Ephemeral Materiality: Biographical Approach to Medieval Wooden Crafts from Hoyo de los Herreros Cave (Cantabria, Spain)

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Ephemeral materiality arising from the darkness: Medieval wooden crafts from Hoyo de los Herreros cave (Cantabria, Spain)

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ABSTRACT

The wooden assemblage recovered from Hoyo de los Herreros cave (Reocín, Cantabria, Spain) in northern Iberia has provided an exceptional opportunity to enlarge our knowledge about perishable material culture from a unique medieval context. This case study enhances the information related to ephemeral material culture associated with the occupation of caves during the Middle Ages in northern Iberia, and the role played by wooden crafts in relation to activities performed within these dark and subterrain areas. All the wooden objects have been systematically studied and dated, combining wood analysis and morpho-technological study with the examination of entomological remains recovered from one of the objects which was in an advanced state of decay. The three bowls and a pointed twig recovered inside the cave were probably related to two different episodes of use, the first dated between 9th to 11th centuries CE, and the second between 11th and 12th centuries CE. It was possible to identify different stages of their *chaîne-opératoires* and the analysis of different aspects of their lifecycle, in tandem with the study of medieval wood crafting, specifically lathe-turning.

1. Introduction

As in most other societies, wood as raw material was crucial for medieval communities (Le Goff, 1988): ubiquitous, widely available, and multi-purpose, wood has been crafted for shaping individual possessions and utilitarian utensils, as well for building. Woodland trees and undergrowth provided wood for crafting during the Middle Ages (Carlé, 1976, Birrell, 1969). The relevance of wooden crafts preserved in archaeological contexts of northern Iberia have been stressed by recent finds in wet conditions (Gutiérrez-Cuenca et al., 2017) or by charring within caves (Teira et al., 2012), by waterlogging in waterfront sites (Martín-Seijo et al., 2021, Peña-Chocarro et al., 2014), within wells (Mato and César, 2017, Del Río et al., 2016), cisterns (Vigil-Escalera, 2018, Fernández-Ochoa et al., 2015), damp pits (Martín-Seijo, 2010) and ditches (Porto et al., 2016). Throughout Europe there is an increasing body of research focused on the study of wooden objects and wood crafting from archaeological contexts dated to the Middle Ages (e.g. Cywa and Wacnik, 2020, Cywa, 2017, Mooney, 2016, Reilly et al., 2016, Solovyova, 2012, Murygin, 2011, Biggam, 2011, Comey, 2010, Keys, 2010, Brisbane and Hather, 2007, Morris, 2000, O'Sullivan, 1998, Mille, 1996, Dietrich, 1994, Earwood, 1993, Mille, 1993). Most of these studies have focused on crafts and technology, as well as on the practical functions of buildings and objects, but there is a gap of research on the study of material culture made of wood and timber as Bintley and Shapland (2013: 3) have highlighted.

Studies on plant-based material culture dated to the Middle Ages are still not common in the Iberian Peninsula (e.g. Martín-Seijo et al., 2021, Teira et al., 2012, Cubero and Ollich, 2007, Navarro and Robles, 1996). Beyond short descriptions and brief references to the presence of these type of objects in medieval contexts (e.g. Carmona, 2012, Hierro-Gárate, 2002), research focused on the study of medieval plant-based crafts has yet to be addressed. There are various reasons for this shortfall: (1) wet or waterlogging preservation in Iberia is not as common as in many other European areas, (2) the fragile nature of plant-based materials has conditioned that most of them were lost after being removed from their archaeological contexts when adequate conservation was not implemented, (3) plant-based crafts have not been one of the main objectives of archaeological research in contexts dated to the Middle Ages, and (4) wooden objects have not been directly dated and ascribed to the medieval period.

In this framework, medieval wooden items recovered from caves become extremely relevant. Specific environmental conditions existing

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within caverns in northern Iberia -permanent darkness, high degree of humidity, and low and stable temperatures- have favoured the preservation of wood and other plant materials although their study is still rare. Wood and other plant remains -such as barks or fibres- are relatively abundant within caves, but the repeated use of these subterranean areas makes it difficult to assign them to the medieval period if they are not directly radiocarbon dated. Caves frequently contain rich medieval assemblages, involving a wide range of religious and secular activities (Bergsvik and Dowd, 2018). They comprised both Christian and non-Christian rituals, as well as secular practical functions such as domestic occupation, shelter, storage, workshops, or hideouts amongst others (Bergsvik and Dowd, 2018). In northern Iberia there are examples of caves occupied in relation to non-normative burial rite such as Riocueva (Entrambasaguas, Cantabria, Spain) or the Lower Gallery of La Garma (Ribamontán al Monte, Cantabria, Spain), both dated to the Early Middle Ages (Arias et al., 2018, Gutiérrez-Cuenca et al., 2017). Whilst other caves were also used for shelter and/or storage functions such as Cova Eirós (Becerreá, Lugo, Spain) dated to 10th–11th centuries CE (Teira et al., 2012). In all these cases plant-based crafts preserved by charring or water saturation have been found, and there are references to the presence of wood remains in other caves (Muñoz and Ruiz, 2015, Hierro-Gárate, 2002). As caves are places which remain in a permanent or semi-permanent state of darkness, the use of torches for lighting has favoured the survival of partially charred wood or charcoal (e.g. Arias et al., 2018) or of firewood burnt within the caves (e.g. Gutiérrez-Cuenca et al., 2017).

Despite this, caves were never fully illuminated, in this context of vision deprivation other sensory experiences such as touch, smell, and taste, were probably amplified (Dowd, 2020). Within this kind of darkscapes (*sensu* Dowd, 2020), studies on material culture and materiality of plant-based crafts acquire a broad scope. This research proposes an integrated study of the objects, including the properties of the materials they are made of (cf. Ingold, 2000), by addressing the research from an engagement of material culture and materiality point of view. This is a crucial approach to those objects made of wood because this is a living material. Different factors are behind the material qualities of wood which is affected by its physical forms and properties depending on the species that produced it -anatomical structure of the wood or bark, growth patterns (age, size, shape), branching habits or the presence of chemicals such as resins, gums, or tannins- (Hurcombe, 2007, 2014). As living material, wood is affected by decay in a process which includes changes in physical properties and appearance -colour, odour, hardness, and brittleness, and even the sound, of the material- (Unger et al., 2001).

