ANTHROPOLOGICAL AND ARCHAEOLOGICAL INVESTIGATION OF THE NECROPOLIS (14TH–15TH C. AD) EXCAVATED IN 2020 AT CAPE CHIRAKMAN / BIZONE, KAVARVA, BULGARIA

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Cuvinte-cheie: *necropole creștine din Evul Mediu târziu, studiu antropologic și arheologic, identificarea vârstei și sexului, reconstrucția staturii și greutății corporale, investigație paleopatologică.*

Keywords: *Late Medieval Christian necropolis, anthropological and archaeological study, age and sex identification, stature and body weight reconstruction, paleopathological investigation.*

Rezumat: *Prezentul articol evidențiază rezultatele analizelor de teren și de laborator ale rămășițelor osteologice umane descoperite în 2020 în timpul cercetărilor arheologice desfășurate la situl „Cetatea antică și medievală de la Capul Chirakman", situat în apropierea orașului actual Kavarna, în nord-estul Bulgariei. Au fost cercetate douăsprezece morminte cu ritual funerar de „inhumare", conform canonului creștin, și datate în secolele XIV–XV p.Chr. Au fost identificați în total 14 indivizi, folosind metode antropologice standard. Rezultatele analizei rămășițelor osteologice umane din ansamblurile funerare din Evul Mediu târziu, arată un raport aproape egal între copii și adulți. Același fapt este valabil și pentru raportul dintre bărbați și femei. Indivizii de sex masculin se disting prin oase foarte masive, cu o lungime mare și, în mod corespunzător, statura „înaltă" și „foarte înaltă", în timp ce femeile au o statură „medie".*

În general, analiza paleopatologică a scheletelor adulte arată o frecvență foarte mare a bolilor degenerative-distrofice ale coloanei vertebrale și articulațiilor. Deseori au fost identificate modificări morfologice paleopatologice dentare și maxilare, chiar și la un individ de sex masculin, matur (40–50 ani), la care se observă o afecțiune osoasă metastatică (cel mai probabil este necesar un diagnostic diferențial) la nivelul mandibulei.

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Abstract: *The present article includes the results of field and laboratory analysis of human bone remains, discovered in 2020, during archaeological surveys at the site "Antique and Medieval fortress at Chirakman cape", located near present-day town of Kavarna, Northeastern Bulgaria. The funeral ritual of the twelve investigated graves was "inhumation" according to the Christian canon, and they were dated to the 14th–15th centuries AD. A total of 14 individuals were identified, using standard anthropological methods. The results of the analysis of the human skeletal remains in the Late Medieval grave constructions show an almost equal ratio between subadults and adults. The same applies to the ratio between males and females. Male individuals are characterised by very massive and large bones with a corresponding "tall" and "very tall" stature, while females are of "middle" stature.*

In general, the palaeopathological analysis of adult skeletons shows a very high frequency of degenerative-dystrophic diseases of the spine and joints. Dental and jaw palaeopathological morphological changes are also often identified, and even in a mature male individual (40–50 years) a metastatic bone involvement of the mandible is observed (most likely differential diagnosis).

Introduction

Archaeological excavations at Cape Chirakman began in 1929[1] and have continued with interruptions until the present days[2]. During the regular surveys carried out in 2020 at the "Ancient and Medieval Fortress of Cape Chirakman", twelve Late Medieval Christian inhumation graves (dated 14th–15th c. AD.) were discovered and studied[3]. The burial structures are surrounded by stones, most of which are vertically driven. In one of the graves, stone plates that cover the pit are found. In others, slate stones were placed in different areas of the upper part of the skeleton. The skeletons are laid on the back, with stretched lower limbs, and the upper ones are bent at the elbow joint and placed on the abdomen. The orientation of the skeletons is E-W, with the head to the west. Bronze buttons were found in two of them, and a bronze hairpin in another. The concentration of the structures in two squares, as well as other graves studied in 2004–2005, suggest that they are part of a necropolis, which is most likely associated with a church or chapel, situated on the remains of the basilica complex located nearby. The stratigraphic position of the excavated graves, as well as the finds from them, allow us to date the structures to the 14th–15th

[1] MĂRCULESCU 1934, 1935.

