1-1-2016

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A New Radiometric Date and Assessment of the Last Glacial Megafauna of Dream Cave, Derbyshire.

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Abstract

The extinct fauna of Dream Cave, Derbyshire, has played a significant role in the history of British cave paleontology, a near-complete woolly rhinoceros from the cave having being famously illustrated in 1823. The fauna was not subsequently re-studied until 2000, with the publication of an indirect radiometric date by uranium-series disequilibrium dating of a presumed-overlying flowstone. Here we present a direct radiocarbon date of 43,330 ± 1800 rcyBP, 45083 – 48613 calBP (1 σ) on a representative *Bos/Bison* bone, with additional comments on the fauna and the taphonomy of the site.

Keywords

Coelodonta, *Bos*, *Bison*, *Rangifer*, Marine isotope stage 3, Pleistocene, Britain.

Introduction

In December 1822, lead miners sinking a shaft in the hamlet of Callow, near Wirksworth, Derbyshire, serendipitously intersected a natural cavity that was found to be filled with "a confused mass of argillaceous earth and fragments of stone" (Buckland, 1823, p. 62), within which lay the essentially complete and well preserved skeletal remains of a woolly rhinoceros *Coelodonta antiquitatis*. The subsequent excavation also revealed the

original natural open fissure into which the animal had apparently fallen or been washed. The owner of the property, Phillip Gell, communicated the discovery to the Rev. D. Stacy, who in turn notified William Buckland, the first Reader in Geology at Oxford. Buckland had just achieved some fame following his publication of an excavation at Kirkdale Cave, Yorkshire (Buckland, 1822), and the Dream Cave discovery came as he was working on his major treatise on cave paleontology. The discovery of the rhinoceros was remarkable enough that the cave and specimen were illustrated in profile in Buckland's' influential *Reliquiae Deluvianae* (1823), and the reproduced copper plate has become well known (e.g. Rudwick, 1995). Following Buckland's death in 1856 and the formal opening of the Oxford University Museum in 1860, the Dream Cave collection was absorbed into the museum's collections but was not formally curated until recently (Howlett, *pers. comm* 2016). No formal listing of the Dream Cave fauna has been attempted since 1874, and no direct radiometric dating or re-survey of the site has previously been undertaken.

Study Site

Dream Cave (also known as Dream Hole (Ford and Gill, 1984) and Dream Mine (Ford et al., 1977); 53.07° N, 1.59° W; 244 m; Figure 1) is a natural karst cavity developed along a mineralized vein in the Lower Carboniferous Monsal Dale Limestone Formation (British Geological Survey, 2016). In its current form, the site consists of a broad open fissure some 14 m deep, with an artificially enlarged cavity and solution tubes extending in a WNW - ESE direction. The original fill has been almost entirely removed and none of the original stratigraphy is evident, but a small deposit of previously-excavated material remains (Figure 2). All known fossils from the site are preserved in the Oxford University Museum of Natural History (OUMNH) collections.

Faunal remains

Following the near-complete excavation of the cave, the faunal remains entered William Buckland's personal collection at Christchurch College, Oxford, and were transferred to the Oxford University Museum sometime after the founding of that institution in 1860 (Gordon, 1894). Archival research in the OUMNH reveals that the larger bones were on display in the museum by 1861, and at some point between 1872 and 1874 the smaller ones were moved into drawers nearby (Howlett, *pers. comm*., 2016).

The current faunal list comprises only megafaunal species, presumably due to a lack of interest in the microfauna in the mid-19th century, rather than their true absence from the cave. In fact, a letter from Phillip Gell to Sir Everard Home, dated 21 May 1823, noted

> "*The Rhinoceros appears to have occupied the centre of the Cave, the Ox and Deer one end, and the smaller animals the other end.*" (Gell, 1823).

The identity and disposition of these "smaller animal" remains is unfortunately unknown.

Specimens in the Dream Cave collection, based on identifications by the authors, include the woolly rhinoceros (*Coelodonta antiquitatis*, 1 individual; OUMNH Q.1511, 92 elements; Fig. 3), bison/aurochs (*Bos primigenius/ Bison priscus*, 1 juvenile individual; OUMNH Q.7755, 18 elements; and at least one adult; OUMNH Q.7756–Q.7759, 4 elements), reindeer (*Rangifer tarandus;* OUMNH Q.7769-Q.7780, 12 elements), and horse (*Equus;* OUMNH Q.7781, 1 element). It should be noted however that the *Equus* specimen, a partial right radius with the diaphysis of the ulna adherent (Fig 4A) has a lighter coloured patina than the other Dream Cave material, and jagged breaks suggesting that it was not water-rolled. It is possible that this specimen originated elsewhere and was mis-associated with the Dream Cave collection by an earlier investigator. Boyd-Dawkins examined the Dream Cave collection and included *Equus* in his short description of the material (Boyd-Dawkins, 1874), but the provenance of the specimen remains uncertain.

The complete osteological list appears in Appendix 1.

Lithological material:

The Dream Cave collection also includes two lithological samples: a block of flowstone (OUMNH Q.7782) and a piece of limestone from the fissure wall (OUMNH Q.7783). The latter is marked "A" and "B" in ink at the two ends, and the accompanying label reads:

"Projecting side of the fissure at the Dream Cave near Wirksworth just under the Plumb line. see Plate 20 of Buckland's Cavern Papers. the Scratches from A. to Base are from the diluvial fragments that fell in by this fissure to the cave below".

