PAPERS AND MONOGRAPHS OF THE FINNISH INSTITUTE AT ATHENS VOL. XXII

THESPROTIA EXPEDITION III
LANDSCAPES OF NOMADISM AND SEDENTISM

Edited by Björn Forsén, Nena Galanidou and Esko Tikkala

ISSN 1237-2684
ISBN 978-952-68500-0-9

Printed in Finland by Vammalan Kirjapaino

Cover: The Bronze Age site of Goutsoura seen from the south. Photo: Björn Forsén

Layout: Esko Tikkala

Contents

Human Skeletal Remains from the Bronze Age Cemetery of Goutsoura

Markku Niskanen

This chapter focuses on human skeletal remains recovered from the Bronze Age site of Goutsoura, which includes two burial grounds: the northern tumulus located in Area 2 and the southern cemetery located in Area 3.[1] Very large numbers of human bones were recovered from these two burial grounds. There were a few fairly intact and undisturbed burials as well as separate skeletal elements of numerous additional individuals.

Bone preservation is variable. Some bone finds were well-preserved and remained intact during their recovery and storage, but many others either broke into smaller fragments or even disintegrated, which greatly increased the number of already very large number of fragments. Findings presented here are to be considered very preliminary as they are based on only one week of review of this vast quantity of uncleaned bone fragments. The time constraints prevented the proper counting and organizing of bone fragments. Therefore, the proportional representations of different anatomical regions are not given and all statements on numbers of individuals (e.g. the minimum number of individuals) are preliminary.

All stature estimates from long bone lengths are done using Ruff *et al.*'s sex-specific equations for South Europeans.[2] Sex is determined from the pelvic shape[3] or joint size.[4] Age of children and sub-adults is estimated from dentition,[5] diaphyseal length[6] or epiphyseal closure.[7] Bone finds from the northern tumulus are discussed first, followed by a discussion of bone finds from the southern cemetery.

The northern tumulus

The northern tumulus included a central slab-lined cist grave, several burials of children (Child graves 1, 2, 3 and 4), a cremation burial and isolated (scattered) human bone finds. The central slab-lined cist grave is discussed first, followed by the child graves and additional burnt human bones found from this area.

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[1] For the general description and stratigraphy of the site, see Forsén, this volume; for the grave structures, see Lima, this volume. I have gained much from the careful excavation and detailed reports by the square supervisors Tommi Turmo, Sarita Sandell, Otso Manninen, Jarkko Saipio, Niko Latvakoski and Rasmus Åkerblom. I also want to thank Björn Forsén for his help while studying the material and writing this chapter. The drawings were made in field by Niko Latvakoski (Figs. 4-5) and Rasmus Åkerblom (Figs. 6-7) and later inked by Anna Patteri. Figs. 1-3 are by Esko Tikkala.

[2] Ruff *et al.* 2012, table 3.

[3] Buikstra and Ubelaker 1994.

[4] Male-female sectioning points are from Spradley and Jantz 2011, table 8.

[5] White and Folkens 2000, fig. 17.1, table 17.1.

[6] Cordoso *et al.* 2014.

[7] Cordoso 2008a; Cordoso 2008b.

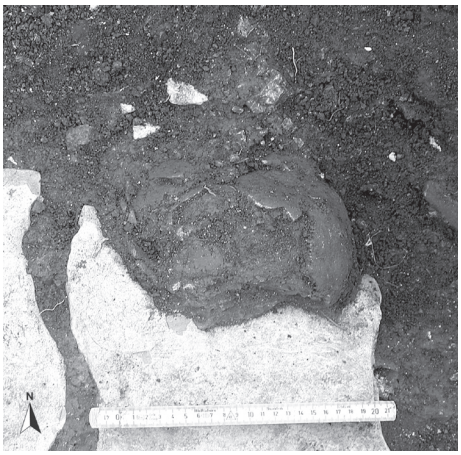

Fig. 1. Broken skull found on top of the eastern end of the central cist grave's cover slab in the tumulus.

Fig. 2. Skeletal remains in the central cist grave of the tumulus.

Central slab-lined cist grave

This cist grave is located in an east to west direction in the centre of the northern tumulus. According to the excavation report, a broken skull was found on top of the eastern end of the cist's cover slab (Fig. 1).[8] This skull broke into many small pieces during recovery, but includes at least the parietals and a broken frontal bone. When this cist grave was opened it revealed what appeared to be the skeletal remains of two adults (Fig. 2). Individual 1 was buried in supine position fully extended with the head towards the west. Individual 2 is represented by a heap of disarticulated postcranial bones and a few loose teeth at the eastern end of this cist. This heap of bones may also include bones from a third individual.

Bones of Individual 1 were found in anatomically correct positions, as in an undisturbed burial. The skull of this individual was, however, incomplete. It included a partially preserved mandible, the mastoid regions of temporal bones (mastoid height 26.5 mm) and the occipital bone, but not its frontal bone and parietal bones. The incomplete skull from the grave top (Fig. 1) includes these missing cranial elements and apparently does not include those found inside the grave. These two partial skulls may well represent the one and the same skull, demonstrating that this grave had been opened and the burial disturbed. Bones of this individual were very poorly preserved and disintegrated during their recovery. It was thus possible to make only a few observations and take even fewer measurements.