[2] BONEV *et alii* 2021; BONEV *et alii* 2022; CHOLAKOV, MIHAYLOV, NEYKOVA 1982; GATEV 2007; KITOV 1973; KITOV 1990; KITOV, PETKOV, SALKIN 1987; LAZARENKO 2006; LAZARENKO, MIRCHEVA, DOBREV 2007; MIRCHEV, TONCHEVA, DIMITROV 1962; SALKIN 1982; SALKIN 1984; SALKIN 1986; SALKIN 1987; SALKIN 1989; SALKIN 1996; SALKIN 2007; SALKIN, GEORGIEV, DOBREV 2004; SALKIN, ORACHEV 1989; SALKIN, GEORGIEV 2004; SALKIN, GEORGIEV 2006; SOTIROV, GATEV 1996; SOTIROV, GATEV 2005; SOTIROV, GATEV 2006; SOTIROV *et alii* 1990; THEODOSIEV 2004; TONKOVA, SLAKIN, LAND 2004; TONKOVA, SALKIN 2005; TOPTANOV 1984; VASILEV 1984; VASILEV 1985; VASILEV *et alii* 1973; VASILEV, SALKIN, SOTIROV 1976; VASILEV *et alii* 1977; VASILEV *et alii* 1978; VASILEV *et alii* 1979; VASILEV *et alii* 1981; VASILEV, MIHAYLOV, CHOLAKOV 1985; VASILEV *et alii* 1986; VASILEVA *et alii* 2017; VASILEVA, BONEV, MADZHAROV 2018a; VASILEVA *et alii* 2018 b; VASILEVA, BONEV, MADZHAROV 2019; VASILEVA *et alii* 2020.

[3] BONEV *et alii* 2021, p. 1055–1059.

centuries. This statement is confirmed by a radiocarbon analysis, which shows that the calibrated dates vary between 1358 to 1410 (**Fig. 1**).

Until now, only two Ottoman period Christian necropolises in Northeastern Bulgaria have been anthropologically studied and published-skeletal series near the fortress walls of Kaliakra and on the Cape Chirakman near the town of Kavarna. In Kaliakra, 92 graves dating from the 15th–17th c. AD are discovered[4]. Anthropological analysis shows that almost two-thirds (63%) of the buried are children in early infancy. As reasons for the extremely high childhood mortality in the series, the anthropologist[5] highlights the insufficient development of medicine during this historical period and poor sanitary and hygienic life conditions. The palaeodemographic study shows that the average life expectancy of adults is approximately 45 years, higher in males. Identical values of palaeodemographic indicators are also determined in the population (15th–17th c. AD) of Chirakman[6]. Representation about physical type of the studied population of Kavarna (according to the data of the necropolis of Chirakman) is obtained from the anthropological investigation of a total of 752 skeletons carried out in the 80's of the 20th c. The bones of the limbs in adult individuals are characterised by the predominance of medium dimensions and moderately expressed relief. In females, gracile skeletons are also very common. The studied population shows high percentage of degenerative-dystrophic changes affecting the bone-joint apparatus of the spine and limbs, almost equally in both sexes (a total of 70 skeletons).

A total of 14 individuals are identified–6 subadults (5 children and a male juvenile) and 8 adults (4 males, 3 females and an adult individual of undetermined sex). Investigated human skeletons, especially those of the adult individuals, are relatively well preserved, which allowing detailed, anthropological and paleaopathological studies to be carried out. Approved anthropological methods are used to determine the age at death and sex of the buried[7]. The reconstruction of the stature[8] and body mass[9] of the adults is performed by well-established methods. Palaeopathological bone changes are identified and described according to the well-established methodologies[10]. In one of the cases (Grave No. 7) a radiographic study was also carried out.

The data obtained from the anthropological study of 12 Christian graves excavated at Cape Chirakman in 2020 will be compared with the results of the analysis of other synchronous skeletal series from the territory of Bulgaria, as well as with the stature data from the first registers of the living Bulgarian population after 1878[11].

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[4] RADICHKOV 1993.

[5] RADICHKOV 1993.

[6] KONDOVA, BOEV, CHOLAKOV 1981; KONDOVA, BOEV, CHOLAKOV 1982; BOEV, KONDOVA, CHOLAKOV 1982; BOEV, KONDOVA, CHOLAKOV 1989.

[7] ALEKSEEV 1966; ALEKSEEV, DEBETS 1964, p. 37; BASS 2005; BROTHWELL 1965; BUIKSTRA, UBELAKER 1994; KÜHL 1985; FEREMBACH, SCHWIDETZKY, STLOUKAL 1980, p. 517–549; GERASIMOV 1955; LOVEJOY *et alii* 1985, p. 57–66; MARESH 1970, p. 157–200; SCHAEFER, BLACK, SCHEUER 2009; ZUBOV 1968.

