Dietary trends in early medieval Croatia as evidenced by stable isotope analysis

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Little is known about the diet of early medieval Croatian populations. Written sources talking about this topic are scarce, so most of the data are available from paleoontological studies or, in rare cases, from stable isotope analyses. The main aim of this study is to reconstruct the dietary patterns of the early medieval Croats based on nitrogen and carbon stable isotopes analysis, but also to examine if there are significant differences between the sites and between the sexes.

The series includes 30 human and one animal (sheep/goat) bone sample from five EM (6th-12th c. CE) sites located on the eastern Adriatic coast. The majority of individuals had δ13C values between −19.7% and −17.6% and δ15N values between 8.6% and 10.5%, which is consistent with a diet based primarily on terrestrial C3 resources with little or no marine or C4 input. Higher δ15N values in two adult individuals suggest the consumption of large amounts of high-trophic level protein, or of freshwater fish. Two other individuals, an adolescent and a 1.5-2.5 year old child, had high δ13C values, indicating the consumption of marine foods or a C4 resource such as millet. The young child also had an elevated δ15N value, so was probably consuming a C4 or marine-based weaning food whilst still breastfeeding. No differences were apparent between sites or between males and females in the analysed sample. These results provide us with new information on diet and lifestyle of individuals inhabiting eastern Adriatic during the Early Middle Ages.

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Male migration, family structure and children’s health in a seasonal agricultural community in Veracruz, Mexico

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Family structure is widely known to be associated with children's health and wellbeing. Controlling for a range of backgrounds factors, children experiencing family stability are most likely to have healthy outcomes on most measures. The aim of this study was to determine the effect of prolonged father absence due to economic migration on the nutritional status and health of his children. Research was conducted in Ocotepec, a small mestizo subsistence agricultural community with very low human development indices and high marginalization in Veracruz, Mexico. Families in Ocotepec rely, to a large extent on maize milpas for their year-long staple food supply, and on relatively small government cash transfers and variable remittances to pay for agricultural inputs and other purchased goods. Although women and children typically participate in agricultural activities, crop-management decisions and strenuous heavy workloads are men’s traditional responsibility. However, in nearly half the households, young men out-migrate in search of paid employment and are gone for most of the agricultural year with adverse consequences for their milpas’ productivity. Data on household food security, anthropometric indices (weight-for-height, height-for-age and weight-for-age) and acute illness frequency were compared for children aged 5-12 years in female vs. male-headed households. Results show complex associations between migration-related male absence, food production and children’s nutritional and health status. Higher purchasing power and relatively higher standards of living in households receiving male-earned remittances do not always compensate for the negative effects of male absence on food security in this community. Findings are discussed within a biosocial framework.

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Intestinal parasites of wild orangutans in Gunung Palung National Park, Borneo, Indonesia

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Parasitology is increasingly employed by field primatologists to better understand the ecology and health of wild primate populations. This study examined the intestinal parasites of wild Bornean orangutans in Gunung Palung National Park. Gunung Palung is relatively pristine orangutan habitat where many other orangutan sites consist of degraded secondary forest. As habitat disturbance and contact with humans are known to increase parasite infection...
Introductions

Little is known about the diet of early medieval Croatian populations. Written sources talking about this topic are scarce, so most of the data are available from palaeodietary studies or, in rare cases, from biochemical analyses of early medieval skeletal remains. Considering the importance of the subject but also the paucity of more comprehensive analyses dealing with this topic the primary aim of this study is to get a better intra- and inter-population-based perspective on the dietary patterns of inhabitants of early medieval Croatia based on nitrogen and carbon stable isotope analysis, but also to examine if there are significant differences between the studied sites and between the sexes and age groups.

Material and methods

The study is comprised of five rural sites (Dubravice, Stranče-Gorica, Korjnik polje-Livade, Omišalj-Mirine, and Vacići-Laduje) located on the eastern Adriatic coast and its hinterland (Fig. 1). These sites are dated to the early medieval (EM) period, i.e. between the 5th and 12th centuries CE, based on the radiocarbon dates, horizontal and vertical stratigraphy, and recovered artefacts (Cetinščič 2011; Caudefouly-Bully 2014; Gu giấcha 1987; Krmčević personal communication; Petrinčev 2006).

The complete skeletal series includes 142 individuals. The skeletons were sexed and aged using standard morphometric methods (Bukroš & Uskoković 1994; Scheuer & Black 2000). All adults were allocated to either ‘male’ or ‘female’ categories. Non-adults were divided into two age groups: IYC (infants, younger than 8 years), and OUC (older children/youths, 8-17 years) while adult individuals were assigned to a single age group. The study utilised 30 human bone samples representing slightly more than 20% of the total series: ten males, ten females and ten non-adults. One sheep/goat sample was also taken. RibS (n=15) and long bones (n=16) were targeted as the most appropriate skeletal elements for the analysis.

