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8 Human osteoarchaeology in Greece: an overview of the past 10 years and directions for the following 10

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Human osteoarchaeology, the study of human skeletal remains from archaeological contexts, has a long history in Greece. This review paper examines the developments that have occurred in the field over the past decade using case studies published from 2015 onwards. These studies have been selected to demonstrate the wealth of osteoarchaeological research, geographically and temporally, and are organized based on the themes of mobility, diet, palaeopathology, activity patterns, and funerary archaeology. The final part of the paper discusses some of the key challenges that human osteoarchaeology in Greece faces. Most prominent among these challenges is the limited financial support for the humanities, the few national-level training opportunities in human osteoarchaeology in higher education, the lack of a national association within the field that could promote standardized practices and collaboration, and the fact that most osteoarchaeological material has come to light through rescue excavations. In association with these challenges, the future prospects of osteoarchaeology in Greece are briefly discussed.

Introduction

Human osteoarchaeology is a field of research that studies past human skeletal remains in their broader socio-cultural context (Buikstra 1977). The human skeleton serves as a unique source of information on various aspects of past life, such as diet, mobility, mechanical stress, and pathology (Larsen 2015; Nikita 2017). Interpreting osteoarchaeological data can be complex, but engaging with the lives of individuals from the past through the examination of their skeletal remains allows for a more inclusive and nuanced understanding of history, giving voice to individuals who are often marginalized in textual sources, such as women and children.

The field of human osteoarchaeology in Greece has a rich history, with numerous studies investigating the living conditions of the region's inhabitants from prehistory to recent periods. This paper builds upon previous reviews of Greek osteoarchaeological research (Buikstra and Lagia 2009; Lagia, Papathanasiou and Triantaphyllou 2014). *Archaeological Reports* also covered this topic seven years ago (Nikita and Triantaphyllou 2017); however, there is already a wealth of important new information and new future directions to consider. This review focuses specifically on studies conducted between 2015 and the present. It highlights key themes in osteoarchaeological research, including pathology, mobility, diet, activity patterns, and funerary practices, and shows the broad range of research questions explored and the methodological and theoretical advancements made in recent years. Following an overview of current research, this paper delves into the challenges and future directions for the field of human osteoarchaeology in Greece, as its objective is not only to provide an overview of osteoarchaeological

Map. 8.1. 1. Achlada; 2. Agia Marina, Xereas; 3. Aidonia; 4. Akanthos; 5. Akraiphia; 6. Aposelemis; 7. Archontiko; 8. Athens; 9. Ayia Irini, Kea; 10. Ayios Vasilios North Cemetery; 11. Azoria; 12. Chania (ancient Kydonia); 13. Church of Taxiarches, Attica; 14. Franchthi Cave; 15. Glyka Nera; 16. Hagios Charalambos; 17. Hagios Sozon, Orchomenos; 18. Halasmenos; 19. Halos; 20. Helike; 21. Istron Kalo Chorio; 22. Kallithea; 23. Kamilari; 24. Kamini; 25. Kephala Petras; 26. Kephala, Kea; 27. Kirrha; 28. Kleitos; 29. Koropi; 30. Koukounaries; 31. Krousonas; 32. Lazarides; 33. Livari-Skiadi; 34. Makri; 35. Makriyalos; 36. Maroulas; 37. Mavropigi, Filotsairi; 38. Moni Odigitria; 39. Mygdalia; 40. Nea Nikomedeia; 41. Nea Styra; 42. Nemea; 43. Paiania; 44. Paliambela; 45. Phaleron; 46. Pontokomi-Vrysi; 47. Revenia; 48. Sissi; 49. Stavroupoli; 50. Tharrounia; 51. Theopetra Cave; 52. Thessaloniki; 53. Tiryns; 54. Toumba Kremastis Koiladas; 55. Tsepi; 56. Varambas; 57. Vasiliki; 58. Voudeni; 59. Xirolimni, Portes.

investigations, but also to advocate for enhanced collaboration, communication, and integration within the discipline.

A brief mention of the methodology employed in conducting the literature review is warranted. This review is primarily based on publications found in international journals and edited volumes. Papers published in conference proceedings or Greek journals/books,

as well as unpublished theses, have been excluded. This decision was made because the great majority of relevant studies over the past decade has appeared in international outlets, but also to ensure that readers seeking further information on the topic can easily access the references cited in this paper.

Thematic developments: a lot has happened in 10 years . . .

The field of human osteoarchaeological research in Greece over the past decade has continued its emphasis on diverse themes (Nikita and Triantaphyllou 2017). A review of the *Bi(bli)oArch* database (https://www.biblioarch.com/), a bibliographic resource for human osteoarchaeological studies in the Eastern Mediterranean and Middle East (Nikita *et al.* 2021), revealed 123 studies conducted in Greece from 2015 to 2024. The following selection of studies has been organized according to the themes explored, while the location of the examined assemblages is given in Map 8.1.