Individual 1 was a female, based on her small mastoid processes (height 26.5 mm). She was in her late teens or early 20s at the time of death because there is only some dentine exposed in M_1s and incisors. The enamel of the M_3s is hardly even polished, and because a trace of the epiphyseal line is visible in a proximal left radius, this would indicate, furthermore, that this individual's radial epiphyses had just completed union.

[8] For a more detailed description of the grave, see Forsén, this volume and Lima, this volume.

This generally occurred at age 16-17 in the early twentieth century Lisbon females representing the middle-to-low socioeconomic group.[9] This Portuguese reference population is probably quite appropriate for the Bronze Age Mediterranean Europeans for age assessment purposes because it predates recent acceleration in growth and maturation rates.

Her estimated stature based on skeletal length was lower than 150 cm (perhaps 143 cm based on Fig. 2, which was used in skeletal length estimation). Thus, she was very short-statured. A well-preserved left fibula from bone bags of "the second individual" indicates a much taller stature (154.26 cm, as estimated below). However, this fibula is much more likely associated with Individual 2 or even a third individual because it is better preserved than other bones of Individual 1 and its epiphyses are fully fused. This epiphyseal fusion indicates that this bone belongs to an older individual because the fibular and radial epiphyses fuse at about the same age.[10]

Individual 2, and the apparently additional individual, are represented by postcranial bones and a few loose teeth from a heap of bones at the eastern end of the cist that was sampled as "Bones #2". These bones are considerably better preserved than those of Individual 1. A fairly well preserved right ilium clearly exhibits female morphology. This female individual was fully grown at the time of her death because all epiphyses of lower limb bones and vertebrae are completely fused indicating a fully grown adult individual. Two loose teeth from the eastern end of this grave appear to originate from two or more individuals, due to different amounts of tooth wear. An apparently recently erupted third molar (M_3) indicates a young adult (late teens or early 20s). Another M_3 has some dentine exposed indicating clearly older age (late 20s or early 30s).

I have used sex-specific equations for prehistoric and historic South Europeans published by Ruff *et al.* to estimate stature of this individual and other individuals discussed in this chapter.[11] Applying an equation for summed maximum lengths of femur (M-1) and tibia (M-1a) (right femur 43.1 cm + right tibia 35.2 cm = 78.3 cm) provides a stature estimate of 158.06 cm for this individual. Her stature was thus quite average for this period.[12] This female had a rather slender body build, as indicated by her femoral head super-inferior breadth (40 mm), which is small both absolutely and relative to femoral length for European females (average 42.5 mm).[13] Because joint size relative to long bone length correlates with body build, this individual probably had a rather slender physique.

A pair of fibulae (the left one has a maximum length of 33.3 cm; the right one is not measurable) included in bone bags of "the second individual" are due to their good preservation and the epiphyseal fusion schedule clearly associated with Individual 2. I converted the maximum fibular length (33.3 cm) to the maximum tibial length (34.29 cm) using a regression equation (Tibial length in cm = 1.026 × Fibular length in cm + 0.129, r = 0.986, SEE = 0.52 cm, n = 64). This estimation of tibial length from fibular length is thus about 0.9 cm too short (length of right tibia 35.2 cm - estimated tibial length from length of left fibula 34.29 cm = 0.91 cm) if these bones are from the same individual.

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[9] Cardoso 2008b, table 14.
[10] Cardoso 2008a, tables 18 and 19 vs. Cardoso 2008b, table 14.
[11] Ruff *et al.* 2012, table 3.
[12] On prehistoric and historic European statures, see Niskanen *et al.*, in preparation.
[13] For the European average, see Ruff *et al.* 2012, table 2.

Stature estimation based on this fibular length (154.26 cm) is also 3.4 cm shorter than that based on the length of right tibia (157.66 cm), which also demonstrates this length disparity.

The above tibial length-fibular length disparity is, however, just barely within 95% confidence interval for individual values about mean if tibial length is regressed against fibular length, whether bones from the same side or opposite sides are compared. We thus cannot rule out that this left fibula and right tibia belong to an individual whose left lower leg is possibly a little shorter (but not pathologically so) than his/her right lower leg. Relative robusticities of the bones in question (based on a visual examination) are also what one would expect if these bones are from the same individual. The existence of a possible third individual included in this cist grave is mainly based on teeth from the eastern end of this cist grave appearing to originate from a young adult and a much older adult, based on different amounts of tooth wear. The direct dating of bones from inside this grave would be required.

