Journal of Archaeological Science: Reports 15 (2017) 30–39

Contents lists available at ScienceDirect

Journal of Archaeological Science: Reports

journal homepage: www.elsevier.com/locate/jasrep

Insights into the Copper-Bronze Age diet in Central Italy: Plant microremains in dental calculus from Grotta dello Scoglietto (Southern Tuscany, Italy)

Marta Mariotti Lippi[a], Lisa Pisaneschi[a,*], Lucia Sarti[b], Martina Lari[c], Jacopo Moggi-Cecchi[c]

[a] Dipartimento di Biologia, Università degli Studi di Firenze, Via G. La Pira 4, 50121 Firenze, Italy
[b] Dipartimento di Scienze storiche e dei beni culturali, Università degli Studi di Siena, Via Roma 56, 53100 Siena, Italy
[c] Dipartimento di Biologia, Università degli Studi di Firenze, Via del Proconsolo 12, 50122 Firenze, Italy

ARTICLE INFO

Keywords:
Phytoliths
Starch grains
Cereals
Millets
Prehistory

ABSTRACT

Plant microremains were recovered from dental calculus of nine individuals found in the Final Copper-Early Bronze Age burial contexts of Grotta dello Scoglietto, a site in Southern Tuscany. Starch and phytolith analyses provided information about the plant use in the diet of a small but significant subset of the local population. The consumption of a remarkable variety of cereals is well documented, including *Hordeum*, possibly *Triticum*, and minor crops, representing an additional proof of the contemporary use of a variety of cereal crops by Copper-Bronze age populations, in accordance with previous data from other coeval sites in Tuscany and Italy which indicate a noticeable increase in the variety of crops in the diet. The presence of millets is particularly interesting because these crops were not recorded by the isotopic analysis in the same site. The large number of plant remains occurring in a very small amount of tartar deposit confirmed the suitability of dental calculus for collecting information about ancient diets.

1. Introduction

Dietary habits and lifestyle of ancient populations are interesting topics, currently the object of research by archaeobotanists, archaeozoologists and anthropologists. Our knowledge on the exploitation of the natural environment during Paleolithic times is growing and suggests consumption of wild cereals, underground storage organs, fish and meat (e.g. Piperno et al., 2004; Revedin et al., 2010; Hardy and Moncel, 2011). Starting from Neolithic, human populations have progressively enriched the list of food plants and animals, following the dietary changes introduced by agriculture and domestication. Assemblages of seeds, fruits and animal bones may be found in anthropogenic archaeological context, possibly offering direct evidence of their use by humans, but this kind of finding is not always available. Therefore, research has been carried out on plant microremains, such as pollen, starch grains, phytoliths on lithic tools etc. (Weiss and Kislev, 2008; Sadori et al., 2010), or the isotope ratio in bone collagen and carbonate (Ambrose, 1986), with the aim to obtain additional data.

As recent research has highlighted, dental calculus may be considered a further valuable archive that can preserve information about ancient diets and lifestyle. Indeed, dental calculus traps numerous microorganisms, microscopic food fragments and other minute debris that entered the mouth and it is able to preserve them into a mineral (calcium phosphate) matrix effectively conserving them and allowing their recovery in archaeological contexts (Lieverse, 1999). Therefore, different data can be inferred from dental calculus. The microorganisms enclosed during the calcium phosphate precipitation mostly belong to the oral microbiome, whose composition plays an important role in the formation of calculus itself and is related to many factors such as the salivary pH, the composition of the diet, the oral hygiene (Adler et al., 2013; Warinner et al., 2014; Weyrich et al., 2015). The isotope ratio can also be explored in the bulk samples of dental calculus. Generally isotopic analyses are carried out on bone and dentine collagen and are regarded as an index of consumption of animal and vegetable proteins (Ambrose, 1986; Scott and Poulson, 2012); however, recent comparative isotopic analyses carried out on collagen and dental calculus belonging to the same individuals (Salazar-Garcia et al., 2014), revealed no correlation, suggesting that the two materials should be treated in a different manner and results need different interpretations, as should be expected considering the very different processes involved in their formation. The plant residues, mainly represented by starch grains and phytoliths, indicate which plants were used as food (e.g. Fox et al.,

* Corresponding author.
E-mail addresses: marta.mariotti@unifi.it (M. Mariotti Lippi), lisa.pisaneschi@alice.it (L. Pisaneschi), lucia.sarti@unisi.it (L. Sarti), martina.lari@unifi.it (M. Lari), iacopo.moggicecchi@unifi.it (J. Moggi-Cecchi).

http://dx.doi.org/10.1016/j.jasrep.2017.07.005
Received 28 March 2017; Received in revised form 26 June 2017; Accepted 7 July 2017

1996; Henry and Piperno, 2008; Hardy et al., 2009; Hardy and Moncel, 2011; Henry et al., 2011, 2014; Hart, 2016), but can also reveal the use of the mouth and teeth for non-dietary activities or the material used for dental hygiene (Radini et al., 2016).

Therefore, interpretation of the data collected from the analyses of dental calculus should also take into account the formation of the calculus itself. In fact, the rate of its formation and its total amount is not constant in the same individual and varies noticeably among individuals, depending on numerous parameters related not only to the environmental context and local resources, but also to the genetic features of the organism, the state of health, the sex and age (Nancollas and Johnsson, 1994; Lieverse, 1999). Also to consider is the fact that the calculus that is found on the teeth does not correspond to that formed during the entire lifespan of the individual, but only to the part left unremoved in the last period of life, the duration of which is unknown. Therefore, it is impossible to relate the residues found in the calculus to a precise span of time, but only to an undetermined period antecedent its last formation: in the case of a skeleton, the date of the death of the individual indicates a *terminus ad quem*, i.e. the latest possible date of the period of calculus formation.