Methods

Dream Cave was surveyed using standard magnetic cave surveying techniques (Dasher, 1997) in January 2016. Data were processed in COMPASS software (Fish, 2015) and the final product drawn in profile to replicate the original Buckland illustration as closely as possible. Aerial imagery was obtained using a custom-built photogrammetric unmanned autonomous quadcopter.

A left tibia, OUMNH Q.7755/14, of *Bos primigenius/ Bison priscus* in the Oxford University Museum of Natural History collections was selected for this study. A 10 mm core was drilled from the specimen (Fig. 5) using a sterile diamond-tipped core bit and transferred to a DNA-free centrifuge tube. Radiocarbon dating was performed at the Oxford

Radiocarbon Accelerator Unit using the collagen ultrafiltration method of preparation (Brock *et al*., 2010).

Results

Macromolecular collagen yield was 9.2 %, indicative of excellent preservation. The specimen provided a finite radiocarbon date of 43,300 ± 1800 ($\delta^{13}C$ -21.12; OxA-33959), and thus 45083 - 48613 calBP, 1 σ, calibrated against the InterCal13 dataset (Reimer *et al*., 2013).

Discussion

A previous study of the age of the Dream Cave fauna was attempted by McFarlane *et al*. (2000), based on the discovery of a block of flowstone, OUMNH Q.7782, in the Buckland collection at Oxford. Although Buckland does not mention flowstone in his 1822 account, the specimen is clearly labelled "The Dream Cave Wirksworth" in his handwriting and consists of flowstone ~ 2 cm thick with residual argillaceous sediment on the underside, and was obviously considered significant by Buckland at the time of collection. McFarlane *et al*. (2000) considered this specimen to have been a flowstone cap over the original fossiliferous sediment, and obtained a uranium-thorium disequilibrium date of 36,451 – 1262, +1277 yr on the lowermost layer as a minimum age for the underlying fauna. The direct radiocarbon age of 43,330 ± 1800 rcyBP, 45083 – 48613 calBP (1 σ) on aurochs bone reported in this study is fully consistent with this interpretation.

The radiocarbon dated *Bos/Bison* material was emplaced in the cave during marine isotope stage (MIS) 3, substage 3C/B (Fig. 6), at the beginning of a cooling phase that preceded the rapid warming and flowstone deposition at the MIS 3A optimum. The Dream Cave faunal assemblage is consistent with other British MIS 3 mammal faunas reviewed by Dinnis et al., 2016). Examination of the remnant deposit of allochthonous sediment in Dream Cave reveals a heterogeneous mixture of sub-rounded metamorphic gravels and finer matrix (Fig 2). This material cannot have originated in the immediate vicinity, as Dream Cave lies near the summit of a small limestone hill. The nearest source of metamorphics is an outcrop of the Hopton Agglomerate, some 1.5 km due west of the cave (c.f. Shirley, 1958).

Buckland (1823) noted that the bones of the rhinoceros lay "nearly in the center of this subsiding mass, and at a height of many feet above the floor of the actual cave" (Buckland, 1823, p. 62), and were in close proximity to one another. On this basis, he concluded that the cave had not acted as a pitfall (as mis-stated by Boyd-Dawkins in 1874),

since this would have resulted in the skeletal elements being scattered on the sediment floor through normal taphonomic processes of displacement, but rather that the animal represented "*a carcass that was drifted in entire at the same time with the diluvial detritus*" (Buckland, 1823, p.64). Although Buckland was writing in the context of a Noachian Universal Deluge (Rudwick, 1995), his explanation was taphonomically correct in its essential elements. MIS 3 was characterized by "large amplitude, millennial scale cycles of abrupt temperature rise followed by gradual cooling" which correlate with Dansgaard-Oescher cycles (Moseley *et al*., 2014). The Dream Cave fauna is almost coeval with an intensively studied *Coelodonta* site in Staffordshire (~ 40 km SSW of Dream Cave) where Shreve *et al*. (2013) have reconstructed mean monthly July and January temperatures of 8 to 11 ºC and -16 to -22 ºC respectively, noting that annual spring thaws would be associated with high-energy flood regimes. The Dream Cave megafauna was likely emplaced by a single debris flow during one of these flood events, and we consider the *Bos/Bison* radiocarbon date as likely to be coeval with the more famous woolly rhinoceros specimen, the deer specimens; we remain ambivalent with respect to the *Equus* specimen.

The woolly rhinoceros, *Coelodonta antiquitatis*, is a relatively uncommon component of the British late Pleistocene fauna, known from less than 20 locations and a comparable number of individuals (Jacobi *et al*., 2009; Schreve *et al*., 2013). A set of 17 ultrafiltration-based radiocarbon dates presented by Jacobi *et al*. (2009) range from 55,900 ± 4000 to 31,140 ± 170 rcyBP in age. *Coelodonta* has also been reported from Ogof-yr-Ychen (Caldey Island, Wales) at 22,350 ±620 rcyBP but this date was rejected by Jacobi *et al*. (2009) since it is based on an earlier, less reliable radiocarbon methodology. A number of probabilistic methods for the estimation of extinction ages are available (McFarlane, 1999); application of the median gap method to the Jacobi *et al*. (2009) dataset, with the addition of one date from Schreve *et al*., (2013), gives the lower 95% confidence limit on the extinction age as 28,460 rcyBP, adding support to Jacobi's view that the Ogof-Yr-Ychen date should be regarded with caution. The age of the Dream Cave fauna, based on the co-excavated *Bos/Bison* skeleton, falls almost mid-way through the demonstrated tenure of *C. antiquitatis* in Britain.

