



10.5281/zenodo.556353

IDENTIFICATION OF SKELETAL REMAINS FROM A MYCENAEAN BURIAL IN KASTROULI-DESFINA, GREECE

Maria-Eleni Chovalopoulou, Andreas Bertsatos, and Sotiris K. Manolis,

Department of Animal & Human Physiology, Faculty of Biology, School of Sciences, National & Kapodistrian University of Athens, Panepistimiopolis, GR157 01 Athens, Greece

Received: 28/10/2016

Accepted: 25/03/2017

Corresponding authors: chovalopoulou.eleni@gmail.com; andreas.bertsatos@gmail.com; smanol@biol.uoa.gr

ABSTRACT

The present work details the findings of the anthropological study of the skeletal material unearthed from the Kastrouli archaeological site on July 2016. The skeletal material was significantly deteriorated with most of the bones fragmented beyond a level to yield any information. Despite almost no single bone was found intact, hence no metrics for stature estimation are provided herein, a number of sufficiently preserved femur bones along with numerous teeth were identified and allowed for MNI estimates for this commingled burial. We identified 15 adults along with 2 subadults, an infant and a fetus. Skeletal remains of domesticated animals were also recovered from the same undisturbed context, for which the recovered archaeological artifacts suggest that the tomb was Mycenaean/Late Helladic in date.

KEYWORDS: Kastrouli archaeological site, Mycenaean/Late Helladic tomb, skeletal remains, anthropological study.

INTRODUCTION

Few anthropological studies have been conducted with regard to the region of Phokis. This paper presents the findings of the anthropological study of the skeletal (animal and human) remains recovered from the Kastrouli archaeological site on July 2016. Other well-known sites are Delphi, Amfissa and Kirra, which have unearthed several Mycenaean skeletons and a skull with trepanation (Manolis *et al.*, 1994). The excavation of the Kastrouli site was the joint effort of the international collaboration between the Laboratory of Archaeometry of the University of Aegean and the Center for Cyber-Archaeology at University of California San Diego. First results of the excavation are presented in Sideris *et al.* (2017).

The environmental conditions in Greece regarding bone conservation appear similar to other areas in the eastern Mediterranean (eg. Cyprus), which are characterized by calcareous soils and show a wide range of climatic variations from dry / hot to wet / cold. More specifically, differences in bone conservation may be due to soil type, moisture, deep plowing and exposure to sunlight, the root system of plants and the activity of various rodents and insects. With regard to the Kastrouli site, the unearthed skeletal material was poorly preserved resulting to severe limitations on the information that could be retrieved from the macroscopic analysis of the skeletal remains.

The skeletal remains were examined at the Delphi Archaeological Museum on September 2016 and a number of samples was prepared and retained for further analyses. Detailed report and supplement material about the sampling are provided separately.

MATERIAL & METHODS

The skeletal material was significantly deteriorated with most of the bones fragmented beyond a level to yield any information. Figure 1 sets an example of the condition of the bones. Despite almost no single bone was found intact, hence no metrics for stature estimation are provided herein, a number of sufficiently preserved femur bones along with numerous teeth were identified and allowed for Minimum Number of Individual (MNI) estimates for this commingled burial. With respect to adult individuals, three MNI estimates were calculated based on fragments of proximal right and proximal left femoral metaphyses as well as on left mandibular first molar teeth. Additionally to MNI, we report on sex and age composition, dental and other skeletal pathological characteristics as well as the identification of non-human skeletal remains, which

were unearthed from the excavation site along with the human skeletal material.



Figure 1: a) Fragmented long bones; b) Miscellaneous fragments

Minimum number of individuals: In order to determine the minimum number of individuals represented in the commingled burial from the Kastrouli site, we sorted the identified bones by side and skeletal element and subsequently assigned the highest frequency as MNI. The MNI for subadults, child and infants were recorded separately.

Sex determination: Sex determination was performed following standard osteological methods for adults, especially including patterns of robusticity and cranial and pelvic morphology (Buikstra and Ubelaker, 1994). Additionally, the teeth have also been evaluated for sex prediction in an effort to improve the resulted sexing of the buried individuals at the Kastrouli site. According to the work of E. Zorba and her colleagues on a modern Greek collection (Zorba *et al.*, 2014), the maxillary second incisors followed by maxillary canines are the most dimorphic teeth. Their sex discrimination

equations for these particular teeth have been applied to the available samples of the studied material.

