

Round #1

by Ruth Blasco, 04 Jan 2022 12:49

Manuscript: <https://osf.io/x8m4j>

PCI Archaeology #229: revision

We have received comments from four reviewers on your manuscript. You will see that, while they find your work of interest, they have raised some points that need to be addressed by a revision.

Please pay special attention to the clarifications that the reviewers make on the definitions, as well as some relevant points to include in the Introduction (e.g., irreversible damage during the recovery-conservation period and the differences in woodworking according to the different types of societies). Please also consider doing a more extensive bibliographic review of the studies of wooden artifacts, in addition to those carried out at European sites.

My congrats because all reviewers agree the manuscript will be a useful tool for all specialists working on wood technology and could become a basic starting point for a unified terminology.

>>Many thanks to our recommender, Ruth Blasco, as well as our five reviewers for their fantastic and useful comments, additional terms and references, requests for clarifications, and reorganisation. In addition to the four PCI reviews, we had invited Michael Bamforth to also comment, and his review and our responses are at the end, as we made changes accordingly. We have worked to address the concerns and undertaken the following:

1.) Added many new references, for specific non-European sites (16+), as well as more archaeological sites within Europe, wood science publications, etc. The coverage is therefore now more global, and more comprehensive. At the same time, we did not necessarily add all suggested references, either because we were unclear what these references are (when the full references were not provided), or because this is intended as a referenced glossary, not a review paper.
2.) Added several new terms: Xylophagus Insects; Faecal pellets, insects; Working Across the Grain; Bevel Cut (Bevel); Perimeter Cut; Delaminated; Impact-induced peeling; Impact crack
3.) Adapted or changed other terms and definitions (see e.g. comments to individual reviewers). We await future clarifications on certain queries, and these can be adapted for later versions as needed.
4.) Expanded the introduction to include discussion about preservational environments, variability amongst stone-tool using hominins and societies, and the effects on assessing the archaeological assemblage according to both preservation and social factors, further explanation of the plan for future versions, and more about the chaîne opératoire framework (including a new image).
5.) Begun, as per one reviewer's request, to add explanatory images in an appendix of figures, with a total thus far of 18 photographs and diagrams.
6.) Separated the Phases into distinct tables, and organised terms alphabetically within these.

Reviewed by Paloma Vidal-Matutano, 27 Dec 2021 12:55

This manuscript is a necessary work for the analysis of wooden artefacts. One interesting and attractive point is that it presents the glossary in table format, classifying it into logical categories (from raw-material to post-excavation). The authors have done an excellent and comprehensive work, very necessary for a technological approach to wooden artefacts from archaeological contexts, as there is still a general gap in established nomenclature. I highly recommend the publication of this manuscript, which will be a very useful tool for all specialists working on this issue. My congratulations to the authors for doing such a thorough job of reviewing nomenclature and thinking through terms.

Some minor changes:

Page 9, "puncture": Do you mean drilling? Maybe it's a term that should depend on the size of the hole?

>>Thank you for pointing out the issue here. We have clarified the definition that puncture is a morphological description, and made more detail, and added that drilling is one anthropogenic gesture through which a puncture or indeed a perforation could occur.

Puncture: Damage of variable size, form and depth in the form of a hole in the wood surface that does not fully perforate* through the entire object. Can be natural (e.g. root damage*) or anthropogenic (e.g. drilling).

Perforation: Damage of variable size, form and depth in the form of a hole that passes completely through the object, i.e. with an entry and exit. Can be natural (e.g. root damage*) or anthropogenic (e.g. drilling).

Note: Not to be confused with 'perforation plates' in plant vessels

Page 11, "Fungal infestation": The degree of fungal decay is also classifiable. See works from Blanchette (natural contexts) and from Moskal del Hoyo, Henry et al. and Vidal Matutano et al. (archaeological contexts).

>>Thank you, we really appreciate this input. We have adapted the definition and added citations:

Infestation of wood by fungi. There are two groups: wood-destroying fungi (rot*) and wood discolouring fungi (moulds, blue stain). The degree of decay is classifiable (e.g. see Blanchette 2000). [Clausen, 2010; Richter 2015, p. 31; Blanchette 2000; Dillehay 1997, p. 140; Vidal-Matutano et al. 2021; Moskal-del Hoyo et al. 2010]

Page 11: Maybe "xylophagous insect" should be described, as they can also be observed. "Faecal pellets" too, as they are useful to identify the insects.

>>We have added these terms, definitions and citations, as per our further communication.

Page 21, “stop mark”: Maybe the Hayden’s Ho Ho classification (1979) (step, hinge, faether) should be here included?

>>We have added this, and the reference.

Reviewed by Oriol López-Bultó, 30 Dec 2021 17:53

General comments:

Wooden elements have always been part of the archaeological record, especially in certain areas as the British Isles, the alpine regions, or Scandinavia. But it has been in recent years when tools are thoroughly been studied following techniques and principles developed to study other materials as the logical-analytical System, Use-wear and tool-marks analysis or the idea of *chaîne opératoire*. This paper summarizes the observations and descriptions of the most relevant publications about this topic of the last 20-30 years, paying special attention to the new research developed from the last 6 years till nowadays.

Given the relevance of the topic approached and the increasing literature related to it, this paper looks very promising and could become a basic starting point (meaning citations) for many and relevant future publications in international journals. Therefore, it is worthy to consider its publication.

Despite that, in my opinion, the manuscript would benefit from some general and specific observations to increase its potential.