Mobility

The study of mobility has a longstanding history in Greece due to the country's favourable geographical location and historical role as a hub for various civilizations. Osteoarchaeological research on human mobility can be approached through three distinct methods: isotopic analysis, biodistances, and ancient DNA. Isotopic analysis, mostly employing strontium and oxygen isotopes, is a primary tool for determining past mobility patterns by distinguishing between local and non-local individuals, as well as identifying first-generation migrants (Britton 2020). The ratio of strontium isotopes ($^{87}Sr/^{86}Sr$) present in human dental tissues reflects the food consumed. Thus, individuals who primarily consume locally sourced food will have $^{87}Sr/^{86}Sr$ ratios in dental enamel that closely match those of the surrounding environment, if they were buried in the same location where they grew up (Bentley 2006). Such individuals are classified as 'locals'. Conversely, individuals who have non-local origin would exhibit different ratios in their enamel compared to the local environment. Additionally, the oxygen isotopes ($\delta^{18}O$) present in skeletal remains are influenced by water consumption and can provide insight into an individual's geographical origin based on regional precipitation patterns (Pederzani and Britton 2019). However, isotopic analysis can rarely, if ever, definitively determine an individual's origin because isotopic values tend to overlap across different regions. Moreover, isotopic analyses often fail to trace short-term residency and recurrent mobility events (Prowse 2016), while various anthropogenic and environmental factors can affect isotopic values in skeletal remains. These factors include, among others, the consumption of imported food and water (which could make local individuals appear non-local, since their isotopic signatures would not match the local values but the values of the area from which the food/water is imported), water treatment methods (e.g. boiling water increases its $\delta^{18}O$ value), the sea-spray effect (i.e. the alteration of bioavailable strontium isotope ratios in coastal areas as a result of the transfer of sea-sourced strontium to terrestrial environments), and the use of fertilizers (modern fertilizers exhibit variable strontium isotopic composition and their use in agriculture alters the regional bioavailable strontium isotope values) (Maurer *et al.* 2012; Lightfoot and O'Connell 2016; Alonzi *et al.* 2020).

Argyro Nafplioti has been at the forefront of isotopic paleomobility research in Greece, as demonstrated in her earlier works (e.g. Nafplioti 2008). In a recent study, she used strontium and oxygen isotopes to investigate mobility patterns in the Pre- and Protopalatial population of **Sissi**, Crete (ID8207, ID8241; Nafplioti *et al.* 2021). The findings indicated a local population that may have engaged in regional mobility (i.e. within a 5km

radius from the site or from nearby locations in the Malia bay). Three possible explanations were proposed for this mobility: 1. accessing diverse food sources in the surrounding area to buffer against climate fluctuations and vulnerability; 2. concentration/nucleation of settlements, typical of the Late Prepalatial period; 3. burial of individuals from nearby locations in the Sissi cemetery. This research highlights the value of isotopic analysis in studying ancient mobility patterns, supporting regional mobility in this case, while also underscoring the limitations in confidently identifying the reasons behind such mobility events.

Another interesting study utilized strontium isotopes exclusively but examined multiple sites in north Greece, namely **Stavroupoli** (ID6432), **Nea Nikomedeia**, **Paliambela** (ID325, ID9603), **Makriyalos**, **Revenia**, **Kleitos** (ID1976, ID2726), and **Toumba Kremastis Koiladas**, spanning various phases of the Neolithic period (Whelton *et al.* 2018). The isotopic analysis revealed minimal mobility during the Early and Middle Neolithic periods, but increased movement in the Late Neolithic phase. These isotopically-defined mobility patterns were further supported by the pottery distribution and exchange networks, stressing the importance of examining mobility and connectivity using different lines of evidence.

Biodistance analysis is another commonly used method for studying mobility. This approach relies on the hereditary nature of various skeletal and dental characteristics, suggesting that individuals sharing specific anatomical traits are more likely to be genetically related than those who do not possess such traits (Rathmann 2024). The most informative anatomical traits for biodistance analyses are typically found in the teeth and cranium, including both measurable and non-measurable features (e.g. Sjøvold 1984; Carson 2006; Irish *et al.* 2020). For this reason, data collection for biodistance analysis involves gathering measurements of dental and cranial dimensions, as well as recording the presence or absence of non-measurable dental and cranial traits. These data are then utilized to calculate different distance measures, providing insight into the biological distance between individuals or groups being studied (e.g. Sutter and Verano 2007; Nikita, Mattingly and Lahr 2012; Velasco 2018; Mardini *et al.* 2023a; Rathmann *et al.* 2023). Biodistance analyses offer a cost-effective, non-destructive, and quick approach to assessing biological similarities between groups. However, these analyses offer only indirect insights into patterns of mobility. A small biodistance between two groups typically suggests a common ancestry and potential gene flow, indicating the movement of individuals and exchange of genetic material between populations. Nonetheless, biodistance analyses alone do not provide information on the timing, frequency, or extent of the gene flow events.

