Report on the 2022 excavations at Wogan Cavern (Pembroke, Pembrokeshire, UK)

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Abstract: In a previous article in this journal (Dinnis *et al*., 2022), we described the first season of archaeological excavations at Wogan Cavern (Pembroke, southwest Wales). Although based on excavation of a very small volume of deposits, we suggested that the sediments in Wogan Cavern may have very good potential for preserving archaeological remains. Specifically, an intact early Holocene archaeological layer and underlying, bone-bearing Pleistocene deposits encouraged us to believe that the cave might be an important early prehistoric site. Here, we provide an update on our previous work, detailing the findings of the 2022 excavation season. The 2022 work identified several phases of historic and prehistoric activity. The early Holocene archaeological layer containing diagnostic Mesolithic artefacts, found previously in the eastern part of the cave, was shown to extend towards the centre of the cave. Stratigraphically lower deposits dating to the Pleistocene, previously demonstrated close to the cave's eastern wall, were also shown to extend towards the cave's centre. Excavation of the Pleistocene deposits close to the cave's eastern wall revealed evidence for human occupation, with one and possibly two Upper Palaeolithic layers present. The archaeological assemblage(s) from these lower deposits bear similarities to the Palaeolithic stone tool assemblage from the famous Paviland Cave, located c.30 miles (c.50km) to the east. Overall, our 2022 work confirms that Wogan Cavern is an early prehistoric site of national, and potentially international, significance.

Introduction:
Wogan Cavern and our 2021 fieldwork

Wogan Cavern, located at NGR SM 9817 0165[1] lies beneath the Great Hall of Pembroke Castle (Figs 1 and 2). According to Dixon (1921; terminology modified by Waters *et al*., 2009; see also Gunn *et al*., 2022), the cave has developed within Early Carboniferous limestone forming part of the Pembroke Limestone Group. Some observations indicate the cave might have a hypogenic origin (Gunn *et al*., 2022).

Comprising a single large chamber measuring c.23m north–south and c.18m west–east, with a maximum height of around 5m, it has a wide and high north-facing entrance and a present-day floor that is somewhat uneven but generally flat, with a height above Ordnance Datum (aOD)[2] of 9–10m. In the early thirteenth century a wall was built across the cave's mouth (Fig.2), incorporating a gateway and windows into the cave, and a spiral stair was cut connecting the cave to the castle's inner ward above. Although it would clearly have served as a useful space, very little is known about the historical use of the cave (Dinnis *et al*., 2022). Furthermore, whereas Wogan Cavern is thought to have witnessed several early archaeological and antiquarian investigations, these are extremely poorly documented, and historical collections from the cave are small and poorly contextualized (see Dinnis *et al*., 2022 for the known history of investigation).

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[1] NGR stands for [British] National Grid Reference.
The map position of any point within Great Britain can be represented by a National Grid Reference. NGR SM 9817 0165 is an 8-figure NGR that describes the location of a 10m x 10m square within the 100km square designated SM. More or fewer figures claim higher or lower precision.
[For more detail see, for example: https://digimap.edina.ac.uk/help/our-maps-and-data/bng/]

[2] Though its nature is more complicated in detail, for many purposes the British Ordnance Datum (OD) can be considered as the mean sea level at Newlyn in Cornwall. It is also described as Ordnance Datum Newlyn (ODN). The abbreviation "aOD" is used to reference elevations that lie "above Ordnance Datum". [For more information see, for example:
https://www.tandfonline.com/doi/full/10.1080/01490419.2015.1121175]

Figure 1: Aerial view of part of the northern wall of Pembroke Castle, showing the Great Hall (centre). Wogan Cavern lies beneath the Great Hall. [Image courtesy of Owen Howells.]

In the light of how little is known about Wogan Cavern, our current work has two major objectives:

1. to determine the extent of intact sedimentary deposits, and
2. to test these deposits for material of archaeological importance.

Following an assessment of the site in 2019 (supported by the British Cave Research Association Cave Science and Technology Research Fund), a program of excavation was initiated. The first phase was a small-scale test excavation carried out in June/July 2021. This established the presence of intact Holocene and Pleistocene deposits in the eastern side of the cave (Trench 5; see Fig.3; Dinnis *et al*., 2022). A well-stratified early Holocene layer that included diagnostic Mesolithic artefacts was found underneath a calcium carbonate speleothem floor. Underlying this were Pleistocene sediments. The deepest excavated deposits revealed in 2021 (c.75cm below the surface) contained fragmentary bone, including pieces identified as mammoth, reindeer, horse and deer (Dinnis *et al*., 2022). Minimal investigation closer to the centre of the cave (Trench 7; see Fig.3) revealed a thin layer of post-medieval spoil overlying potentially intact sediments. Similarly small-scale investigation in the cave's southwestern corner (Trench 2; see Fig.3) indicated the historical removal of a prehistoric archaeological layer, provisionally interpreted as equivalent to the layer with Mesolithic artefacts still present on the cave's eastern side. Despite this large-scale disturbance, the same area appears to retain intact, stratigraphically lower, deposits of probable Pleistocene age. For more details of the 2021 work the reader is referred to Dinnis *et al*. (2022).

Figure 2: The interior of Wogan Cavern during excavation in summer 2022, taken from the back of the cave. [Photo: R Dinnis.]