- The paper summarizes more than 100 definitions and observations, which is an admirable effort and a huge amount of work. But the amount of information displayed or the way it is organised could compromise de efficiency or the clarity during the reading.

>>We have now separated the groups of terms into distinct tables, and have alphabetised the terms within each table. The *chaîne opératoire* structure, along with the headings and the searchability in digital format, and the use of the * symbol to cross-reference other defined terms should make terms relatively straightforward to find.

- In the title and the first sentence of the abstract the authors specifically put the focus on the technological aspects, which seems like an adequate point of view. But later on, the scope of the manuscript widens to taphonomy, use, raw materials concepts, and so on, making the manuscript very large and, maybe, difficult to work with. The authors should consider omitting the concepts that go far from the technological scope or, at least, reduce it to the more basic and essential to understand the manufacturing concepts. Otherwise, they should modify the title, abstract and introduction.

>>We agree that the use of the term 'technological' in some instances was inappropriate, and we have removed it in several places. However, there is a difference between 'Wood Technology' (like 'Lithic Technology' and 'Bone Technology') and 'technological analysis'. Wood technology, within a *chaîne opératoire* framework, encompasses multiple phases, including raw material acquisition, manufacture, use and discard, and necessarily must also take taphonomy into consideration (see, e.g. Soressi & Geneste 2011 and other papers now cited in the glossary). Therefore, we have not removed the term technology from the title, for this is not the same as 'technological analysis'. Within such a framework, those focusing

on a particular aspect (e.g. a technological or a functional analysis) should easily be able to locate the terms without needing to work with those in other sections unless desired.

- Some of the concepts seem a little bit out of place, and I would suggest the creation of subfolders, maybe inside the “GENERAL TERMS” phase for, at least, anatomical/dendrological concepts. Or even consider the creation of a new PHASE.

>>The general terms are those that could potentially fit into a number of phases, and/or are very basic terms. Many anatomical terms, for example, fit into raw material phase (Phase 0), as it is in a description of the raw material selected and its features that these terms should be useful. We feel the organisation of phases makes sense, and fits with the established *chaîne opératoire* approach as outlined above, but nevertheless even for those who choose to not work within such a framework, the terms should be easily located.

- Inside some of the folders, some concepts are parts or subdivisions of more general concepts already explained. I would suggest creating some sort of hierarchy inside every “PHASE”, so it is visibly clear how some concepts are part or belong to a more general concept: e.g., Bark – inner bark, outer bark, cambium; Wood – sapwood, heartwood, earlywood, latewood, pith, ...

At the same time, if this hierarchy is applied, the codes should be modified to state this hierarchy.

>>We have decided to go with the reviewer’s suggestion to alphabetise the terms, rather than creating a grouped hierarchy within each phase. In particular, since there is often no logical order regarding technological traces, e.g. chopping marks, scraping marks, cut marks and so on, an alphabetic order seems better suited to accommodate the terminology. While we played around with the idea of creating subdivisions, it was quickly evident that doing so would create complications. Just as one example, the term ‘splinter’ within the general terms could be an intentional blank shaped for tool manufacture, or it could be a feature from a natural or use break.

- Some of the definitions or the concepts themselves could be confusing, the reader could benefit from some pictures or drawings.

>>We agree, and have sought to include both photographs and drawings where we have had the capacity to do so. Future versions can be improved with additional images.

- The concepts in between every Phase follow no order whatsoever. If the intention is to consult this paper as a reference “dictionary” they should follow some order, at least alphabetical.

>>We have added a new section about future versions.

Future Versions

It is our intention that the glossary remains for the time being as a preprint. In this way the glossary can develop over the coming years as researchers continue to make suggestions to improve the definitions and citations. The preprint server facilitates edits to the work as a new versions while preserving older versions. We welcome

collaborative and constructive comments from our peers, whether they be those who are analysing wood, or those whose work with other technologies can help expand this research agenda. Researchers who wish to make a substantial new contribution such as a new translation, or the provision of images, are welcome to join the current co-authors in a new preprint version.

Specific observations:

“GENERAL TERMS”

- This phase is the more extended and, at the same time, the less specific. In “GENERAL TERMS” are described morphological, anatomical or dendrological terms, as well as general aspects. The reading would benefit from their aggrupation. I suggest creating “subfolders” inside the “GENERAL TERMS” phase at least for anatomical/dendrological terms (cross-section, tangential section, radial section...), and a subfolder for morphological terms should be considered.

>>Although there are pros and cons of either reorganising by groups, we have alphabetised rather than sub-grouped for all ‘folders’.

- “Drying crack” should be moved to the “TAPHONOMY” folder.

>>We feel drying crack is probably better in the general terms, since although this can certainly be taphonomic, it can also occur during the use period, or also during Phase 4, after conservation.

“PHASE 1 MANUFACTURE”

- Even though the introduction and title of the paper clearly state that it focuses on stone-tools societies, the concept “Sawing mark” can be confusing. Even more when the concept of the saw itself is defined by the presence of sharp teeth or a dentated edge. It is true that, as the author correctly refers, Vidal-Matutano et al use this concept refers to a repetitive motion with a stone blade, but it still sounds confusing. Maybe the authors should consider modifying the concept as “sawing with a smooth blade” and provably adding the concept “sawing with a dentated blade” given that the resulting tool-mark could be definitively different.

>>We don’t disagree, and think you are likely correct. However, at present we lack the ability to create definitions about the different ways that sawing with an unretouched blade or a dentated/denticulated blade might make, because we lack any good quality experimental references comparing these. We have adapted the definition to include the possibility of sawing with either smooth or denticulated edges, with a note that there are currently clarifications needed with comparative samples and images. This should therefore be something to work on for a future version.