Considerable differences in bone preservation between these two (or three) individuals and the fact that some cranial elements of Individual 1 were relocated on top of the flat cover slab of the grave indicate that there were two separate burial events. There was at first a primary burial of a young female individual laid down in supine position (Individual 1). At a later date, there was a secondary burial of disarticulated skeletal elements of another female (Individual 2), who was also rather young at the time of death, and possibly some elements of a third individual, at the eastern end of the cist. Furthermore, Individual 2 and this possible third individual were apparently not buried as complete bodies, but as collections of various bones from these individuals. Alternatively, these disarticulated skeletal remains from the eastern end of this cist could represent an earlier burial (or burials) that was (were) pushed to one side of this grave to make room for Individual 1, but the above-mentioned much poorer bone preservation of Individual 1 argues against this interpretation.

Child Grave 1

Square 509/508, Loc. 3 (Burial Block) contained the skeletal remains of a child buried in hocker position.[14] There is a partial braincase; a mandible (permanent M_1 in place, M_2 crown with unformed roots); a maxilla (permanent first incisor that has a fully formed crown, but only half of its root is formed; M_2 that has a complete crowns, but no root formation); a right temporal piece, including a mastoid process measuring 16.5 mm in height; a permanent mandibular incisor with almost completely formed root; small cranial base fragments; a left and a right clavicle; a left and a right scapula; long bone fragments; a left radial shaft; carpal and tarsal fragments; a proximal tibia with unfused epiphysis; a right femoral shaft; a fragmentary maxilla with four reasonably well preserved teeth (a first and a second incisor that have fully formed crowns and ½ formed roots, a canine that has a fully formed crown and ¼ formed crown, a first premolar that has a fully formed crown and a root that has begun to form). All these skeletal elements are clearly from the same individual because there is no overlap of elements and all age diagnostic features indicate approximately the same age, i.e., ca. 7-8 years.[15]

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[14] The Burial block was lifted and excavated at the store rooms in Gardiki. For a more detailed description of the grave, see Forsén, this volume and Lima, this volume, Fig. 10.

[15] Based on dental development according to White and Folkens 2000, fig. 17.1, table 17.1.

Child Grave 2
In Square 505/508, Loc. 3, cranial pieces of a child, including a mandible, were recovered as sample C.[16] The dental age is ca. 6-7 years based on an almost completely erupted M_1. In addition, three isolated teeth, including one maxillary incisor, one maxillary canine and one mandibular incisor, were also recovered from this square. These isolated teeth were placed in a different bone bag from remains of the cranial specimen discussed above. The crowns of these permanent teeth are formed, but the roots are still at least partly unformed, indicating ca. 6-9 years of age.[17] These teeth are thus likely not from the same individual. In addition, there are also fragmented pieces of long bone shafts and some rib fragments.

Child Grave 3
Cranial and postcranial elements of an infant came from square 503/508. This infant grave may belong to the bottom of Loc. 1 and even to the uppermost cultural layer.[18] My age estimation of this infant is ca. 6-8 months because the deciduous incisors and molars have not yet erupted, although their crowns are formed or almost formed.[19] Furthermore, the pars *basilaris* is in three separate pieces.[20] There are also numerous frontal and parietal fragments. Postcranial elements include rib fragments, pieces of most long bones (humera, ulna, radia, femora and tibia), as well as fragments of several "flat" bones (scapulae and iliac wings).

Child Grave 4
Skeletal remains of an infant were found in square 509/507.[21] The cranial remains include pieces of both temporal bones, pieces of a sphenoid, and recently erupted deciduous incisors, indicating age of ca. 12-18 months. The postcranial pieces include a tibial shaft piece ca. 53 mm long, clavicles, ribs, as well as fragmented bones.

Cremation burial
Burned human bones were recovered from a charcoal layer in square 503/505, Loc. 4-5, which was interpreted as a cremation burial predating the tumulus.[22] The bones parietal and cranial base fragments as well some postcranial fragments are also included. These recovered bone fragments do not indicate whether this is the actual site of cremation burial, although the clear charcoal layer seems to speak for it.

The southern cemetery

The southern cemetery is located 70 m south-southwest of the northern tumulus. The cemetery consists of six slab-lined cist graves (Graves 1, 2, 3, 4, 5 and 6) surrounded

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[16] For a more detailed description of the grave, see Forsén, this volume and Lima, this volume, including Figs. 11-12.
[17] See White and Folkens 2000, fig. 17.1, table 17.1.
[18] For a more detailed description of the grave, see Forsén, this volume and Lima, this volume.
[19] See White and Folkens 2000, fig. 17.1.
[20] The fusion of pars basilaris and pars lateralis occurs at 5-7 years of age according to Schaefer *et al.* 2009, 15.
[21] See Lima, this volume.
[22] For further information concerning the cremation burial, see Forsén, this volume, and Lima, this volume, Fig. 6.

by conjoining stone circles.[23] All graves except Grave 1 (looted during the course of excavation) were recovered intact. Human skeletal remains recovered from these graves are here discussed in numerical order from Grave 1 to Grave 6.

Grave 1

Diagnostic human remains recovered from inside this grave include a temporal bone fragment, a short femoral shaft piece (midshaft antero-posterior and medio-lateral diameters are 28.0 mm and 27.5 mm, respectively), probably from a left femur, and a separate femoral head fragment (supero-inferior breadth 43.5 mm). The sides of these femoral pieces were not determined. Their relative sizes suggest that they could originate from the same individual.