An example of the recent use of this methodology investigated mobility and connectivity during the Late Bronze Age and Early Iron Age in Greece and other parts of the Balkans (Michael *et al.* 2023). The research included skeletal assemblages from east Crete to Romania, with the Greek material coming from **Achlada** (ID6604, ID8159) in Macedonia, **Halasmenos**, **Vasiliki**, **Istron Kalo Chorio**, and **Azoria** in Crete, **Kallithea** and **Voudeni** in the Peloponnese, and **Kamini** in Attica. The authors estimated the biodistance among these assemblages to test whether an isolation by distance model is valid in their dataset. According to this model, communities that exhibit geographical proximity should demonstrate a small biodistance compared to more distant groups. The results indeed supported an isolation by distance model for the assemblages under study, which in turn suggests a process of gradual mobility and integration rather than migrations and population displacements (which would have disrupted the expected pattern of smaller biodistance among geographically proximal groups). This study demonstrates the effectiveness of biodistance analyses in exploring broader patterns of mobility, while also emphasizing the need for further refinement of the results through isotopic analysis or other methods.

Fig. 8.1. Marathon, Tsepi. Tomb 43, © ASA.

Biodistance analysis has also been used to study mobility at a much smaller scale. An example of such an application involved the examination of kinship and postmarital residence patterns at the **Tsepi** cemetery (ID6140; Fig. 8.1) in prehistoric Marathon (Prevedorou and Stojanowski 2017). The intra-cemetery biodistances showed that various forms of kinship (biological, fictive, practical) were reflected in the burial practices. Biological lineages influenced the spatial arrangement of tombs to some extent, while male exogamy was postulated on the grounds of greater phenotypic (morphological) variation in males compared to females.

Ancient DNA (aDNA) is another key method that provides insights into past human migration patterns by examining diachronic changes in genetic ancestry (e.g. Anthony 2023; Schmid and Schiffels 2023). Ancient DNA studies typically explore shared ancestry among individuals in various geographical and temporal contexts, focusing on different parts of the genome (e.g. mitochondrial DNA for female-driven mobility but also whole-genome studies) (e.g. Underhill and Kivisild 2007; Llamas *et al.* 2016; Bai *et al.* 2018; Steinrücken *et al.* 2019; Wang *et al.* 2020; Figueiro 2024). However, aDNA analysis can be costly and may be ineffective in environments with poor genetic material preservation.

In recent years, there has been a notable increase in aDNA studies in Greece, focused on prehistoric remains, following a global trend. This trend is associated with recent major advances in aDNA methodology (e.g. decontamination and sequencing methods), coupled with enhanced interest for periods for which few other lines of evidence are available, such as historical texts. A recent paper by Nuno Silva and colleagues (2022) examined the levels of mitochondrial diversity in Neolithic Greek populations and the association between these populations and hunter-gatherers and farmers along the Danubian Neolithic expansion route. The aim of this comparison was to explore the timing and character of the European Neolithic expansion. The Greek assemblages included **Theopetra Cave** (ID813) in Thessaly, **Maroulas** (ID2825) on Crete, **Revenia**, **Makriyalos**, **Paliambela**, **Stavroupoli**, **Toumba Kremastis Koiladas**, **Kleitos**, **Mavropigi** (Filotsairi) (ID8513), **Xirolimni** (Portes), and **Nea Nikomedeia** in Macedonia, **Franchthi Cave** (ID4879) in the

Fig. 8.2. Aidonia. Aerial photograph showing the *dromos* and chamber of the two new unplundered tombs in the E part of the Mycenaean cemetery, as well as tombs from the previous excavation. © Hellenic Ministry of Culture/ Ephorate of Antiquities of Corinthia; Nemea Center for Classical Archaeology.

Peloponnese, **Makri** in Thrace, and **Tharrounia** (ID14974) on Euboea. The results revealed genetic homogeneity in Greece until the Neolithic era, but a discontinuity between the Neolithic population and modern Greeks. Additionally, after the rapid spread of the Neolithic culture, mobility along the Danube expansion route decreased and genetic inputs from local hunter-gatherers on farming communities increased.

As another recent example, Eirini Skourtanioti and colleagues (2023) examined genome-wide data from Neolithic to Iron Age individuals from the Greek mainland, Crete, and the Aegean Islands. Specifically, the sites under examination covered **Aposelemis**, **Chania** (ancient Kydonia) (ID15859, ID18542), **Hagios Charalambos**, and **Krousonas** on Crete, **Aidonia** (ID6918, ID6919, ID6920; Fig. 8.2) in the Peloponnese, **Glyka Nera** (ID5358, ID6038, ID6089) in Attica, **Tiryns** (ID116, ID752, ID9161, ID10139, ID16849) and **Mygdalia** (ID2340) in the Peloponnese, **Nea Styra** (ID18501) on Euboea, **Koukounaries** on Paros, and **Lazarides** (ID99, ID242, ID1928) on Aegina. A shared ancestry was found between early Cretan farmers and people from the Neolithic Aegean, and significant gene flow from Anatolia to Crete marked the Late Neolithic and Early Bronze Age. Additionally, gene flow from central/eastern Europe to mainland Greece was identified for the Middle Bronze Age and it spread to Crete from the seventeenth to twelfth centuries BC. Finally, this study found a high degree of consanguineous endogamy, further supporting the interconnectedness of the Aegean region.