A tool mark resulting from repeatedly moving the long, sharp edge of a tool back and forth over the same location The tool’s active edge is usually sharp ($\leq 75^\circ$) with a straight or convex delineation. The blade edge may be smooth or denticulated. The

tool edge is in continuous contact at or close to a 90° angle to the material. The gesture results in linear striations that vary in length and have either V-shaped or irregular profiles.

Note: further work is required to better understand the tool mark traces and profiles that may be left by smooth vs. denticulated tool edges.

- Some concepts as “wood chip”, “wood shaving”, “point”, “round wood”, ... are not technological concepts. Unquestionably they are the result of a manufacturing process, but not part of this process. At least, they should be moved to the “RAW MATERIAL” folder or even better to a new “Morphology” folder.

>>The production of wood chips and wood shavings within a *chaîne opératoire* framework could occur during raw material acquisition (e.g. chopping off a branch or down a tree trunk), but also do occur during the manufacture phase, even if they are byproducts. All these are important categories in reconstructing the technology and working process. Within *chaîne opératoire* it does indeed matter whether a tree trunk, branch, roundwood, or split wood are being used, as each has different properties providing advantages and disadvantages to the tool-maker. Equally, wood shavings might indicate fine working by planing/carving, whereas wood chips would rather result from coarser approaches, i.e. carving/chopping. Therefore they are pivotal in the context of the *chaîne opératoire* concept. See also: “Like any technical action in stone-working, debitage is incorporated into a *chaîne opératoire*, for which an operative knapping scheme subtended by a project can always be recognized ; this holds true whatever the period and the methods involved. “ (Inizan, M.-L., & Féblot-Augustins, J. (Eds.). (1999). *Technology and terminology of knapped stone: Followed by a multilingual vocabulary - Arabic, English, French, German, Greek, Italian, Portuguese, Spanish*. CREP.).

“PHASE 2 USE, MAINTENANCE, DISCARD”

- the terms referring to maintenance, conceptually, should be moved to “PHASE 1 MANUFACTURE” instead.

>>Within a *chaîne opératoire* framework, maintenance is generally conceptualised within the use phase. See, e.g. this diagram from Sørensen 2006. Therefore, we will leave the maintenance terms within the use phase. This will also provide better means to differentiate between original tool design and the reworked/final appearance of tools, (as found during excavation), which is crucial in reconstructing the tool biography.

Step 0	Procurement Locate raw materials, selection, testing, transport
Step 1	Production Decortication of nodules Initial shaping of core Preparation of platform
Step 2	Production of blades
Step 3	Production of tools Hafting
Step 4	Utilization use of retouched or unretouched tools Resharpener reworking of tools
Step 5	Discard Breakage Terminal edge-wear/damage

“RAW MATERIAL”

- Some of the concepts are extremely basic, even for a non-specialist reader. The reading would be easier and smoother if some of them were omitted: e.g., wood, bark, ...

>>We hope to provide some very basic terms and suitable references for beginner learners as well, so this can be used as a learning resource alongside one for specialists, particularly given language challenges.

- Some of the concepts should be moved to a new suggested subfolder for anatomical/dendrological terms (maybe inside “GENERAL TERMS”): e.g., earlywood, latewood, callus tissue, compression wood, tension wood, ...

>>As above, we have opted for alphabetisation within each folder. In combination with the use of the * symbol we hope this will help those using the resource find things readily.

Reviewed by Eva Francesca Martellotta, 09 Dec 2021 07:12

The article by Milks et al. consists of a glossary for the traceological analysis of wooden tools in archaeological contexts. In general, this article aims to contribute significantly to the study of ancient wooden artefacts - a topic not yet systematically investigated, neither from an archaeological nor experimental perspective.

The authors clearly stated the objects of the work. The cited literature is relevant and up to date. I appreciated the idea of a modifiable glossary to leave room for future improvements on the terminology and how the authors considered the overlapping of terms, fundamental to start the path towards a unified terminology.

I am not able to give any feedback on the German glossary.

Please consider the following suggestions.

- p. 8: does the 'warped (Wa)' term also include alterations due to modifying wooden tools' shape using fire? If that is the case, it might be helpful to include it in the definition by specifying that such attributes could be ascribed to both anthropic (e.g., manufacturing processes) and natural modification (e.g., natural bushfires).

>>We agree with this, and have modified the definition as follows:

Wood that is bent or twisted out of shape as a result of the effects of temperature or moisture changes. Warping can be intentional (anthropogenic), natural (e.g. heat from bushfires or variation in moisture), or can occur during or after conservation.

- p. 8: in the attributes of 'Striation (Str)', I would suggest enriching the definition of 'density' by adding an 'overlapping' or 'superposed' category. In the case of anthropogenic agents, a greater density of the marks might give information regarding the intensity of use of the tool.

>>We agree with this and have modified the definition as follows:

Linear marks - grooves and/or ridges. These can be natural or anthropogenic, and can be produced by tool edges, abrading with a tool, additives, use, or taphonomic factors. They can be described by delineation (e.g. straight or sinuous), cross-sectional profile (V-shaped, U-shaped, irregular or indeterminate), depth, length (short, medium or long), orientation (parallel, transversal, oblique or multidirectional with respect to the major axis) and density (isolated, grouped, superimposed, etc.).

- p. 9: in 'Puncture (Pu)', it might be appropriate to explain the definition of 'hole' better. Is it considered a complete perforation - that is, from side to side of the tool - or does it also include incipient perforations? It could be useful to discern anthropogenic and animal agents.