This paper addresses the study of a small collection of medieval wooden objects in all its complexity. During the medieval period complex lifecycles of objects have been attested in other rural communities of Iberia (e.g. Vigil-Escalera, 2020). In this case study, the place where wooden objects have been found is extremely relevant, because all these wooden craft items ended their lifecycle within a cave which was also used as a burial place. This paper summarises a multidisciplinary study of this set of plant-based crafts involving, archaeobotanical and morpho-technological analysis of each object, besides the analysis of the archaeoentomological remains recovered from one of the wooden bowls. This research aims to: (1) obtain information about wood crafting in the medieval period from wood procurement to technological aspects, (2) shed light to the ephemeral material culture recovered from cave contexts and the role played by wooden objects in the different activities developed in these subterrain areas, and finally, (3) increase our knowledge on the medieval material culture made of plant materials by addressing the research gap identified in the study of medieval wooden crafts in the Iberian Peninsula.

2. Material and methods

2.1. Case study

The site of Hoyo de los Herreros (Barcenaciones, Reocín) is a limestone cave located in the central part of Cantabria Province (Spain) (Figs. 1 and 2). It is part of a complex karstic system, lies at 130 m a.s.l. and measures at least 1,350 m in length. An archaeological survey was carried out in 1980 by archaeologists from C.A.E.A.P. (*Colectivo para la Ampliación de Estudios en Arqueología Prehistórica*) (Muñoz and Ruiz, 2015: 296-298, Gómez-Arozamena, 2003: 223). It consisted in the exploration of the cave in its length and in the recovery of samples of archaeological remains that were on the soil surface. The cave consists of two galleries, one to its right side and one to the left side with a wide chamber next to it, and a further narrow passage in its interior. In the right-hand gallery a deposit of pottery sherds was recovered which was dated to the medieval period. A flat-grinding slab was recovered in the left-hand gallery, while the wide chamber next to it, which was full of stone blocks, remains of several individuals -several femora, jaws, ribs, etc.- were found together with pottery, a bronze belt buckle and wooden bowls (4047-001 and 4047-002) (Muñoz and Ruiz, 2015: 296-297, Gómez-Arozamena, 2003: 223, Fernández-Acebo, 2003). The fragments of bowl 4047-001 were found under a big stone block beside the wall on the right side of the chamber and nearby human remains (Muñoz and Ruiz, 2015: 297). In the inner part of the cave, in the entrance to a very narrow and low passage and near to three pits dug in the floor, there were found fragments of another wooden bowl (4047-003) and a number of sticks, partially burnt, only one of them -which showed a pointed edge- was gathered (4049) (Muñoz and Ruiz, 2015: 297, Fernández-Acebo, 2003, Gómez-Arozamena, 2003: 223). The micro-spatial distribution of the archaeological materials is not available, despite their spatial distribution within the cave being exhaustively described (Muñoz and Ruiz, 2015: 296-297). These wooden items were initially ascribed to the Iron Age (De Luís, 2014, Smith and Muñoz, 2010, Morlote et al., 1996: 223-224). The archaeological remains provide evidence for the use of the cave perhaps during different periods. In addition, there were many charcoal marks on the cave walls, probably associated with the use of torches (Gómez-Arozamena, 2003: 223).

2.2. Wood analysis

All the samples deposited at the MUPAC (*Museo de Prehistoria y Arqueología de Cantabria*) collection were studied: (4047-001, 4047-002,

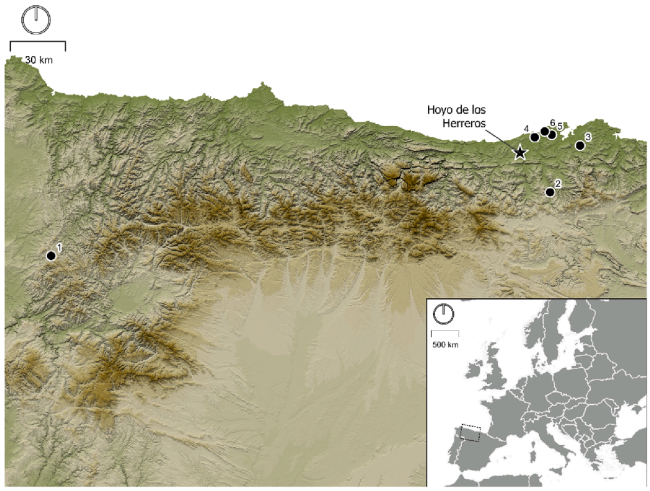

Fig. 1. Location of Hoyo de los Herreros, and other sites mentioned in the text: 1) Cova Eirós, 2) La Garma, 3) Riocueva, 4) Cudón, 5) El Juyo and 6) Las Penas (map elaborated by Emilio Abad Vidal).

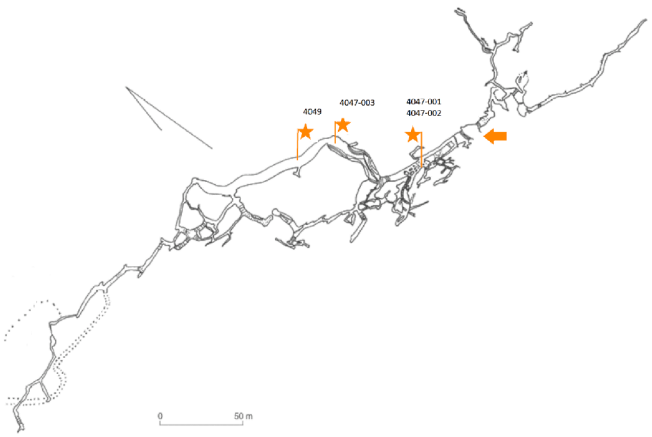

Fig. 2. Map of Hoyo de los Herreros Cave (modified from Gómez-Arozamena, 2003). The arrow is pointing to the entrance of the cave, and the stars the areas where the wooden objects were found.