Diet

The study of diet has been a prominent subject of research in Greek osteoarchaeology, with almost 40 studies appearing since 2015 (*Bi(bli)oArch* database). Various methods, including

the examination of dental diseases and dental wear as well as stable isotope analyses, have been utilized in this direction.

Dental diseases such as caries and calculus have been linked to the consumption of specific types of food, with caries associated with high carbohydrate intake and calculus associated with both high carbohydrate and high protein intake (Hillson 2018; 2023; Ullinger and Loewen 2022). However, factors beyond diet, such as hormones, saliva composition, oral hygiene, and tooth use, also play an important role in the development of dental diseases (Christersson *et al.* 1992; Pitts *et al.* 2017). Therefore, while there is a clear association between dental diseases and dietary habits, this relationship is indirect (Vergidou and Nikita 2024).

While dental diseases are commonly studied in osteoarchaeological research, there are few studies that specifically focus on these diseases and their correlation with diet among ancient Greek populations. One such study compared the oral health of males and females in Roman **Pontokomi-Vrysi** (*Provincia Macedonia*) (ID9711) and concluded that there was little differentiation in diet between sexes (Vergidou *et al.* 2021). In contrast, a separate study in Hellenistic to Late Antique Knossos identified an overall higher frequency of caries in males compared to females, suggesting varying levels of carbohydrate consumption (Moles 2023). The same study also examined temporal changes in dental diseases and diet at Knossos and noted an increase in caries rates during Roman times. The cause for this increase could not be securely identified, but alternative interpretations included: a) a more cariogenic diet or changes in food processing that increased food stickiness; b) increased connectivity and/or new populations arriving in Knossos, which changed food availability, food consumption patterns, or dental hygiene practices; or c) overall greater prosperity during this period, which might make more refined, hence cariogenic, foods available for consumption.

Isotope analysis, particularly of carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$), offers another valuable approach to understanding past dietary practices. This technique operates on the premise that the isotopic composition of an individual's skeletal/dental tissues reflects that of their diet (DeNiro and Epstein 1978). The variation in isotopic signatures among different foods is influenced by several factors, including the photosynthetic pathways of plants, differences between aquatic and terrestrial ecosystems, and trophic level enrichment (DeNiro and Epstein 1978; 1981; Schoeninger and DeNiro 1984; Schoeninger 1985).

Isotope analyses have become a prominent tool in Greek osteoarchaeology, as demonstrated by Anastasia Papathanasiou and colleagues (2015) and the contributions therein. Such studies have investigated the consumption of different types of plants and proteins across different archaeological assemblages and demographic groups (e.g. Vergidou *et al.* 2023 for Roman Macedonia). Moreover, studies have linked dietary patterns to mortuary data and associated social structures (e.g. Panagiotopoulou *et al.* 2016 found differences in the consumption of C3 and C4 plants as well as animal protein depending on the individuals' age, sex, and funerary offerings in Early Iron Age **Halos** (ID9026, ID17058; Fig. 8.3). Additionally, isotope analyses have been used to examine infant feeding practices, particularly breastfeeding and weaning (e.g. Kwok, Garvie-Lok and Katzenberg 2018 for Byzantine **Nemea**; Ganiatsou *et al.* 2022; 2023 for Roman **Thessaloniki**), but also the association between limited breast milk consumption and physiological stress (Bantavanou *et al.* 2024). Diachronic changes in dietary patterns in relation to social, political, cultural, and economic developments represent another line of research in isotopic dietary studies in Greece (e.g. Moles *et al.* 2022 for Hellenistic to Late Antique Knossos). Finally, in a few cases, isotopic analyses have been applied to human, plant, and animal remains simultaneously to investigate diet alongside agricultural and animal husbandry practices (e.g. Nitsch *et al.* 2017 for Early Bronze Age–Late Bronze Age **Archontiko** (ID6730) and Middle Bronze Age–Late Bronze Age Toumba **Thessaloniki** (ID828); Vaiglova *et al.* 2018 for Neolithic **Makriyalos**).