>>Thank you, we agree. We have followed the bone damage literature, and created a new term for perforation, with clearer definitions of both, adapting them after definitions. We have seen both punctures and perforations in the wet wood at Schöningen, which are probably taphonomic (e.g. animals and insects), but both could also be anthropogenic (e.g. drilling could cause a puncture/perforation, depending on how far it goes in), so we have

added this to these general terms. Punctures also are different from pitting, as the surface consists of a hole, not crushed or indented material. Thus someone could say that there is a puncture, and then further describe its characteristics in order to assess the agent. We would welcome further suggestions for this, and/or citations.

Puncture: Damage of variable size, form and depth in the form of a depression or hole in the wood surface that does not fully perforate* through the entire object. Can be natural (e.g. root damage) or anthropogenic (e.g. drilling).

Perforation: Damage of variable size, form and depth in the form of a hole that passes completely through the object, i.e. with an entry and exit. Can be natural (e.g. root damage) or anthropogenic (e.g. drilling). Note: Not to be confused with 'perforation plates' in plant vessels

- p. 9: the term 'Notch (No)' is also used to describe surface damages owing to the use of wooden tools as retouchers (Martellotta et al., 2021). It might be helpful to add a synonym in this glossary to avoid confusion.

>>Thank you for this observation. The difficulty is the use of the term 'notch' has been used in all the other publications cited as an intentionally shaped incision, so we cannot really suggest a synonym to replace what is a rather commonplace use of the term. What we have done is to modify the definition notch, which already had included 'use' as a possible factor, and cited the reviewer's publication as well.

Definition

Notch: A V-shaped or U-shaped indentation or incision, usually intentionally shaped during manufacture, but can also occur during use (e.g. from percussion) or taphonomic phases.

Source

Manufacture: Aranguren et al. 2018; Bailey et al. 2020, p. 58; Bamforth 2017; López-Bultó et al. 2012, p. 61; Vidal-Matutano et al. 2021; Dillehay 1997, p. 146; Nadel et al. 2006; Piqué et al. 2015; Alix et al. 2011

Use: Martellotta et al. 2021

- p. 11: the authors define 'beaver traces (BT)' as gnawing marks, but they also cite the use of beaver teeth as tools by humans. I imagine that these two marks appear different, so I suggest adding a new term to identify the marks caused by the use of beaver teeth as tools or specify in the current definition of BT that this term does not describe marks produced by an anthropogenic agent.

>>This is a good point – we have created a new term under manufacturing called 'Beaver Tool Marks' and taken the anthropogenic reference out from the natural traces category.

- p. 12: 'root (Roo)' is defined as primarily underground parts of the tree, but this is not true for some species (for instance, mangroves and other tropical trees).

>>Also a good point! We have modified the definition as follows:

Part of the tree that connects the vegetation organs with water and nutrients in the soil, and anchors the tree.

- p. 22: is 'signature (Sig)' intended to be similar to the 'micro-striations' observed in cutmarks on bones (Fernandez-Alvo and Andrews, 2016)? If that is the case, it might be helpful to use the same term or add 'micro-striations' as a comparative synonym with osseous traceology (like it was done with SiF).

>>Thank you. We were unsure what the above citation is, but we have made the suggested change, and cited some other work instead (Bello et al. 2009; Bello & Galway-Witham 2016) for micro-striations and signature features.

- I would suggest adding the term 'peeling' as a surface modification: it is relatively common on wooden items, often associated with fractures, and could have natural or anthropogenic origins.

>>Thank you for this suggestion. After further discussion with the reviewer we have included the term.

Impact Induced Peeling: Small detachments of a thin layer of wooden surface as a result of flexion or impact, e.g. during use as a retoucher. This type of use wear from use as a retoucher occurs when the trajectory of the impact is parallel to the lithic edge.

- I think it would be helpful to specify if all the cited surface damage is caused by natural or anthropic agents or both - unless this information is not available.

>>Thank you for pointing this out. We have gone through all the general terms and added natural/anthropogenic to all where that was appropriate. In the other categories it ought to be clear whether such marks are natural/anthropogenic, due to their classification within a particular phase.

- Overall, I think this work would benefit if more information regarding the observation method for each surface damage were provided, e.g., low-power or high-power approach and if the observed sample is archaeological or experimental. I imagine most surface damages are easily distinguishable from one another; however, it would be helpful to know which degree of observation is required to appreciate the detailed descriptions in this glossary. Although I acknowledge that this could be the focus for a future version of the glossary, I think this information could already be available within the rich literature the authors cited.

>>We agree that this would be useful, but probably would be best explored and defined within a methods paper in which there would be significantly more room and scope to

elaborate upon these different methods, and provide examples and images (macro and micro). This would be a very useful addition to the literature, in our view.

I remain available for any further discussion.

Reviewed by Laura Caruso Fermé, 14 Dec 2021 22:19

Dear Editor,

The work done is interesting and necessary for the development of specific studies on the study of wooden artifacts and the production sequences related to woody raw materials. Given my experience and trajectory in the study of wooden artifacts belonging to different types of societies (hunter-gatherers; Neolithic), recovered in different types of contexts (completely dry and submerged or underwater) and geographical areas (Europe and South America), I think that it would be important to consider some aspects in this initial phase of the construction of the glossary.

