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Reassessing the diet of Upper Palaeolithic humans from Gough's Cave and Sun Hole, Cheddar Gorge, Somerset, UK

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ABSTRACT

Richards et al. (2000) reconstructed the diet of the human remains found in Gough's and Sun Hole Cave through isotope analysis. They concluded that these people consumed an entirely terrestrial-based diet. Their reconstruction was based upon comparison of the results from human bones with those from a very small number of associated animals. The diets of the Gough's and Sun Hole Cave human were different from the other six Upper Palaeolithic humans from the British Isles for which dietary information has been obtained through isotope analysis. The work of Richards et al. (2000) suggests that they were the only ones for whom marine or freshwater resources did not play a significant role in their diets. We test this through further analyses of faunal remains from Gough's Cave, Sun Hole and other contemporary sites (Kent's Cavern, Aveline's Hole, Kendrick's Cave). Despite the limited faunal sample, the original palaeodietary reconstruction is broadly consistent with our findings. The isotope values of the main protein sources consumed by the humans from both sites are consistent with those of red deer and bovines, and, for a single individual, with that of horse and red deer. Reindeer was postulated in the original reconstruction as a potential food source, but this seems very unlikely based on our isotope reconstruction and the archaeological remains.

1. Introduction

The analysis of carbon and nitrogen isotopes from bone collagen is a widely established technique for reconstructing the diets of ancient humans and animals (Bocherens et al., 1995; Schwarcz and Schoeninger, 1991; Richards and Hedges, 1999; Privat et al., 2002; Pearson et al., 2007). However, within the last ten years, a number of studies have demonstrated that analysis of a significant number of contemporaneous animal species is necessary if one is to reconstruct confidently human palaeodiets. This is because there is significant isotopic variability within populations (Stevens et al., 2006; Bocherens and Drucker, 2006), derived from climatic and environmental influences (Richards and Hedges, 2003; Stevens and Hedges, 2004; Hedges et al., 2004; Bump et al., 2007; Murphy and Bowman, 2006; Stevens et al., 2008). In this paper, we reassess previous dietary reconstruction of Gough's Cave and Sun Hole humans considered in Richards et al. (2000). Their reconstruction was based upon comparison of the results from human bones with those from just five associated animals; one red deer (*Cervus elaphus*), two horses (*Equus ferus*), one wild cattle (cf. *Bos primigenius*), and one Arctic fox (*Alopex lagopus*)(Fig. 1). Richards et al. (2000) restricted their isotope analysis to fauna that had been previously radiocarbon dated on the basis that $\delta^{15}N$ results from the Oxford Radiocarbon Database were highly variable over the Lateglacial to Holocene transition. Subsequent research has shown that in Northwest Europe faunal $\delta^{15}N$ values are depleted during the Lateglacial relative to those from the Holocene (Richards and Hedges, 2003; Stevens and Hedges, 2004).

To date, stable isotopes have been used to provide information relevant to the dietary adaption of eleven Upper Palaeolithic humans from the British Isles. Marine or freshwater protein has been reported to be a significant part of the diets of five of these individuals (Paviland $n = 1$, Kendrick's Cave $n = 4$ but MNI = 3), and to be a more minor part of the diet for a sixth individual (Eel point $n = 1$) (Richards, 2000; Richards et al., 2005; Schulting et al., 2005; Bocherens and Drucker, 2006). The humans from Gough's Cave and Sun Hole are the only Upper Palaeolithic humans from the British Isles that are reported to have consumed an entirely terrestrial-

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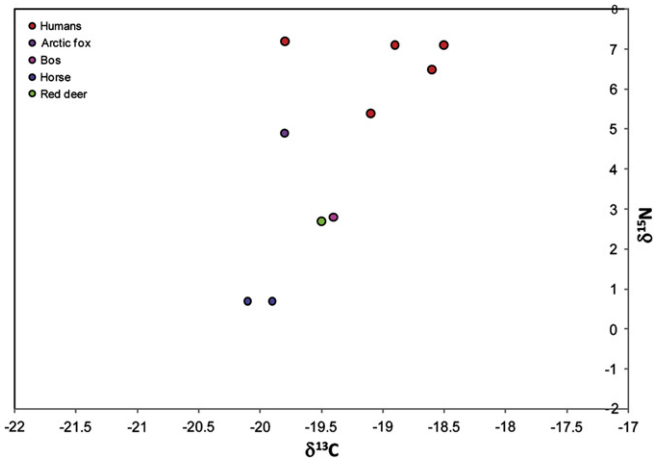

Fig. 1. Human and faunal carbon and nitrogen isotope signatures from Gough's Cave and Sun Hole Cave from Richards et al. (2000) (Redrawn).

based diet (Richards et al., 2000). They concluded that the protein consumed by these humans was sourced primarily from terrestrial herbivores, mainly red deer and wild cattle, and possibly reindeer (*Rangifer tarandus*) rather than horse. For the reasons outlined above, it is essential to re-evaluate this interpretation through further analyses.