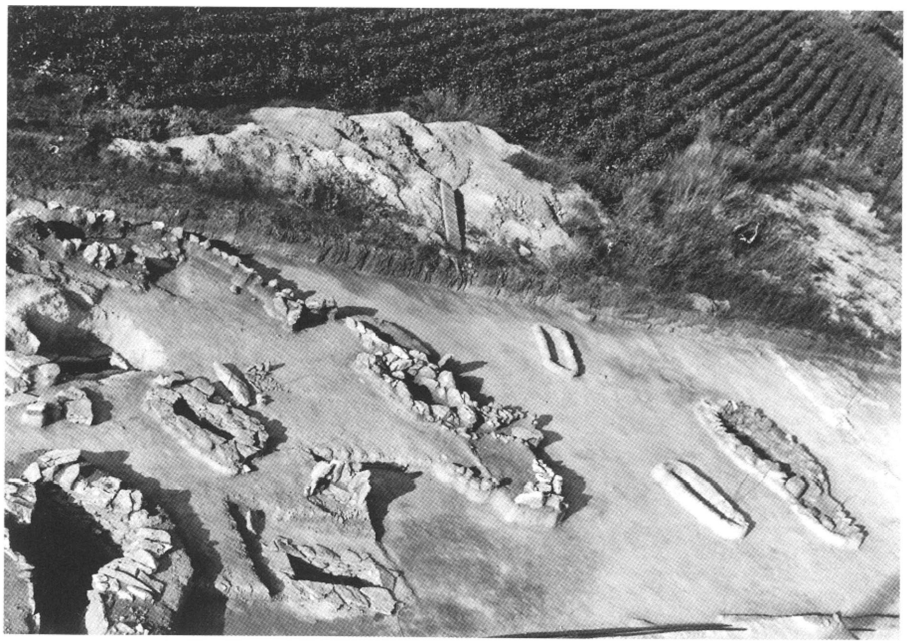

Fig. 8.3. Platanos Almyrou, Halos. Iron Age necropolis. © EfA.

A study by Courtney McConnan-Borstad and colleagues (2018) is noteworthy for its examination of the impact of natural events on dietary patterns. The study investigated dietary trends from the Hellenistic to Byzantine period in **Helike** to determine if meat restrictions that applied during fasting days in the Byzantine period could be detected isotopically. Although the meat restrictions would be expected to result in higher fish consumption in Byzantine times, the stable carbon and nitrogen isotope results revealed that the diet of Byzantine period individuals actually contained fewer marine resources compared to those in the Hellenistic period. Similarly, Roman diet was based on terrestrial resources with limited marine inputs. The authors suggest that these temporal trends may not reflect cultural practices, but they may instead be linked to a lagoon that formed after the 373 BC earthquake, facilitating access to aquatic resources temporarily.

Palaeopathology

Palaeopathology involves the study of diseases in past individuals. Diseases of diverse aetiology may leave evidence on the human skeleton (e.g. congenital, dental, joint, infectious, circulatory, metabolic, endocrine, neoplastic, trauma) (Grauer 2023). Thus, palaeopathology can offer important insights on past life quality, medical knowledge, (structural) violence, social care practices, and more.

Recent research on Greek palaeopathology tends to incorporate the study of diseases within a broader osteoarchaeological context, rather than as isolated findings. This approach involves integrating palaeopathological data with other evidence, such as demography and diet. Despite this trend, there are a few studies that have specifically examined various pathological conditions present in ancient Greek skeletal remains.

Chryssa Vergidou and colleagues (2022) studied various lesions indicative of physiological and mechanical stress, as well as instances of trauma in a Roman period group from **Pontokomi-Vrysi** in Upper Macedonia, focusing on sex- and age-related

patterns (see also above Vergidou *et al.* 2021 for dietary patterns from the same assemblage). Their findings suggested greater mechanical stress among males, indicating some sex-based division of labour within this community. Furthermore, the population appeared resilient based on the physiological stress indicators in adults and juveniles.

Other studies have focused on more specific pathologies identified on single individuals. For instance, Paraskevi Tritsaroli (2018) documented a case of diffuse idiopathic skeletal hyperostosis in a male individual from the Byzantine church of Taxiarches in Attica, a condition often associated with high social status (although this association has been subject to criticism: Rogers and Waldron 2001). In another study, Susan Kirkpatrick Smith and Maria Liston (2020) identified a case of *myositis ossificans traumatica* in the lumbar vertebrae of an adult from Late Bronze Age **Athens**. Additionally, Asterios Aidonis and colleagues (2021) investigated four cases of trepanation, a surgical procedure whereby a hole is opened into the cranium, in females from the ancient Greek colony of Akanthos. All individuals survived the procedure, even briefly. Interestingly, trepanation was performed using scraping and drilling, deviating from Hippocratic recommendations.

In concluding the palaeopathology section, we should mention a study that did not analyse human bones but instead used soil sediment surrounding the pelvic bones in burials from the Neolithic to Byzantine period in two sites (Kephala and Ayia Irini) on the Greek island of Kea (Anastasiou *et al.* 2018). The study revealed the presence of intestinal helminth eggs (whipworm – *Trichuris trichiura* and roundworm – *Ascaris lumbricoides*) in four individuals, highlighting the exposure of individuals to parasites and stressing the importance of more systematic soil sampling and associated analyses.

Activity patterns

The exact activities in which individuals have been involved in the past cannot be determined from skeletal remains (Jurmain *et al.* 2011). However, the skeleton, being a living tissue, reacts to external stimuli by either forming new bone or resorbing it and adjusting its shape biomechanically (Ruff, Holt and Trinkaus 2006). Therefore, it is feasible to broadly evaluate levels of mechanical stress, compare stress levels between different sexes or other groups, and make relative assessments of activity patterns, especially when supported by additional evidence such as historical records, ethnographic data, or grave goods associated with specific craftspeople (Becker 2019; Wesp 2020; Mardini *et al.* 2023b; Nikita and Radini 2023).

