
Relict traditions: Techno-typological analysis, direct radiocarbon dating and protein mass spectrometry of biserial harpoons from Denmark suggest Palaeolithic traditions continued into the Holocene

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Abstract

The transition from the Late Palaeolithic to the Early Mesolithic in Denmark, was marked not only by a shift in climate but also a change in material culture. The most common remains encountered on archaeological sites are flints, while organic materials dating to these periods are exceedingly rare, but not unknown. Of the organic artefacts assumed to belong to the Late Glacial Ahrensburgian period, a characteristic type are the biserial harpoon projectile points made from bone or antler. Through chrono-typological comparison with finds in more southern areas, they are thought to be of Late Glacial age. However, this hypothesis remains untested. We, therefore, carried out a series of analyses on five such artefacts from Denmark to unravel their biographies. Firstly, we performed an in-depth techno-typological analysis of the artefacts. Secondly, each was directly radiocarbon dated to allow each to be firmly placed in chronological sequence. Lastly, we identified the species chosen for their manufacture through protein mass spectrometry (ZooMS and LC-MS/MS). The technological and typological assessment shows a close affinity for all artefacts to the Palaeolithic Ahrensburgian tradition, despite the AMS results showing that they date well into the Preboreal. The species utilized for the raw material for four of the five artefacts were of the elk (*Alces alces*), and the last and chronologically youngest was identified as being made from reindeer (*Rangifer tarandus*). This late date for the species in this region may indicate that the animal used may have been among the last, relict individuals present in the region prior to local extinction. Overall, these results indicate a delay in cultural change

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amongst certain groups of hunter-gatherers and potentially the coexistence of hunter-gatherer groups of Palaeolithic and Mesolithic tradition and the exploitation of the same species in Denmark during the Preboreal.

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