Results of the 2022 excavation

The 2022 excavation took place over a three-week period in late June/July. Work was limited to the investigation of two trenches that were started in 2021 (Trenches 5 and 7; see Fig.3). Further excavation of Trench 5 sought to continue testing Pleistocene deposits for archaeological and palaeontological material, and to access deeper sediments. Excavation in Trench 7 sought to clarify whether the surface encountered during the 2021 season was indeed an intact, historic-age cave-floor surface, and, if so, to establish the nature of the intact sediments. As in 2021, deposits were hand-excavated, with 3D recording of finds and dry- and wet-sieving of excavation spoil to enhance the recovery of small archaeological/palaeontological pieces.
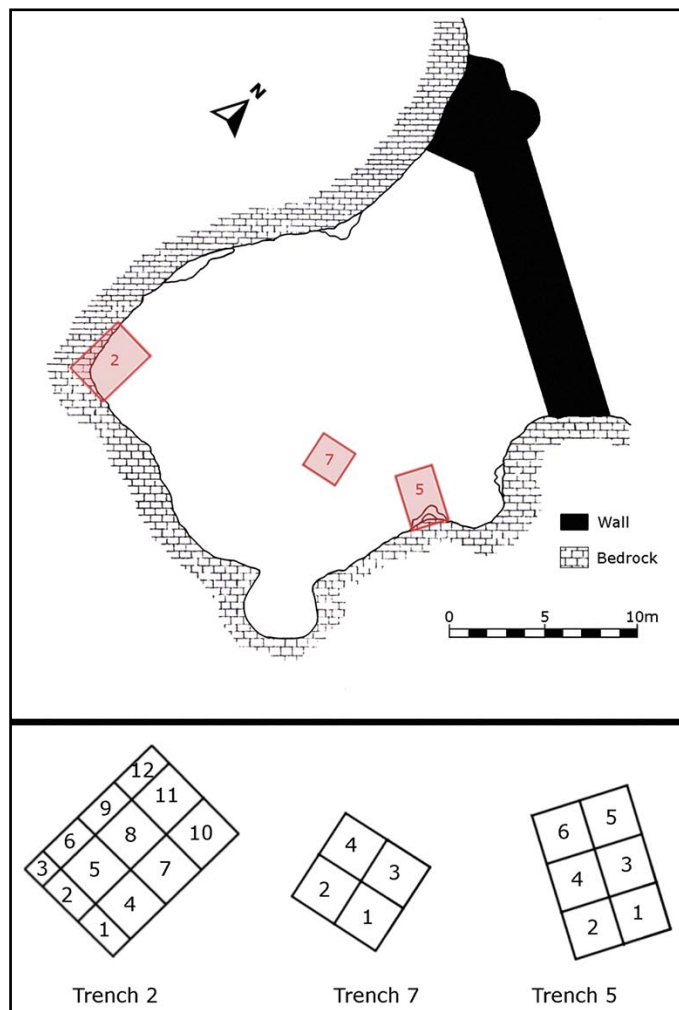
Figure 3: Plan of Wogan Cavern (modified from King, 1978, p.111), showing the locations of Trenches 2, 5 and 7 (top) and the designated 1m × 1m squares within each trench (bottom). Work in 2022 was restricted to parts of Trenches 5 and 7.
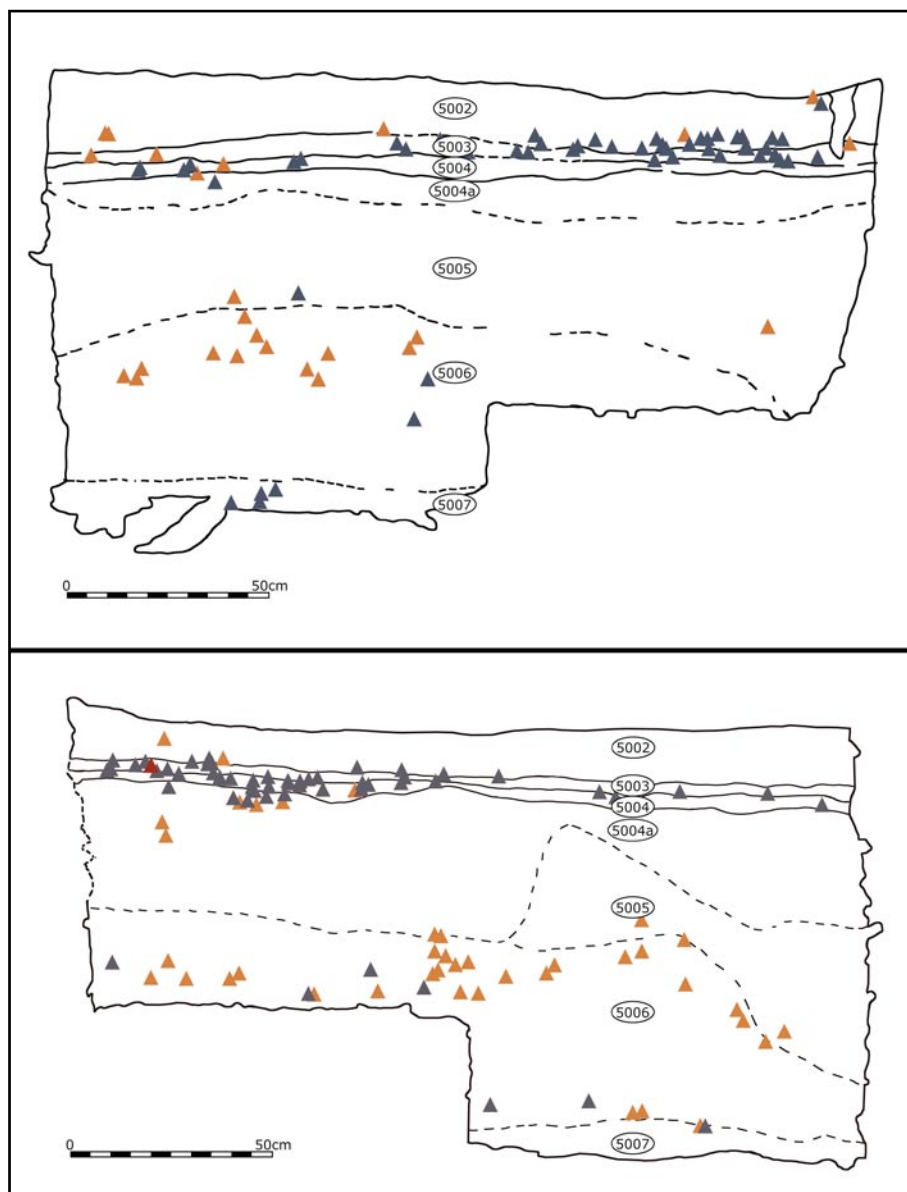
Trench 5

Excavation of Trench 5 was limited to two 1m × 1m squares: Square 4 and the adjacent Square 6 (see Fig.3). Square 4 had previously been excavated to a maximum depth of c.75cm in 2021. In 2022 it was excavated to a maximum depth of c.80cm. During the 2022 season Square 6 was excavated from surface down to a maximum depth of c.1.1m. The geological sequence is shown in Figure 4 and described in Table 1, which also details its archaeological contents. Figure 5 shows sampling of the trench's southern wall at the close of excavation. Overall, the 2022 excavations confirmed a stratigraphy in Square 6 closely resembling that in Square 4 (see Fig.4), demonstrating the extension westwards of intact deposits:

The stratigraphy of Square 6 can be summarized, from top to bottom, as:

- Calcium carbonate speleothem layer (=Context 5002) forming the cave floor, and containing a marine shell assemblage
- Red-brown clayey sandy silt "cave earth" (=Context 5003), containing an early prehistoric lithic assemblage that includes diagnostic Mesolithic tool types
- Pale orange-red sandy clay with some angular limestone clasts (=Context 5004), containing archaeological material, including characteristically Mesolithic lithics
- Abundant angular limestone clasts and pale yellowish-red-brown clayey sandy silt matrix (=Context 5004a), containing archaeological material in its upper part, including one characteristically Mesolithic piece
- Tightly packed scree of angular limestone clasts with red-brown clay matrix (=Context 5005), containing sparse microfauna/fragmentary bone
- Abundant angular and less commonly subangular limestone clasts, alongside some broken crystalline stalagmite pieces, and with a pale yellowish-red-brown clayey sandy silt matrix (=Context 5006), containing two accumulations of bone and lithic material, one within its upper part and one at its base
- Angular limestone clasts and some small, rounded clasts, with yellowish-brown-red crumbly clay silt matrix (=Context 5007), with bone and lithic material in its uppermost part.

