





Peer Community In Archaeology

Fresh insights into the Middle Paleolithic of the Côa Valley (Portugal) and the importance of quartz

Sara Daffara  based on peer reviews by **Davide Delpiano**, **Marta Arzarello**  and 1 anonymous reviewer

Patrícia O. S. Ramos, Thierry J. Aubry (2024) Latest updates on the study of the Middle Palaeolithic Lithic assemblages of Cardina- Salto do Boi site (Côa Valley, Portugal). OSF preprints, ver. 11, peer-reviewed and recommended by Peer Community in Archaeology.

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The Middle Palaeolithic period represents a crucial phase in the Prehistory of Europe, marked by the dominance of Neanderthal populations and their adaptive strategies. In Portugal, this period is characterized by a wealth of archaeological sites that provide valuable insights into the lifeways, technology, and environmental adaptations of its inhabitants (Aubry et al., 2011; J. L. Cardoso & Cascalheira, 2024; Cascalheira et al., 2022; Zilhão, 2001; Zilhão et al., 2021). One of the most significant is Gruta da Figueira Brava, located near the modern coastline: recent research has highlighted its role as a key site for understanding coastal adaptation by Neanderthals (Zilhão et al., 2020). Almonda Cave System is another pivotal area (Marks et al., 2001; Marks et al., 1994), offering a long stratigraphic sequence that includes Middle Palaeolithic layers. A prominent site is also Foz do Enxarrique (Cunha et al., 2019), rich in lithic artifacts indicating a reliance on local hunting and foraging. The lithic technology of the Middle Palaeolithic in Portugal is largely characterized by the widespread use of the Levallois method, with variations reflecting local adaptations and raw material availability. Quartz, quartzite and flint were commonly used, indicating a strategic selection of materials based on functionality and proximity.

The Côa Valley, located in northern Portugal, is renowned for its rich archaeological record spanning from the Middle Palaeolithic to the Upper Palaeolithic (Aubry et al., 2012, 2016). The region's significance lies not only in its rock art but also in its evidence of human occupation and technological development during the Pleistocene. Middle Palaeolithic sites in the Côa Valley are characterized by lithic assemblages associated with Neanderthal populations. These sites reveal a predominance of quartzite and flint tools, typical of Middle

Palaeolithic technology. Excavations at sites like Cardina-Salto do Boi have uncovered stratified deposits with stone tools and faunal remains, shedding light on subsistence strategies and mobility patterns. As shown by the work presented by Patricia Ramos & Thierry Aubry, the tools from these layers exhibit a range of core reduction techniques, including Levallois flaking. The chosen approach for studying the lithic assemblage emphasizes the significance of raw materials in defining the technological behaviours employed by Neanderthal groups. Specifically, the study highlights the intensive use of quartz as a primary resource. The classification of different types of quartz, based on defined criteria and categories, reveals variations in material selection and technological practices across the analysed layers. This detailed analysis allows for a deeper interpretation of the technological strategies adopted by Neanderthal groups at the Cardina-Salto do Boi site. The work of Patricia Ramose and Thierry Aubry demonstrates how the Middle Palaeolithic record of the Côa Valley continues to provide interesting insights into Neanderthal life in the Iberian Peninsula.

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Reviews

Evaluation round #2

DOI or URL of the preprint: <https://doi.org/10.31219/osf.io/s3jd2>

Version of the preprint: 7

Authors' reply, 21 November 2024

Good afternoon,

Thank you for your careful revision. I have tried to answer all your annotations. I have also uploaded the new version, however, when I tried to change the title and abstract of the preprint an error occurred and I couldn't fix it. I tried looking for help, but wasn't able to find information.

Thank you for the opportunity,

Patrícia

[Download tracked changes file](#)

Decision by [Sara Daffara](#) , posted 26 September 2024, validated 27 September 2024

Dear Authors,

Attached is your revised submission. I greatly appreciated the revision work, which has significantly improved the readability and clarity of the interesting work presented. However, there are still revisions necessary before I can proceed with recommending your manuscript. The sections where modifications are required are indicated by comments in the attached text.

