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Palaeoclimate and palaeohydrology of a mid-Pleistocene hominin site at Boxgrove, southern England, from palaeoecological and geochemical analyses of ostracods

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An understanding of hominin evolution and distribution requires knowledge of the physical and biotic environment in which the species lived. Although large-scale reconstructions using, for example, marine sediments provide a valuable environmental context for hominin evolution, they must be complemented by smaller-scale, site-specific environmental investigations from localities close to where the hominin remains have been found. We used a novel combination of ostracod-based palaeoecological and geochemical data to reconstruct environmental conditions at Boxgrove, an important Palaeolithic site in southern England. At Boxgrove, high sea level towards the end of the Cromerian Complex led to the deposition of the shallow-marine Slindon Sand Member, which is overlain by sediments of the Slindon Silt Member deposited initially in a regressive sea and ultimately in a series of streams and shallow spring-fed ponds ('Pond Facies') on the abandoned coastal plain, associated with which is evidence of hominin activity. We present faunal and geochemical evidence from 'Pond Facies' ostracods for palaeoenvironments during the time of hominid occupation. Ostracod Sr/Ca and Sr-isotope measurements are consistent with a water source derived from the Upper Chalk with negligible marine influence. Mutual Ostracod Temperature Range (MOTR) air-temperature estimates for the Slindon Silt Member are $\sim$0

and 17.5 ˚C for January and July respectively (cf. $\sim$6 and 16 ˚C, respectively, today). δ^{18}O values from ostracod shells reflect the isotopic composition of pond water and water temperature, together with vital offsets from isotopic equilibrium.gδ^{18}O values of water in short-resident-time spring-fed ponds generally reflect δ^{18}O values in precipitation, which correlates with air temperature in mid-latitude areas. The δ^{18}O values from shells of *Candona neglecta* from the Slindon silts suggest a water isotope composition similar to, or up to about 2 $\%_{\text{,}}$ lower than, present values for a hypothetical pond in a similar setting, the exact value depending on seasonal water temperature regime and the timing of shell formation. Low Mg/Ca values in the ostracods allude to lower calcification temperatures compared with today, consistent with the MOTR temperature estimates. Preliminary results therefore suggest that the coastal plain was both colder and experienced greater seasonal temperature variation than present during the period of mid-Pleistocene human occupation, possibly associated with a general climatic downturn at the end of the Cromerian.