As was the case for Square 4 in 2021, deposits immediately underlying the speleothem floor layer (=Contexts 5003 and 5004, and the uppermost part of 5004a; see Fig.4) contained the richest archaeological assemblage. The lithic assemblage is a laminar/lamellar technology, including characteristically Mesolithic pieces, consistent with the assemblage found previously in the adjacent square. In addition to the diagnostically Mesolithic lithic artefacts, the remains of pig/boar and hare recovered from Context 5003 in 2022 (Table 2) are consistent with an early Holocene age for material in the layer.

Whereas it is possible that the archaeological layer contains Late Glacial as well as early Holocene material, and/or indications of multiple phases of Mesolithic activity (Dinnis *et al*., 2022), it is clear that it is well stratified overall (Fig.4). It is well defined, with a near horizontal orientation that aligns with that of the geological strata, which show only a slight westward dip towards the cave's centre. The layer might represent an occupation surface or surfaces. The lithic material's freshness indicates limited post-depositional movement, and evidence for burning (e.g. burnt bone, charcoal) alongside lithic and bone material suggests that a range of activities is represented. Spatial patterning of the archaeological remains is indicated by differences noted between the two excavated squares. Square 4, closer to the cave wall, yielded a richer lithic assemblage, whereas evidence for burning was more pronounced in Square 6, with Context 5003 in Square 6's northern part darkened by charcoal/burnt-bone staining, and with an area of apparent heat transformation of the sediment (=hearth?) present at the top of Context 5004.

Figure 4 (left):
South-facing (top pane) and north-facing (bottom pane) sections of Trench 5 at close of excavation, showing geological contexts and the locations of all plotted finds from the 2021 and 2022 seasons. Finds from the excavated area's southern half are plotted against the north-facing section, and those from the northern half on the south-facing section. Orange triangles denote bone, grey denote lithics and red denotes shell. For details of the contexts see Table 1.

Figure 5 (above): *Sampling of the southern wall of Trench 5 for sedimentary ancient DNA samples at close of excavation.*
[Photo: E-L Jimenez.]

Context	Context description	Contents	Preliminary interpretation/notes
5001	Thin dark brown sandy mud on cave floor.	<u>WC21</u>: Glass (modern); pot sherd (medieval), shell; bone/microfauna; metal. <u>WC22</u>: N/A.	Modern tread containing mixed-age material; equivalent to Context 7001 (Trench 7, see Table 3).
5001a	Mottled deposit: contains some fine red-brown clay and some patches of darker brown sandy clay with abundant charcoal flecks. Present against cave wall / atop 5002 in eastern end of trench (Square 2). Unexcavated.	N/A.	Mixed spoil of various deposits.
5002	Granular calcium carbonate speleothem formation, c.10–25cm. Rare large (~6cm) clasts of stalagmite and angular limestone within matrix. Apparently present across the entire trench with the possible exception of the northwesternmost corner of the trench (i.e. the northwestern corner of Square 5). The formation is flat in Squares 3–6 and part of Square 1; against the cave wall it is present but stands in raised formations.	<u>WC21</u>: Shell (abundant, especially limpet shells); bone/microfauna; worked lithics (rare). <u>WC22</u>: Shell (abundant, especially limpet shells); bone/microfauna (including one piece in a condition consistent with the Pleistocene material); charcoal; coal/anthracite; worked lithics (rare).	Equivalent of Context 7008/7009 (in Trench 7, see Table 3)
5003	Dark red-brown moist sandy clayey silt (cave earth) underlying 5002, generally c.2–6cm thick. Matrix-supported but with uncommon limestone clasts (<5cm) along with abundant charcoal flecks. Small lenses of cemented sediment present. In Square 6, and especially close to the south-facing section, the sediment is very dark from charcoal/burnt-bone staining, and thicker than average (c.5cm).	<u>WC21</u>: Shell (rare); bone/microfauna (fragmentary); burnt bone; abundant worked lithics (some characteristically Mesolithic pieces, including Early Mesolithic-type pieces). <u>WC22</u>: Shell (rare); bone/microfauna; burnt bone; charcoal; worked lithics (including some characteristically Mesolithic pieces).	Early Holocene ("Mesolithic") archaeological layer. <u>WC21</u>: In Square 4, two small "cut" pits in the underlying 5004, filled with 5003, were denoted 5003a and 5003b.
5003a	Square 4: Depression in the underlying 5004, ~30 × 25cm and ~10cm deep, filled with 5003.	<u>WC21</u>: Bone; worked lithics.	Possible early prehistoric disturbance of the cave floor (bioturbation?).
5003b	Square 4: Depression in the underlying 5004, ~10 × 15cm and ~7.5cm deep, filled with 5003.	<u>WC21</u>: Burnt bone; worked lithics; fauna remains.	Possible early prehistoric disturbance of the cave floor (bioturbation?).
5004	Pale orange-red sandy clay; matrix contains numerous angular limestone clasts (~5cm); less moist, and stiffer, than the overlying 5003. c.3–10cm thick, although overall slightly thinner in Square 6 (c.3–5cm). Clay at the top of the context in the northern part of Square 6 appears thermally-altered.	<u>WC21</u>: Bone/microfauna; burnt bone (two pieces); shell; worked lithics (including one Late Mesolithic-type microlith). <u>WC22</u>: Bone/microfauna; shell; worked lithics (including one characteristically Mesolithic piece and one characteristically Late Glacial/Mesolithic piece); charcoal.	Archaeological material probably same as in overlying 5003.
5004a	Pale yellowish-red-brown clayey sandy silt. Matrix is slightly darker than overlying 5004, and mainly differentiated from 5004 by a greater abundance of angular limestone clasts (5–10cm) and a more clast-supported matrix. Variable thickness (see Fig.4), up to 15cm thick in the northern part of the trench and up to 35cm thick in the southern part.	<u>WC21</u>: Bone/microfauna; burnt bone (two pieces); shell (rare); worked lithics (rare). <u>WC22</u>: Bone/microfauna; shell (rare); worked lithics (including one characteristically Mesolithic piece); charcoal.	Pleistocene deposit. Worked lithics pieces found only in the uppermost part of the context. Some or all are likely to be intrusive from the overlying contexts.
5005	Tightly packed scree deposit of angular limestone clasts. Red-brown clay (stiffer and darker than 5004a) within a clast-supported matrix. Some voids evident between clasts (water percolation?).	<u>WC21</u>: Rare microfauna in top part of context (spits 1, 2 and 3). <u>WC22</u>: Rare microfauna/small bone fragments throughout sequence.	Pleistocene deposit. NOTE: Bone material and a lithic artefact excavated from Square 4 in 2021 were recorded as coming from the lowermost excavated part of Context 5005 (spits 6, 7; see Dinnis *et al*., 2022). 2022 exposure of deposits in Square 6 and re-examination of the trench walls made it apparent that these finds in fact belonged to a lower context (5006). This context is subtly different from 5005 (see context descriptions here), although it should be noted that in places it was hard to distinguish a clear boundary between the two. Finds attributed to the lowermost excavated part of Context 5005 in 2021 (Dinnis *et al*., 2022) are therefore here retrospectively attributed to the uppermost part of Context 5006. Context absent from northernmost part of Square 4 (see Fig.4).
5006	Similar matrix to 5004a, and therefore slightly paler/more yellowish in colour, and more friable and less clayey, than the overlying 5005. Abundant angular limestone clasts as higher in the sequence, but additional subangular limestone clasts and common broken crystalline stalagmite pieces. Incompletely excavated in Square 4.	<u>WC21</u>: Bone/microfauna; probable cut-marked bone; struck flake fragment. (Note this material was previously attributed to Context 5005 (Dinnis *et al*., 2022). Here it is retrospectively assigned to the upper part of 5006 – see Context 5005 note.) <u>WC22</u>: Bone/microfauna (locally abundant); lithic artefacts; burnt bone; charcoal; shell (rare fragments).	Pleistocene deposit. Microfauna was found in variable amounts down the sequence, but the larger finds were concentrated in two layers: the first occupying the upper part of the context (spits 1–7 of Square 6, and especially spits 3–7), and second in the context's basal part, immediately overlying the lower Context 5007. See Fig.4.
5007	Matrix very similar to 5006 and 5004a – pale yellowish-brown-red crumbly clay silt – but marked from the overlying 5006 by subtle textural and colour differences: • the base of 5006 was marked by looser deposits than the majority of 5006; • at the boundary were some small pockets of small clasts not seen in the overlying 5006; • the matrix of 5007 was slightly redder in hue, especially in the southwestern part of the square; • in addition to angular limestone clasts were small (c.3cm), rounded clasts. **Note**: only a limited amount (c.5cm) of 5007 was excavated from Square 6 only (see Fig.4).	<u>WC21</u>: N/A <u>WC22</u>: Bone/microfauna (abundant); lithic artefacts.	Pleistocene deposit.