[8] PEARSON 1899; TROTTER, GLESER 1952.

[9] RUFF, SCOTT, LIU 1991, p. 397–413.

[10] AUFDERHEIDE, RODRIGUEZ-MARTIN 1998; ORTNER 2003; ORTNER, PUTSCHAR 1981; PINHASI, MAYS 2008.

[11] STOEV 2012.

Results

Grave No. 6/2020 (Pl. 1.1; Pl. 6.1)

Burial construction: pit surrounded by vertically placed flat stones of various sizes. At the skull, they are larger; the southern row is missing, with only one preserved in situ; width at skull – 0.46 m; width at lower limbs – 0.26 m; length 1.90 m.

Orientation: West–East

Position of the skeleton: laid on its back with stretched lower limbs. The skull is slightly tilted to the north, on the humerus. The upper limbs are bent at the elbow joints and placed on the abdomen.

Characteristics / note: The grave was covered with flat stones, only 4 were preserved in the field, from the pelvic area to the lower limbs, stone levels – 119.84–119.89 m. They lie relatively horizontally.

Condition of *the bone material*: good. Skull – cranium; postcranial skeleton – fragmented and incompletely represented.

Age at death: 40–50 years old (*maturus*)-determined by the degree of obliteration of the cranial sutures.

Sex: female (determined by pelvic girdle, skull features and limb measurements by BASS 2005, KÜHL 1985, ALEKSEEV 1966):

Bone feature	Size, (mm)	Bone feature	Size, (mm)
Epycond.D hum. dx	58.0	*D caput radii dx*	22.0
Epycond.D hum. sin	58.5	*D caput radii sin*	21.0
Vert D caput humeri dx	40.0	*Trans. D caput hum. dx*	39.0
Vert D caput humeri sin	40.0	*Trans. D caput hum. sin*	38.0
D caput femoris dx	42.0	*D caput femoris sin.*	42.0
Epycond.D fem. dx	73.0	*Epycond.D fem.sin*	73.0
L clavicula dx	125.0	*L clavicula sin*	127.0

The bones are moderately massive, with strong relief on the upper limbs and moderate relief on the lower limbs.

Stature: **Average stature:** 150.61 cm[12] – under middle stature

154,50±4,01 cm[13] – middle stature

151.76±3.64* cm[14]-under middle stature-*reconstructed only by the length of lower limbs

Bone	Length, (cm)
Humerus dx	29.0
Humerus sin	28.5
Radius dx	21.7
Radius sin	21.2
Ulna dx	23.8
Ulna sin	23.7
Femur sin	-

[12] PEARSON 1899.

[13] TROTTER, GLESER 1952.

[14] TROTTER, GLESER 1952.

Femur dx	39.0
Tibia dx	32.0
Tibia sin	31.3
Fibula dx	31.3
Fibula sin	31.1

Body weight: 60.11 kg (reconstructed by the diameter of the head of both femurs).
*Dentition***:** permanent, incomplete:

Right															Left
8	7	6	X	X	X	X	X	1	X	3	4	5	6	7	8
8	7	6	5	X	3	2	X	1	2	3	4	5	6	7	8

1 – permanent tooth preserved in the alveolus; X–tooth, lost *post mortem*
Abrasion of the masticatory surface of the teeth-moderate–3–4 degree.
Number of examined teeth: 24

Dentofacial pathology:
• Tartar;
• Pitting enamel hypoplasia (PEH) in the lower right second and third molars. This defect is due to stress in the physical development of the individual caused by various factors-premature birth, malnutrition and/or change of diet, bacterial or viral infections, trauma, etc. It is often seen in palaeopopulations, including Bulgarian ones[15]. The feature also appears in other populations from 14th c. AD., as studied by the old capital Tarnovo from the church of Holy 40 Martyrs[16].

Skeletal pathology:
• Degenerative Joint Disease DJD (spondylosis and arthrosis) in the thoracolumbar spine (degree 3) and in the right shoulder joint (degree 2);
Anatomical cranial variations: no observed.