4047-003, 4049). The taxonomic identification involved the observation of macro- and micro-anatomical features of wood in the three anatomical sections: cross, tangential, and radial (Domínguez-Delmás, 2020, Cartwright, 2015). These features were compared with wood anatomy atlases and their identification keys (Gale and Cutler, 2000, Hather, 2000, Schweingruber, 1990). Each wooden piece was observed under a stereoscopic microscope (Leica M80) at MUPAC and wood samples were also observed under a reflected-light microscope (Olympus CX40) at the Archaeobotany Lab of the USC (*Universidade de Santiago de Compostela*). Photographs were obtained using a Scanning Electron Microscope (ZEISS EVO LS 15, RIAIDT-USC). Beyond taxonomic identification other dendrological (Marguerie and Hunot, 2007, Schweingruber, 2007) and taphonomic attributes (Théry-Parisot et al., 2010, Thery-Parisot, 2001) were also recorded. The part of the plant crafted (i.e. trunk, twig, root, etc.) was noted, and besides, the distinction between heartwood and sapwood was made by the presence or absence of inclusions such as tyloses or gum deposits (Schweingruber et al., 2008). The qualitative evaluation of tree-ring curvature following the categories (i.e. weak, moderate, strong, and indeterminate) described by Marguerie and Hunot (2007) also helped to estimate the calibre of wood used for crafting. The presence of biodeterioration of wood (e.g. hyphae and mycelia, xylophagous galleries) was recorded to provide information about the state of wood (Martín-Seijo, 2020, Moskal-del Hoyo et al., 2010, Carrión and Badal, 2004, Hickin, 1963).

2.3. Morpho-technological study

All the objects have been classified attending to their possible function, and in the case of containers we have followed categories of classification described by Sands (2012). For morpho-technological study of the lathe-turned vessels we have followed the criteria established by Keys (2010: 198). The following dimensions of the bowls were measured: rim diameter, base diameter, and maximum surviving height (Keys, 2010: 198 and Fig. 159). The description of the appearance and techniques used to make lathe-turned vessels their profiles, rim forms and base outlines have been described following the descriptions of Morris (2000: 2165–2166).

2.4. Archaeoentomological analysis

One bowl, 4047-003 shows evidence of borings by xylophagous insects. Within one of these emergence holes, pupal galleries, insect frass and larval insect remains were recovered. These remains were observed under a Scanning Electron Microscope (ZEISS EVO LS 15) and further analysed with the use of relevant entomological literature.

2.5. Chronology and radiocarbon dating

The wooden remains were initially ascribed to the Iron Age (De Luís, 2014, Morlote et al., 1996: 223-224). Four samples for AMS dating were obtained, one from each of the wooden objects preserved at the MUPAC collection. To obtain these without damaging the morphology and original surfaces of the objects, samples were taken from fractures or cracks prioritising the areas situated in the outermost parts of trunks and twig with the aim of avoiding ageing the radiocarbon date by sampling inner and oldest rings. This radiocarbon dating program ensures the chronological framework for wooden objects not found in stratigraphic contexts as proposed by (Earwood, 1989–1990). In the case of cave contexts directly dating plant-based crafts is crucial to assign an accurate chronology because this kind of subterrain places have been frequented from Prehistory to recent times.

2.6. Object's lifecycle

To examine the sequence of events and decisions behind the manufacture process of wooden objects we have applied the concept of *chaîne-opératoire* (Cresswell, 1983). This conceptual framework facilitates the organisation of the sequence of actions involved in the production process from (1) raw material supply, (2) to the preparation of raw material including transport and conversion process from the original support to the manufactured object, (3) followed by product preparation (storage, drying, shaping, polishing, etc.) and (4) ended by the final product. But this concept does not comprise the complete lifecycle of objects which does not always follow a single line path (Joy, 2009). After their creation, wooden objects might be used, repaired, reused, adapted, recycled, or discarded (Schiffer, 2010), as has been attested previously for other kind of wooden crafts (Sands, 2021, Sands and Marlière, 2020). To complete the information obtained from the objects themselves it is necessary to also consider their depositional contexts that might inform about performances in which they participated (Joy, 2009).

3. Results

The three wooden bowls were made of ash (*Fraxinus* sp.) and the stick was made of hazel (*Corylus avellana*) (Fig. 3, Fig. 4, Table 1). The latter was a small twig shaped by roughly cut with a sharp tool (Fig. 4). All the wooden bowls were turned from mature trunks or large branches, tyloses were observed filling the earlywood vessels indicating that they were made from heartwood (Table 1). In wooden bowl 4047-001 up to 53 annual rings were counted and up to 46 in bowl 4047-002; no

Fig. 3. Wooden objects from Hoyo de los Herreros cave (scale 1 cm).

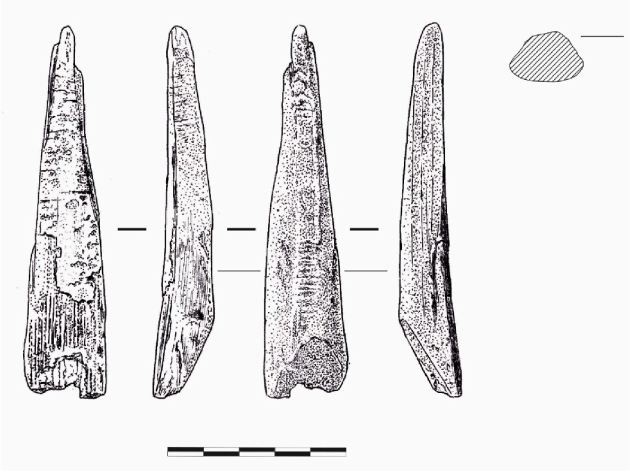

Fig. 4. Pointed stick 4049 from Hoyo de los Herreros (scale 5 cm). Drawn by Xurxo Constela Doce.

sapwood was identified so it was impossible to register how many annual rings were missing. In 4047-003 fragmentation and surface deposits on the bowl prevented counting the annual rings. To the naked eye, in the surface of this bowl there were visible xylophagous insect galleries filled with faecal pellets and insect remains evidencing an advanced degree of wood decay (Fig. 5b to 5d). Its inner surface preserved white and black surface deposits and traces of charring (Fig. 5a). Fungal hyphae were identified in all the samples (Fig. 6).

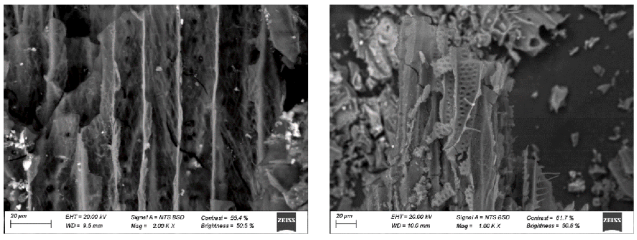

Fig. 6. From left to right. Evidence of wood decay in *Fraxinus* sp. (4047-003) and *Corylus avellana* (4049) from Hoyo de los Herreros.