Table 1: *Trench 5 contexts and archaeological contents, based on findings in Squares 4 and 6 in 2021 (=WC21; see Dinnis et al., 2022) and 2022 (=WC22). These context descriptions supersede previous descriptions in Dinnis et al. (2022). See also Figure 4. Note the retrospective change in our interpretation of the lowermost part of Context 5005 as excavated in 2021 – it is now thought that the bone and lithic material recovered from the lowermost part of "Context 5005" actually derived from the uppermost part of the stratigraphically lower 5006.*

Taxon	5002	5003	7001	7001/7002	7002	7003/7004	7004	7006	7007	7008	7009	7012	7014	Total NISP
Pig/Wild boar (*Sus scrofa*)	2	1			2	2			2	1	1	2		13
Cattle/Aurochs (*Bos taurus*)					2	2	2	2	1	1				10
Sheep/Goat (Caprinae)					2		3		1					6
Fox (*Vulpes* sp.)											1	4		5
Cattle / Large Cervid (Large artiodactyla)					1				1			1	1	4
Red Deer (*Cervus elaphus*)	1								1					2
Hare (*Lepus* sp.)		1			1									2
Mammalia (large-sized)	1				1			1	2			2		7
Mammalia (medium-sized 1)	2		2	1	5			3	4			3		20
Mammalia (medium-sized 2)								1						1
Passerines (Passeriformes)					1							1		2
Phasianids (Phasianidae)												2		2
?Guillemot (cf. *Uria aalge*)													2	2
Shorebirds (Charadriiformes)												1		1
Total Birds			2		8	2		1		4	4	19	4	44
Fish													1	1
Total NISP	6	2	4	1	22	6	5	8	10	8	6	31	6	115

***Table 2**: List of taxonomic identifications by context for faunal material from the higher (=Holocene) layers from the 2022 excavation of Trenches 5 and 7. Contexts 7001–7004 are interpreted as antiquarian spoil deposits; Context 7007 is the fill of cut feature [701] (see Tables 1 and 3 for full details of the contexts). The counts presented do not include material catalogued as micro-fauna. Identifications were made by EMM using the comparative reference collection at the University of Aberdeen. Note: Context 7014 is here interpreted as the uppermost part of the Pleistocene deposits (see text) but has here been included in the analysis of "Holocene" faunal material, because some material within it possibly or probably relates to the overlying (Holocene) Context 7012. NISP = Number of Identifiable Specimens.*

Lower deposits in Trench 5 (Contexts 5004a to 5007) are characterized by abundant angular limestone clasts. Our interpretation of this unit as (Upper) Pleistocene was confirmed by identification of typical Late Pleistocene species (mammoth, horse, deer, reindeer) among the fragmentary fauna collected previously (Dinnis *et al*., 2022). A single lithic artefact found within these lower deposits in 2021 hinted that they contained archaeological (rather than just palaeontological) material (Dinnis *et al*., 2022), although this conclusion was inevitably tentative given the presence of only one worked lithic piece.

Excavations in 2022 confirmed that archaeological remains were present in the Trench 5 Pleistocene deposits, and also demonstrated the organized distribution of archaeological and palaeontological material within them. Whereas microfauna and very small bone fragments were found at low levels elsewhere in the sequence, lithic and larger faunal finds were restricted to:

1. The upper part of Context 5006, and

2. The lowermost part of 5006 and top of Context 5007 (Fig.4).

Context 5005, which differs geologically from over- and under-lying deposits, seemingly contained no archaeological artefacts and very little bone.[3]

Some caution is necessary due to the small area excavated and the possibility that the Pleistocene deposits have been reworked in antiquity, but the overall distribution of finds (Fig.4) suggests that two archaeological layers might be present within the Pleistocene deposits, and therefore that Trench 5 has three stratigraphically discernible early prehistoric layers.