In the first place, I consider that it would be necessary to explain the different conservation contexts of wooden artifacts. This point is extremely relevant since the conservation conditions are those that will determine and condition the type of study carried out on the different artifacts. In general, the recovery of wooden artifacts occurs in water logged contexts and in archeological deposits with highly humid sediments. In these cases, as the wood is submerged in water during long periods of time, it loses part of its components (cellulose and hemicellulose) due to hydrolysis, acquiring a soft consistence without mechanic resistance. The recovery of artifacts in this kind of contexts needs certain conservation techniques. During the recovery-conservation period, these artifacts may undergo tensions and contractions of the woody fibers causing not only small deformations but also irreversible damages. On the contrary, the recovery of wooden artifacts in completely dry contexts, without significant fluctuations in temperature and humidity is not frequent. I think that it is important to explaining these questions in the introduction , because the type of conservation context of the artifacts will condition and determine the type of traces that are preserved on their surface. The studies carried out with this kind of artifacts allowed to observe different kinds of traces that prove, for example the polishing and shining of the wood surface (e.g., Caruso Fermé, 2012, 2015, 2021; Caruso Fermé et al., 2014; Caruso Fermé et al., 2015; Caruso Fermé et al., 2020).

>>We agree and have added the following to the Introduction, encompassing what the reviewer suggests and adding frozen contexts:

Archaeological sites that are submerged or are in frozen or subaquatic contexts, and which maintain a high level of humidity are most likely to lead to the preservation of wood (e.g. Alix et al. 2012; Aranguren et al. 2018; Bosch et al. 2006; Caruso Fermé et al. 2021b; Clark 2001; Facorellis et al. 2014; Fagan et al. 1966; Nadel et al. 2006; Panagopoulou et al. 2018; Thieme 1997). However, these conditions can also result in greater possibility for taphonomic and post-excavation alterations to the overall morphology and surface traces which in many cases can be permanent (see e.g. Allington-Jones 2015; Rios-Garaizar et al. 2018). In contrast, wood from dry archaeological contexts without significant changes to temperature and humidity can result in better surface preservation, particularly in absence of restoration (e.g. Caruso Fermé & Civalero 2014; Caruso Fermé et al. 2020; Caruso Fermé et al., 2021a; Gilbert et al. 2008; Latorre et al. 2013; Vidal-Matutano et al. 2021).

In the second place, I think it is also important to highlight the differences in woodworking according to the different types of societies. Among hunter-gatherer groups, characterized by a great variability in the frequency and type of movements, the wastes or discards linked to wood work will be scarce and will respond to the needs inherent to societies with high residential mobility (Caruso Fermé, 2012, 2015; Caruso Fermé et al., 2011; Caruso Fermé et al. 2014; Caruso Fermé et al., 2015; Caruso Fermé and Aschero, 2020). On the other hand, in contexts corresponding to agropastoral societies the wood work can leave a great amount of discards linked to the construction of habitat structures and manufacturing of tools (López Bulto et al., 2020; Caruso Fermé et al., 2021). I think that this point will be important for the study of the production sequences and use of woody raw material and the study of the wooden artifacts.

>>We agree and have added some sentences to the introduction section about the variation to be expected during nearly 2 million years of likely woodworking, amongst different social structures and species of Homo.

It is important to note that societies utilising stone tools encompass significant variability as a result of sites and artefacts being the result of activities by different species of *Homo* with variable subsistence strategies, social structures, mobility patterns, and environments. Thus, although the use of stone tools may be broadly unifying - particularly in terms of a technological analysis - there will inevitably be significant variability in terms of types of stone tools utilised in wood availability and selection, products (e.g. small tools vs. large dwelling structures), woodworking byproducts, maintenance and discard of wooden artefacts, and their depositional environments.

Finally, I suggest doing a more extensive bibliographic review of the studies of wooden artifacts, in addition to those carried out on European sites. This information will give the glossary a higher quality and would show that it was organized based on the reading of various investigations.

>>We agree wholeheartedly with this comment. In addition to the non-European sites that were already cited in the references (d'Errico et al. 2012; Caruso Fermé et al. 2014; Caruso Fermé et al. 2021a; Nadel et al. 2006; Dillehay 1997; Martellotta et al. 2021), we have now added the following citations that relate to non-Western European sites:

- Abdel-Azeem et al. 2019 (Egypt)
- Clark 2001 (Zambia)
- Luebbers 1978 (Australia)
- Belitzky et al. 1991 (Israel)
- Jolie et al. (Peru)
- Latorre et al. 2013 (Chile)
- Gilbert et al. 2008 (USA)
- Alix et al. 2012 (Yukon, Canada)
- Friedman 1975 (USA)
- Caruso Fermé et al. 2020 (Argentina)
- Caruso Fermé & Civalero 2014 (Argentina)

- Caruso Fermé et al. 2015 (Argentina)
- Fagan et al. 1966 (Zambia)
- Fagan & van Noten 1971 (Zambia)
- Terberger et al. 2021 (Russia)
- Roberts et al. 2022 (Australia)

Many additional citations have also been added to the introduction and/or terms to round out the scope, for example:

- Bigga et al. 2015
- Panagopoulou et al. 2018
- Piqué et al. 2015
- Caruso Fermé et al. 2021b
- Thieme 1997
- Thieme 2000
- Bosch et al. 2006
- Facorellis et al. 2014
- López-Bultó & Piqué Huerta 2018
- Fluck 2015
- Milks et al. 2019
- Revedin et al. 2018
- Solé et al. 2013
- Vidal-Matutano et al. 2022
- Hayden 1979a
- Hayden 1979b
- Warren 1911

Further citations from bone technology literature, experiments, chaîne opératoire, wood science, wood anatomy and taphonomy have also been added throughout.