A partial left innominate found in the eastern part of this grave is definitely from a male individual, based on its masculine sciatic notch shape. Acetabular height measured from this innominate is 52.5 mm. A right maxilla of an adult, also from the east of this grave, is more likely to derive from a male individual than from a female, due to its size and robusticity. A fairly complete shaft of a right femur (midshaft antero-posterior and medio-lateral diameters are 28.5 mm and 27.5 mm, respectively) was also found at the eastern end of this grave. This femoral shaft piece and the one from inside of Grave 1 grave have similar midshaft diameters to those of the Bronze Age males from Lerna[24] and the Roman Imperial period males.[25] They are thus more likely to derive from male individual(s) than from female individual(s).

It is difficult to say if the above bones originate from the same individuals. Because the average difference of the acetabular and femoral head diameters is 8.7 mm (± 1.8 mm), it is possible that at least the femoral head recovered from inside this grave could be associated with the left innominate found in the eastern end of this grave, but this size-match does not demonstrate that all the specimens mentioned above represent the same individual.

Grave 2

This burial was found in a small cist (only 0.77 m long), apparently constructed for a child. The bones from the cist comprise disarticulated cranial and postcranial bone fragments of an infant or a young child. All teeth are deciduous teeth and include the following: fully formed central incisor crowns, almost fully formed lateral incisor crowns and partly formed molar crowns. This degree of dental elements indicates an infant who was about six months old at the time of death.[26]

Cranial elements are also represented by a separate *pars basilaris*. Postcranial remains are represented by vertebral bodies without appendixes and eight long bone diaphysis. Humeral diaphyseal length (77.5 mm) indicates an infant of about six months of age (0.478 years).[27] This is consistent with the above age assessment based on the dental development.

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[23] For the construction and stratigraphy of these graves, see Forsén, this volume and Lima, this volume.
[24] See Angel 1971, table 6.
[25] See Minozzi *et al.* 2013, table 3.
[26] See White and Folkens 2000, fig. 17.1, table 17.1.
[27] Based on applying a combined-sex regression equation in Cardoso *et al.* 2014, table 5.

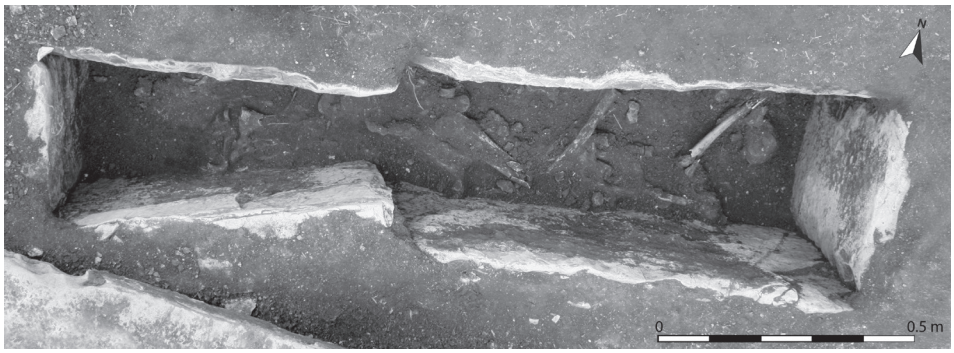


Fig. 3. Skeletal remains in Grave 3 of the southern cemetery.

