

## How well is *Patella vulgata* Linnaeus 1758 reflecting changes in sea surface temperatures (SST)? First results using living and archaeological samples from Northern Spain

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Human populations have been exploiting coastal regions in different parts of the planet, at least since the Middle Palaeolithic. In Cantabrian Spain, the study of the exploitation of molluscs and shell middens formation during the late Pleistocene and early Holocene has shown the importance of these resources in human diets, being one of the most commonly collected species the limpet *Patella vulgata* which is present from the upper Palaeolithic to the Neolithic (ca. 40,000-5700 cal BP).

In recent years, the application of geochemical techniques on carbonate materials has yielded significant results in palaeoclimate and archaeological research. Variations in stable oxygen isotopes in seawater can be recorded in shell carbonates of many gastropod and bivalve molluscs and can be used as useful indicators of temperature fluctuations. Moreover, as marine molluscs form their shells daily by precipitating carbonate along different line growths, they are also used to determine the season of death. In this study, we performed stable oxygen and carbon isotope analyses on *P. vulgata* shells from archaeological sites of Northern Spain with two main objectives: (1) the reconstruction of the evolution of sea surface palaeotemperatures from before the last glacial maximum to the mid-Holocene (ca. 40,000-5700 cal BP) and (2) the study of subsistence strategies and mobility and settlement patterns of the hunter-gatherers. Thus, thanks to the seasonal climatic variations that *P. vulgata* reflects, information can be obtained about the times when the molluscs were gathered. It is equally possible to determine whether the climate changes have influenced the subsistence and social strategies used by human groups over time.

This work presents preliminary results of the palaeoclimate reconstruction. For this purpose, we took a total of 174 powdered samples from the inner surface of the marginal part of *P. vulgata* shells (where the last growth lines precipitate) recovered in 36 stratigraphic units from archaeological sites of different ages in Northern Spain. Samples were then analysed in a Finnigan MAT 251 mass-spectrometer to obtain the stable carbon and oxygen isotope values. For comparison, we also analysed 48 samples of living specimens collected monthly along two years (2005 and 2006) in order to identify seasonal variations in sea surface temperature. Results show that archaeological *P. vulgata* specimens reflect important temperature differences (ca. 30,000-5700 cal BP) between Palaeolithic samples (colder conditions) and Mesolithic and Neolithic ones (warmer). They also show a good correspondence with global palaeoclimate curves obtained in Greenland ice cores (GRIP and GISP2).