We are avoiding citing non-English and non-German citations relating to specific terms, because we have organised the sources to correspond with the precise use of that term, or in some instances we have noted alternative uses of a term in English. Throughout the process the objective is to come to an agreement about the most frequently utilised term for a particular phenomenon, and to reference those papers wherein we find that specific term used. It would not be appropriate to add citations for publications in other languages, for which we are not sure of the precise translations and connotations. However, should researchers like to provide a translation of the glossary in another language, and join the co-authors in a subsequent version of the glossary, we would welcome this contribution, and any appropriate associated citations.

THE GLOSSARY

-Phase 0 (raw material)

I do not understand the classifications made in Phase 0 (raw material) very well. I think it would be important to differentiate the natural traces from the anthropic ones.

>>Phase 0 is a common concept in *chaîne opératoire* frameworks, and thus an important section to have in the Glossary. We are a bit confused regarding the comment about separating natural from anthropic traces in relation to Phase 0 since there are no terms within this Phase in which we reference anthropogenic traces or causes. Please also see comment below on why in General Terms we sometimes say that outside the phases in a *chaîne opératoire* framework the definitions say 'natural or anthropogenic'. The phases have been further explained in the introduction, with the addition of an image.

-Phase 1 (manufacture)

I suggest incorporating as categories:

-wood debarking

>>This term is already in the glossary, with citations (See 'Debarked surface'). The idea is that we don't have to adhere specifically to a term when writing. For example, we could say we see a debarked surface, or that people undertook to debark the wood, etc. It is flexible. We have clarified this in the introduction:

We do not intend that these terms be used rigidly, and especially not so in a grammatical sense, but rather the terms provide a referenced framework.

-wood roughing

>>We do not understand what this means and have asked for further clarification. We would be pleased to add this term once reviewer can provide a further explanation of this process. We found the following citations for the term, but no definition and as we do not understand the term we cannot at present include it: López-Bultó & Piqué Huerta 2018; Caruso Fermé & Aschero 2020; Caruso Fermé et al. 2021.

-wood polishing

Papers are recommended in the pdf. In these papers these types of traces are explained with microscope images (in archaeological wood and current wood)

>>Yes, we recognise that there was a decision to be made about inconsistencies for two different terms falling under manufacture – Abrasion and Polish, as researchers use both to mean the same/similar processes. After consideration we had opted for the term 'Abraded surface', i.e. a surface that has been deliberately abraded and/or polished, following Vidal-Matutano et al.'s 2021 definition. We had 'polish' in brackets under this term; to make it consistent, we have changed this to 'polished'. Researchers use both terms somewhat interchangeably, thus we have grouped them together. We further differentiated between 'use polish' and 'rounded', the latter being more general in case the causation of this trace is not clear.

- Phase 2 (use)

I suggest incorporating as categories:

-bright polish

>>We would be happy to add this term, and have asked the reviewer for a clear definition but not had a response. In the meantime we have adapted the definition of Use Polish:

Polish that develops during use, particularly when isolated on a specific part of a wood artefact. Polish can further characterised by type (e.g. bright polish) and direction, e.g. 'longitudinal polish' and 'horizontal polish'.

-polish in longitudinal direction or horizontal direction

>>We have adapted the Use Polish definition to clarify that this can be multidirectional. See above.

Papers are also recommended in the pdf.

Finally, I consider that the revised paper has an interesting objective and shows bibliographic research work. However, I suggest incorporating more readings on works dedicated to the study of wood as raw material among societies of the past. I consider that a more exhaustive review would strengthen and reinforce the glossary presented. On the one hand, it would show a broader knowledge about the study of woody raw materials. On the other hand, it would add the knowledge of all researchers who have a trajectory in the study of these topics, regardless of the geographical context, in addition to recent publications.

>>Many thanks for this comment and observation. Please see our reply above in regards to expanding the bibliography, including with a wider geographic coverage.

The revised pdf provides authors with a list of publications.

Comments from pdf:

There has been much work on the use of wood as raw material since the Lower Paleolithic

Some references:

- Aranguren et al., 2018
- D'Errico et al., 2012
- Schoch et al., 2015
- Thieme 1997,1985
- Mania 1998
- Clark 1969,1995
- Nadel et al., 2006
- Wagner 1995
- Oakley, 1949
- Oakley et al., 1977
- Bamford and Henderson, 2003
- etc, etc...

>>Many of those listed (Aranguren et al., 2018; D'Errico et al., 2012; Schoch et al., 2015; Thieme 1997,1985; Nadel et al., 2006; Oakley et al., 1977; Bamford and Henderson, 2003)

are already cited in the glossary in relation to specific uses of terms. The reference in that particular sentence refers to the earliest existing indication of woodworking, not the sole example from the Lower Palaeolithic:

“...residues on stone tools suggest that hominins may have worked wood using stone tools from as early as 1.7 million years ago (Dominguez-Rodrigo et al. 2001).”

Two sentences later, we had cited many of those above references and have added a few more. We would like to point out that the purpose of the current work is providing a concise technical glossary on wood technology, and is not a complete review of Palaeolithic wooden artefacts and technology. Accordingly, the cited literature in the introduction is selective.

I think it is important to say that in general, the recovery of wood artifacts occurs in submerged or subaquatic contexts and archeological deposits with a high level of humidity in sediments.

Some references:

- Fugazzola and Mineo, 1995
- Knapp 2010
- López Bultó, et al. 2020
- Sampson et al. 2012
- Piqué i Huerta et al., 2014
- Facorellis et al., 2014
- Guilaine y Briois 2005
- Caruso Fermé et al., 2021
- Bosch et al., 2000
- etc, etc...