Osteoarchaeological research often examines mechanical stress and activity patterns by analysing pathological conditions such as osteoarthritis and Schmorl's nodes. This approach was utilized by Chryssa Vergidou and colleagues (2022) in their investigation of male–female division of labour in Roman Macedonia (see Palaeopathology section). Another method involves studying muscle attachment sites on bones to understand habitual behaviours, as seen in the analysis of the people of Archaic **Phaleron** (ID6141; Fig. 8.4) by Fotios Alexandros Karakostis and colleagues (2021). The authors captured the morphology of hand muscle attachment sites using three-dimensional morphometrics, and compared the resulting physical activity patterns between the general population and a subgroup of male skeletons who had suffered violent deaths. The results supported distinct patterns of activities between the males of the two groups, with the individuals suffering a violent death exhibiting a prominent power-grasping tendency, suggesting engagement in more strenuous manual labour during their lifetime compared to the general male population.

Multi-approach studies

Various bioarchaeological studies seek to gain a comprehensive understanding of the living conditions of past communities by combining data on demography, pathology, diet, and other aspects of life that can be inferred from skeletal remains. For instance, Anna

Fig. 8.4. Phaleron. Eastern part of the cemetery (Esplanade Sector) revealed in 2016. © Hellenic Ministry of Culture/ Ephorate of Antiquities of Piraeus and Islands.

Karligkioti and colleagues (2023) found high levels of hardship in rural populations in Attica (**Paiania**, **Koropi**, **Varambas**, **Agia Marina**, **Xereas**) from the Classical to the Roman period. Temporally, individuals from the earlier periods showed higher mechanical stress but lower physiological stress compared to those of later periods. With regard to sex differences, no significant differences were found between males and females in physiological stress. However, labour division changed between the Classical and Roman periods since the former was characterized by no sex difference in manual labour, while the latter witnessed greater mechanical stress among males compared to females. Although any interpretations emanating from this study are limited by the small sample sizes, it underscores the necessity of bringing together multiple lines of osteo-archaeological evidence.

Similarly, Efthymia Nikita and colleagues (2019) assessed changes in quality of life and patterns of mobility over time in the region of Boeotia, focusing on the **Akraiphia** cemetery (ID10636). The analysis of palaeopathological evidence, physiological stress markers, and dental wear supported harder living conditions during the Hellenistic, Roman, and post-Roman periods, though similar living standards for males and females across time. Furthermore, the study's analysis of biodistances revealed a break in population continuity between the Hellenistic and Roman periods, potentially associated with increased gene flow/mobility within the Roman Empire. Also in Boeotia, Paraskevi Tritsaroli and colleagues (2022) performed palaeopathological and stable isotopes analyses on Byzantine and post-Byzantine period individuals from **Hagios Sozon** in **Orchomenos**. Their findings indicated a lifestyle that was neither harsh nor easy compared to other sites, evidence of mobility, a terrestrial diet, and lack of significant consumption of freshwater foods despite the proximity to Lake Copais. The study additionally explored the burial practices at Hagios Sozon, shedding light on aspects of social organization as

evidenced through a family burial structure and the mortuary treatment for preterms, perinates, and infants.

Another study integrating skeletal and funerary data focused on the Late Bronze Age **Achlada** (ID8159) community in Florina. Dimitra Michael and colleagues (2021) examined the impact of economic marginalization on the daily lives of Achlada's inhabitants. Although health, diet, and mechanical stress were similar in Achlada and other Mycenaean settlements, physiological stress was higher in the individuals from Achlada, suggesting a greater hardship that was potentially due to limited connectivity with major trade routes. Specifically, the authors hypothesized that, due to its limited network connections, the community of Achlada had reduced access to reciprocal intercommunity exchange networks that could act as a buffer at times of hardship, leading to poorer health and dietary outcomes and subsequently higher levels of physiological stress. Furthermore, at an intra-assemblage level, this study found differences between Achlada males and females in terms of various skeletal markers. Specifically, males showed higher levels of mechanical stress, while females exhibited higher physiological stress during childhood/adolescence. In addition, enamel hypoplastic defects, which represent physiological stress markers and form during childhood, were more frequent in middle and old middle-aged males than females, which led the authors to the conclusion that males may have had better childhood stress coping mechanisms than females.

Funerary archaeology

Osteoarchaeological investigations, instead of concentrating on health, disease, diet, mobility, and other mostly biological parameters mentioned earlier, may instead have a social anthropological focus, delving into the funerary practices surrounding the deceased. Such studies analyse taphonomic indicators, such as the representation and spatial distribution of skeletal elements, weathering and fragmentation patterns, signs of burning or cut marks, level of skeletal articulation, and other factors to understand how bodies were treated postmortem and what insights can be gleaned about the cultural beliefs surrounding death (Weiss-Krejci 2011; Williams and Giles 2016).