Age estimation: Estimation of age-at-death relied on ectocranial suture closure (Meindl and Lovejoy, 1985), tooth formation and eruption (Scheid and Weiss, 2012), and general size and development of cranial and postcranial elements and long bone diaphyseal lengths (Buikstra and Ubelaker, 1994).

RESULTS & DISCUSSION

Demography: The three most frequently identified skeletal elements are presented on Table 1. Based on the proximal right femoral metaphyses identified in

the skeletal material, there are at least 15 adult individuals contained in the tomb of the Kastrouli excavation. For the purposes of MNI calculation the entire skeletal material was considered a single unified burial, since at the time limited excavation data prevented from locating each bag to specific locus at the excavation site. However, Table 1 also records the corresponding crate and bag id number for each bone fragment or tooth considered in the MNI calculations. Note that all teeth were stored in the same bag (Bag Barcode: 12345679) in crate 11, therefore only basket number is provided.

Table 1: Summary of individual counts for adult MNI calculation

Bone/Tooth examined	Individual count	Crate	Bag
Femur (proximal right femoral metaphysis)	4	1	65089241, 29983837, 87612616, 86557874
	1	7	37362902
	7	9	52857722A
	1	10	11111111
	2	11	12345678, 22223333
MNI:	15		
Femur (proximal left femoral metaphysis)	3	1	29983837, 65089241
	2	7	37362902
	6	9	52857722A
	2	11	12345678
MNI:	13		
Left Mandibular First Molar	11	11	B.20136, B.20148, B.20142, B.20119, B.20108, B.20081
MNI:	11		

Skeletal remains of subadult individuals have also been identified along with one case of an infant, based on cranial fragments and one case of a fetus, based on a well preserved occipital bone. Table 2 summarizes all subadult skeletal remains identified and also records the corresponding crate and bag id number. The

bone fragments considered in the MNI calculation and age estimation of the subadult individuals are pointed out. According to the findings at least 2 subadults have been identified, one of which was less than 11 years old in age at death.

Table 2: Detailed list of individual counts and age estimates for subadults

Age estimate	Identified Bone fragment	Crate	Bag
<18	Vertebral body	10	39094155
<18	Ischial bone	10	11111111
<11	Distal epiphysis of humerus bone	11	88888888
<18	5 vertebrae (4 bodies + 1 cervical) Left clavicle, 2 metatarsals, cranial fragment	11	88888888

<18	Right femur**, Left ulna	11	12341234
Fetus	Occipital bone (intact)	1	96530842
Infant	Cranial fragment	1	96530842
<13*	Proximal metaphysis of tibia bone	1	86557874
<18	2 ulnar bones	7	36289943
<18	1 metatarsal	9	49754227
<13	Humeral head	9	49754227
<18	Radius bone	10	11111114
<12	Right femur **, femoral head	10	11111112
*Based on Scheuer <i>et al.</i> , 2000			
**Bones accounted for subadult MNI of 2.			

Despite some age estimation was possible for the subadult individuals, no adult age-characteristic bone fragments were identified. The few fragments of auricular surface and pubic symphysis found in the skeletal material were too degraded for any age-related morphological evaluation. The poor condition of the bones is also responsible for the limited ability in sex determination of the adult individuals. Table 3 summarizes the identified bones that provided information about sex. The examination of the skeletal material yielded a minimum of 1 male and 1 female individual.

Using Zorba's prediction equations on the root length of the maxillary canines and second incisors available in the skeletal material from the Kastrouli site, an additional male individual has been identified raising the sexually identified individuals to 2 males and 1 female in total (Table 4). More specifically, 2 maxillary right canines were determined as males and

1 maxillary left canine as well as 1 maxillary left lateral incisor were determined females. Measurement details for each corresponding tooth are given in Table 4.