The remains of a large bovid in the collection were originally classified as *Bos primigenius* (Aurochs). While a review of the Dream Cave material (principally post crania from a juvenile individual) did not yield any evidence to the contrary, there are biostratigraphic grounds to query the identification. Currant and Jacobi (2001) argue that *Bos*, which was unquestionably part of the British fauna in MIS 13, MIS 7 and MIS 5 times, may have been absent during MIS 3, where *Bison priscus* was present. Unfortunately this view is based in part on postcranial specimens that are not reliably diagnostic for these genera. In the most recent review of auroch material, Wright (2013), accepts bovid specimens from MIS4 -3 Coygan Cave (Wales) as *Bos*. Given the similarity of post cranial

remains between these taxa, we treat the large bovid remains from Dream Cave here as "*Bos/Bison*".

The Dream Cave deer remains comprise 12 antler fragments, described by Buckland as "*some portions of deer's horns, of the size but not the shape of those of a large fallow deer, and some of them having the upper extremities palmated*." (Buckland, 1823, p. 63). All show at least some sign of smoothing by fluvial movement. While two specimens from the collection, OUMNH Q.7769 and Q.7770, were figured in Buckland (1823) in Plate 22 as numbers 3 and 4 respectively, little further work appears to have been done on these specimens. All examined antler fragments appear to be attributable to *Rangifer tarandus*.

OUMNH Q.7769 (Fig. 4B), an unshed basal antler fragment from the left side, is described as follows: "*Lower extremity of a horn, still adhering to the skull, found with the rhinoceros in the cave near Wirksworth, 1822. Near it were several cylindrical portions of the shafts of similar horns, nearly of the same diameter as this, having their surface very smooth*." (Buckland, 1823, p. 276). It consists of a remnant of the frontal bone and pedicle, with a portion of the fronto-parietal suture preserved at the posterior side. Although the specimen is eroded, the interface between the base of the beam, burr and the pedicle is clear. At first glance, the eroded remnant of a brow tine lying on the burr seems to curve to the broken base of a bez tine, orientated laterally and located c. 20 mm above, recalling *Cervus elaphus*. The pedicle is short and robust, however, and the burr – although eroded – does not seem to have been as developed or have the rough surface and pearling typically associated with *C. elaphus*. While pedicle length is known to decrease with age (e.g. Lister, 1990), measurements (Table 1) also indicate that pedicle length would be anomalously short for its diameter when compared with data from Pleistocene-age and extant *Cervus* specimens (cf. Lister, 1990). Examination of the remnants of the brow and bez tines suggest that while the former is severely eroded it was unlikely to have been substantial. Conversely, the cross section of the base of the bez tine indicates that this tine would have been elongate in proximal-distal direction and flattened medio-laterally: more akin to *Rangife*r than *Cervus*. Taken together, OUMNH Q.7769 is parsimoniously attributed to *Rangifer tarandus*. An estimate of the surface area of the pedicle (Table 1) compared with data from extant North American specimens (Miller *et al*., 2013) is equivalent to data from large male antlers.

OUMNH Q.7770 (Fig. 4C) is described in Buckland as follows: "*Portion of a flat and palmated horn found with No. 3,*" and is a fragment of palmated and flattened tines of *Rangifer tarandus*.

Among the "*several cylindrical portions*", four specimens clearly refit to form a shed antler of *Rangifer tarandus* (Fig. 7A): OUMNH Q.7771/1, a brow tine that preserves a portion of anterior beam and anterior pedicle; OUMNH Q.7771/2, a preserved posterior portion of pedicle and basal beam with proximal shaft of bez tine; OUMNH Q.7771/3, a

fragment of palmated distal bez tine; and OUMNH Q.7771/4, beam with remnant base of posterior tine. Comparison of the estimated surface area of the refitted pedicle (Table 1) with data in Miller *et al*. (2013) suggests a male individual.

OUMNH Q.7772/1 and Q.7772/2 (Fig. 7B) comprise a robust unshed antler beam including a broken portion of the antler base with pedicle and fragment of fronto-parietal suture (OUMNH Q.7771/1). The presumed basal location of brow and bez tines is broken away. Pedicle length (16.0 mm) is very short and indicates *Rangifer tarandus*. OUMNH Q.7772/2 is a fragment of the beam. A further beam fragment (OUMNH Q.7773) may also be associated with these specimens. OUMNH Q.7774 is a more gracile unshed antler of *Rangifer tarandus*. Remnants of the pedicle, brow and bez tines are preserved. Comparison of measurements of the pedicle (Table 1) with data in Miller *et al*. (2013), however, suggest that this specimen also derived from a male.

Buckland's account of the cave also mentions "the radius and some other bones of a stag" (Buckland, 1822, p. 63) but these have not as yet been located in the OUMNH collections (Howlett, *pers*. *comm.,* 2016).

