct right conti nuou s	CON CAV E	SCA LED	SHO RT	Reto uche d Leval lois point
853 4.2 N6	57	36	11	7	198	108. 8354	NA	25	20	66	95	NO			FAC ETT ED	Leval lois trian gular flake	Bidir ectio nal longit udina l	YES	direct right	CON CAV E	SCA LED	LON G	
298 4.1 N6	58	26	7	2	91	78.4 6904	22	44	27	70	96	40%	distal left	NO	DIHE DRA L	Point	Indet	NO					
186 4.1 N6	40	22	7	1	77	66.5 5334	42	25	12	89	80	NO			FAC ETT ED	Point	Unidi rectio nal longit udina l	NO					
65 R.4 N7	54	34	4.5	2	76.5	102. 1487	61	29	21		98	NO			WIN GED	Leval lois P	Thre e blow s	YES	direct left conti nuou s	DEN TICU LAT ED	SCA LED	SHO RT	Reto uche d Leval lois point