Table 1
Wood analysis results and radiocarbon dates from Hoyo de los Herreros.

Code	Frags.	Taxa	Material-Plant part	Object	Lab Code	Radiocarbon Age	2 Sigma Calibrated results
4047-002	6	*Fraxinus* sp.	Wood-Trunk-Heartwood	Bowl	Beta-562140	1100 ± 30	(95.4%) 887-1013 cal AD
4047-001	2	*Fraxinus* sp.	Wood-Trunk-Heartwood	Bowl	Beta-562139	1060 ± 30	(81.1%) 943-1024 cal AD
4047-003	5	*Fraxinus* sp.	Wood-Trunk-Heartwood	Bowl	Beta-525643	960 ± 30	(95.4%) 1020-1155 cal AD
4049	1	*Corylus avellana*	Wood-Twig	Pointed stick	Beta-562141	910 ± 30	(94%) 1033-1190 cal AD

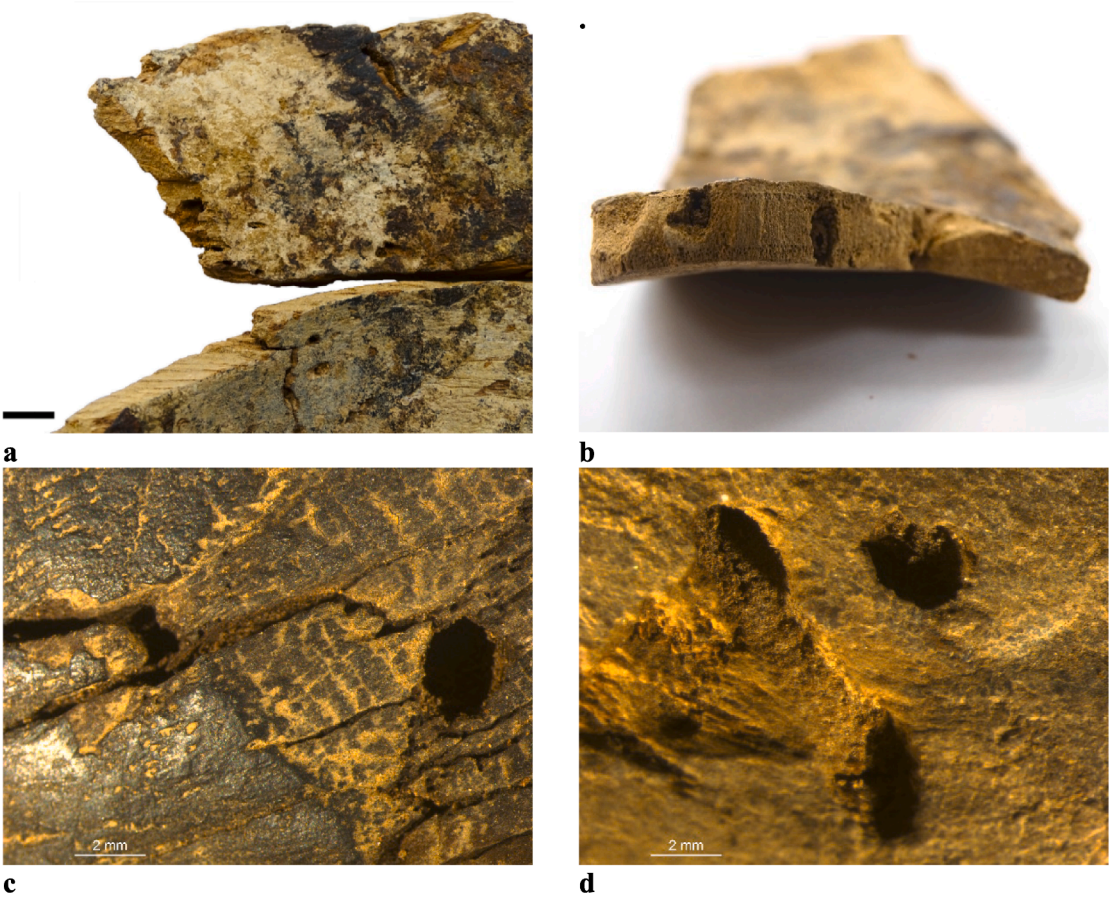

Fig. 5. Bowl 4047-003 from Hoyo de los Herreros. a) Detail of the white and black deposits on the inner surface (scale 1 cm). b, c and d) Detail of wood-borer's galleries filled with pellets and entomofaunal remains.

In the three cases the wooden bowls were lathe-turned, the hook-ended tool marks were visible to the naked eye in bowls 4047-001 (Fig. 7) and 4047-002. Despite not being visible in 4047-003, the regular thickness of the walls indicates that it was also made on the lathe (Fig. 8). The three bowls were hemispherical with plain rims (Table 2, Fig. 8). All of them were similar in size and morphology (Table 2, Fig. 8) to other ones recovered from medieval contexts of Atlantic Europe (Mille et al., 2019, Morris, 2000, Keys, 2010, Hurley et al., 1997). A purple colour on the surface of bowl 4047-001 is a result of mycelia colonisation (Fig. 9a and 9b). Evidence for erosion and random cracks were noted from 4047-002 (Fig. 9c and 9d).

Lathe-turning of ash bowls was done until recently using green wood because it is easier to work (Naveiras et al., 2004, Graña, 1985), and it has probably been done in this way at least since the Middle Ages (Mille, 1996). As wood for turning blanks into bowls was not seasoned, the time span between the felling of the tree and the crafting of the wood would be a few days or weeks, avoiding the old-wood effect on radiocarbon dating (Schiffer, 1986), although even for seasoned timber this is likely to have fallen within the standard deviation of the date. In the absence of stratigraphic information and since all the wooden remains were recovered on the cave floor, the dates obtained may indicate that the wooden assemblages are related with two episodes of use during the Middle Ages (Fig. 10). The first episode was dated to 887-1024 cal. CE and relates to bowls 4047-001 and 4047-002 (Table 1). The second episode relates to another bowl (4047-003) and a pointed object (4049), and was dated one or two centuries later, to 1020-1190 cal. CE (Table 1), although there is a slight overlap.