Relative to the uppermost early prehistoric ("Mesolithic") layer, the lithic assemblages from both accumulations in the Pleistocene deposits are small. Laminar pieces in both, however, suggest true blade production, and therefore an Upper Palaeolithic age. A range of raw materials is represented in both assemblages, including those previously described as rhyolite and as "black Carboniferous chert" (Swainston, 2000). The use of these non-flint materials is consistent with Upper Palaeolithic sites elsewhere in southern Wales, most notably Paviland Cave on the Gower peninsula, some 30 miles (c.50km) east of Wogan Cavern. Intriguingly, one artefact found at the very base of Context 5006 is reminiscent (in terms of techno-typology) of a series of artefacts in the mixed-age collection from Paviland Cave (Sollas, 1913; Swainston, 2000; Dinnis, 2012).

These artefacts have long been considered part of Paviland's Aurignacian assemblage (Swainston, 2000; Dinnis, 2011; Jacobi and Higham, 2011), currently thought to represent Britain's earliest *Homo sapiens* occupation. It is also notable that the lithic artefacts from the Pleistocene deposits at Wogan Cavern show minimal edge damage. As is the case for the overlying early Holocene layer, post-depositional movement of the Palaeolithic archaeological material might have been minimal.

Large-mammal faunal material from the Pleistocene deposits is highly fragmentary. Specimens identifiable using traditional zoo-archaeological methods are limited to three cervid bones in the higher accumulation and a single cervid bone in the lower. Despite its fragmentation, some pieces show possible or probable human modification, and others are burnt. This suggests that at least part of the faunal assemblage is anthropogenic, consistent with the associated lithic assemblages.

Good environmental evidence comes instead from the small mammal remains. Microfauna-rich layers in Contexts 5006 and 5007 are dominated by remains of the European narrow-skulled vole (*Lasiopodomys anglicus*), the collared lemming (*Dicrostonyx torquatus*), and a vole species, probably the common vole (*Microtus arvalis*). All are adapted to arctic, subarctic, and continental environments of the tundra, northern boreal, and steppe zones of northern Europe and Asia, and are common within European small mammal faunas of the Last Glacial (Baca *et al*., 2023). Fish and amphibian remains provide additional environmental information. The presence of sticklebacks and frogs indicates nearby waterbodies, likely streams or rivers with shallow backwaters or pools on the floodplain. These findings indicate a predominantly open, treeless landscape, with marshes and shallow waterbodies in close proximity to the cave.

Overall, our 2022 excavation in Trench 5 demonstrates...

1. ... that the sequence of intact early Holocene and Pleistocene deposits identified in 2021 extends westwards within the cave;

2. ... that the early prehistoric archaeological layer with diagnostic Mesolithic pieces directly underlying the calcium carbonate speleothem floor also extends in that direction;

3. ... that deeper Pleistocene deposits contain archaeological (Upper Palaeolithic) material, potentially present in two separate layers, and...

4. ... that these early prehistoric archaeological layers appear to be well-stratified.

The thickness of intact deposits preserved in this area, however, still remains unknown.

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[3] *Material found in 2021 that was previously attributed to Context 5005 is here reattributed to Context 5006 – see Table 1 for details.*
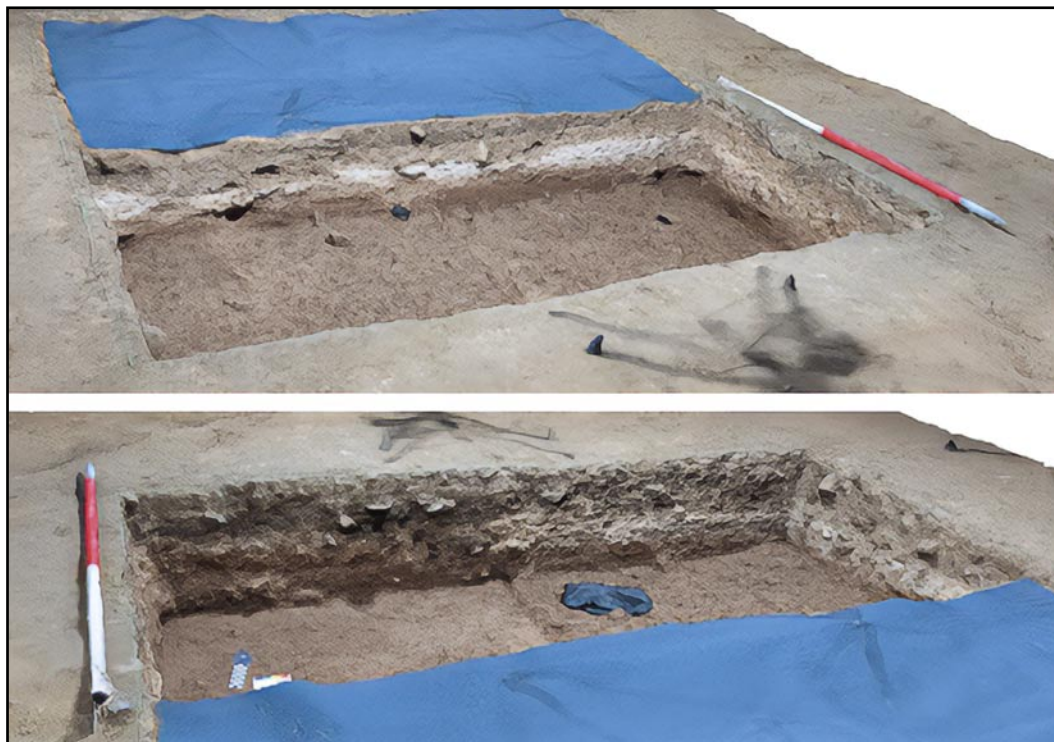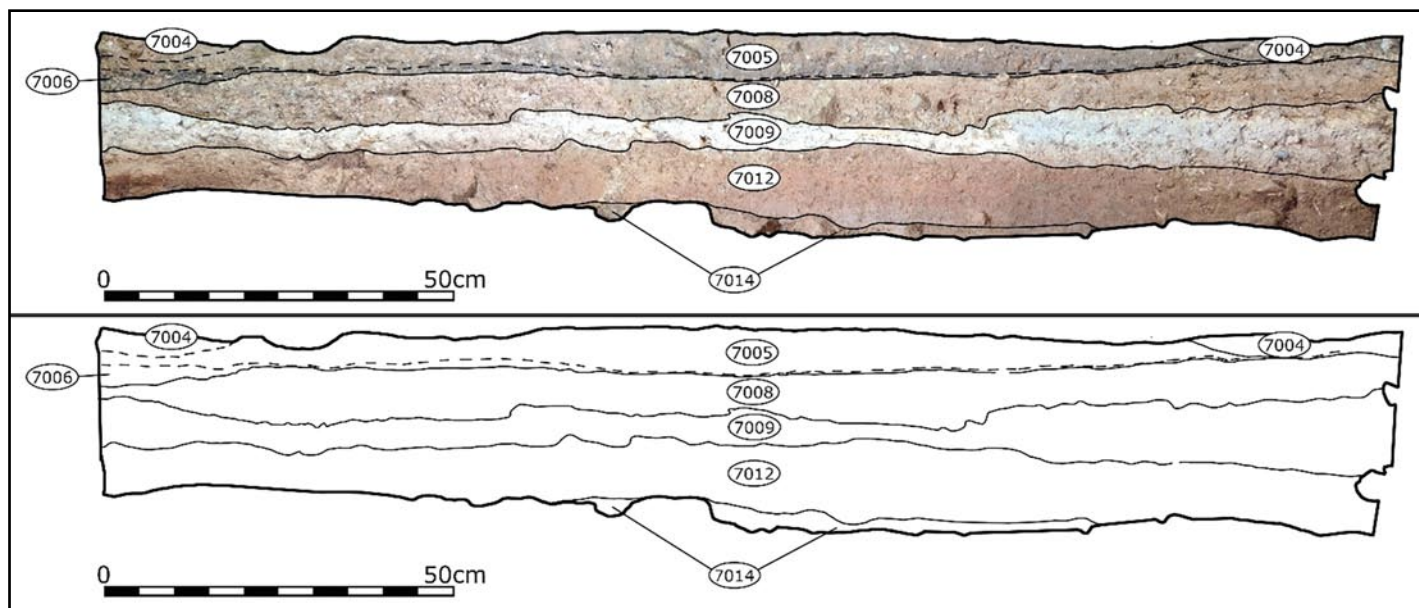
Trench 7