Gough's Cave is part of a large cave-system situated on the southern side of Cheddar Gorge in the Mendip Hills of south-west England (NGR: ST 4670 5391) (Fig. 2). It is the lower part of a cave-system whose higher parts include Great Oone's Hole, Long Hole, and Gough's Old Cave (Jacobi, 2004). Numerous excavations have taken place at the site since the 1890s. Of cave-sites in the United Kingdom, occupied during the Later Upper Palaeolithic, Gough's Cave contained the largest sample of artefacts and associated faunal remains. The technology found at Gough's Cave belongs to the Magdalenian and very earliest stage of the succeeding *Federmessergruppen* industries. Tools found in the cave include "Cheddar" and "Creswell" points. Horses, followed by red deer, are the most abundantly represented fauna (Parkin et al., 1986). Reindeer remains are extremely limited and only present as artefacts – such as antler "*bâtons-percés*". The tooth eruption patterns of immature red deer from Gough's Cave suggest that the site was occupied in the winter. However, incremental banding of both red deer and wild horse teeth suggest a summer occupation (Beasley, 1987). Butchery cutmarks are found on many of the animal bones, indicating skinning, dis-memberment, filleting, and the removal of the lower limb tendons and ligaments (Parkin et al., 1986). Cutmarks were also found on the human bones, possibly indicating cannibalism or, alternatively, *post-mortem* removal of flesh (Currant et al., 1989).

Pollen analyses from Gough's Cave suggest a dry landscape, with a flora dominated by the Liguliflorae/Compositae sub-family including *Artemisia*, *Armeria*, and Chenopodiaceae (Leroi-Gourhan, 1986). Trees accounted for less than 10% of the pollen with the dominant species being *Betula*, *Alnus*, and *Corylus*. This suggests a largely open landscape but with some woodland in sheltered valleys. Although small amounts of pine pollen were found at Gough's Cave, it is likely to have been brought there by wind transport rather than being from local trees (Leroi-Gourhan, 1986). Although sedimentological analysis was carried out at Gough's Cave, few conclusions could be drawn about the environmental conditions in the region surrounding the cave (Collcutt, 1986).

Skeletal remains of four adults and one child from Gough's Cave were radiocarbon dated during the late 1980s and early 1990s. The radiocarbon determinations ranged from 12,380 ± 110 BP (OxA-2796) to 11,480 ± 90 BP[1] (OxA-2234) (Table 1). A recent research programme focusing on the re-dating Palaeolithic archaeological sites in western Europe using modern pre-treatment methods, including ultrafiltration, has produced a much more consistent and precise set of radiocarbon dates for the humans and fauna from Gough's Cave (Jacobi and Higham, 2009). This suggests that the previously dated samples may have been affected by various forms of contamination. Three human bones have now been re-dated and give ages ranging between 12,590 ± 50 (OxA 17849) and 12,485 ± 50 BP (OxA 17846). Humanly modified bones have also been re-dated. With one exception, the radiocarbon determinations gave ages ranging from 12,600 ± 80 (OxA-18035) to 12,415 ± 50 BP (OxA-17832). These dates are assumed to relate to the Magdalenian use of the cave. A single cut-marked red deer bone has given a slightly more recent age and tentatively been associated with a *Federmessergruppen* period occupation (12,245 ± 55 BP: OxA-18067). A full list of the human and animal bones which have been dated is given in Table 1.

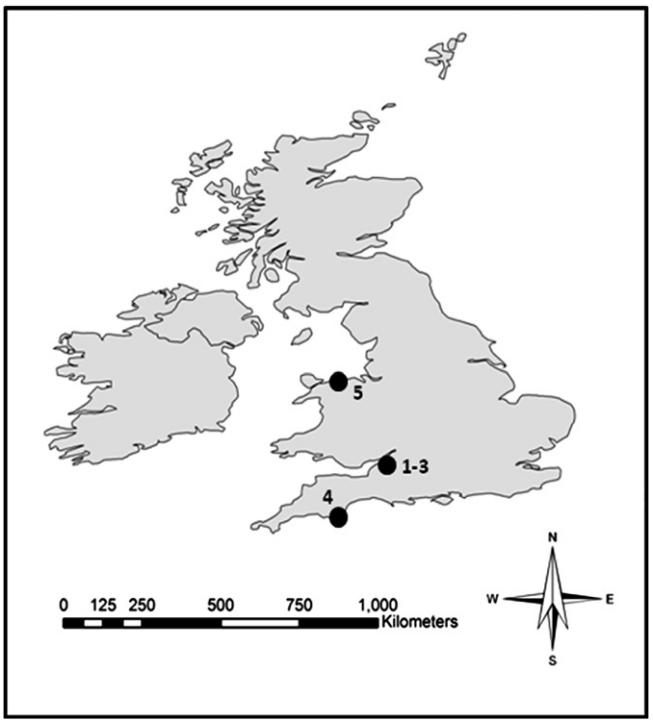

Fig. 2. Location of sites mentioned in text: 1 = Gough's Cave, 2 = Sun Hole Cave, 3 = Aveline's Hole, 4 = Kent's Cavern, 5 = Kendrick's Cave.

Sun Hole is a small fissure cave located on the north side of Cheddar Gorge almost opposite to Gough's Cave (NGR: ST 4673 5408) (Fig. 2). It was excavated in the late 1920s, early 1950s, 1968, and the late 1970s. Stratigraphic unit one at the site contained a small number of Later Upper Palaeolithic artefacts including diagnostic tools, similar to those from Gough's Cave. The Lateglacial fauna from this site included steppe pika (*Ochotona pusilla*), wolf (*Canis lupus*), brown bear (*Ursus arctos*), wild horse, reindeer and saiga antelope (*Saiga tatarica*) (Currant, in Collcutt et al., 1981); also small mammals. Some of the wild horse remains from Sun Hole are human food debris (Jacobi and Higham, 2009). In the 1980s a human ulna from Sun Hole was radiocarbon dated and gave an age of 12,210 ± 160 BP (OxA-535). This has now been re-dated to 12,620 ± 50 (OxA-19557) Three samples of wild horse from Sun Hole gave dates of 12,610 ± 90 (OxA-14766), 12,545 ± 55 (OxA-

[1] In this paper, ages BP are uncalibrated radiocarbon ages.