Research in funerary archaeology in Greek contexts has primarily focused on prehistoric collections, exploring the diverse beliefs and practices surrounding death in different societies and periods. Sevasti Triantaphyllou (2016) has observed complex patterns of manipulation of deceased individuals in Pre-and Protopalatial Crete (**Kephala Petras**, **Kamilari** (ID11719), **Moni Odigitria** (ID9914, ID11723), **Livari-Skiadi**), highlighting the intricate processes adopted by the living to establish connections with the dead (direct ancestors and collective past). Similarly, elaborate mortuary customs involving very different processes in the creation of secondary deposits have been documented in Late Bronze Age **Kirrha**, Phocis (ID7921, ID8604; Lagia *et al.* 2016). For example, one cist grave contained a fully articulated skeleton on the uppermost context, the heavily commingled bones of a second individual on the east side of the middle layer, and a rectangular cist to the west of the middle layer containing the densely packed bones of a third individual. Another cist grave housed the partially articulated skeleton of a young child in the upper layer and the commingled remains of at least three adults in a lower layer, while a third cist grave contained the primary and secondary burials of two infants. Similarly, earth pits had been used for primary burials, as well as for single and multiple secondary burials. This complexity in burial customs was interpreted as a means to build connections between the living and the ancestors and stress lineage continuity at a community level.

Research by Ioanna Moutafi and Sofia Voutsaki (2016) at the Mycenaean **Ayios Vasilios** North Cemetery in Laconia (Fig. 8.5) provides another example of varied funerary practices and secondary treatment of the deceased in prehistory. In this cemetery, differences in funerary treatment appear to have been driven by the age-at-death of the deceased.

Fig. 8.5. Agios Vasilios. Cist grave Tomb 23 and the pit for infant burials. © ASA.

Furthermore, the mortuary practices gradually evolved to encompass different forms of secondary treatment of the deceased (e.g. skeletal disarticulation, commingling, and relocation), which may emphasize broader concepts of lineage and descent. In parallel, the co-existence of various burial practices (e.g. contracted and extended burials, intramural and extramural graves, small pits and large cists) suggested tensions between tradition and innovation as well as integration and differentiation. It is also important to mention Ioanna Moutafi's (2021) study on funerary practices and their social implications in Mycenaean **Voudeni**, Achaea. This research showed that the association between social change and mortuary practices is often reflected in subtle shifts in the treatment of the deceased.

Challenges and prospects

Although the field of Greek osteoarchaeology has a rich history and a broad thematic span (as outlined in the previous sections), it faces several challenges. While many of these challenges are common to osteoarchaeologists globally, this discussion will specifically address the challenges that are particularly pertinent in the Greek archaeological context.

A significant obstacle faced by the field of archaeology and the humanities in general is the limited financial support provided by national and European funding agencies. The prevailing tendency to prioritize disciplines with immediate economic advantages has resulted in meagre funds being allocated to the humanities, with only a few exceptions.

While public benefit foundations have played a crucial role in supporting archaeology in Greece, their focus tends to be on funding excavation projects and museum exhibitions rather than on lab-based analysis, such as the study of human remains. Nonetheless, osteoarchaeologists working in Greece have been successful in securing competitive grants from prestigious organizations. For example, the *TEFRA* project focuses on the use of fire on human remains in the prehistoric and protohistoric Aegean, covering both cremations and other forms of heat-induced alterations (https://tefraproject.web.auth.gr/-/index.php/en/). The project has received funding from the Hellenic Foundation for Research and Innovation, and, through a series of case studies and experimental work, it explores technological aspects around the use of fire in funerary contexts, as well as the osteobiography of the individuals who had been exposed to fire. Several bioarchaeology research projects have also been funded by the prestigious Marie Skłodowska-Curie postdoctoral fellowships scheme. Among these, *EPOCH GeoChem* adopted a multi-isotope approach to examine the Neolithic transition on Crete with a focus on the dating of early human occupation on the island, mobility patterns, and diet (https://cordis.europa.eu/project/id/654736). *BODICON* also examined issues of mobility and diet, but now through a combination of macroscopic and isotopic methods and with a focus on capturing the embodied political transformations that occurred at Dion during Roman colonization (https://cordis.europa.eu/project/id/841096). *HumAn* adopted an even broader methodological approach, encompassing macroscopic and microanalytical methods for the assessment of biological relatedness, diet, mechanical stress, and health diachronically from Archaic to Roman times in Boeotia (https://cordis.europa.eu/project/id/702991). Finally, *MYSOBIO* reconstructed Mycenaean mortuary practices as social responses to death and explored their relationship with socio-political developments that led to the rise and fall of the Mycenaean palaces (https://cordis.europa.eu/project/id/747458). Very importantly, a European Research Council Consolidator grant was recently awarded to the project *CityLife*, which will explore the impact of urbanization on living conditions across time, with a focus on Thessaloniki. These achievements underscore the acknowledged significance of osteoarchaeology and highlight the need to emphasize further its relevance to contemporary society, particularly in providing insights into diachronic patterns of health, disease, climate change adaptation, social inequality, and other pertinent issues.

