

Dental macrowear analysis of the Neanderthal mandible Bourgeois-Delaunay 1 (Charente, Southwestern France)

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Neanderthals are characterized by large anterior teeth relative to the posterior dentition, with a distinctive morphology marked by robust crowns, strong shovelling, labial convexity, presence of a lingual tubercle and by a high level of wear [1]. The latter is often cited as one of the main pieces of evidence indicating the use of teeth as tools for daily task activities. Such interpretation is based on ethnographic studies from Inuit and Australian Aboriginal populations. The repetitive use of the anterior dentition could have led to a change of the cranio-mandibular morphology, as proposed by the anterior dental loading hypothesis [1], resulting in the unique Neanderthal cranio-facial anatomy.

The aim of this study is to examine tooth macrowear patterns of the Neanderthal mandible of Bourgeois-Delaunay 1 (BD1) to obtain information about its chewing behaviour and its diet, in combination with dental tissue proportions and cortical bone distribution. The remains of BD1 were recovered in 1967 from layer 12 of Bourgeois-Delaunay cave shelter located in the final Middle to initial Late Pleistocene site complex of La Chaise-de-Vouthon (Southwestern France). The mandible, with complete and well-preserved dental crowns, has been dated between 127 and 116 ka (Marine Isotope Stage 5e) and it has been associated with temperate fauna [2]. To shed light on BD1 masticatory behaviour, we employ the occlusal fingerprint analysis method [3], a digital approach based on the identification and measurement of occlusal wear facets, enabling to decode information about diet and cultural habits of the individual. We combined the macrowear results with published enamel and cortical bone thickness data of BD1 [4]. BD1 is characterized by a greater level of wear in the anterior teeth relative to its posterior dentition, which follows the typical Neanderthal pattern [1]. Moreover, a detailed examination of premolars and molars reveals the presence of larger dentine exposures and larger enamel wear facets on the left side, suggesting that the left part of the mandible was the preferred chewing side of BD1. The dental tissue proportions are equally distributed between the left and the right antimeres, without a clear asymmetric pattern. However, a slight right dominance in cortical bone thickness is found at M1/M2 and M2/M3 levels [4]. The discrepancy between asymmetric wear and cortical bone distribution could be partially due to the balancing movements that occur in the non-working side of the mandible during mastication.

Furthermore, a comparative analysis of the relative wear areas of the right second molar places BD1 in the deciduous woodland ecogeographic distribution, which is compatible with a diet consisting of meat and plant foods [5]. This agrees with the temperate fauna associated with BD1 [2].

Future studies are needed to better understand if the unique Neanderthal cranio-dental morphology represents an adaptation to resist high mechanical loadings due to tooth-tool uses.

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