In addition to frass and bore dust within visible holes from bowl 4047-003, insect fragments were recovered from one of the galleries including parts of what is probably a coleopterous larva (Fig. 11). The insect emergence holes are slightly oval with a diameter of c. 2.5 mm. (Fig. 5c and 5d). Microscope images of two of the insect galleries, apparently pupal chambers in the bowl show lengths of c. 10 and 10.5 mm (Fig. 5).

Identification of fossil xylophagous insects from their borings has rarely been attempted. Girling (1993) noted possible anobiid borings in medieval timbers from Beeston Castle in Cheshire and Skidmore (pers. comm.) was able to recognise the cerambycid *Arhopalus rusticus* from its borings in timbers from the Bronze Age trackway on Thorne Moors, south Yorkshire. Passing references to 'woodworm' and 'deathwatch beetle' also occur in the archaeological literature, although the few identifications have been based upon imagines preserved in pupal chambers and galleries. The recent publication of photographs and descriptions of identified borings in modern wood from Sweden (Ehnström and Axelsson, 2002) provides a useful compendium of possible identifications, although it has to be recognised that other species occur further south in Europe. Recently a multidisciplinary approach combining xylology, dendrology and archaeoentomology has provided

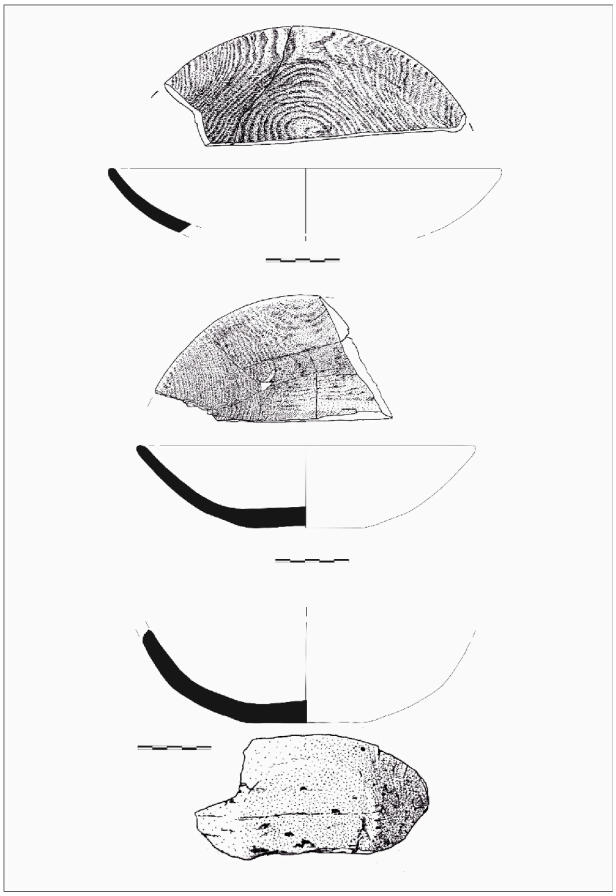

Fig. 8. Wooden bowls from Hoyo de los Herreros, from up to down 4047-001, 4047-002 and 4047-003, scale 5 cm (Drawn by Xurxo Constela Doce). The distortion of the upper part of the bowl in 4047-003 has prevented us to add the rim to the drawing.

Table 2
Morphology and dimensions (in mm) of wooden bowls from Hoyo de los Herreros.

Museum Code	Form	Diameter at rim	Diameter at base	Height
4047-001	Hemispherical	272	Incomplete	Incomplete
4047-002	Hemispherical	236	78	56
4047-003	Hemispherical	Incomplete	85	Incomplete

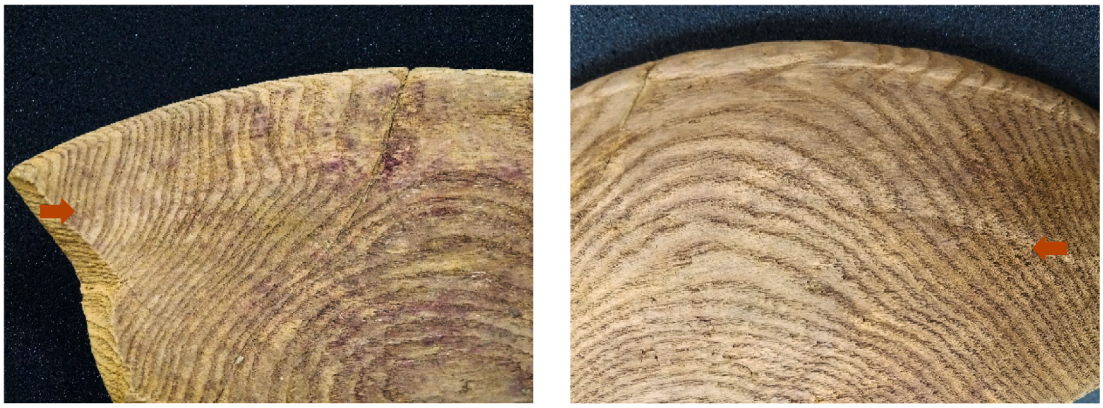

Fig. 7. Parallel tool scars in the inner and outer surfaces of wooden bowl 4047-001 from Hoyo de los Herreros.