I have noticed, although a document tracking the changes was not uploaded, that many of the suggestions made by the three reviewers have been addressed. However, some of the observations made by the reviewers were not taken into consideration. In particular, Reviewer 2 suggested enhancing the bibliography by including certain articles, which I did not see in the revised bibliography. Additionally, I am not certain if the English revision requested by two of the reviewers has been fully completed.

I suggest reviewing the text in light of my comments and, at the same time, addressing the observations made by the three reviewers point by point. If you disagree with or do not wish to accept some of the proposed suggestions, I ask that you explain your reasoning in your future authors' reply.

Finally, may I strongly suggest that you share the raw data as .csv files or other easily readable format, rather than pdf, in the OSF repository? Pdf files do not easily allow the reuse of such data.

Sincerely,
Sara Daffara [Download recommender's annotations](#)

Evaluation round #1

DOI or URL of the preprint: <https://doi.org/10.31219/osf.io/s3jd2>

Version of the preprint: 5

Authors' reply, 14 September 2024

Thank you kindly for your careful revision. We have tried to correct our draft in order to make the article better understandable and cohesive and have thus updated the manuscript for new revision.

Decision by [Sara Daffara](#) , posted 16 June 2024, validated 17 June 2024

Revisions needed

Dear Authors,

I have received the reviews for your manuscript submitted to PCI Archaeology, and the general opinion from myself and the three reviewers is that major revisions are necessary before a recommendation can be made. In agreement with the reviewers, I believe that your manuscript presents interesting data on the lithic behavior of Neanderthals in managing raw materials other than flint in a geographical area that is still not well-known regarding these specific aspects. The reviewers provide suggestions for clarifying some arguments and I urge you to address these.

In particular, I recommend reorganizing some parts of the text as suggested by the reviewers and including more quantitative data where requested.

One of the critical points that needs to be addressed, as highlighted by more than one reviewer, concerns the consistency between the title and the content of the manuscript. As suggested by the reviewers: "The title and initial portion of the text allude to a contribution towards reconstructing the site formation processes. However, this aspect seems tangential to the results and discussion. Consequently, revising the title and introduction to align more closely with the actual content or incorporating relevant data pertaining to the site's formation would enhance coherence".

I suggest enhancing the introduction of the manuscript by adding a subsection dedicated to the presentation of the site, expanding the section that addresses the issues discussed, providing more detailed arguments, and enriching the bibliography. This will make the article more accessible to readers who are not familiar with the geographical area in question or the general issue being discussed. In agreement with the reviewers, I suggest including more quantitative data and specifying the absolute numbers alongside the percentages to which they refer. In the "Materials and Methods" section, it would be appropriate to provide more details regarding the statistical analyses conducted. Finally, I agree with the reviewers' comments regarding the need to better detail the characterisation of raw materials, even if only by summarising the data in a table. Once you have addressed the suggestions of the reviewers and you have uploaded the revised manuscript I will be delighted to move forward with publication.

Finally, may I strongly suggest that you share the raw data as .csv files or other easily readable format, rather than pdf, in the OSF repository? Pdf files do not easily allow the reuse of such data.

Sara

Reviewed by [Marta Arzarello](#) , 14 May 2024

The article holds significance primarily in shedding light on the lithic behavior of Neanderthals concerning non-flint raw materials.

While the manuscript is well-crafted, certain enhancements could facilitate better comprehension, and additional details are necessary to evaluate the technological analysis effectively:

-Introduction: It would be beneficial to specify the dating method along with its associated error margin. Furthermore, incorporating data regarding paleoenvironmental reconstruction would aid in interpreting both the results and the technological analysis more cogently.

-Methodology: Although the adopted methodology is clearly delineated, a more precise description of the studied materials is warranted. A clear enumeration of the number of studied implements is essential for interpreting the percentages cited in the results section. Additionally, the rationale behind segregating cores from flakes, particularly in the context of analyzing reduction sequences, requires elucidation. The conflation of knapping methods and techniques in lines 7-13 suggests a need for a slight reorganization of the text.