Grave No. 7/2020 (**Pl. 1.2; Pl. 6.2**)
Burial construction: elongated trapezoidal shaped burial pit, wider at the skull and narrower at the lower limbs. It is enclosed by stones of various sizes. The east and south sides are missing. Some of the enclosing stones are vertically driven-in.
Grave dimensions: length 2.04 m; width west 0.54 m; width east 0.45 m.
Orientation: West-East
Position of skeleton: laid on its back with stretched lower limbs. The upper limbs are bent at the elbow joint and placed on the abdomen. The skull is tilted slightly to the south, with the right cheekbone resting on the humerus. Most of the upper and lower limbs are not preserved. Southern upper limb bent at the elbow joint and placed in front of the chest. The bones are well preserved; most of the phalanges of upper and lower limbs are missing.
Grave inventory: bronze button, in the pelvic area

[15] RUSSEVA 2010; RUSSEVA 2016, p. 529–531; ATANASSOVA 2018.
[16] RUSSEVA 2013, p. 364–365.

*Characteristics/note***:** 10 fragments of wheel-made pottery from Late Antique period; one from a Hellenistic amphora and 3 fragments from the Late Medieval period were found in the grave fill.

Condition of the bone material: skull and postcranial skeleton – fragmentarily and incompletely represented.

Age at death: 40–50 years old (*maturus*)-determined by the degree of obliteration of the cranial sutures.

Sex: male (determined by pelvic girdle, skull features and limb measurements by BASS 2005, ALEKSEEV 1966):

Bone feature	**Size, (mm)**	**Bone feature**	**Size, (mm)**
Epycond.D hum. dx	66.0	*D caput radii dx*	-
Epycond.D hum. sin	67.5	*D caput radii sin*	-
Vert D caput humeri dx	48.0	*Trans. D caput hum. dx*	47.0
Vert D caput humeri sin	47.0	*Trans. D caput hum. sin*	40.0
D caput femoris dx	51.0	*D caput femoris sin.*	52.0
Epycond.D fem. dx	-	*Epycond.D fem.sin*	90.0
L clavicula dex	149.0	*L clavicula sin*	-

The bones are very massive with moderate relief on the upper and weak – on the lower limbs.

Stature: average stature: 163.52 cm[17] – under middle stature

167.80±3.70 cm[18] – over middle stature

168.24±3.31* cm[19]-over middle stature-*reconstructed only by the length of lower limbs

Bone	**Length, cm**
Humerus dx	32.0
Humerus sin	30.9
Radius dx	-
Radius sin	23.0
Ulna dx	-
Ulna sin	25.5
Femur sin	45.0
Femur dx	44.2
Tibia dx	36.0
Tibia sin	36.3
Fibula dx	-
Fibula sin	35.4

Body weight: 77.63 kg (reconstructed by the diameter of the head of both femurs).

Dentition: permanent, incomplete

[17] PEARSON 1899.

[18] TROTTER, GLESER 1952.

[19] TROTTER, GLESER 1952

Right															Left
8	7	6	X	4	X	X	X	X	X	X	4	5	6	7	0
8	7	6	5	4	0	0	0	0	0	0	0	X	6	7	8

4 – permanent tooth preserved in the alveolus with complete root growth; 0 – tooth lost *ante mortem* or tooth agenesis; X–tooth lost *post mortem*

Abrasion of the masticatory surface of the teeth – moderate – grade 3–4.

Number of examined teeth: 16

Dentofacial pathology:

• Retinated right upper third molar due to underdeveloped radix;

• Distant neoplasia with bone metastasis (probable differential diagnosis[20]) (**Pl. 1.3–1.6**).

Skeletal pathology:

• Degenerative Joint Disease DJD (spondylosis) in the lumbar spine (degree 3).

Grave No. 8/2020 (**Pl. 2.1; Pl. 6.3**)

*Burial construction***:** enclosed by stone slabs to the west, east and south, with part of the southern slabs missing (from the skull to the pelvic area); width at skull – 0.65 m; width at lower limbs – 0.25 m; length 1.93 m.

Orientation: West-East

Position of the skeleton: laid on its back with stretched lower limbs. The skull is slightly tilted to the south, on the humerus. The upper limbs are bent at the elbow joints and placed on the abdomen. Most of the phalanges of the upper limbs are missing.

*Characteristics/note***:** three flat stones were found, placed on the skeleton relatively horizontally. The westernmost is placed in the chest area and covers the entire skeleton up to the pelvis. The middle stone has an elevation of 119.76 m. The westernmost is 0.41 m from the western stone enclosing the burial pit. Single charcoal flecks were recorded within the fill of the burial pit. A small quantity of wheel-made pottery fragments-from the Late Antique and Hellenistic periods, a badly corroded iron object and two iron nails were also found in the soil. Bone remains from another, probably earlier, grave was uncovered 0.20 m to the southwest. Vertebrae, ribs and phalanges were visible in the field. Some of these remains were uncovered on and close to the skull of the individual in grave 8.