In spite of these limitations, the analysis of dental calculus appears particularly suitable since experimental tests have shown that the removal of dental plaque does not cause damage to the dental enamel, even on archaeological material (Henry and Piperno, 2008).

Aim of this study is to improve our knowledge about the food plants consumed by Copper-Bronze Age populations in Central Italy (3rd-2nd millennium BC), a period characterized by a noticeable increase in the variety of crops in the diet (Bellini et al., 2008). The finding of human skeletons in a multiple burial at Grotta dello Scoglietto, in Southern Tuscany (Fig. 1), made available a considerable number of tartar deposits coming from different individuals belonging to the same populations. The study offered the opportunity of exploring the diffused plant consumption in a small but representative subset of the Copper-Bronze Age population at Scoglietto.

Previous information about food plants in Tuscany during the Prehistory is available from the analyses of seeds and fruits recovered in different contexts, such as waste deposits, hearths and ritual offerings (Bellini et al., 2008). A peculiar food residue found at the site of Scarceta di Manciano in Southern Tuscany, consisting of flour lumps mixed with caryopses and legume seeds, more specifically testifies the use of mixtures of cereals and pulses during the Recent Bronze Age (Rottoli, 1999). A broader source of information on food choices in Bronze Age populations in Central Italy is also represented by recent work on the analysis of N and C stable isotopes (Varalli et al., 2015). In that study, data on Grotta dello Scoglietto suggest a high animal protein intake, with a probable consumption of fish. Also, d13C values show a narrow range typical of C3 plant consumption.

1.1. The site

Grotta dello Scoglietto (42° 40′ 9.55″ N, 11° 2′ 58.78″ E, 20 m a.s.l.) is a cave located on the Western slope of the Scoglietto promontory in the Northern part of the Uccellina Mountain range, Southern Tuscany, about 4 km away from the current coastline.

As shown by the archaeological findings, the cave was used during Copper-Bronze, Roman age and modern period with different purposes, in particular for burial practices (Cardini and Rittatore, 1948, 1949, 1952; Rittatore, 1951; Ceccanti and Cocchi, 1978; Cavanna, 2007; Leonini et al., 2006; Pizziolo et al., 2009; Sarti and Martini, 2015).

Grotta dello Scoglietto became in the archaeological literature one of the most significant Tuscan sites of the Early Bronze Age (Peroni, 1971; Ceccanti and Cocchi, 1978). Various anthropological studies have been dedicated to the remains found during the excavations (e.g. Parenti, 1962; Capasso and Piccardi, 1980).

Since 2007, the prehistoric team of the University of Siena began a multidisciplinary project on the prehistoric archaeological resources of Grosseto's territory (Leonini et al., 2006) and from 2011 until today, L. Sarti organized excavations to monitor the entity of the residual archaeological deposit after the previous researches (Cavanna, 2007) and for a systematic study of the human presence and of the burial practices in the cave (Sarti, 2011; Sarti and Martini, 2015). The new research checked several portions of new archaeological deposit never before involved in past excavations thanks to which it was possible to verify and to define the stratigraphy of the cave.

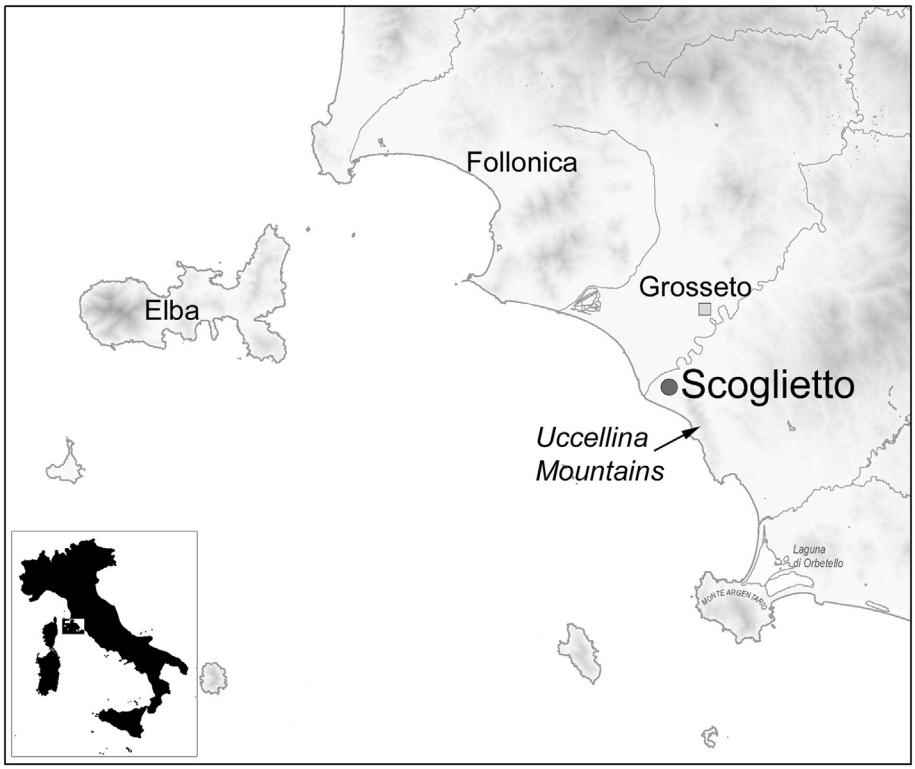

Fig. 1. Location of the Scoglietto cave site.