Collagen extraction was carried out at University College Dublin, and followed a modified Longin method (Longin 1971). Bone samples were demineralised in 0.1M HCl until soft and pliable, and then gelatinised in pH 2.4 water at 70°C for 48 hours. The resulting solution was filtered using Ezea Filters and then freeze dried. Collagen samples of approximately 0.5 mg were weighed and analysed in duplicate at the University of Bradford Stable Isotope Laboratory. Three samples were also analysed at Queen’s University Belfast in conjunction with radiocarbon dating.

All analysed samples yielded collagen of good macroscopic appearance, and had C/N ratios between 3.2 and 3.4 thus indicating good protein preservation (Table 1). The range of δ13C was between -17.7 and -15.9‰ (n=18,404.7‰) while the δ15N range was between 8.6 and 11.7‰ (n=9,810.8‰) (Fig. 2).

The mean C and N values for each separate site are presented in Table 2. When C and N mean values were compared by site the only significant difference was recorded in δ15N values between Dubravice and Korjnik polje (p=0.005, df=11, n=35), while all other sites exhibited almost identical values.

The δ15N (‰) values increased from -19.0 to -17.3‰ (n=18,404.4‰) while females’ ranged from -19.1 to -17.6‰ (n=18,540.4‰) (Fig. 3). Male and female δ15N values were between 8.7 and 11.7‰ (n=9,810.3‰), and 8.6 and 10.9‰ (n=9,751.7‰) respectively. The comparison between the sexes revealed that there are no significant differences between M and N values, i.e. both males and females exhibit very similar mean values.

In non-adult individuals δ15N values spanned between -19.7 and 15.9‰ (-18.414,1‰) while δ15N ranged from 8.5 to 11.7‰ (n=9,751.9‰) (Fig. 4). On the other hand, δ15N in adults were between -19.1 and -17.6‰ (n=18,404.4‰), and δ15N spanned from 8.7 to 11.1‰ (n=9,810.8‰). As seen from the presented data both C and N mean values in adults and non-adults are quite similar, and therefore no significant differences between these two categories were detected.

The stable isotope results suggest that diet was predominately based on terrestrial C3 resources, but with some input from C4 or possibly marine foods. Individuals of all sites appear to have relied on a similar range of dietary resources, however the lower δ15N values at Korjnik polje might indicate an individual who had a somewhat greater intake of plant related to animal proteins than was the norm at other sites.

Discussion and conclusion

The stable isotope results suggest that diet was predominately based on terrestrial C3 resources, but with some input from C4 or possibly marine foods. Individuals of all sites appear to have relied on a similar range of dietary resources, however the lower δ15N values at Korjnik polje might indicate an individual who had a somewhat greater intake of plant related to animal proteins than was the norm at other sites. Although the isotope data from most of the subadults plots within the same range as that from the adults, the subadult δ15N values are more varied and cover a wider range. This implies that diet was more varied among the subadults than the adults in particular, two subadult groups have different δ15N values, which suggests that they were following different diets. All these groups show higher δ15N values than the remainder of the individuals analyzed. It is also possible that this individual was consuming animal proteins from higher trophic levels rather than terrestrial. Two adult males from Vacići (MAR81 and V10A) are outliers to the rest of the adults as they have high δ15N values, which are probably the consequence of a greater animal protein intake than other individuals sampled, or of consuming animal protein from higher trophic levels. These two individuals are quite interesting as they were buried in two monumental stone sarcophagi together with a large number of grave goods (the Carolingian sword, Byzantine gold coin, a pair of battle axes, etc.), which strongly implies an elevated social status.

As already mentioned, written historic sources talking about the diet of EM Croatian populations are almost non-existent, therefore the only data on this topic are available from palaeodietary studies and/or rare biochemical analyses. For example, a study of elemental status (metal content) from bones of the EM inhabitants of Naklice conducted by Stuiver et al. (2010) suggests that the probable main dietary components were leafy vegetables, legumes and small amounts of cereals. Furthermore, a comprehensive palaeodietary study by Stuiver et al. (2010) indicates that the diet of the Croats was significantly different in comparison to the diet of late Roman populations inhabiting the same region, i.e. it was much more dependent on carbohydrates, mostly cereals. A similar hypothesis was proposed by Lufftott et al. (2012), based on their C and N stable isotope ratios obtained from four EM Croatian sites. δ13C and δ15N values in their EM samples were statistically different from those of the late Roman period inhabiting different diet. It seems that the diet of the EM individuals from this study included varying amounts of protein with high δ15N values, presumably milk while the Roman diet was more balanced (Lufftott et al. 2012).

The comparison of the results of the present study with those from the study by Lufftott et al. (2012) reveals that the EM Croats δ15N and δ13C values are almost identical, strongly suggesting a very similar, almost uniform, diet of the EM inhabitants of the eastern Adriatic coast and its hinterland with very few local peculiarities. This diet was predominately based on terrestrial C3 resources, with a varying input from C4 (probably millet), and with a very low intake of marine resources. It also seems that sex and age did not play a significant role in the quantity and quality of foods consumed, but apparently it was more associated with the social status of an individual as seen in the example of two adult males from Vacići.

References


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