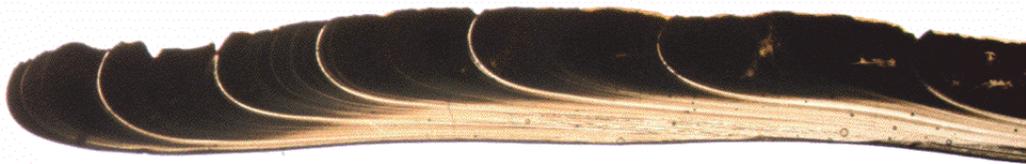
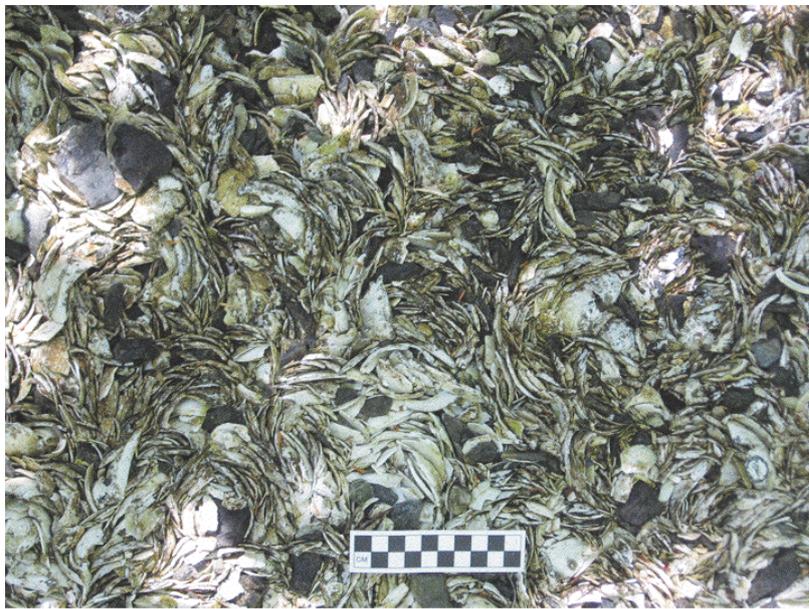


Stable Isotopes in Archaeological Midden Shells: High-Resolution Paleoclimatic & Paleoenvironmental Archives



Photographs courtesy of Meghan Burchell

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Prehistoric Shellfish Exploitation in a Mediterranean Coastal Environment: Oxygen Isotope Analyses on Intertidal Gastropods From NW Sicily

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In the Mediterranean region shellfish exploitation started in the Middle Palaeolithic and increased significantly in the Upper Palaeolithic. Numerous prehistoric cave deposits in coastal NW Sicily have preserved substantial evidence for the exploitation of marine molluscs, starting from the Upper Palaeolithic (ca. 12,500 BP) and continuing up to the Neolithic (ca. 6,800 BP). The main species recovered from these sites and exploited as food resources are intertidal marine gastropods, such as limpets (*Patella*) and topshells (*Osilinus* sp.). There is very limited evidence for the consumption of intertidal or shallow water bivalves in the prehistoric Sicilian sites. The shellfish assemblages from these sites offer the opportunity to investigate the role of marine resources in the diets of coastal Mediterranean hunter-gatherers, from the final stages of the Pleistocene to the mid-Holocene, when an agro-pastoral economy was adopted.

The main objectives of the present project are to study the patterns of mollusc exploitation within each cultural phase (both within individual sites and between sites), to verify whether changes in shellfish exploitation occurred between different cultural phases and to determine whether changes in exploitation strategies were caused by environmental changes or by changes in human subsistence strategies. It was therefore decided to adopt an approach that would combine traditional zooarchaeological investigations of the shellfish assemblages, with isotopic studies of the molluscs, backed by present-day ecological surveys. The opportunity of undertaking isotope analyses for determining season of shellfish collection could provide valuable information on the periodicity of site occupation and on site function, potentially throwing light on more complex issues such as hunter-gatherer mobility and territoriality.

To address these issues, data from a sufficiently high number of sites and layers, relating to different cultural episodes, is required. It was therefore necessary to use a species that could yield sufficiently accurate estimates of season of collection, by adopting a relatively straightforward sampling technique. Taking into account the ecology, biology, shell growth and oxygen isotope fractionation of the Mediterranean intertidal mollusc taxa present in Sicilian middens, it was decided to use *Osilinus turbinatus* (Born) as a paleo-seasonality indicator. In order to verify the suitability of *O. turbinatus* for $\delta^{18}\text{O}$ analysis, studies of shell growth have been undertaken at four shores in northern Sicily. The results of these surveys attest that growth occurs in every season, albeit at varying rates through the year. In addition, shells at these shore localities were collected on a monthly basis and sampled at the growing edge for $\delta^{18}\text{O}$. The results of these analyses confirm that isotope fractionation in *O. turbinatus* from NW Sicily occurs in equilibrium with seawater and that intra-annual discrimination of seasonal fluctuations can be obtained using this species. $\delta^{18}\text{O}$ analyses have been undertaken on archaeological shells from nine sites: another eight other sites are currently being analyzed. The results from the archaeological specimens confirm the reliability of *O. turbinatus* as a paleoenvironmental indicator, as they appear to track broadly the temperature variations that occurred between the Late Pleistocene and the first few millennia of the Holocene.

$\delta^{18}\text{O}$ analyses on shells from different cave sites show that, in the Upper Palaeolithic and the early Mesolithic, shellfish collection occurred mainly during the coolest months of the year, and definitely not in the summer. Evidence from Grotta dell'Uzzo shows that the periodicity of shellfish exploitation changed through the Holocene as a result of transitions in hunter-gatherer subsistence strategies in the late Mesolithic and of the adoption of an agro-pastoral economy in the early Neolithic. $\delta^{18}\text{O}$ analyses have also been undertaken on shells in apparent association to burials, such as a sample of *O. turbinatus* that was recovered from Mesolithic levels ($8,159 \pm 37$ BP) at **Grotta d'Oriente, on the island of Favignana**. The extremely narrow range of $\delta^{18}\text{O}$ values obtained from these shells appears to suggest that their collection occurred within a short time and, possibly, even within the same day. The case studies presented will serve to discuss the potential and the constraints offered by $\delta^{18}\text{O}$ analysis on intertidal gastropods for targeting paleoecological and archaeological reconstructions.