- Results: Providing a percentage breakdown of the non-quartz raw materials utilized would add depth to the findings. In Figure 3's legend, substituting the code for the complete names of raw materials would enhance accessibility for readers less familiar with the site. Considering that the study hinges on various types of quartz, furnishing descriptions and evaluations of their knapping aptitude would be insightful.

Figures 4, 8, 9, 11, and 12 lack clarity and fail to convey useful data. Replacing them with a more comprehensive statistical analysis based on volumes and technological categories would be advantageous.

The significance of reduction sequences (Levallois, discoid, etc.) warrants further elaboration in terms of the number of implements, morphology of cores, and technological behaviour. Additionally, the criteria employed for identifying the bipolar technique on anvil should be explicitly articulated due to the inherent challenges associated with its recognition.

- Discussion: While the discussion raises intriguing points, its organization lacks clarity. Different facets appear somewhat amalgamated, necessitating a more structured diachronic perspective, particularly concerning methods, techniques, and raw materials.

The title and initial portion of the text allude to a contribution towards reconstructing the site formation processes. However, this aspect seems tangential to the results and discussion. Consequently, revising the title and introduction to align more closely with the actual content or incorporating relevant data pertaining to the site's formation would enhance coherence.

Reviewed by anonymous reviewer 1, 17 May 2024

Title and abstract

-Does the title clearly reflect the content of the article? Yes, No (please explain), I don't know
-Does the abstract present the main findings of the study? Yes, No (please explain), I don't know

Introduction

-Are the research questions/hypotheses/predictions clearly presented? Yes, No (please explain), I don't know.

After a general dissertation about lithic technology, the introduction focuses on the presentation of the archaeological site and sequence, as well as the chronological context. The Research questions are not clearly stated in this section. The Introduction should include them and eventually separate the archaeological site description in another subsection (i.e. 1.2. Archaeological site).

-Does the introduction build on relevant research in the field? Yes, No (please explain), I don't know.

The data obtained here is quite relevant for the understanding of a period not so well known in the Foz Côa valley, and, extensively, the inland Iberia: the final Middle Paleolithic. They provide a new approach to understanding the Middle to Upper Paleolithic transition in Foz Côa Valley from a technological point of view. However, the background of the introduction section is quite general and not clearly related to the topic of the paper.

For the background, I would also recommend some references (and references therein) regarding postdepositional processes on quartz lithic assemblages:

*Driscoll, K., Alcaina, J., Égüez, N., Mangado, X., Fullola, J.-M., & Tejero, J.-M. (2016). Trampled under foot: A quartz and chert human trampling experiment at the Cova del Parco rock shelter, Spain. *Quaternary International*, 424,*

130-142. <http://dx.doi.org/10.1016/j.quaint.2015.04.054>

Venditti, F., Tirillò, J., & Garcea, E. A. A. (2016). Identification and evaluation of post-depositional mechanical traces on quartz assemblages: An experimental investigation. *Quaternary International*, 424, 143-153. <http://dx.doi.org/10.1016/j.quaint.2015.07.046>

Materials and methods

- Are the methods and analyses sufficiently detailed to allow replication by other researchers? [X] Yes, [] No (please explain), [] I don't know

-Are the methods and statistical analyses appropriate and well described? [X] Yes, [] No (please explain), [] I don't know

Results

- In the case of negative results, is there a statistical power analysis (or an adequate Bayesian analysis or equivalence testing)? [X] Yes, [] No (please explain), [] I don't know.

- Are the results described and interpreted correctly? [] Yes, [] No (please explain), [X] I don't know.

The description of the result is correct but incomplete. I would suggest: a) enumerate and include clear references to the different groups described in the text (ie. Group I; Group-II...). That is, in each paragraph clearly specify which groups (I-V) are described; b) Remark / label those groups in the black boxes created in Figure 3; c) include some quantitative data in order to strengthen the qualitative assertions made in the text. I would suggest adding a table with the number and percentage of the diagnostic cores and/or flaking products related to each knapping method cited (Levallois, discoidal, bipolar on anvil...) and clustered following the groups identified and described in the text.