Table 3: Detailed list of fragments with sex information

Sex	Bone fragment	Crate	Bag
Male	Left frontal bone	7	84352657
Male	Left mastoid process*	7	24499362
Male	Right frontal bone	9	52857722
Male	Mandibular fragment	9	21131895
Female	Right mastoid process*	10	11111112
*Both fragments are the temporal bone fragments with the petrous part that were retained for subsequent DNA extraction			

Table 4: Detailed list of teeth with sex information

Tooth examined	Type of measurement	Root length (mm)	Predicted Sex	Basket
Max* left canine	Mesial root length	16.02	Female	B.20096
Max* right canine	Buccal root length	15.52	Male	B.20136
Max* right canine	Buccal root length	17.06	Male	B.20081
Max* left lateral incisor	Distal root length	13.74	Female	B.20081
Max* = Maxillary				

Pathology: With respect to pathological conditions regarding the skeletal remains, dental wear was identified in most cases of the teeth examined. Furthermore, the only 2 fragmented mandibles with teeth still attached that were found in the studied material, both exhibited dental wear on the first molar and dental caries on the second premolar. Figure 2 illustrates such

a case from a mandible fragment stored in bag 39094155, crate 10. One of the two cases also exhibited periodontal disease.



Figure 2: Dental wear and caries

Since there is no evidence of the age at death of the individuals, who constitute the skeletal material from the Kastrouli site, or any knowledge so far on their dietary habits, no conclusions can be drawn regarding their oral health status.

The only other pathological condition identified in the skeletal remains was the existence of Schmorl's nodes in a number of vertebrae. The most prominent case of Schmorl's node disease identified on a thoracic vertebra is shown in Figure 3.

Animal skeletal remains: Several bones of various animals have been unearthed commingled with the human skeletal remains. Among those that were identified as domesticated animals a large number of snake vertebrae and few different species of gastropod shells (snails) have also been recovered. With respect to the domesticated animals, bones and/or teeth belonging to *Gallus gallus domesticus* (chicken), *Bos taurus* (domesticated cow), *Sus scrofa domesticus* (domesticated pig) as well as *Ovis aries/Capra hircus* (sheep/goat) were identified. In addition to the inherent difficulty to distinguish between the latter (sheep/goat), the recovered bones were poorly preserved and fragmented to allow for a more precise identification.

Considering that Loci 112 and 121 represent the only undisturbed context, for which the recovered archaeological artifacts suggest that the tomb was Mycenaean/Late Helladic in date, the only animal bones identified in these Loci were attributed to domesticated cow and sheep/goat.

Considering that Loci 112 and 121 represent the only undisturbed context, for which the recovered archaeological artifacts suggest that the tomb was Mycenaean/Late Helladic in date, the only animal bones identified in these Loci were attributed to domesticated cow and sheep/goat.



Figure 3: Schmorl's node disease

ACKNOWLEDGEMENTS

The authors would like to thank Dr. Dimitris Michailidis at the Malcolm H. Wiener Lab for Archaeological Science of the American School of Classical Studies at Athens, whose help was instrumental in the precise identification of the animal bones.

REFERENCES

- Buikstra, J.E., Ubelaker, D. (eds.) (1994). *Standards for data collection from human skeletal remains*. Arkansas Archaeological Survey Research Series 44: Fayetteville.
- Hillson, S. (1986). *Teeth*. University Cambridge Press. Cambridge.
- Manolis, S.K., Papagrigorakis, M.J., Zafeiratos, C. (1994). Trepanations in Greece: observations on a Middle Bronze Age skull. *HOMO* 45 (Suppl): S80, 1994.
- White, T.D., and Folkens, P.A. (2005). *The human bone manual*. Burlington, MA: Elsevier-Academic Press; 464 pp.
- Sideris, A., Liritzis, I., Liss, B., Howland, M.D., Levy, T.E. (2017) At-risk cultural heritage: new excavations and finds from the Mycenaean site of Kastrouli, Phokis, Greece. *Mediterranean Archaeology and Archaeometry*, 17(1): 271-285.
- Scheid, C.R., and Weiss, G. (2012). *Dental Anatomy*, 8th Ed., Wolkers Kluwer/Lippincott Williams & Wilkins, 514 pp.
- Scheuer, L., and Black, S. (2000). *Developmental juvenile osteology*. S. Diego, CA: Academic Press. 587 pp.
- Zorba, E., Vanna, V., and Moraitis, K. (2014). Sexual dimorphism of root length on a Greek population sample. *HOMO* 65:143-154.