Comment on “Sedimentary DNA from a submerged site reveals wheat in the British Isles 8000 years ago”

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Smith et al. (Reports, 27 February 2015, p. 998) identify wheat DNA from an 8000-calendar-years-before-the-present archaeological site in southern England and conclude that wheat was traded to Britain 2000 years before the arrival of agriculture. The DNA samples are not dated, either directly or from circumstantial evidence, so there is no chronological evidence to support the claim.

Current understanding of the spread of agriculture across Europe indicates arrival in Britain about 6000 years ago, having taken about 2000 years to spread across central Europe and the English Channel from the Mediterranean (1). There is abundant evidence for the occurrence of early forms of wheat in Britain after 6000 calendar years before the present (cal yr B.P.), so the main claim of Smith et al.’s investigations at Bouldnor Cliff southern England, is the early date of about 8000 cal yr B.P. (2), rather than the discovery of wheat itself.

The samples examined for DNA (2) come from a monolith, S308, collected “from a location at the site” [p. 999 in (2)], or “in the proximity MS-08 and MS-05, which were adjacent to each other” [p. 4 in the supplementary materials (SM) for (2)]. Nowhere in the Report is there any mention of a measurement between S308 and other monoliths, either horizontally or vertically. It is not clear how much time elapsed between the collection of the dated monoliths and S308. All the radiocarbon dating was carried out on monoliths other than S308 (table S1 in the SM for (2)). No information is provided on other analyses that would provide a firm link between the DNA analyses of S308 and any sample of the dated monoliths. Sedimentary analyses were carried out on the other monoliths (3) and might easily have been applied to S308 to provide a link even if, for some reason, it was not possible to obtain a radiocarbon date directly from the sediment matrix (within which the wheat DNA was obtained) of S308.

The stratigraphic section for Bouldnor Cliff [figure 1B in (2)] shows a complex series of coastal sediments, dipping into a channel. This raises the possibility that samples taken later, even if at the same measured location (horizontal and vertical) as the originals, might have come from a stratigraphically different part of the sequence, depending on accuracy and precision of both horizontal and vertical measurements, as well as allowance for erosion between the dates of sample collection. There are also inconsistencies in the presentation of the stratigraphy, including the relative extents of monoliths MS-04 and MS-07 [separated by a gap in figure 1B in (2) but contiguous in figure S2 in the SM for (2)]. Reference material is made to a paleosol, which might incorporate material from a wide range of ages.

The only evidence for wheat at the site comes from DNA. There are no wheat macrofossils or wheat pollen in the samples. The contention is that this indicates that the wheat did not come from nearby agriculture (2). However, whenever the wheat was incorporated in the sediment (from nearby agriculture or trading), it must have been associated with macrofossil remains, such as wheat grains. Both hazel and alder macrofossils (but not DNA) were found in or near S308 (2), so it is curious that no trace of wheat remains have been found. There are inconsistencies in the DNA—even after the phylogenetic intersection analysis (PIA)—including the presence of DNA from animals known in the mid-Holocene only from regions far removed from southern Britain, such as Ursus maritimus (polar bear, Arctic) and Cervus nippon (Sika deer, East Asia), and from tropical grasses (Panicoideae). These suggest that some false positives are coming through PIA or that the taxonomic precision indicated is inappropriate for the content of the database, which might be relevant to the age or origin of the wheat identification.

Given that S308 contains DNA of wheat, how might it have arrived there? There are a number of possibilities. The samples may be contemporaneous with the monoliths (2), so the wheat may have been traded from Europe, presumably all the way from the Mediterranean at 8000 cal yr B.P. (2). Alternatively, if the samples are actually much younger, the wheat may have been incorporated from nearby agriculture, perhaps from eroded soil, and ended up near to early Holocene samples through the vagaries of sedimentation in a complex channel and coastal situation. The latter is the more parsimonious view, in the absence of evidence to the contrary. Finally, the identification of the wheat DNA may be another false positive in the comparisons with database DNA.

The claim that wheat was being traded to Britain at 8000 cal yr B.P. has substantial implications for understanding of the archaeology of northwest Europe in the early postglacial period. Such a claim can be readily substantiated by dating the sediment matrix of the samples directly. A claim based on undated samples, lacking any incontrovertible link to dated samples, is insufficient to overturn current understanding.

REFERENCES AND NOTES

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