Future of the Dream Cave site

The Dream Cave site lacks the protective status of a Site of Special Scientific Interest, and has suffered from agricultural debris dumping and partial in-filling. Although the cave is unlikely to produce additional palaeontological specimens, the historical significance of the site is sufficient to warrant basic conservation measures and the provision of appropriate interpretive materials.

Acknowledgements

We thank the staff of the Oxford University Museum of Natural History for access to the specimens. Tom Higham of the Oxford Radiocarbon Accelerator Unit kindly examined the osteological material in advance and advised on sampling. The work was partially funded by a grant from the Keck Endowment of the Keck Science Department, the Claremont Colleges.

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Table 1. Pedicle measurements of antler specimens from Dream Cave, Derbyshire

Specimen(s)	Pedicle	mm
OUMNH Q.7769	Pedicle diameter (medial-lateral/min. axis)	42.50
	Pedicle diameter (anterior-posterior/ maj. axis)	45.52
	Basal (pedicle) circumference	144
	Log basal (pedicle) surface area	3.18
	Pedicle length (measured posterior face):	17.20
OUMNH Q. 7771/1-4	Pedicle diameter (medial-lateral/min. axis)	33.22
	Pedicle diameter (anterior-posterior/ maj. axis)	34.04
	Log basal (pedicle) surface area	2.948
OUMNH Q.7774	Pedicle diameter (medial-lateral/min. axis)	24.46
	Pedicle diameter (anterior-posterior/ maj. axis)	25.48
	Log basal (pedicle) surface area	2.6897

Figure Captions

Figure 1. Dream Cave, Wirksworth, Derbyshire. The upper illustration is Plate 20 from Buckland (1823), "drawn by T. Webster from a sketch by Prof. Buckland". The original sketch is lost. The lower illustration is a plan and section of Dream Cave drawn from a 2016 survey by the present authors. The profile is drawn on the same bearing as the Buckland original. Buckland's shaft "A" is the capped shaft in the modern profile.

Figure 2. Remnant of the original cave fill from which the Dream Cave megafauna was recovered.

Figure 3. Woolly rhinoceros (*Coelodonta antiquitatis*) right mandible, OUMNH Q.1511/7.

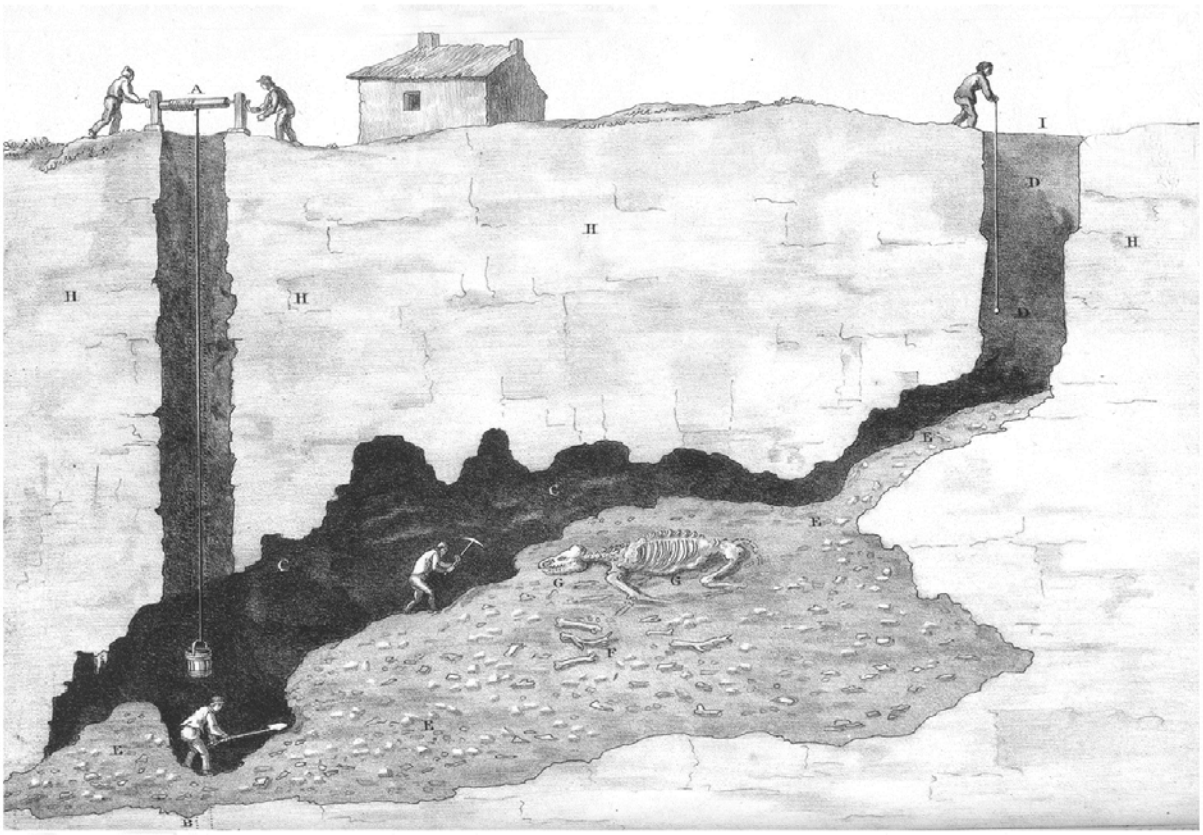
Figure 4. A) Horse (*Equus* sp.) radius from the Dream Cave collection. B-C) Reindeer (*Rangifer tarandus*) antler fragments from Dream Cave; B) OUMNH Q.7769 and C) OUMNH Q.7770. Scale bars are 50 mm.