Grave 3

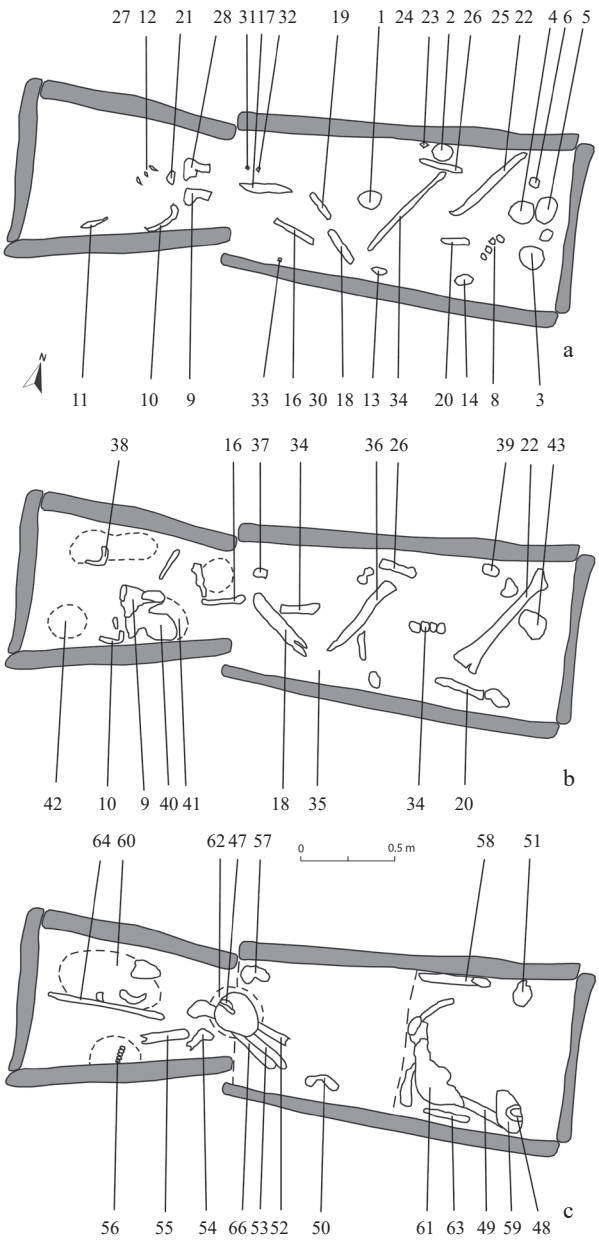
This grave (Fig. 3) contains disarticulated bones of many individuals of both sexes and different ages from several stratigraphic layers. There are also bone clusters, which may well represent bone piles. Bones of one particular individual may thus be distributed between different layers. There are also cranial and postcranial elements (representing upper limb, lower limb and axial skeleton) from different parts of this grave (i.e. west, middle and east part). There is no apparent spatial organization of the skeletal material inside this grave. Cranial and postcranial elements of children and adults were recovered from different parts of this grave (i.e. west, middle and east part), and they were found mixed in bone clusters and/or bone piles. This pattern possibly suggests that many of these bones may not have been laid in this grave in anatomical order. However some of these bones may represent disturbed burials of articulated skeletons. Due to this complex pattern and the very many bones recovered, it was impossible to sort out bones, thus individuals represented, within the short time this study was conducted.

Most of the bones were numbered during the excavation. Sometimes one number was assigned to a concentration of smaller bones. The location of the numbered bones was noted on three consecutive sketches (Figs. 4a-c), representing different depths of the grave. The bones are here described from the top to the bottom, and from the east to the west according to these numbers.

The uppermost layers of the eastern part produced skeletal remains of different individuals. Skeletal remains of subadult individuals include a partial left proximal tibia with an unfused proximal epiphysis (No. 22), two permanent tooth crowns (a mandibular incisor and a premolar) with unformed or only partially formed roots, a partial right hand of a child (No. 25) and a very short partial tibial shaft of a child (No. 26). Skeletal remains of adults include a fully formed third molar, six thoracic vertebrae with fully fused epiphyseal rings, a left talus (No. 34) and a right proximal tibial shaft (No. 36).

Human bones from the uppermost layer of the middle part include bones of subadult and adult individual(s). Those of immature individual(s) include a thoracic vertebra (probably T2) (No. 16) and a right femoral distal epiphysis (No. 39). Those of adults include a thoracic vertebra (T3), a partial left distal humerus, an olecranon process of a left ulna, and parts of both left and right hand (No. 24).

Skeletal finds for the uppermost layer of the western part include bones of at least one adult and one child. There is a left mandibular half (No. 10) of a young adult female, based on the small amount of tooth wear in the third molar and this mandible's



Figs. 4a-c. Sketches showing the position of bones in Grave 3 at different depths.

low symphyseal height (27 mm). There are also two rib fragments (No. 38), which are more likely to derive from an adult than from a child due to their thickness. Bones of children include a small-sized proximal metacarpal fragment (No. 41) that has an unfused epiphysis and a permanent premolar with unformed roots (No. 42), which indicates ca. five years of age.[28] It is not possible to state whether these bones are from the same child or not.

It is very difficult to say if bones from the deeper layers of this grave originate from earlier burials than those from the higher and more recent layers, or if there were bone piles. That is, bones of one individual may have been recovered from different layers. Very detailed and time consuming comparisons of bones or their direct radiocarbon dating would be required to solve this problem.

Skeletal elements recovered from the deeper layers of the eastern part also originated from several different individuals. Both sexes and different ages are represented. There are four cervical vertebrae (from C3 to C6), a partial proximal tibia, a proximal right ulna and a femoral or humeral head fragment (No. 44). The overall size of these bones suggest female, much more than male. There is also a broken mandible (No. 48) and a permanent canine, two permanent premolars and four molars

[28] See White and Folkens 2000, fig. 17.1, table 17.1.

possibly from the same mandible. Of these molars, M_3 exhibits no tooth wear, but the other three (one M_1 and two M_2s) exhibit some tooth wear.

Some skeletal elements from the northernmost edge of this eastern part of the grave originated from at least one adult male, based on their overall size. These include a left partial lateral clavicle piece, femoral head fragment and a talar fragment (probably No. 58).

In addition to the above skeletal remains of adults, skeletal remains of immature individuals were also recovered from this part of the grave. These include two permanent maxillary central incisor crowns, three other incisor crowns, one canine crown with some root formation, one partially formed premolar crown and four molar crowns with unformed root (No. 51). These teeth are probably from one child, whose age was about 5-7 years based on the degree of dental development.[29] Additional skeletal remains of immature individuals include a proximal unfused radial epiphysis, a proximal humeral fragment and numerous rib fragments (No. 63). These bone elements are from one, or several adolescent individuals.

