Jun 01, 2024 Version 2

Differentiation between different soft hammers stigmats, quantitative and traceological approach V.2

DOI
dx.doi.org/10.17504/protocols.io.eq2lyw3mmvx9/v2

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OPEN ACCESS

DOI: dx.doi.org/10.17504/protocols.io.eq2lyw3mmvx9/v2

Protocol Citation: Jean-Thomas Vie, Zixuan Shen 2024. Differentiation between different soft hammers stigmats, quantitative and traceological approach. **protocols.io https://dx.doi.org/10.17504/protocols.io.eq2lyw3mmvx9/v2**Version created by **Jean-Thomas Vie**

Protocol status: In development
We are still developing and optimizing this protocol

Created: April 19, 2024

Last Modified: June 01, 2024

Protocol Integer ID: 101003

Keywords: Lithic, Soft hammer, Stigmats

Abstract

Many studies in archaeology focus on the traces associated with stone knapping during prehistory, debating their correlation with the techniques used (Clément, 2021; Pelegrin, 2000). However, it is important to note that these traces are intimately linked to the physical qualities of the rock, as well as its response to the gesture, force, and experience of the knapper. These criteria can lead to a diversity of marks but can also introduce biases into the analysis, especially as the sensitivity of some rocks varies when struck. Thus, the complexity of interpreting knapping traces intensifies when adopting a qualitative approach, highlighting the multitude of factors to consider for precise analysis.

Furthermore, the historical approach to the analysis of soft percussion use has primarily focused on specific regions such as Europe (Roussel et al., 2009), North Africa (Sari, 2016), the Middle East (Pelegrin and Inizan, 2013), and the United States. These analyses have largely relied on locally available materials, such as limestone, deer antler, or boxwood. Consequently, they offer a limited perspective and may not necessarily generalize results to other geographical or ecological contexts. Additionally, while the use of different soft percussors and their identity have been established in areas where deer are found, many questions remain regarding the identity of the soft percussor in historically deer-free ecological zones. Acquiring soft percussors from animal wood is not possible, but the use of other materials such as hard vegetal wood may have played a similar role.

Through experimental flake production and the traceological study of marks on the platforms of these productions resulting from soft percussion, it would be possible to determine specific traces associated with vegetal soft percussion.

Therefore, we try to compare knapping by different percussors (three soft hammers and one hard hammer) on different raw materials, and observe their dimensional data and technical characteristics.

Attachments

INFO EXPE .pdf

417KB

Experiment record.xl...

21KB

some test results.pp...

659KB

Materials

Stone knapping :

- 4 nodules per type of rocks, ranging in size between 10 and 25cm in length, 10 and 20cm in width, and 4 and 10cm in thickness:
  - Sandstone quartzite
  - Quartzite
  - Flint
  - Quartz

In our case we will use local raw material form the Tokaj Region of Hungary :
  - Limnosilicite
  - Quartz Porphyry

- Percussors :
  - Volcanic rock percussor
  - Boxwood percussor

In our case we will use local percussor form the Tokaj Region of Hungary :
  - Deer antler percussor
  - Cornus Wood percussor
  - Limestone percussor
  - Long bone (great mammal)

Video :
  -camera
  -tripod

Storage :
  -small bags
  -paper
  -pen

Analysis :
  - Dinolite
  - RTI
  - R studio

Safety warnings

Knapping can be dangerous; we highly recommend wearing glasses, gloves, and protective clothing to prevent any injuries.

Before start

Be sure to conduct this experimentation in a controlled environment to avoid any contamination of archaeological sites.

Camera setting

1 Place the camera in front of the experimentator

2 run the carmera and the experimentator explain what do he want to produce

Selection of a specific raw material

3 Select Raw material : Sandstone quartzite, Quartzite, Flint, Quartz

4 Each experimenter would conduct experiments on the **two** raw materials using **five** hammers, aiming to obtain at least five elongated flakes as samples for each combination of raw material and hammer.
We stored each flake in separate bags with a paper explaining the position in the sequence (1, 2, 3, 4, 5), the type of hammer, and the raw material.