On the contrary, the recovery of wooden artifacts in completely dry contexts, without significant fluctuations in temperature and humidity is not very frequent. However, the artifacts recovered in completely dry contexts and without any restoration process, maintain the shape changes on the wood surface (Caruso Fermé, 2012, Caruso Fermé et al.2020; Caruso Fermé et al., 2021)

>>We agree and have added a paragraph to the introduction that discusses wood preservation in relation to wet, dry frozen contexts, with several of the suggested references alongside others (we were in fact not certain what all of the above references were, but as we have added several others as examples we think this should suffice). We have further added that frozen contexts provide preservational conditions.

I think it would be important and convenient to refer to the previous works where these same concepts and analysis techniques are used, in addition to these recent publications.

>>We are not sure exactly what this refers to, but although this is a glossary and not a review paper, we have endeavored to add many additional publications.

‘naturally or anthropogenically’. I think this classification should be separated.

>>We separate natural and anthropogenic throughout the glossary by Phase wherever those terms only relate to one or the other. However, the category of 'general terms' is needed for when there is a lack of clarity, and/or in cases of equifinality where different causal agents can create traces that may overlap and are therefore not necessarily diagnostic. This is a recognised issue in other technologies (e.g. Lithic technology, bone technology, butchery, projectiles), and it is unlikely that there not also be similar issues in the case for wood. Therefore, we use the terms 'naturally or anthropogenically' for those cases when researchers want a more generalised term that cannot be with certainty applied to a manufacturing vs. use vs. taphonomic case.

In wood research it is the case, as with bone and lithic technologies, that we need more experimental reference samples and protocols such as blind tests to further establish the differentiation between many marks, and this may be on a case by case, or indeed on a site by site basis. Further controlled experimental research is needed (and underway) to begin to address some issues about equifinality. Please see, for example also the reviewer's comment (Martellotta) in terms of warping being possible from natural and anthropogenic causes. For the moment, many may prefer to be cautious, and to utilise general terms.

It is possible to identify the natural wood modifications of those anthropic traces. I consider that this is the first form of discrimination needed to carry out technomorphometric analysis.

>>Please see the above comment.

I suggest reading:

Wood Technology: Production Sequences and Use of Woody Raw Materials among Hunter-Gatherer Patagonian Groups Argentina (Caruso Fermé et al. 2021)

>>Thank you, we have read and cited the reviewer's publication.

Tool Mark, Dessication, Taphonomic Fracture: All researchers studying the production sequences and use of woody raw material use this category. I believe that all references should be incorporated...

>>We provide references as a guide, rather than an exhaustive list. We use the search function in publications and also within our pdf database (Zotero) for specific terms. Using this method of search terms we do not find that all researchers utilise each of these terms (tool mark, dessication, taphonomic fracture) in every publication. For example, many researchers do discuss tool marks, but they do not necessarily utilise the term 'tool mark', and thus we do not provide that as a specific reference for that term, even if they do in fact discuss more particular tool marks. We have added new references to terms insofar as we encountered them in our further reading for the review. For taphonomic fracture, we do find the use of the term 'fracture' in one of the reviewer's papers (Caruso Fermé et al. 2015), but it is not evident whether that fracture was from use or was taphonomic or post-excavation, so we have not cited additional papers for that.

Chopping Mark:

I recommend reviewing these works:

- (Caruso Fermé et al., 2021) "wood technology: production sequences and use of woody raw material among ...
- (Caruso Fermé et al., 2015) "A use-wear analysis of wood technology....
- (Caruso Fermé and Aschero, 2020) "Manufacturing and use of the wooden artifacts. A use-wear analysis of wood technology
- (Caruso Fermé, 2012) doctoral thesis

In these works different type cuts: bevel cut, perimeter cut, etc. are registered

>>Bevel cut and Perimeter cut have been added to the terms, and as far as we can determine from the reviewer's papers and images, these fit well with intentional morphological shapes of tools (e.g. Point), rather than with a single tool mark such as a chopping mark/cut mark that will have a particular gesture and/or profile (e.g. see Lopez-Bulto et al. 2020 for analysis of tool mark profiles). We have added the reviewer's papers when appropriate.

Split Wood:

I suggest incorporating as categories:

- wood debarking
>>Please see above.
- wood roughing
>>Please see above.
- wood polishing
>>Please see above.

I recommend reviewing these works. In these papers these types of traces are explained with microscope images (in archaeological wood and current wood)

- (Caruso Fermé et al., 2011) "Análisis arqueobotánico de piezas de madera....
- (Caruso Fermé, 2012) doctoral thesis
- (Caruso Fermé et al., 2015) "A use-wear analysis of wood technology....
- (Caruso Fermé and Aschero, 2020) "Manufacturing and use of the wooden artifacts. A use-wear analysis of wood technology
- (Caruso Fermé et al., 2021) "wood technology: production sequences and use of woody raw material among ...

>>We have read and cited Caruso Fermé et al. 2015, Caruso Fermé & Aschero 202 and Caruso Fermé et al. 2021. If a Spanish translation is created, which we would of course welcome, then it would be also appropriate to add citations in relation to terminology to that translation.

Wear abrasion:

I suggest incorporating as categories:

-bright polish

>>See above.

-polish in longitudinal direction or horizontal direction

>>See above.