During the 2021 field season, Square 3 of Trench 7 (see Fig.3) was excavated to a maximum depth of c.10cm. Deposits excavated were mostly mixed, and were interpreted as spoil from previous (historical) excavation (Dinnis *et al*., 2022). Underlying deposits, reached but left unexcavated, were more coherent. These were provisionally interpreted as an intact historic-age cave floor surface (Dinnis *et al*., 2022).

In 2022, all four squares of Trench 7 were subject to excavation, but only the surface mixed spoil deposits were excavated in Squares 1 and 2. Almost all work was therefore carried out in Squares 3 and 4. The 2m × 1m area of Squares 3 and 4 was excavated to a maximum depth of c.35cm (Figs 6 and 7).

The 2022 excavations confirmed that deposits underlying the mixed surface material were indeed intact and contained evidence of historical activity. Further excavation demonstrated an underlying sequence that is geologically (and archaeologically) equivalent to that in Trench 5. A description of Trench 7's sequence can be found in Table 3, and Figure 7 shows the north-facing section of Squares 3 and 4 at the close of excavation.

Although not clearly defined in the northern part of Square 4, the overall stratigraphy of Squares 3 and 4 can be summarized, from top to bottom, as:

- Shallow spoil deposits containing mixed-age material (Contexts 7001–7004)
- A thin layer (Contexts 7005 and 7006) containing bone (including human remains), abundant shell, Roman-age coins and pottery, and abundant charcoal; this layer seems to be associated with cut-features sunk into the cave floor
- A layer comparable to the calcium carbonate speleothem floor in Trench 5 (Contexts 7008 and 7009)
- A dark red-brown clayey sandy silt (Context 7012), containing an early prehistoric archaeological layer that includes diagnostic Mesolithic lithic tool types
- Pale yellowish brown sandy silt, less clayey than the lower part of the overlying 7012, and with abundant angular limestone clasts (Context 7014), interpreted here as the uppermost part of the Pleistocene deposits.

Figure 7*: The north-facing section of Trench 7 (Squares 3 and 4) at close of excavation. Note: the section is shown following the removal of most of Contexts 7001–7004 from Squares 1 and 2.*

