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ABSTRACT BOOK

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Plio-Pleistocene barnacles and barnacle-rich facies for high-resolution palaeonvironmental reconstructions

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We investigate the use of sessile barnacles as a robust palaeoenvironmental proxy. Their ubiquitous presence in nearshore environments, coupled with the composition of their shells consisting of diagenetically stable low-Mg calcite, makes them particularly promising for such analyses. Moreover, their rapid growth rate allows the recording of short-term variations.

We present analyses conducted on specimens collected from various Pliocene and Pleistocene Italian barnacle-rich deposits. Employing a new approach integrating sedimentology, taphonomy, stable isotope geochemistry, and detailed comparisons with modern counterparts, we demonstrate the efficacy of barnacles in palaeoenvironmental reconstructions. Our findings reveal a barnacle diversity peaking in shallow, nearshore waters and diminishing offshore. This spatial gradient offers valuable insights into water depth and proximity to the coastline. Taphonomic observations highlight distinct preservation patterns, with well-preserved specimens predominantly found in protected areas, contrasting with less pristine specimens in high-energy environments. Notably, the presence or absence of opercular plates serves as a useful indicator of the prevailing hydrodynamic conditions. Regarding C and O isotope analyses, due to the porous and coarse-grained nature of the deposits in which barnacle remains are usually found, the shells are often exposed to meteoric water percolation during diagenesis. On the other hand, specimens sourced from fine-grained substrates exhibit minimal alteration and isotopic ratios consistent with their modern counterparts. Intra-shell variations observed in these fossils reflect patterns similar to those observed in modern barnacles and indicative of short-term environmental fluctuations, such as seasonal cycles.

Our study underscores the enduring utility of barnacles in detailed palaeoenvironmental reconstructions based on skeletal assemblages and their suitability as proxies for palaeoseasonality.