Skeletal elements from the middle part originate from at least two different individuals. A small lumbar vertebra with unfused epiphyses and an unfused proximal tibial fragment are certainly from a child, whereas a vertebral body with a completely fused epipheseal ring (these bones are from No. 45) and a completely fused iliac crest (No. 50) are definitely from an adult individual.

There was a concentration of human bones originating from several different individuals at the boundary between the middle and the western part of the grave. Bones of children or adolescents include a proximal right humerus, five vertebral bodies without epiphyses, an unfused ischium (No. 62), a sternal piece, a distal left femur and an unfused femoral head (No. 66). These bones could have originated from one individual, but that is far from certain. Femoral head diameter (40-42 mm) indicates that this individual (or one of these individuals) was quite likely a female.[30] The age of this individual (if all bones are from the same individual) was anywhere between 10 and 16 (18) years.

Adult bones include a femoral shaft fragment of an adolescent or an adult, due to its overall size from the westernmost edge of the middle part, a left distal femur (epicondylar breadth 69.5 mm indicates female), a femoral shaft piece that fits with the above distal femur (No. 53), as well as several loose teeth of one or several adult, or nearly adult individuals (drawing number not marked on the bone bag, but I assume this to be No. 56). These teeth include four incisors (dentine exposed), one canine (some wear), one premolar (some enamel polishing), one second molar (some enamel polishing) and one third molar (no tooth wear).

Skeletal remains of several different individuals were also recovered from the western part of this grave. These include a large permanent canine, three crowns of permanent molars, a proximal metapodial fragment with an unfused epiphyses and sternal pieces (No. 46). All of these remains could have come from the same individual, whose age was ca. five or six years of age at the time of death. Remains of an older child or children were found in the middle of the western part. These included a humeral shaft of a child (ca. 8-12 years of age based on its size), an unfused proximal metapodial and

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[29] White and Folkens 2000, fig. 17.1, table 17.1.
[30] On femoral head size see Spradley and Jantz 2011, table 8.

one proximal row phalange (No. 55). These bones could have originated from the same individual, but that is difficult to verify.

A scattering of human bones representing at least one young adult individual and one juvenile individual were found in the northwestern corner of this grave. Bones of a young adult include a partial right hand and wrist including four metacarpals (from II to V), a hamate, four proximal row phalanges, a fragment of distal left humerus, six vertebral pieces with apparently fused epiphyseal rings and one vertebral fragment with an unfused ring. These skeletal elements (No. 60 and/or 61) could well originate from the same young adult individual. These bones were mixed with skeletal elements of one or more children. These include an unfused distal metatarsal and two probably unfused femoral condyle fragments of a small-sized distal femur.

Grave 4

Disarticulated human bones were recovered from this grave. A fragmented cranium including teeth was recovered from the western end of this grave, whereas postcranial bones (including several intact long bones) were recovered from the middle of this grave. These bones originate from at least two adult individuals, but not necessarily from more than three adult individuals. The most likely scenario is that these bones represent one adult male individual and one smaller-sized individual, probably female. When possible, the bones are described according to the numbers they were given when excavated (Fig. 5).

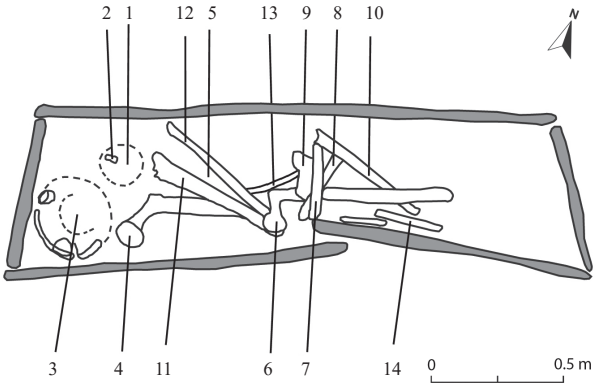

Fig. 5. Sketch showing the position of bones in Grave 4.

There are several braincase fragments (No. 3). The sutures (lambdoid and coronal) are still open, indicating that these cranial elements did not originate from a very old individual. There is an isolated and heavily worn maxillary incisor. There is a partial mandible (No. 1) including five teeth: left and right lateral incisors exhibiting exposed dentine, a left canine with caries at the medial side, a medial left incisor with caries at the lingual surface and the first premolar (P3) with a cavity.

Among the most intact postcranial remains the following can be mentioned. First, there is a complete right femur (No. 4). Its superior-inferior head diameter (45.5 mm) indicates a male.[31] Stature estimation from maximum femoral length (444 mm) is 163.6 cm. Secondly, there is a complete left tibia (No. 11), which probably is from a female individual, due to its gracility. Its maximum length (338 mm) provides stature estimations of 152.8 cm. These stature estimates are provided by Ruff *et al.*'s equations for South Europeans.[32]

[31] On femoral head size see Spradley and Jantz 2011, table 8.
[32] Ruff *et al.* 2012, table 3.