The available figures and graphics are correct and sufficient, but the legends and labels must be made in a larger font in order to increase their readability. For instance, in Figure 1 the absolute values of the dates are not visible (increase contrast with background); The position of Cardina I and II is not shown in the figure; the North arrow is missing...

In Figure 2, the table should be edited.

In Figure 3, the labels are too small. The black boxes should be labeled with the corresponding group (Group I...), and the legend with the raw material types could add an identification for the most relevant raw materials cited in the text (ie. J18, heated quartz; K2, quartzite; J13, rock crystal...), or at least, to those varieties not related to quartz.

Figure call must specify to what item they refer to. For instance, on page 7, line 17 (Fig.6). Do refer to Figure 6.3?

Discussion

-Have the authors appropriately emphasized the strengths and limitations of their study/theory/methods/argument? [] Yes, [] No (please explain), [X] I don't know.

The paper is quite descriptive and refers strictly to the lithic assemblages studied here. The strengths and limitations of their study are well acknowledged, but I miss some contextualization. Only in the final paragraph, a short mention of other archaeological sites is made (Gruta do Caldeirão). The authors should delve into the contextualization of the diachronic trends identified among the Middle and Early Upper Paleolithic sequence of Cardina-Vale do Boi. Archaeological sites from neighbor or Paleozoic analogous areas (Foz do Medal, Cova Eirós, L'Arbreda, sites from Quercy) show similar trends in the management of the different raw materials types during the Middle and Upper Paleolithic, which could reinforce the assessments of the paper. I should recommend the following references:

*Chalard, P., Faivre, J.-P., Jarry, M., Jaubert, J., Mourre, V., & Turq, A. (2007). Espaces du Paléolithique moyen. Témoins d'utilisation de silex allochtones en Quercy (France). *Bulletin de la Société Préhistorique Française*, 3, 217-235.*

*de Lombera-Hermida, A., Rodríguez-Álvarez, X. P., Iglesias, A. A., Díaz Rodríguez, M., Valverde Tejedor, I., Pérez-Alberti, A., Cunha, P. P., Ba García, H., Aldea Moreira, X., Lorenzo Salgueiro, C., Mosquera Castro, T., & Fábregas Valcarce, R. (2021). Between two worlds: Cova Eirós and the Middle-Upper Palaeolithic transition in NW Iberia. *Comptes Rendus Palevol*, 20(42), Article 42. <https://doi.org/10.5852/cr-palevol2021v20a42>*

*Duran, J.-P., & Soler, N. (2006). Variabilité des modalités de débitage et des productions lithiques dans les industries moustériennes de la grotte de l'Arbreda, secteur alpha (Sernyà, Espagne). *Bulletin de la Société Préhistorique Française*, 103(2), 241-262.*

*Jaubert, J. (1997). L'Utilisation du Quartz au Paléolithique Inférieur et Moyen. En J.-P. Bracco (Ed.), *Préhistoire**

Anthropologie Méditerranéennes. L'Exploitation du Quartz au Paléolithique. Premier table ronde. Aix-en-Provence 18-19 Avril 1996 (Vol. 6, pp. 239-259). CNRS.

Vaissié, E., Delvigne, V., Faivre, J.-P., Fernandes, P., Turq, A., & Raynal, J.-P. (2017). *Techno-économie et signification culturelle de l'occupation moustérienne supérieure de Baume-Vallée (Haute-Loire)*. *Comptes Rendus Palevol*, 16(7), 804-819. <http://dx.doi.org/10.1016/j.crpv.2017.06.005>

- Are the conclusions adequately supported by the results (without overstating the implications of the findings)? [X] Yes, [] No (please explain), [] I don't know.

The conclusions are supported by the results, by the authors should reinforce their assessments by providing more quantitative data (especially those aspects regarding the technological features of the assemblages) and contextualization.

A conclusion section, summarizing the results obtained in this study and their significance, must be included.

