PALAEO-DIETARY RECONSTRUCTION OF PREHISTORIC SETTLEMENT OF DISPILIO IN KASTORIA, NORTHERN GREECE

CHANTZI P.[1], DOTSIKA E.[1,2], GEORGIOU D.[1] and SAMARTZIDOU E.[1]

[1] Stable Isotope Unit, Institute of Nanoscience amd Nanotechnology, National Centre for Scientific Research. "Demokritos", 153 10 Agia Paraskevi, Attica, Greece, [2] Institute of Geosciences and Earth Resources, Via G. Moruzzi 1, 56124 Pisa, Italy.
E-mail: p.chantzi@inn.demokritos.gr

The prehistoric lake settlement of Dispilio located in Northern Greece at the southern part of Kastoria Lake about 7Km south of Kastoria town. Among the findings of the excavations except tools a significant quantity of animal bones remains were found. The stable isotope analysis of animal tissues is an established method to get into palaeoecological information (Dotsika *et al*., 2011). Therefore stable isotope analysis of carbon ($\delta^{13}C$) in fossil bone and teeth related to Dispilio archaeological site was performed as it constitutes a reliable technique to reconstruct palaeodietary habits.

The isotope analysis was performed in Stable Isotope Unit, Institute of Nanoscience and Nanotechnology, NCSR Demokritos, Greece with respect to the international standards and analytical precision about 0.1‰ for $\delta^{13}C$ results. In total 37 bone and teeth samples (M1, M2, M3, P2, P3 types) were subjected to established protocols in order to isolate the pure isotopic signal from bio-apatite $[Ca_9((PO_4)_{4.5}(CO_3)_{1.5}OH_{1.5}]$ extraction. All the samples had prior been subjected to elemental microanalysis spectrometer with energy dispersive X-ray (Energy Dispersive X-ray, EDX) in a scanning electron microscope (Scanning Electron Microscopy, SEM) in order to detect possible diagenetic episodes that could be responsible for altered isotopic signals.

The dietary habits determine the carbon content of organisms as proteins, lipids or carbohydrates. The form in which carbon is incorporated concerns organic (collagen) or inorganic (bio-apatite) compounds of an organism's tissues. When strong diagenetic episodes that could strongly affect isotope values are absent, bio-apatite extraction for isotopic analysis leads to reliable dietary information (Dotsika *et al*., 2011). SEM/EDX analysis resulted to un-contaminated samples highlighting the bio-apatite structure through the dominant presence of Ca, P elements. So the interpretation of data based on two major mechanisms that control the carbon isotope values: a) the photosynthetic pathway that plants use and b) isotopic fractionation governed by different biochemical characteristics. There are three photosynthetic pathways corresponding to terrestrial plants: C3 (Calvin plants), C4 (Hatch-Slack) and CAM (Crassulacean Acid Metabolism) (Raco *et al*., 2015). All three governed by different mechanism to incorporate carbon dioxide (CO_2) resulting to different $\delta^{13}C$ values. C4 plants generally range from –9‰ to -19‰ (O'Leary, 1988; Ehleringer and Monson, 1993) while for C3 plants typically range from -20‰ (open areas exposed to water stress) to -35‰ (closed canopy) (O'Leary, 1988; Ehleringer and Monson, 1993). The third photosynthetic pathway CAM presents $\delta^{13}C$ values between the end-members of C3 and C4 types. Moreover the fractionation between diet constituents and carbonate apatite ranges on average between +12‰ to +14‰ (Lee-Thorp *et al*., 1989; Cerling and Harris, 1999) more positive related to average diet.

^{13}C isotope analysis in carbonate structure of fossil teeth and bone samples (Figure 1) corresponding to three different animal species [Sus Scrofa (Wild boars), Capreolus capreolus (European roe deer) and Ursus (Bear)] ranged from -8‰ to -16‰ (mean value -12‰) for bone samples and from -9‰ to -13.2‰ (mean value -11.1‰) for teeth samples. Considering the above analysis about the setting of carbon isotope values it is concluded that C3 plant type mainly characterizes food consumption of animals in Neolithic settlement in Dispilio.

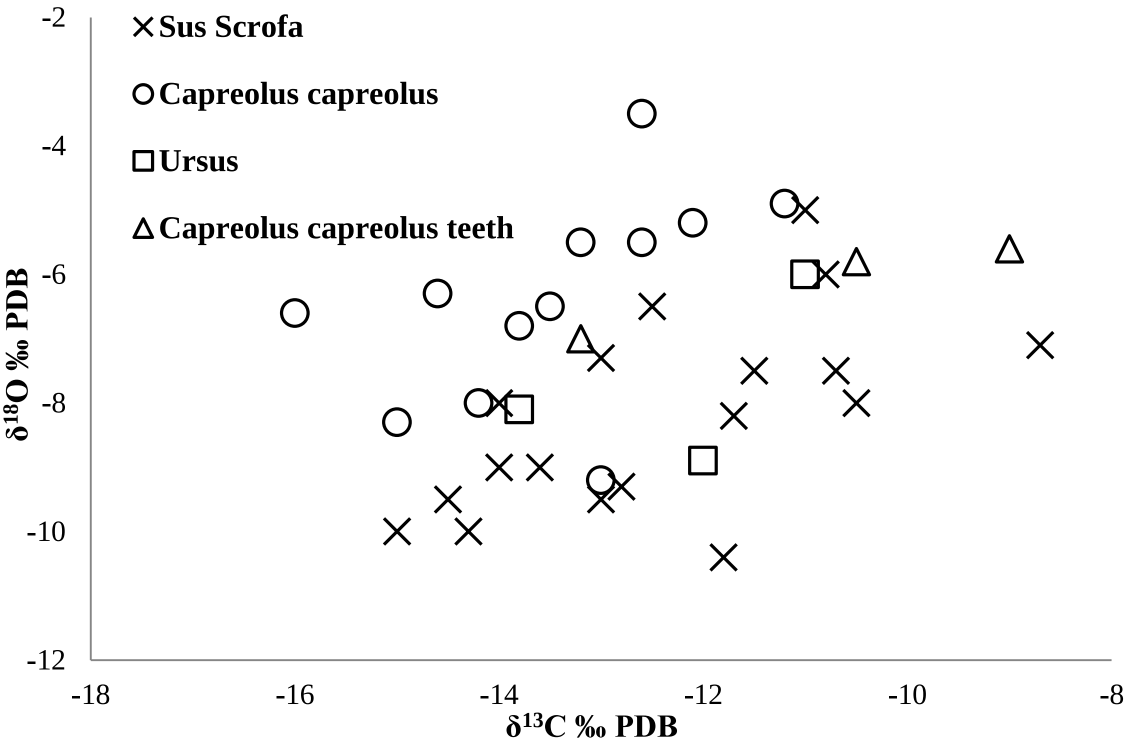

Figure 1: $\delta^{18}O$ versus $\delta^{13}C$ ‰ PDB values for fossil bone and teeth referring to Dispilio archaeological site

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