Figure 5. Aurochs/Bisom (*Bos primigenius/Bison priscus*) left tibia, OUMNH Q.7755/14, showing location of the core extracted for radiocarbon dating.

Figure 6. Marine oxygen isotope curve (adapted from Railsback *et al*., 2015), showing the age of the Dream Cave *Bos/Bison* (boxed) and the bounding dates on isotope substage 3c. Warm episodes are depicted as peaks; cold episodes as troughs.

Figure 7. Refitted reindeer (*Rangifer tarandus*) specimens, A) OUMNH Q.7771/1-4, and B) OUMNH Q.772/1-2.

Figure 1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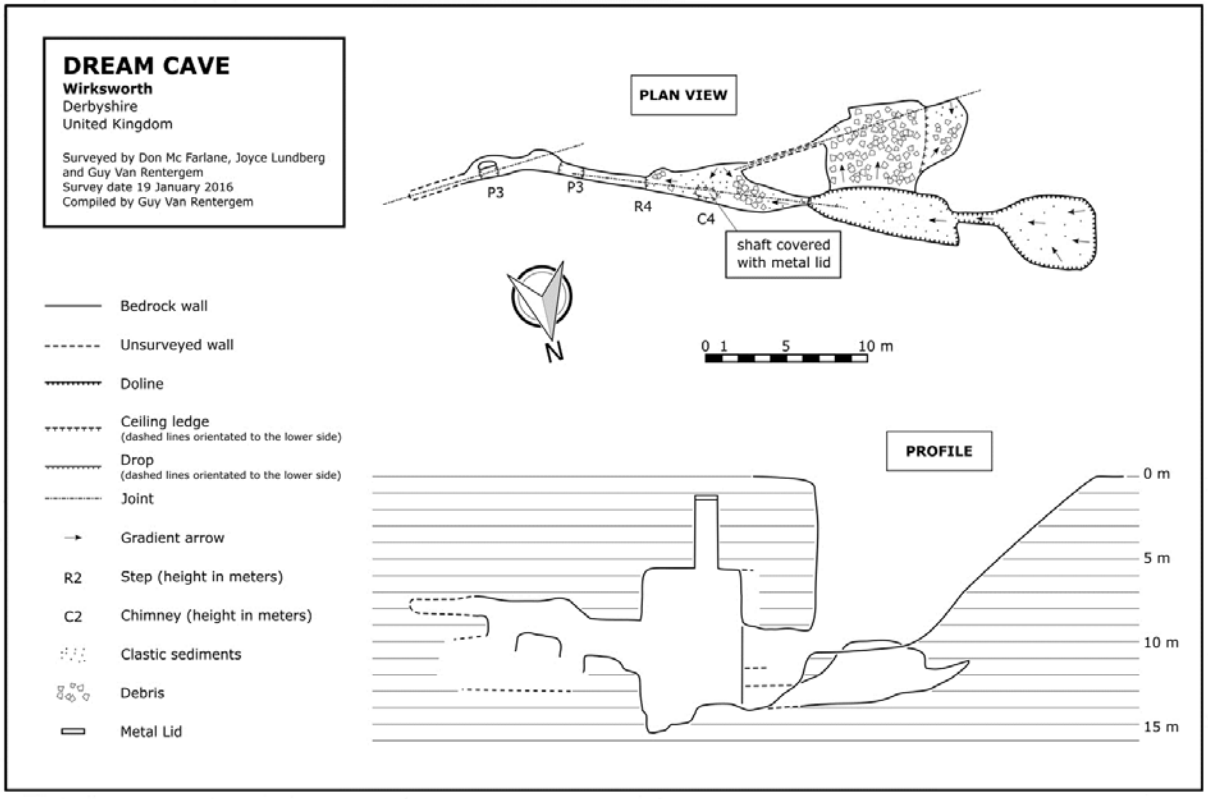

DREAM CAVE
Wirksworth
Derbyshire
United Kingdom
Surveyed by Don Mc Farlane, Joyce Lundberg and Guy Van Rentergem
Survey date 19 January 2016
Compiled by Guy Van Rentergem
PLAN VIEW
P3
P3
R4
C4
shaft covered with metal lid
N
0 1 5 10 m
Bedrock wall
Unsurveyed wall
Doline
Ceiling ledge
(dashed lines orientated to the lower side)
Drop
(dashed lines orientated to the lower side)
Joint
Gradient arrow
R2 Step (height in meters)
C2 Chimney (height in meters)
Clastic sediments
Debris
Metal Lid
PROFILE
0 m
5 m
10 m
15 m