Finally, there is a complete right humerus (No. 10), which robusticity suggests it belonged to an adult male individual. Its maximum length (310 mm) provides a stature estimation of 160.2 cm, if Ruff *et al*. equation for males is applied.[33] This humerus and the above femur could be associated with the same probable male individual because stature estimates provided by upper and lower limb bones are well within the normal range in light of a very large European data set.[34]

Other postcranial bones recovered from this grave are too incomplete to be measured. Their overall size, robusticity, side (left or right) and other features, however, suggest that these bones can be associated with the same two or three individuals that are represented by the three measurable long bones.

Grave 5

This grave included disarticulated and relatively poorly preserved human bones. Both cranial and postcranial elements were recovered. Based on three left distal femora this grave appears to include skeletal remains of one adult male and two females. These two females are either late adolescents or young adults. When possible, the bones are described according to the numbers they were given when excavated (Fig. 6).

A male is represented by a left distal femur (epicondylar breadth of 83.4 mm, estimated from its articular breadth of 77 mm) (No. 4) and a left proximal tibia (epiphyseal breadth of ca. 78 mm, estimated from its articular breadth of 76.5 mm) (No. 9). These dimensions are ca. three or four millimeters larger than the male-female sectioning points (femoral epicondylar breadth 80 mm; proximal tibial epiphyseal breadth 74 mm).[35] These two bones – a left distal femur and a left proximal tibia – could very well originate from the same individual due to the size and shape of their articular surfaces. Epiphyseal union of these skeletal elements appears to be complete, indicating fully adult age.

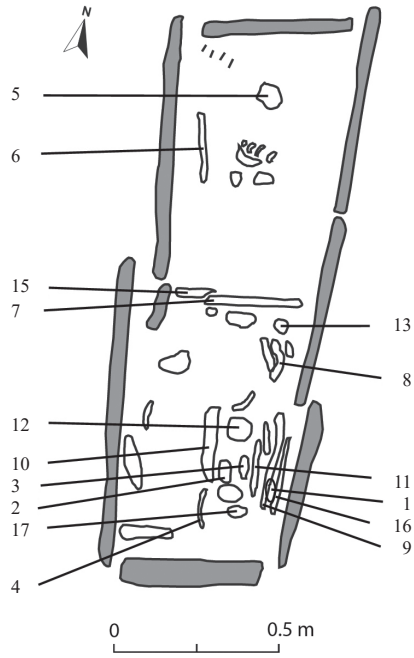

Fig. 6.Sketch showing the position of bones in Grave 5.

Two females are indicated by small articular sizes of two other (a left and a right) distal femora, a right proximal tibia (articular breadth 68.5 mm) and a partial proximal right humerus (humeral head diameter 41 mm is considerably smaller than the male-

[33] Ruff *et al.* 2012, table 3.
[34] Ruff *et al.* 2012; Niskanen *et al.* in preparation.
[35] For the male-female sectioning points, see Spradley and Jantz 2011, table 8. It should be noted here that although joint sizes change much less than long bone lengths when average stature changes, considerable temporal stature changes result in some changes in average joint size. For example, short-statured Bronze Age Greeks published by Angel 1971 have slightly smaller average sex-specific joint sizes than the much taller-statured Euroamericans in Spradley and Jantz 2011.

female sectioning point of 46 mm).[36] It was not possible to determine the epiphyseal fusion of these bones, but there are two partial vertebral columns of two adolescent or young adult individuals found at the southern end part of this grave. Epiphyseal rings are either unfused or in process of fusing. The small overall body vertebral size in both of these columns strongly suggests that both of them originate from fairly small female individuals.

Numerous teeth of at least two individuals were recovered from the northern end of this grave. At least one older adult is included because dentine is exposed in many incisors, canines, premolars and molars. There were also teeth of one or more younger adult because one first molar (M_1) and one second molar (M_2) had no dentine exposed.

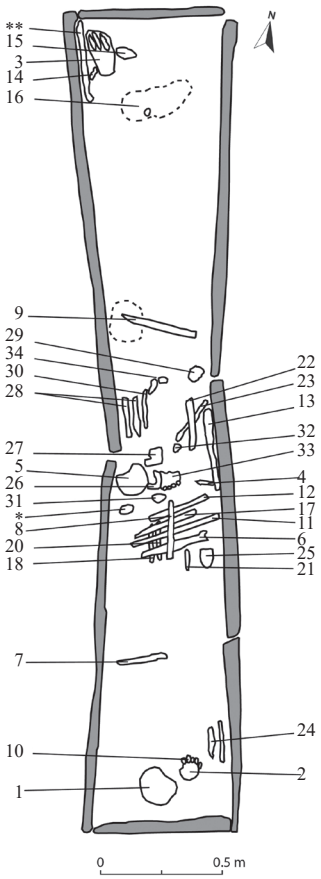

Fig. 7. Sketch showing the position of bones in Grave 6.