The limited availability of national-level training opportunities in human osteoarchaeology poses another challenge, as it necessitates a heavy dependence on foreign universities or institutions to educate future scholars in the field. While this reliance on external institutions is not necessarily negative, it results in scholars interested in working with Greek archaeological material having to train on assemblages with different average preservation status and characteristics compared to those usually encountered in Greece. For example, most assemblages available for training in western European graduate programmes are Medieval and exceptionally well preserved compared to the average Greek archaeological skeletal assemblages, which show moderate to poor preservation given their much older date and local taphonomic conditions. In addition, training that uses foreign assemblages does not allow scholars to network with the national Ephorates of Antiquities and develop experience with Greek procedures for obtaining study and export permits. Despite this constraint, it must be highlighted that two Greek universities, namely the Aristotle University of Thessaloniki and Democritus University of Thrace, have faculty members specializing in osteoarchaeology/biological anthropology. Students pursuing a Master's degree in archaeology at the Aristotle University, particularly those in the prehistoric archaeology programme, have the opportunity to focus their theses on osteoarchaeological topics and gain practical experience. Additionally, a joint postgraduate programme leading to a Master's degree was established in 2017 between the School of Medicine at Aristotle University of Thessaloniki and the School of History and Ethnology at Democritus University of Thrace, with a focus on the history of medicine and biological

anthropology (Papavramidou, Kalogeridou and Papageorgopoulou 2020). These initiatives are instrumental towards developing a national higher education tradition that will give rise to the next generation of Greek osteoarchaeologists, and Greek universities should encourage additional MA-level training in the archaeological sciences, with osteoarchaeology as a sub-specialization.

Another challenge encountered in Greek osteoarchaeology is the absence of a national organization within the field similar to the British Association for Biological Anthropology and Osteoarchaeology. This can be attributed to the relatively small number of osteoarchaeologists in Greece, although this figure is gradually increasing. While this may not appear to be a significant issue, the establishment of such an association, even at a smaller scale and less formal format, could play a crucial role in standardizing practices within the field, such as ensuring the use of consistent data collection protocols tailored to the region's specific preservation conditions and population standards, and promoting data sharing. A set of standardized practices would facilitate comparisons between datasets; this, in turn, would contribute to addressing broader research questions, such as long-term adaptation to climate change and the impacts of migration. Currently, the majority of osteoarchaeological studies on Greek remains consist of individual case studies, which may be very important, but they are rather limited in their ability to address bigger questions.

The ability to address broader research questions is also hindered by the fact that most skeletal assemblages available for study come from rescue excavations. These excavations are often conducted under strict deadlines, limited budgets, and with insufficient presence of experts in the field. Ideally, an osteoarchaeologist should actively participate in the excavation of funerary or other contexts where human remains are retrieved. Realistically, this is often not possible, resulting in important loss of contextual information (Nikita *et al.* 2023). Another serious issue is that, often, by the time funds have been secured to initiate the osteoarchaeological study, the excavators have moved on to a different pressing project and there is simply no time to work closely together in order to contextualize effectively the bioarchaeological data. Additionally, due to the nature of rescue excavations, different specialists may work on different aspects of the archaeological record (e.g. different types of grave goods, taphonomy) at different times. As a result, there is little to no communication among them, which further hinders the contextualization of the bioarchaeological results. These issues limit the ability of Greek osteoarchaeologists to conduct a thorough biocultural assessment of the individuals under study and explore more complex research questions.

Finally, an issue arising from the aforementioned constraints is the tendency to conform to international trends led primarily by scholars from the US and UK, as exemplified by Jane Buikstra and colleagues (2022), rather than taking a leading role in shaping these trends. Specifically, we follow closely international best practices regarding research design, statistical processing, and contextualization of the bioarchaeological findings (with the limitations highlighted above). Furthermore, we acknowledge the importance of making bioarchaeology relevant for contemporary society given the deep time perspectives it may offer to issues such as social inequality and identity, adaptation to climate change, migration and other forms of mobility, (structural) violence, and epidemic disease. Indeed, Greece presents an ideal context for the application of biocultural/biosocial approaches, given its abundant archaeological and textual evidence spanning from prehistory to modern times, and the pressing challenges it faces such as migration, climate change, and social inequality/structural violence. Osteoarchaeologists in Greece have the potential to drive future research agendas, but are currently limited in their ability to do so as they are largely constrained by the issues raised above.

The challenges mentioned above serve to underscore the significant achievements of osteoarchaeological research in Greece. As briefly outlined in the previous sections of this

paper, despite challenges, a multitude of studies conducted by both Greek and international researchers have shed light on various aspects of living conditions throughout time, covering mobility, diet, pathology, activity patterns, but also funerary archaeology, encompassing advanced macroscopic, microscopic, and biomolecular methods. While there are many unanswered questions, continuous research efforts by an increasing number of osteoarchaeologists are filling in important knowledge gaps. The challenges listed above are by now well recognized by stakeholders within and beyond the osteoarchaeological community, and we will continue to actively seek solutions through individual and coordinated efforts. The trajectory of research in the field over the past decade indicates promising future developments and I am looking forward to seeing what a review of the next decade will reveal.

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