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

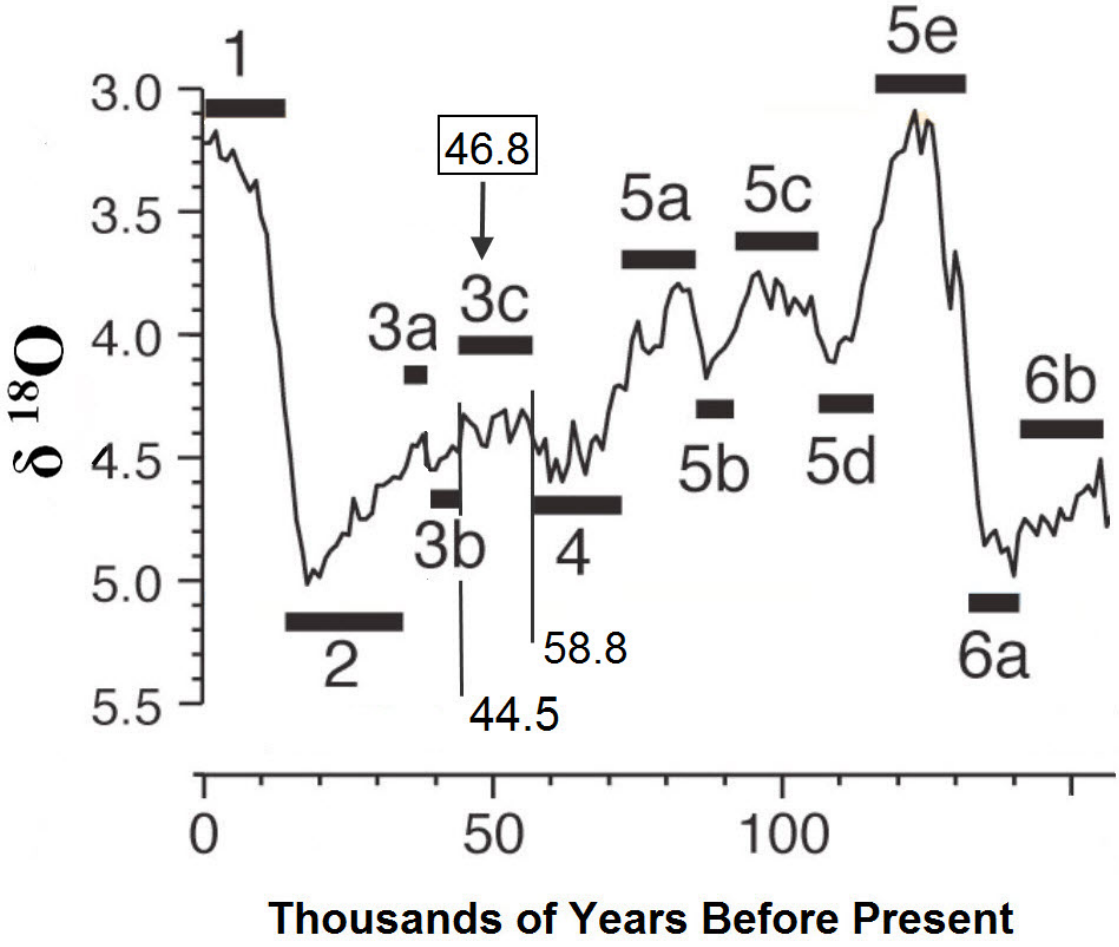
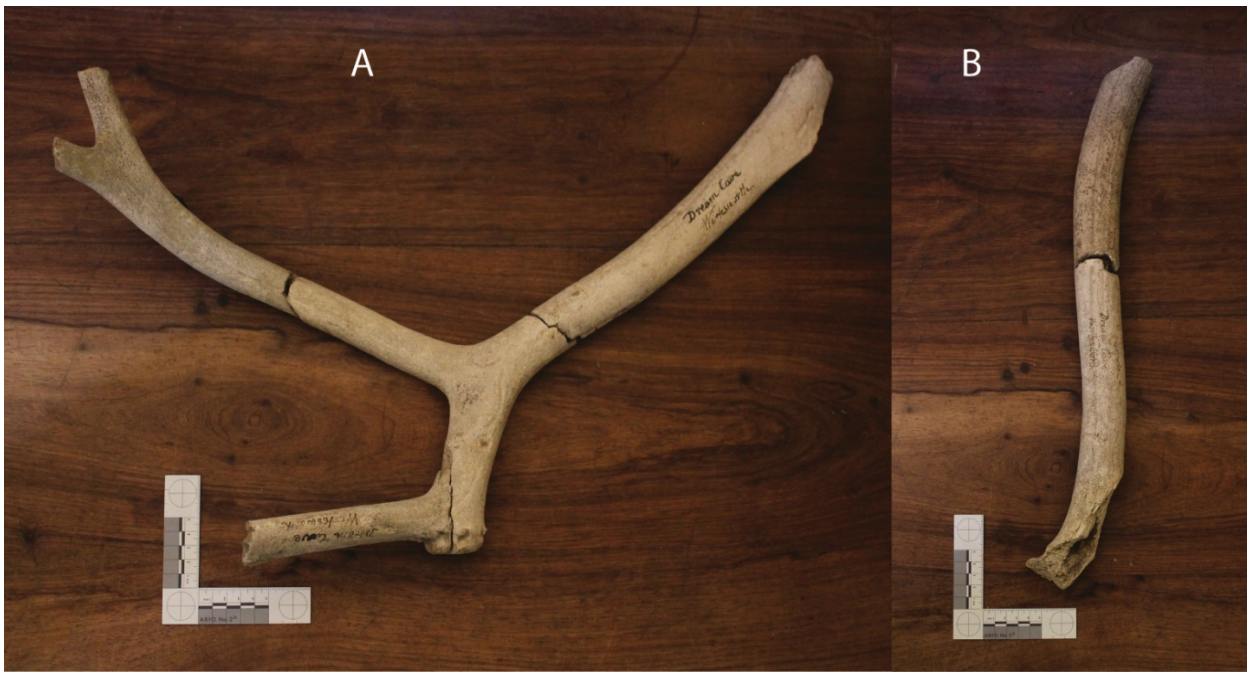