Grave 6

Human skeletal elements recovered from this grave are fragmentary. The minimum number of individuals is three because there are parts of three right humera. One of these individuals is a small and gracile male or a large and robust female. Two other individuals are probably both females. When possible, the bones are described according to the numbers they were given when excavated (Fig. 7).

Cranial elements from the northern end of this grave are somewhat more likely to derive from an adult female than from an adult male. The mastoid process height is 27 mm and thus indicates female more likely than male. The supraorbital region is somewhat masculine, but the nuchal region is clearly feminine. The cranial sutural closure indicates that this individual was a mature adult. All right side maxillary teeth and all three left maxillary molars are in place. There is a large cavity in the right M_1's distal surface, facing a cavity in M_2's mesial surface. Dentine is exposed in incisors, canines, and in the first premolar. All three molars from the right side have flat occlusal surfaces, but no dentine is exposed. Molars from the left side are all heavily worn and dentine is exposed from their entire occlusal surfaces. This individual was apparently heavily using his/her left side for chewing, due to painful cavities in his/her right side molars.

A right humerus (No. 34) from the middle of this grave is more likely to be from a male than from a female individual because its head diameter is quite large (46 mm) relative to the maximum humeral length (305 mm), and because this humeral head diameter is about the same as that of average Roman Imperial period males.[37] Based

[36] On humeral head size see Spradley and Jantz 2011, table 8.
[37] Minozzi *et al.* 2015, table 3.

on a very large European data set,[38] short males tend to have large joint sizes for bone lengths and tall females small joint sizes for bone lengths, which helps in sex assessment of individuals around the male-female sectioning points. Stature estimated from this humeral length using Ruff *et al.* male equation is 158.2 cm.[39]

Epicondylar and articular breadths (78 mm and 72 mm, respectively) of a left distal femur (No. 13) from the middle of this grave is a little below the male-female sectioning point.[40] This distal femur is thus either from a large and robust female or a small and gracile male. It was unfortunately impossible to determine the length of this femur to establish whether it could have originated from the same individual, whose right humerus is discussed above.

There are two right proximal tibiae of about the same size from this grave. First there is a right proximal tibia (No. 29) from the middle of this grave. Its articular breadth (69 mm) indicates a female. This proximal tibia is too small to match a left distal femur (articular breadth 72 mm) also from the middle of this grave discussed above. Another right proximal tibia (also No. 29) also recovered from the middle of this grave has a very similar articular breadth (68.5 mm). The tibial proximal epicondylar breadth values for these two right tibiae are ca. 70.5 mm and ca. 70.0 mm because the mean difference between these two proximal tibial measurements in my European skeletal data is 1.5 mm. These values are considerably below the Euroamerican male-female sectioning points and very similar to the Euroamerican female mean (69.19 mm).[41]

There is a partial vertebral column from the so-called "Bone Middle". The vertebral heights of measurable vertebrae (C3, C4, T3, L2, L3, L4 and L5) summed is 128.70 mm. The overall vertebral size is very small, which indicates female more than male. Therefore, equations for females generated using a sample of 26 females in my European skeletal data are used below. A regression equation (Vertebral column length in mm = 2.759 × the above summed height in mm + 92.835, r = 0.779, SEE = 14.2, n = 26) provides an estimate of 447.88 mm for the total vertebral column length from C2 to S1. Stature estimated from this column length with a regression equation (Stature in cm = 1.597 × Vertebral column length in cm + 76.541, n = 246, r = 0.713, SEE = 4.05) is 148.2 cm.

Conclusions

The very large number of human skeletal remains from Goutsoura, representing both sexes and all ages, could provide a considerable amount of information on the skeletal biology of people in this region during this period. This chapter provides only a very preliminary report on what was a large assemblage and is based on one week of making a quick inventory of easily identifiable bones (or more properly their fragments) found in a very large number of bone bags.

This very preliminary study, however, reveals that there is considerable mixing of skeletal elements of different individuals in these graves. The presence of small bones

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[38] Niskanen *et al.* in preparation.
[39] Ruff *et al.* 2012, table 3.
[40] Spradley and Jantz 2011, table 8.
[41] Cf. Spradley and Jantz 2011, table 8.

(e.g. phalanges, carpals, vertebrae, etc.) inside the cist graves may suggest that earlier burials inside the cist-graves were pushed to one side to make room for later burials. Alternatively, these small bones were missed when bones were collected after excarnation to be buried elsewhere.[42] If these cist graves functioned as ossuaries these Bronze Age burial customs have some similarities with recent Greek burial customs.[43]

My preliminary findings indicate that the Goutsoura people apparently had average statures for the Bronze Age Greeks. Definite or probable males have stature estimates within 158.2-163.6 cm and definite or probable females within 143.0-158.06 cm. These statures are very similar to mean statures (males 161.1 cm, n = 19; females 150.4 cm, n = 11) of the Bronze Age inhabitants of Lerna computed from mean femoral lengths using the same regression equations.[44]

[42] On excarnation, see Dowd 2008.
[43] For burial customs in modern Greece, see Blagojević 2013.
[44] On femoral lengths of the Bronze Age Lerna sample, see Angel 1971, table 6.

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