Reviewer #5 Michael Bamforth

This is a great piece of work which will be of real benefit to the wonderful world of wet wood. I'll certainly be using and referencing this document. Big thanks to you all for putting this together and ensuring it is widely distributed and freely available!

I've not provided references for my comments but, for the most part, these can be provided if required. The comments in square brackets [are notes to myself about where to look for these references].

As an aside, Bamforth 2017 is an 'MA by Research' thesis, not a PhD - I'm not a Dr.

>>This has been corrected in the References

Comments

Breakout – I think this is what I'd refer to as a tear or torn surface [Star Carr / Flag Fen?].

>>Yes, we agree. We didn't want to use the word tear-out in English, as this is different in woodworking terms. Thanks for pointing out that you have an established term. We have changed this to 'Torn Surface', modified the definition, and added citations.

Transverse Surface – When the end of a piece of wood has a transverse cut across the end, be it from edged tools or saws, it is often referred to as cross cut in British archaeological woodworking literature [cf. Goodburn / Milne].

>>We think this is covered in the term Cross-section (Transverse Plane) but have added cross cut in brackets to that term instead. A transverse surface could potentially be from a break, and we wanted a term that could reflect a transverse surface that was not anthropogenically cut (if that makes sense).

Cross-Section – Might also be referred to as end grain. Personally, I'd say that rays are radial and not horizontal (as they can appear vertically as well as horizontally).

>>We have changed horizontal to radial in the definition.

Debarked Surface – I'd reserve this term for a surface which had anthropogenically had the bark removed. The sapwood / bark transition, if exposed but showing no traces of working, we generally refer to as the bark edge [Dendro books?].

>>Thank you for that comment. We have left the term as it is and where it is for the following reasons: wood can also be debarked by animals (e.g. deer, squirrel). Our wood scientist co-author (TK) also uses the term 'debarking' for other means in which bark is removed, e.g. through water activity and weathering. We could not find the term 'bark edge' for natural traces, but this can be added to future versions.

Sawing mark – I'd avoid this term as it would be easy to confuse it with a mark made by a saw

>>We understand your reasoning, but we are leaving the term as it is used by those we cite. The reasoning is also that the gesture is what is being defined, rather than the material of the tool used. Undoubtedly, there is sawing as a gesture prior to the creation of metal saws.

Splitting mark – I think this is what I'd refer to as a split surface

>>Thank you, we have used this term from Lopez-Bultó (spitting tool mark). We have added 'split surface' in brackets, and cited your thesis here.

Roundwood – in the UK this is used to refer to smaller material (less than c.150 mm in diameter). Roundwood can appear whole / in the round or split. This sits opposite timber, which is material with a diameter greater than c.150 mm. Timber can also appear in the round / whole or split. In Britain roundwood (or sometimes just wood) and timber are terms related to historic carpentry practices.

>>Thank you, we have modified the definition:

Blanks used for wooden tools that consist of wood <150 mm in diameter (unprocessed or processed). Larger blanks are sometimes referred to as 'timber'.

We will consider for future versions how and whether to include additional terms regarding blanks (e.g. Timber, etc). We would welcome further discussion on this issue.

Rolled – For me, this is water worn. Rolled could occur as a process without water present.

>>We have changed this term to 'Taphonomically Smoothed' following Dillehay 1997, and to a certain extent Clark. We have not seen the term 'water worn' anywhere in relation to this, including your thesis or the Star Carr volume, but can add it in brackets if we have such a citation in future.

Compression – This could be expanded to detail compression affecting horizontal wood (leading to a distorted transverse cross section, and which can be defined as a 'compression ratio' of vertical Vs horizontal diameter) and compression affecting vertical wood – where you get the weird concertina / 'z' shaped effects. [Star Carr for horizontal, where for vertical?].

>>Yes, good point. We have both kinds of compression at Schöningen. We have amended the definition as follows:

Post-depositional compaction that occurs when the wood has become soft from degradation. The compression can affect the entire wood or occur locally. Compression can affect wood in multiple directions leading to distorted transversal cross-section, and/or distortion of the original longitudinal shape.

Other terms I use it might be worth including:

Preservation horizon – the height above which waterlogged wood does not survive, often described by the degraded tops of uprights.

>>We have opted to not add this term as this would then necessitate many additional general archaeological terms.

Delaminated – I often use this term, e.g.: radial delamination, to describe an item that is falling apart either along the rays or the growth rings, often associated with desiccation.

>>Thank you, we have added this term, and a citation (Fletcher et al. 2018) where we found this term used. Please feel free to suggest further publications where it is used. We noted as well that the term ‘exfoliation’ is often used in bone literature.

Radial Shrinkage – when an item has severely cracked open radially and shrunk significantly, e.g.: a piece of roundwood that was once an entire circle but has desiccated and dried to the extent that it is now appears as a radial conversion, due to extreme shrinkage [there is a figure of this in Flag Fen 2001]

>>We have added to the overall term ‘shrinking’:

Dimensional change in the wood due to the release of water from the cell walls and cell lumina through the drying process. Shrinkage can occur in different directions (e.g. radial shrinkage).

Proximal – End closest to the ground / trunk when growing.

Distal – end furthest from the ground / trunk when growing.

>>We have not added this, as this could be confused with distal/proximal designations for tools (also used in lithics). We can simply say base of the tree, top of the tree when referring to direction of growth.

Split fading out – when the split surface(s) converge with one another or the bark edge to form a point [Star Carr?].

>>We have not created a new term, but rather added to the definition of Splitting Mark and cited the reviewer’s thesis:

Converging splitting marks that feather out can be referred to as ‘Split fading out’.