1
2
3a
3b
3c
4
5a
5b
5c
5d
5e
6a
6b
46.8
58.8
44.5
3.0
3.5
4.0
4.5
5.0
5.5
δ 18O
0
50
100
Thousands of Years Before Present

Figure 7



Appendix 1. Dream Cave osteological material in the Oxford University Museum of Natural History collections. Bovine material follows existing labelling, but is not diagnostic to separate *Bos primigenius* from *Bison priscus*.

Registration_Number	Species_Name	Nature_of_Specimen
Q.1511	Coelodonta antiquitatis	Near complete skeleton
Q.1511/1a	Coelodonta antiquitatis	Anterior part of skull and nasal septum
Q.1511/1b	Coelodonta antiquitatis	Posterior part of skull
Q.1511/1c	Coelodonta antiquitatis	Skull fragment
Q.1511/1d	Coelodonta antiquitatis	Skull fragment
Q.1511/1e	Coelodonta antiquitatis	Skull fragment
Q.1511/1f	Coelodonta antiquitatis	Skull fragment
Q.1511/1g	Coelodonta antiquitatis	Skull fragment
Q.1511/1h	Coelodonta antiquitatis	Skull fragment
Q.1511/1i	Coelodonta antiquitatis	Skull fragment
Q.1511/1j	Coelodonta antiquitatis	Skull fragment
Q.1511/1k	Coelodonta antiquitatis	Skull fragment (maxilla)
Q.1511/1l	Coelodonta antiquitatis	Skull fragment (maxilla)
Q.1511/1m	Coelodonta antiquitatis	Skull fragment (maxilla)
Q.1511/2	Coelodonta antiquitatis	Right upper premolar IV

Q.1511/3	Coelodonta antiquitatis	Right upper molar II
Q.1511/4	Coelodonta antiquitatis	Left upper molar I
Q.1511/5	Coelodonta antiquitatis	Left upper molar II
Q.1511/6	Coelodonta antiquitatis	Left upper molar III
Q.1511/7	Coelodonta antiquitatis	Right mandible with molars I, II, III
Q.1511/8	Coelodonta antiquitatis	Left mandible with molars I, II
Q.1511/9	Coelodonta antiquitatis	Left lower molar III
Q.1511/10	Coelodonta antiquitatis	Atlas
Q.1511/11	Coelodonta antiquitatis	Axis
Q.1511/12	Coelodonta antiquitatis	3rd cervical vertebra
Q.1511/13	Coelodonta antiquitatis	4th cervical vertebra
Q.1511/14	Coelodonta antiquitatis	Cervical vertebra
Q.1511/15	Coelodonta antiquitatis	Thoracic vertebra
Q.1511/16	Coelodonta antiquitatis	Thoracic vertebra
Q.1511/17	Coelodonta antiquitatis	Thoracic vertebra
Q.1511/18	Coelodonta antiquitatis	Thoracic vertebra
Q.1511/19	Coelodonta antiquitatis	Last thoracic vertebra
Q.1511/20	Coelodonta antiquitatis	1st lumbar vertebra
Q.1511/21	Coelodonta antiquitatis	2nd lumbar vertebra
Q.1511/22	Coelodonta antiquitatis	3rd lumbar vertebra
Q.1511/23	Coelodonta antiquitatis	4th lumbar vertebra

Q.1511/24	Coelodonta antiquitatis	5th lumbar vertebra
Q.1511/25	Coelodonta antiquitatis	Sacrum
Q.1511/26	Coelodonta antiquitatis	Rib
Q.1511/27	Coelodonta antiquitatis	Left scapula - proximal end
Q.1511/28	Coelodonta antiquitatis	Right humerus
Q.1511/29	Coelodonta antiquitatis	Left humerus
Q.1511/30	Coelodonta antiquitatis	Right radius - distal end
Q.1511/31	Coelodonta antiquitatis	Left radius
Q.1511/32	Coelodonta antiquitatis	Right ulna
Q.1511/33	Coelodonta antiquitatis	Left ulna
Q.1511/34	Coelodonta antiquitatis	Right scaphoid
Q.1511/35	Coelodonta antiquitatis	Left scaphoid
Q.1511/36	Coelodonta antiquitatis	Right lunar
Q.1511/37	Coelodonta antiquitatis	Left lunar
Q.1511/38	Coelodonta antiquitatis	Left cuneiform
Q.1511/39	Coelodonta antiquitatis	Left magnum
Q.1511/40	Coelodonta antiquitatis	Right unciform
Q.1511/41	Coelodonta antiquitatis	Left unciform
Q.1511/42	Coelodonta antiquitatis	Right metacarpal II
Q.1511/43	Coelodonta antiquitatis	Left metacarpal II
Q.1511/44	Coelodonta antiquitatis	Left phalanx II