Finally, some minor corrections and questions,

- *optically stimulated luminescence should be in capitals*

- *On page 2, lines 14-17, the authors refer to three main tendencies in the distribution of the raw material, but later they are clustered into five groups. It is confusing.*

- *The increasing values of heated quartz J18 show a normal distribution at the area H'1'-17/19. Given that the excavation was made using artificial units, could they correspond to a single occupational event? Is there evidence of hearths or charcoal nearby in these layers? In that case, the presence of heated quartz in these layers could respond to functional factors rather than technological trends.*

- *The English version of the manuscript should be revised.*

Reviewed by Davide Delpiano, 31 May 2024

The study presents a brief characterization of the lithic assemblage of the site Cardina-Salto do Boi, in particular of three different areas excavated, with reference to the raw material and technology used during Middle Palaeolithic occupations. From the title of the paper, a reader should expect a more in-depth integration of the data within the site formation processes, which is not the case. The main scope of the work is to find a direct correlation between the sequences of three different test areas based on raw material, technological and metrical features of the lithic assemblages, without questioning what are these differences due (different deposition rates, different location in the depositional environment, post-depositional movements).

One flaw of the work is represented by the lack of an objective and reproducible approach regarding the main methodological point, that is the identification of raw materials. Figure 2 should present these methods, however, only the raw material categories are presented, without knowing the parameters used for raw material characterization, which are not clear. I would expect data on colour, texture, minerals, microfossils, formation environment, and other petroarchaeological information. For this reason, some categories are not totally comprehensible, such as the "heated quartz" category. It's not clear why the authors considered heated quartz as a specific raw material instead of considering it a taphonomic process. If these methods are deeply addressed in other papers (e.g., Aubry et al., 2022), please report a sketch table with main informations.

Then, I think that the text would need a thorough revision of the English, possibly by a native speaker, since in some parts I found some difficulties to follow the reasoning.

Other minor suggestions:

- Page 2: In the introduction, there are some sentences apparently unrelated and not enough developed. In lines 2-3 "Lithic technology is one of the main tools available to evaluate human components and reconstruct formation processes": please deepen this concept. How lithic technology can integrate studies on site formation processes? E.g., Through refittings, patination, edge and surface preservation, spatial analysis, orientation and inclination of artefacts?

- Just after that, from line 4, the shift to another topic is abrupt and, apparently, it doesn't follow a coherent logical line. Please smooth this passage.
- From line 17: I would personally start a "Context" chapter here. Therefore, I would end the introduction chapter with a reference to the application of the chaine opératoire/economic approach to the Cardina-Salto do Boi site for several reasons.
 - Figure 1: Please, indicate where the site is located within the picture of the valley
 - Page 3, lines 12-13: "A stratigraphical disconformity, interpreted as a deposition hiatus, has been identified between the Middle and Upper Palaeolithic occupations". To which unit does this disconformity corresponds to? I think a sketch stratigraphical sequence with the indication of cultural remains (Middle Palaeolithic, Upper Palaeolithic) would be very useful in this case.
 - Page 3, line 17: "...identification of three main tendencies in the distribution", which are?
 - Page 4, line 15: change UA with AU.
 - Page 4, line 23: instead "for archaeology", I would say "for lithic production processes".
 - Page 5, line 1: with dimensions, do you mean dimensions of the flake or dimensions of the platform?
 - In the Results, I would suggest a table schematizing the lithic production methods attested, and how they change according to units, areas and raw materials. Also, a table with dimensional values (such as averages, maximum, minimum) or a boxplot for each group would be more readable in respect to the charts presented.
 - Page 7, line 3: What do you mean with prismatic reduction sequences? Are these single-platform cores with unidirectional detachments?
 - Page 12: please change the second "figure 10" to "figure 11".

In conclusion, I consider this a good work which deserves to be published but after some necessary revisions. I therefore recommend to:

- integrate the methods section with more information regarding the petroarchaeological characterization.
- Do a thorough revision of the English by a native speaker.
- Add/replace some tables reassuming more clearly the main data.
- Consistently work on the "introduction" and "discussion" sections. In the first one, I would show how lithic studies would conceptually help to understand human and natural formation processes within sites; in the discussion, please integrate your results with other pedo-stratigraphical or cultural features in order to assess more in-depth information on the site formation processes, maybe also by referring to other similar studies carried on other Middle-Upper Palaeolithic sites.