Context	Context description	Contents	Preliminary interpretation / notes
7001	Dark brown sandy mud on cave floor, 1–3cm thick.	<u>WC21</u>: Glass (modern); pot sherd (post-medieval), shell; bone/microfauna; burnt bone; worked flint. <u>WC22</u>: Bone; coal/anthracite; glass (modern); shell; lithic blade fragment.	Modern tread containing mixed-age material; equivalent to Context 5001 (Trench 5, see Table 1). **Note**: 7001 was incompletely excavated across Squares 1, 2 and 4 in 2021.
7002	Compacted, variable deposit, usually c.2–5cm thick, comprised of pockets of red/pink/orange clay and dark-brown mud. Note: across most of the excavated area, 7002 was found in convolutions of the underlying 7003. However, 7003 was not everywhere present; therefore in places (especially in Square 1) 7002 and the similar 7004 were not separable.	<u>WC21</u>: Shell; metal; bone; burnt bone; pot sherd (Roman). <u>WC22</u>: Bone; metal; shell; ceramics (Roman, post-medieval); glass (modern, ?Roman); worked flint; coal/anthracite. Roman coin found in Square 1, but this may in fact belong to the group found in the lower Context 7005.	Historical spoil containing mixed-age sediments and material.
7003	Thin layer of calcium carbonate deposit of variable thickness (from a few mm to 2cm) separating 7002 and 7004. Inconsistently present; absent in much of Square 1.	<u>WC21</u>: Shell; bone; metal; clay-pipe stem fragment. <u>WC22</u>: Shell, bone; worked flint.	
7004	Mixed, discontinuous spoil of varying thickness (1–8cm), primarily a dark brown earth with clods of red/pink/orange clay and containing some angular limestone clasts (<5cm) and charcoal flecks. Note: across most of the excavated area, 7002 was found in convolutions of the underlying 7003. However, 7003 was not everywhere present; therefore in places (especially in Square 1) 7002 and the similar 7004 were not separable.	<u>WC21</u>: Bone/microfauna; burnt bone; metal; worked lithics (including an abruptly blunted point fragment [SF122] of probable Late Upper Palaeolithic or Early Mesolithic age); clay-pipe stem fragments; pot sherds (including Roman and 17th/18th Century); shell (abundant oyster shell). <u>WC22</u>: Bone/microfauna; clay-pipe fragments; metal; coal/anthracite; shell (especially oyster shell); glass (19th century).	Spoil deposit, probably from 19th Century antiquarian archaeological excavation(s).
7005	Fine clay, pale yellowish red-brown, but variable in colour across the two excavated squares, and notably darker in some places. In some areas more heterogenous, with patches of more clayey or less clayey sediment and some clusters of limestone clasts. Underlying 7004 and overlying 7006. Excavated only in Squares 3 and 4.	<u>WC22</u>: Bone (including human remains), shell, coal/anthracite, charcoal, pot sherd (Roman); worked flint; coin (Roman).	Probable intact, historic-age surface, but with some evidence for possible disturbance
7006	Brown clay, overall darker than 7005, containing abundant charcoal flecks. In some areas not separable from 7005. Excavated in Squares 3 and 4.	<u>WC22</u>: Bone (including cut-marked); shell; charcoal; coal/anthracite; worked lithics.	Probable intact, historic-age surface
7007	Fill of Cut [701] (Square 3). Somewhat heterogenous mix: overall a dark brown sandy clayey silt (the colour related to charcoal content), with some small mineral inclusions comparable to those in 7008.	<u>WC22</u>: Bone/antler/microfauna; charcoal; shell (notably oyster); ceramics (Roman, ?Medieval).	
7010	Fill of Cut [702] (Square 3). As 7007.	<u>WC22</u>: Bone; shell; charcoal.	
7011	Fill of Cut [703] (Square 4). As 7007.	<u>WC22</u>: Bone; shell (oyster); charcoal; metal (lead).	
7013	Fill of Cut [704] (Square 4). As 7007, paler in colour (mid-brown), related to fewer charcoal inclusions and more abundant calcite fragments	<u>WC22</u>: Bone/microfauna; shell; charcoal; worked flint (small spalls).	
7008	Pale reddish-brown sandy clay matrix; abundant clasts, predominantly <1cm calcite pieces, alongside rare angular limestone pieces. Similar to the upper part of 5002 (in Trench 5). Excavated only in Squares 3 and 4.	<u>WC22</u>: Bone/microfauna; charcoal; anthracite/coal; shell; worked lithics (few, but including characteristically Mesolithic denticulated piece).	Uncemented type of calcium carbonate speleothem formation equivalent to 5002 in Trench 5 (Table 1). Seemingly contains sparse, mixed-age archaeological material (early and late Holocene)
7009	Granular calcium carbonate speleothem formation, with infrequent stalagmite/angular limestone clasts. White/mushroom-coloured in areas where it was well consolidated (notably in Square 3). Iron staining evident in southern part of Square 3. Variable levels of induration across the excavated squares, and in northern part of Square 4 difficult to discern from the overlying 7008. Excavated only in Squares 3 and 4.	<u>WC22</u>: Bone/microfauna; shells (notably mussel); worked lithics (few).	Calcium carbonate speleothem formation equivalent to 5002 in Trench 5 (see Table 1).
7012	Dark red-brown clayey sandy silt (cave earth), very few clasts. Some pockets cemented. More clayey towards base. Excavated only in Squares 3 and 4. Completely excavated in Square 3; excavated across Square 4 except the square's northwestern part.	<u>WC22</u>: Bone/microfauna; burnt bone; charcoal; worked lithics (including diagnostic Mesolithic types); shells (notably mussel). SF117 (flint flake) found on its side in northwestern part of Square 4.	Equivalent to Context 5003/5004 in Trench 5 (see Table 1).
7015	Cluster of large limestone pieces (c.10cm) within 7012 in northwestern corner of Square 4. The associated matrix was essentially 7012, but slightly darker in colour.	<u>WC22</u>: Microfauna (abundant); worked flints. SF120 (flint flake fragment) found on its side.	
7014	Pale yellowish brown crumbly sandy silt. Less clayey than the lower part of the overlying 7012. Abundant angular limestone clasts (5–10cm). Surface of deposit dips northwestwards, towards the centre of the cave. Limited excavation of context, restricted to Square 4.	<u>WC22</u>: Bone; worked flints.	Pleistocene deposit. Equivalent to Context 5004a in Trench 5 (see Table 1).

Table 3: *Trench 7 contexts and archaeological contents, based on findings in 2021 (=WC21; see Dinnis et al., 2022) and 2022 (=WC22). These context descriptions supersede previous descriptions in Dinnis et al. (2022). See also Figure 7.*

Excavation of the uppermost deposits confirmed observations made in 2021. Contexts 7002 and 7004, which make up the majority of the uppermost unit, contained redeposited clods of different sediment types and mixed-age archaeological artefacts (early prehistoric, Roman, post-medieval). Clay-pipe fragments found in Context 7004 are all likely to be 19th century, and a fragment of glass from Context 7003/7004 is from a 19th century wine bottle. These finds point to 7004 (at least) being a typical antiquarian spoil deposit.

Underlying deposits were excavated in Squares 3 and 4. Contexts 7005 and 7006 constitute a relatively homogenous and generally-thin clay layer, with the difference between the two contexts related mainly to the underlying 7006, being more charcoal-laden. Finds within these contexts are consistent with a historical age: a Roman coin, a Roman-age pot sherd, shell, a few struck flint artefacts, coal/anthracite and bone (including cut-marked animal bone). Where discernible, the Roman-age pottery fragments from all excavated deposits in Wogan Cavern (including from demonstrably mixed spoil deposits; see above and Dinnis *et al.* 2022) appear to be later Roman in date. The overall assemblage includes South-West Black Burnished Ware cooking vessels and Oxfordshire and Nene Valley 'table wares'. A later Roman age for the ceramic assemblage accords with the mid-fourth century AD date of the coin found in Context 7005.
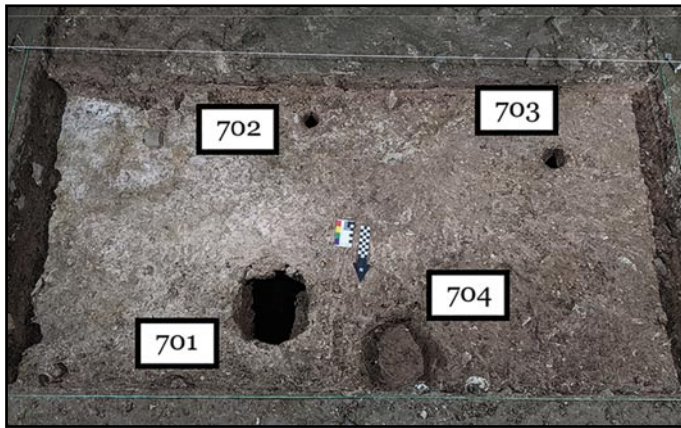
Figure 8: *Surface of Context 7009 in Squares 3 and 4 of Trench 7, showing cut features [701]–[704] following removal of their fills.*
Note *the variability of colour in 7009 across the trench, related to its variable level of induration (see text and Table 2).*

In addition, three human bones were recovered from Context 7005 in Square 3: a patella and two metacarpals. The two metacarpals refit, and all three bones could be from the same individual: an adult, who judged by their size was probably male. The presence of these specific elements and the absence of larger bones is intriguing. It is possible that these bones (and, indeed, other material found in the layer) are a secondary deposit, left behind following an earlier phase of digging in the cave. Radiocarbon dating of material from this part of the sequence will hopefully shed light on its origin.