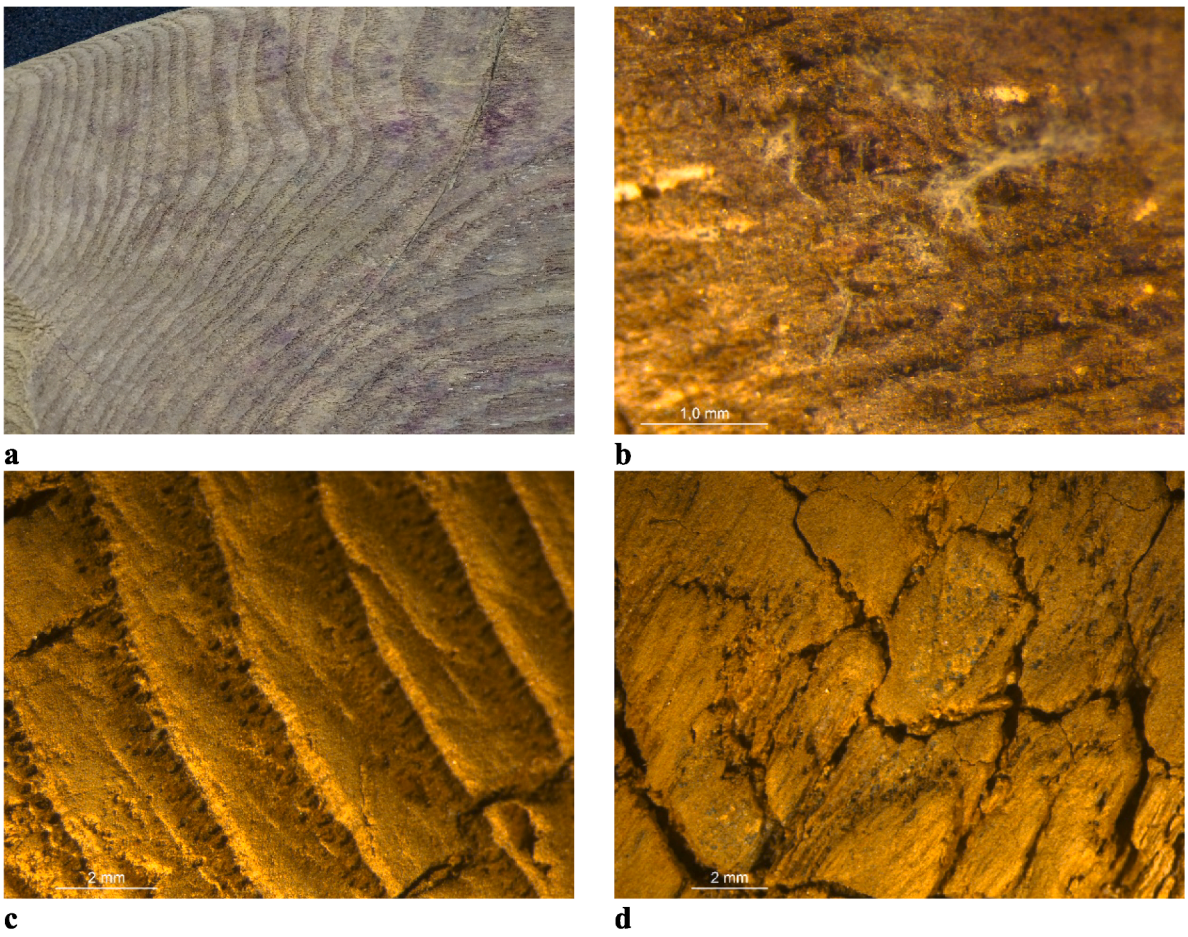

Fig. 9. Wooden bowls from Hoyo de los Herreros. a) Purple colour of the surface and b) mycelia colonisation in wooden bowl 4047-001. c) Erosion of the original surface and d) arbitrary cracks in wooden bowl 4047-002.

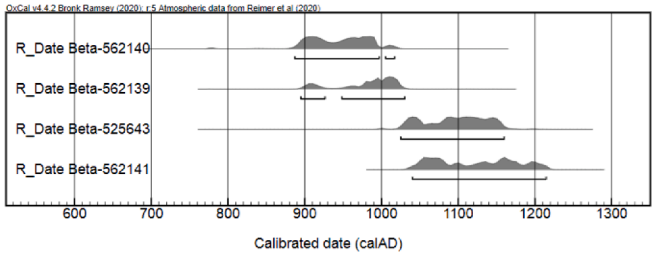

Fig. 10. Multiple plots of radiocarbon dates obtained from the wooden assemblage of Hoyo de los Herreros.

promising results (Toriti et al., 2020, 2021).

Considering the size of the emergence hole, the length and shape of the pupal gallery, and the powder like frass in these galleries, the damage is consistent with longhorn beetles, Cerambycidae. Buprestidae were also considered. However, in addition to differences with the galleries and the frass, the emergence holes produced by relevant taxa have a distinctive D-shape (cf. Moraglio et al., 2013, Ehnström and Axelsson, 2002). Although the shape and measurements of the galleries and emergence holes are very similar to these caused by the house longhorn, *Hylotrupes bajulus* (L.), the galleries produced by *Hylotrupes* tend to merge and individual tunnels have fine grooves (Pournou, 2020, Busvine, 1980). After considering a range of cerambycids which attack *Fraxinus* and eliminating species on the basis of size and nature of borings, the best match appears to be with *Leptura* sp. (e.g. Ehnström and Axelsson, 2002, 254-60; Gonzalez Pena et al., 2007), a polyphagous genus which is found on a range of deciduous trees (Hoskovec et al., 2016). Most species develop in dead and decaying stumps (Alexander, 2002) and Ehnström and Axelsson (2002: 257-258) list *L. quadrifasciata* and *L. maculata* as typical of ash, although the latter would be unlikely.

4. Discussion

The wooden assemblage from Hoyo de los Herreros has given an exceptional opportunity of taking a glimpse into the perishable material world dated to the Middle Ages. To date, most of the wooden materials studied have been recovered from domestic or artisanal contexts placed in cities, villages, castles, or farms but on very few occasions has it been possible to study wooden objects recovered from caves that might be associated with non-ordinary practices.

4.1. Crafting

Raw material for crafting the bowls was probably obtained from local resources, as well as the hazel twigs. Nowadays in this area oak or riparian woodlands are frequent and meso-hygrophilous species such as ash and hazel grow in association with them (Amigo et al., 2017). Pollen analysis obtained from Culazón (González-Pellejero et al., 2014) and La Molina (Pérez-Obiols et al., 2016) peat bogs indicate that cereals and grasses had a large presence in the medieval landscape of the area. During this period, the pollen diagrams are dominated by mixed deciduous taxa, primarily oak and hazel. The availability of ash and hazel in this area would have favoured their use, but other factors cannot be ignored, such as the regenerative capacity of both taxa, or the preference