Q.1511/45	Coelodonta antiquitatis	Right metacarpal III
Q.1511/46	Coelodonta antiquitatis	Left metacarpal III
Q.1511/47	Coelodonta antiquitatis	Right phalanx III
Q.1511/48	Coelodonta antiquitatis	Right phalanx III
Q.1511/49	Coelodonta antiquitatis	Right metacarpal IV
Q.1511/50	Coelodonta antiquitatis	Left metacarpal IV
Q.1511/51a	Coelodonta antiquitatis	Right ilium - main piece
Q.1511/51b	Coelodonta antiquitatis	Right ilium - fragment
Q.1511/51c	Coelodonta antiquitatis	Right ilium - fragment
Q.1511/52	Coelodonta antiquitatis	Left ilium - part
Q.1511/53a	Coelodonta antiquitatis	Right femur - head
Q.1511/53b	Coelodonta antiquitatis	Right femur - fragment
Q.1511/53c	Coelodonta antiquitatis	Right femur -distal end
Q.1511/54	Coelodonta antiquitatis	Left femur - head
Q.1511/55	Coelodonta antiquitatis	Right patella
Q.1511/56	Coelodonta antiquitatis	Left patella
Q.1511/57	Coelodonta antiquitatis	Right tibia
Q.1511/58	Coelodonta antiquitatis	Left tibia
Q.1511/59	Coelodonta antiquitatis	Right astragalus
Q.1511/60	Coelodonta antiquitatis	Left astragalus
Q.1511/61	Coelodonta antiquitatis	Right calcaneum

Q.1511/62	Coelodonta antiquitatis	Left calcanueum
Q.1511/63	Coelodonta antiquitatis	Right navicular
Q.1511/64	Coelodonta antiquitatis	Right cuboid
Q.1511/65	Coelodonta antiquitatis	Left cuboid
Q.1511/66	Coelodonta antiquitatis	Right metatarsal II
Q.1511/67	Coelodonta antiquitatis	Right astragalus
Q.1511/68	Coelodonta antiquitatis	Right metatarsal III
Q.1511/69	Coelodonta antiquitatis	Left metatarsal III
Q.1511/70	Coelodonta antiquitatis	Right phalanx III
Q.1511/71	Coelodonta antiquitatis	Left phalanx II
Q.1511/72	Coelodonta antiquitatis	Left phalanx III
Q.1511/73	Coelodonta antiquitatis	Right metatarsal IV
Q.1511/74	Coelodonta antiquitatis	Left metatarsal IV
Q.7755	Bos primigenius	Partial skeleton of juvenile
Q.7755/1	Bos primigenius	Atlas
Q.7755/2	Bos primigenius	Lumbar vertebra
Q.7755/3	Bos primigenius	Neural spine
Q.7755/4	Bos primigenius	Right humerus
Q.7755/5	Bos primigenius	Right ulna
Q.7755/6	Bos primigenius	Right radius
Q.7755/7	Bos primigenius	Partial left radius
Q.7755/8	Bos primigenius	Right metacarpal
Q.7755/9	Bos primigenius	Left metacarpal
Q.7755/10	Bos primigenius	Right pubis
Q.7755/11	Bos primigenius	Head of right femur
Q.7755/12	Bos primigenius	Left femur
Q.7755/13	Bos primigenius	Right tibia
Q.7755/14	Bos primigenius	Left tibia
Q.7755/15	Bos primigenius	Right metatarsal

Q.7755/16	Bos primigenius	Right calcaneum
Q.7755/17	Bos primigenius	Phalanx
Q.7755/18	Bos primigenius	Partial head of left humerus
Q.7756/1	Bos primigenius	Left calcaneum
Q.7756/2	Bos primigenius	Left scaphocuboid
Q.7757	Bos primigenius	Right magnum
Q.7758	Bos primigenius	Partial ?scaphocuboid
Q.7759	cf. Bos	Rib - 1st left
Q.7760	cf. Bos	Rib - probably 4th left
Q.7761	Large mammal indet.	Rib
Q.7762	Large mammal indet.	Rib
Q.7763	Large mammal indet.	Rib
Q.7764	Large mammal indet.	Rib
Q.7765	Large mammal indet.	Rib
Q.7766	Large mammal indet.	Rib
Q.7767	Large mammal indet.	Rib
Q.7768	Large mammal indet.	Rib
Q.7769	Rangifer tarandus	Basal antler fragment - left
Q.7770	Rangifer tarandus	Antler fragment
Q.7771/1	Rangifer tarandus	Basal antler fragment - ? right
Q.7771/2	Rangifer tarandus	Basal antler fragment - ? right
Q.7771/3	Rangifer tarandus	Antler fragment - ? right
Q.7771/4	Rangifer tarandus	Antler fragment - ? right
Q.7772/1	Rangifer tarandus	Basal antler fragment ? right
Q.7772/2	Rangifer tarandus	Antler fragment - ? right
Q.7773	Rangifer tarandus	Antler fragment
Q.7774	Rangifer tarandus	Basal antler fragment
Q.7775	Rangifer tarandus	Antler fragment
Q.7776	Rangifer tarandus	Antler fragment
Q.7777	Rangifer tarandus	Antler fragment
Q.7778	Rangifer tarandus	Antler fragment
Q.7779	Rangifer tarandus	Antler fragment
Q.7780	Rangifer tarandus	Antler fragment
Q.7781	Equus sp.	Right radius