Selection of a specific raw material

5 Preparation of the elongated flake core：

6 Preparation of a bifacial preform while opening somes striking platforms (optional)

6.1 Choosing the suitable hammer：1 Boxwood percussor、2 Deer antler percussor、3 Soft rock percussor such as sandstone or limestone、 4 bone hammer

Knapping with different hammers in order to produce flakes

7 Use hammer from low to high hardness to produce flakes :
Soft rock percussor, volcanic rock percussor.
We plan to knap in the order of Sandstone quartzite, Quartzite, Flint, Quartz. For each raw material, we use the hammer in order to get 10 flakes (i.e., for each raw material, we will get 40 flakes totally）

8 please use only *tangential gesture*

9 first produce 10 flakes with Boxwood percussor

10 Store each flake with a paper explaining the type of hammer the raw material the gesture of production position in the dicritical schema with a number or on the excel document

11 10 flakes with bone percussor

12 Store each flake with a paper explaining the type of hammer the raw material the gesture of production position in the dicritical schema with a number or on the excel document

13 10 flakes with Deer antler percussor

14 Store each flake with a paper explaining the type of hammer the raw material the gesture of production position in the dicritical schema with a number or on the excel document

15 10 flakes with soft rock percussor

16 Store each flake with a paper explaining the type of hammer the raw material the gesture of production position in the dicritical schema with a number or on the excel document

17 you can also store the core used to produce the flakes

Data record Macroanalysis

18 Macro Mesurments
Collecting information from the artifacts. **Technical information** included the length of flakes, the technical size, the size and surface of the butt, the morphology of the butt and bulb, the existence of ripples, bulb scars, impact points, lips, the angle de chasse, and the flaking angle.

18.1 Wave small bags, pens, papRer, cell phones, vernier calipers, rulers, gloves and goggles. Gloves and goggles are used as protaective tools, and we use small bags to store flakes and use a pen and paper to record numbers and other information. The vernier caliper is used to measure the size information of cores and flakes. When taking photos, we use the ruler as a scale. Since we

don't have a protractor, we use the app on the phone to meeth a caliper in plastic if it is possible to avoid making new traces on the flakes.

18.2 Technological size（length width, thickness，size of the piece)

18.3 morphological lenght of the piece

18.4 width of the flake

18.5 thickness of the flake

18.6 width of the butt

18.7 thickness of the butt

18.8 morphology of the bulb

18.9 Existence of hackles

18.10 Existence of lips

18.11 Existence of ripples

18.12 Existence of bulb scar

18.13 Existence of point of impact

18.14 angle de
chasse (dorsal talus angle)

18.15 flaking angle (ventral talus angle)

Data record Microanaysis

19 Additionally, we collected **micro-trace information**, including the existence of residue and a photographic representation of the trace.

19.1 For recording the datas and take the pictures at a microscale, use Dynolite. Thanks to those pocket microscope you can observe the presence or absence of the followings caracteristics and take a picture of it. you can also use RTI to improve the recording of the data.

20 Using statistical software to analyze the aforementioned data, and we made comparisons between the experimental results.

21 Micro trace (micro ware on talus)

22 smached residue

23 craks

24 hertzian cone 40x 50x zoom
angle of the cone
size of the cone
smached crack

25 scar small removal retouchings

26 stration

Data analysis

27 Morphometric analysis

27.1 Use first morphological lenght of the piece and surface of butts.

27.2 Do a Shapiro wilk to verify the normality of the data

27.3 If its Normally distribued you can do an anova or Manova to see the relashionship between the surface of the talus regardig the material of the Hammer if its not normally distribued you can don a non parametric test as Kruskal-Wallis.

27.4 To visualise the data a scatter plot with regression line can be interesting.

28 For the macro analysis we chose to compare
Angle de Chasse
Flaking angle
Existence of each stigmats recorded

28.1 Angle de chasse and flaking Angle can be analysed like in the previous test

29 For the micro analysis we chos tcompare :
Existence of smached residue, striations and hertzian cone (Byous 2013)

29.1 For the qualitatives data you can use a Chi squared test to verify the existence or no of a stronger correlation between a hammer and the presence of a stigmat.

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