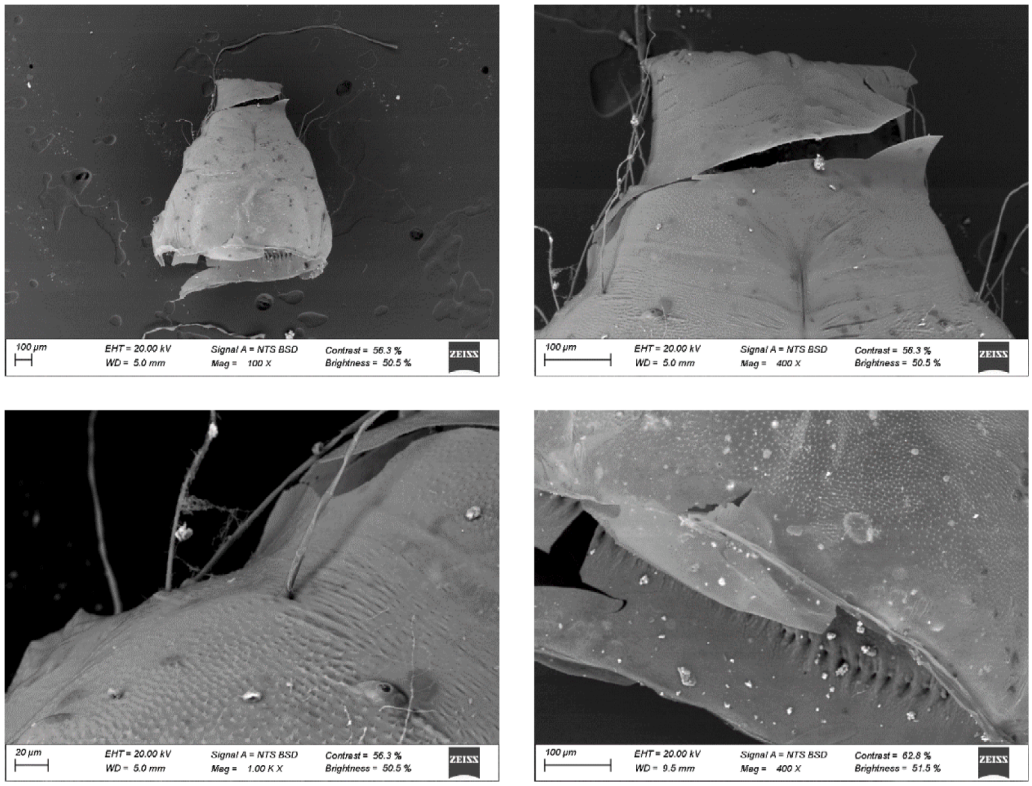

Fig. 11. Insect remains recovered from bowl 4047-003 of Hoyo de los Herreros.

of certain types of wood for crafting objects, for aesthetic or symbolic reasons (Pastoureau, 2004: 101-106).

The bowl 4047-003 showed evidence for xylophagous insect attack, since *Leptura* sp.is primarily a woodland genus, and *L. quadrifasciata* and other members of the genus are associated with old growth woods (Alexander, 2002, Koch, 1992) and would not infest worked wood indoors, it is likely to have been associated with the log or the blank used for the artefact as opposed to later infestation. This might indicate that only infested wood was available, and the priority was access to ash wood, and that the insect infestation was a secondary matter, or that perhaps the insect attack was not deemed prohibitive for the use of wood. The evidence for fungal hyphae on this bowl is probably associated with the insect infestation since most cerambycids tend to oviposit into wood already attacked by fungi.

The morpho-technological study of the wooden crafts provides information related to different stages of the *chaîne-operatóire.* In the case of the wooden bowls, all were made from mature trunks of ash (*Fraxinus* sp.). Ash is a hard, flexible, and easily turned wood with strongly marked growth rings which provides a decorative grain for containers (Keys, 2010: 196, Wood, 2005: 42-43). *Fraxinus* wood was commonly used throughout Europe for lathe-turning bowls and plates during Middle Ages, despite local preferences for other woods - alder (*Alnus* sp.), birch (*Betula* sp.), oak (*Quercus* sp.), chestnut (*Castanea sativa*), beech (*Fagus* sp.) or maple (*Acer* sp.) amongst others- have been also identified (Martín-Seijo et al., 2021, Mille et al., 2019, Cywa, 2017, Solovyova, 2012, Keys, 2010, Morris, 2000, Hurley et al., 1997, Dietrich, 1994, Mille, 1993).

Lathe-turned receptacles were most probably made by specialised artisans, wood-turners and sometimes other artisans related to wood-crafting, since making this kind of object requires specific skills and tools - a lathe, gouges, etc. - which need frequently sharpening and repairing, besides skilled handwork and a deep knowledge of materials (Edlin, 1974, Graña, 1985, Wood, 2005). The cutting season was traditionally conditioned by moon phases and plant cycles, in the case of ash the preferred period was during August waning (Graña, 1985). The humidity content of wood greatly conditions the lathe-turning process, and it is carefully controlled by artisans (Wood, 2005). Wood was usually worked green (Mille, 1996, Rackham, 2009), several days or weeks after it was cut, depending on the moisture content (Wood, 2005, Graña, 1985). A high degree of humidity or excessive drying can both cause problems in cutting (Wood, 2005). The wood conversion method used to prepare the blanks was by cutting the roundwood trunk in small segments of length equal to its diameter, and then splitting half-sections through the heart avoiding the pith to reduce the chance of cracking (Morris, 2000, Graña, 1985). Then the block was roughly shaped using an axe and attached to the lathe (Graña, 1985). All the vessels were face-turned, wood grain was aligned perpendicular to the axis of rotation. This was the most common method for manufacturing small to very large bowls throughout medieval Europe (Keys, 2010, Morris, 2000, Hurley et al., 1997, Dietrich, 1994) and into recent times (Graña, 1985).

In the case of the hazel twig (4049), one of its edges was shaped using probably a knife or another small blade tool giving the object a polygonal section. The outer surface was partially burnt but fire had only affected the external part of the item, which indicates that despite being in contact with fire it was not used as a torch or for kindling inside the cave. It was found associated to other twigs which were not recovered.