Four cut-features ([701]–[704]; see Fig.8) appeared to be associated with the layer represented by Contexts 7005 and 7006. They were cut into the stratigraphically lower layer represented by Contexts 7008 and 7009. A fragment of Roman pottery recovered from the top of Context 7009 in the south-facing section of Square 4 is stratigraphically below the cut of [704], thereby providing a maximum age of c.2nd Century AD for that cut. The fills of all four cuts were broadly comparable (see Table 3). The most notable finds came from the fill of [701]: a pig/boar jaw and a fragment of red deer antler bearing chop marks (Fig.9).

Underlying Contexts 7005 and 7006 was a 10–20cm layer of indurated sediment (=Contexts 7008 and 7009) interpreted as the equivalent of the calcium carbonate speleothem floor in Trench 5 (i.e. Context 5002) (see Tables 1 and 3). Context 7009 is interpreted as a more-cemented version of 7008, although the layer was variably degraded or well-cemented across the excavated squares. The presence of this layer demonstrates that deposits in this area of the cave are largely intact. Finds from these contexts are a mix of early Holocene and more-recent objects (Table 3).

Figure 9: *Red deer antler base bearing chop marks, found in the fill of [701].*

Underlying this was a largely clast-free dark red-brown silt (Context 7012) (Fig.10), containing an early prehistoric archaeological layer. The layer's lithic assemblage is a blade/ bladelet technology with several characteristically Mesolithic pieces, including an (Early)-Mesolithic-type microlith. The faunal assemblage includes fox and pig/boar remains, which would fit well within a Mesolithic assemblage, and contrasts with overlying contexts containing sheep/goat and cattle (Table 2). Also notable are bones of medium-sized birds (Table 2), which, given their context, might be anthropogenic. Similarly, the assemblage of mussel shells in Context 7012 contrasts with the marine shell signature of higher layers, which instead contain abundant oyster shells.

The small-mammal faunal assemblage from Context 7012 is characterized by temperate woodland species such as wood mouse (*Apodemus sylvaticus*), yellow-necked mouse (*A. flavicollis*) and bank vole (*Clethrionomys glareolus*), alongside particularly abundant remains of field vole (*Microtus agrestis*), which is typically the most common rodent in tussocky grassland with plenty of ground cover including tall grasses and herbs. Remains of water vole (*Arvicola amphibius*), northern vole (*Alexandromys oeconomus*) and pygmy shrew (*Sorex minutus*) also indicate the presence of wetter, herb-rich environments. The additional low-level presence in Context 7012 of colder-adapted species (e.g. collared lemming; *Dicrostonyx torquatus*) is intriguing. Future work will try to clarify whether this is a true reflection of early post-Glacial small-mammal communities, or whether these remains represent reworking of material from older deposits. The latter might not be surprising, given the possible Late Glacial lithic material recognized previously in equivalent deposits in Trench 5 (Dinnis *et al*., 2022), and similar reworking of lemming remains in comparable sequences elsewhere (e.g. Miller *et al*., 2007).

Context 7012 is clearly the equivalent of 5003/5004 in Trench 5. Both contained comparable archaeological and faunal assemblages, had a similar stratigraphical position (i.e. immediately beneath the calcium carbonate speleothem floor) and were similar lithologically (i.e. clayey silts). However, some differences are observable between the two trenches. The lithic assemblage in Trench 7 is relatively less rich, evidence for burning is far less in Trench 7, and the associated mussel shell assemblage in Trench 7 was not found in Trench 5. Together with the freshness of both the faunal and lithic material, these differences argue for good spatial organization of the cave's uppermost early prehistoric ("Mesolithic") layer.

Context 7012 overlay a pale yellowish brown sandy silt (=Context 7014), less clayey than the lower part of the overlying 7012, and with abundant angular limestone clasts. The surface of Context 7014 dipped gently northwards/northwestwards, towards the cave mouth, with a more pronounced dip in the northwestern corner of Square 4. A very limited amount of 7014 was excavated from the southwestern part of Square 4 (see Fig.7). 7014 is here interpreted as the stratigraphical equivalent of 5004a in Trench 5, and therefore as the uppermost part of the Pleistocene sediment unit.

Figure 10: *Screengrab of a 3D model of Trench 7 during excavation, showing the surface of the hardened calcium carbonate speleothem layer (Context 7009) in Square 3 and the underlying "cave earth" (Context 7012) in Square 4. Note the features (packed with black fabric) cut into the deposits. These are remnants of historic-age activity in the cave (see text).*

In summary, our 2022 excavation in Trench 7 demonstrates...

1. ... that in this part of the cave, historic-age archaeological features and remains are present beneath spoil from historical excavation(s);
2. ... that the calcium carbonate speleothem formation, found in Trench 5 to the east, extends into the area of Trench 7;
3. ... that a sequence of intact early Holocene and Pleistocene deposits comparable to that in Trench 5 is also present in the area of Trench 7, and...
4. ... that the well-stratified early prehistoric archaeological layer with diagnostic Mesolithic pieces found in Trench 5 extends into the area of Trench 7.

Thus, although the presence of Pleistocene deposits was demonstrated, these were not tested meaningfully for content of archaeological and palaeontological remains, and so their thickness in this area remains unknown.

Conclusions and future plans

In 2021, intact early Holocene and Pleistocene deposits containing archaeological/palaeontological material were identified close to Wogan Cavern's eastern wall. In 2022, our excavations closer to the cave's centre identified comparable intact Holocene and Pleistocene deposits, along with a continuation of the uppermost early prehistoric ("Mesolithic") archaeological layer, as well as more-recent historic-age activity. Furthermore, deeper testing of the sediments close to the eastern wall confirmed that the Pleistocene deposits contain evidence for (Upper) Palaeolithic occupation. In forthcoming seasons we will continue our testing of the cave deposits to understand better what they contain. Specifically, we plan to test the western part of the cave, as well as continue work in Trench 5 to access and test deeper deposits on the cave's eastern side.

Our 2022 excavations have demonstrated that Wogan Cavern is an archaeological site of national importance. Although conclusions are inevitably caveated with a reminder of the small amount of sediment excavated so far, it appears that the cave retains a large volume of intact deposits, and that these deposits contain a record of early prehistoric activity stretching back into the Late Pleistocene. As we described previously (Dinnis *et al.*, 2022), this is extremely rare for Britain, where large-scale early excavations removed most or all sedimentary deposits from our most important cave sites. Furthermore, and again with the caveat that only a very small amount of the cave has so far been tested, the cave's near-horizontal stratigraphy and the apparent stratigraphical separation of its archaeological horizons are promising indicators of the nature of its archaeological remains. It might well transpire that Wogan Cavern's archaeological value lies as much in the quality of its archaeological evidence as in its quantity. Certainly, the spatial patterning evident from just four excavated square metres of the early Holocene ("Mesolithic") layer, as well as the relative freshness of lithic artefacts in older deposits, bodes very well for successful future research.

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