4.2. Use (or uses)

All the wooden objects considered in this study ended their lifecycle within the cave which had probably been utilised several times during the Middle Ages. According to the radiocarbon dates, the archaeological contexts and the spatial distribution, the wooden objects were probably linked to at least two different episodes. The oldest was most probably between 9th and 10th centuries CE (Table 1, Fig. 10), and at least the bowl 4047-001 was spatially associated with human remains belonging to several individuals. The absence of an anthropological study besides the scarce archaeological information related to the detailed distribution of the findings makes their interpretation difficult. However, the existence of burials within caves dated in 7th and 8th centuries CE elsewhere

in Cantabria, such as La Garma, Cudón, El Juyo, Las Penas and Riocueva (Arias et al., 2018), reinforces their interpretation as the remains of a multiple burial. These funerary deposits within caves usually consist of multiple burials often of young individuals; the deceased were buried clothed and accompanied with personal ornaments (belt buckles, rings, earrings, beads) and everyday objects (pottery, wooden containers, tools, etc.) (Arias et al., 2018, Gutiérrez-Cuenca et al., 2017, Gutiérrez-Cuenca and Hierro-Gárate, 2012), similar to those of Hoyo de los Herreros. Items such as spoons, scoops, cups, or bowls were one of the few personal belongings common people owned during the Middle Ages.

Wooden containers were widely used in the day-to-day life of medieval communities for consuming food and drink (Keys, 2010), in contrast with receptacles made of other materials such as pottery, they were light, resistant and easily portable. The presence of lathe grooves identified in 4047-001 and 4047-002 is common in traditional lathe-turning, where inner and outer surfaces of bowls were not polished. The marks of hook-ended tools were progressively removed by their regular use and cleaning, sometimes using sand as noted in anthropological studies (Kinmonth, 2017). The presence of clearly visible tool marks in these two objects may suggest that these bowls were handled in a particular way which preserved these marks before being deposited in association with the human remains.

These burials within caves do not follow the common rites of Christian inhumations which took place within sanctified ground in cemeteries, around or within churches or chapels in individual graves (Augenti and Gilchrist, 2011). They have been associated with exceptional situations that had led to exclusion from the society. There are numerous possibilities leading to fear and rejection from normal society, such as groups of brigands, epidemic deaths, or behaviour condemned as witchcraft or other delinquency (Arias et al., 2018, Gutiérrez-Cuenca and Hierro-Gárate, 2012, Hierro-Gárate, 2008). In this historical context, burial rites and the material culture associated with them can be interpreted as a symbolic interaction between the living and the deceased identity (Williams, 2007) and/or as emotive deposits (Gilchrist, 2008). In the case of Hoyo de los Herreros, two wooden bowls (4047-001 and 4047-002) were found close to human remains and associated with other archaeological items such as pottery sherds and a bronze belt buckle. The presence of these wooden objects could be part of the personal possessions of the deceased or could be left as offerings to the dead by the mourners, maybe containing food or drink.

The other group of wooden objects which has been dated between 11th and 12th centuries CE (Table 1, Fig. 10) was found far from the entrance and in a passage difficult of access. The wooden bowl, the hazel twig, and other twigs -which were not gathered- were associated with three pits dug in the cave floor. The bowl 4047-003 presented a smoothed surface and the presence of inner surface deposits, contrasting with the other two wooden bowls, and probably as consequence of a different kind of handling or because it was longer in use. All these wooden items may have been used for lighting in the dark. Perhaps the wooden bowl was used as a receptacle for carrying embers as it has preserved evidence of partial carbonisation on its inner surface, and it is possible that the hazel twigs could have been used as torches. The hazel twig presented evidence of charring but only in its outer surface and its use is uncertain. Beyond this functional interpretation, we cannot discard an alternative hypothesis that the presence of these wooden items associated to the three pits dug in the floor cave, may relate to supernatural and spiritual beliefs (Gilchrist, 2008). The selection of hazel wood for making this item and its presence in these contexts may be related to its properties as protection against evil supernatural beings or as a symbol of rebirth (Baklid, 2017, De Cleene and Lejeune, 2003).

The presence of hazel twigs within caves during the medieval period have been attested repeatedly mostly for lighting this dark and subterrain areas (e.g. Arias et al., 2018). Hazel wood was traditionally used to make charcoal and as occasional firewood. This shrub has a lot of uses including crafts, animal and human foddering, medicinal uses, etc. (Pardo de Santayana, 2003). *Corylus* sticks have been used in the past to repel evil (Gale and Cutler, 2000) and they occur in high medieval graves in northern Europe, perhaps with a magical function (Holloway, 2008, Baklid, 2017). In other Cantabrian caves, such as La Garma (Arias et al., 2018) and Riocueva (Gutiérrez-Cuenca et al., 2017), hazel charcoal was found in contexts dated to 7th-8th centuries CE. In both cases, all examples belong to very young branches, probably gathered in the vicinity of the cave, and may have been used for lighting purposes, such as in torches or small hearths (Arias et al., 2018), or as firewood involved in complex post-sepulchral practices -including smashing and burning skulls of corpses- which might be related to "necrophobia", the fear of the dead (Gutiérrez-Cuenca et al., 2017).

5. Conclusions

Despite their scarcity in archaeological contexts in southern Europe, exceptional findings such as the assemblage recovered from Hoyo de los Herreros highlight the relevance of perishable material culture during the Middle Ages. The extraordinary preservation of plant-based materials recovered within caves provides a unique opportunity of approaching medieval material culture of rural sites, going beyond activities related to day-to-day life. The major challenge of studying perishable material culture from cave contexts is the fact that cave floors are palimpsests with evidence of multiple frequentations of these dark and subterrain areas which were used as shelters, storage areas or even as funerary sites amongst other uses during the medieval period. This case-study demonstrates that depositional processes within caves are challenging and require accurate spatial studies and direct radiocarbon dating of organic objects.

Despite being a small assemblage, this set of objects gives a glimpse into medieval wooden material culture. This assemblage also provides information about perishable material culture involved in non-normative burial practices, in which the wooden bowls were probably part of the funerary rite as part of the offerings or personal items of the deceased, perhaps other rituals performed and chance use of the cave. The selection of ash wood was probably associated with making lathe-turned bowls, as in other medieval European sites. The combination of archaeobotanical and archaeoentomological analyses demonstrates their relevance in the refinement of the understanding of biological processes of wood decay and in the reconstruction of object lifecycles. Perhaps woodwork using infested wood was a direct reflection of the availability of suitable wood for artefacts depending on the socioeconomic status.

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CRediT authorship contribution statement

María Martín-Seijo: Conceptualization, Methodology, Investigation, Resources, Writing – original draft, Writing – review & editing, Visualization, Supervision, Funding acquisition, Project administration. **Eva Panagiotakopulu:** Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review & editing.

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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