Amongst the redeposited bones on the skull of grave 8, the rim of a medieval vessel was found with glazing on the inner surface.

Condition of the bone material: poor. Skull and postcranial skeleton – fragmented and incompletely represented.

*Age at death***:** 40–50 years old (*maturus*)-determined by the degree of obliteration of the cranial sutures.

Sex: female (determined by pelvic girdle, skull features and limb bone dimensions by BASS 2005, KÜHL 1985, ALEKSEEV 1966:

[20] The diagnose was made after X–ray bone observation and consultation with Prof. dr. Georgi Tomov, MD., phd. from Plovdiv Medical University.

Bone	Size, (mm)	Bone	Size, (mm)
Epycond.D hum. dx	56.0	*D caput radii dx*	22.5
Epycond.D hum. sin	56.0	*D caput radii sin*	22.5
Vert D caput humeri dx	41.0	*Trans. D caput hum. dx*	40.0
Vert D caput humeri sin	41.0	*Trans. D caput hum. sin*	39.5
D caput femoris dx	43.5	*D caput femoris sin.*	44.0
Epycond.D fem. dx	-	*Epycond.D fem.sin*	74.5
L clavicula dx	129.0	*L clavicula sin*	134.0

The bones are gracile, with a slight relief on the upper limbs and moderate relief on the lower limbs.

Stature: average stature**:** 154.79 cm[21] – middle stature

158.97±3.93 cm[22] – over middle stature

157.80±3.65* cm[23]-over middle stature-*reconstructed only by the length of lower limbs

Bone	Length, cm
Humerus dx	30.5
Humerus sin	29.9
Radius dx	22.7
Radius sin	-
Ulna dx	24.3
Ulna sin	-
Femur sin	42.2
Femur dx	41.8
Tibia dx	33.4
Tibia sin	34.0
Fibula dx	32.9
Fibula sin	33.1

Body weight: 63.93 kg (reconstructed by the diameter of the head of both femurs).

Dentition: permanent, incomplete:

Right															Left
0	7	0	X	4	X	X	X	X	X	X	X	X	0	7	0
0	7	6	5	X	X	X	X	X	X	3	4	5	6	7	0

4 – preserved permanent tooth in the alveolus; **0** – tooth lost *ante mortem*; – tooth not found in the material and no preserved alveolus; **X–**tooth lost *post mortem*

Abrasion of the masticatory surface of the teeth–4th degree.

[21] PEARSON 1899.

[22] TROTTER, GLESER 1952.

[23] TROTTER, GLESER 1952.

Number of examined teeth: 11
Dentofacial pathology:
• Periodontal changes.
Skeletal pathology:
• DJD in the right knee joint (degree 2–3)-gonarthrosis;
Anatomical cranial variations: no observed.

Grave No. 8A/2020

Bones from an adult individual in the age group *Adultus* (30–35 years old) of undetermined sex. Spondylotic changes (degree 3) with osteophyte formation in the thoracic spine are observed (**Pl. 2.2**).

Grave No. 9/2022 (**Pl. 2.3; Pl. 6.4**)

Burial construction: enclosed by stones of various sizes, most of them vertically driven-in. Most of the enclosing stones on the northern side and the crosswise lying stones at the lower limbs are missing; width at skull, 0.52 m; width at lower limbs, 0.16 m; length 2.10 m.

Orientation: West-East

Position of the skeleton: laid on its back with stretched lower limbs. The skull lies horizontally, with the northern part missing. The upper limbs are bent at the elbow joints and placed on the abdomen.

*Characteristics / note***:** two horizontally laid stones at depth 119.88 m. were found on the skull, in the area of the shoulders. After removal of the stones, it is clear that the lower jaw of the skull lies underneath them. In the fill of the burial pit, single uncharacteristic fragments of wheel-made vessels, dating to the Late Antique period, and one badly corroded iron object, as well as single mussel and snail shells were found. Southwest of the skull, a femur from another skeleton was uncovered. The burial feature (No. 9) disturbed another burial pit to the east.

Condition of the bone material: skull and postcranial skeleton – fragmentarily and incompletely represented.

Age at death: 25–26 years old (a*dultus*)-determined by the relief of the symphyseal surface of the pubic bone.

Sex: male (determined by pelvic girdle (**Pl. 2.4**), skull features, limb measurements by BASS 2005, KÜHL 1985, ALEKSEEV 1966):

Bone	**Size, (mm)**	**Bone**	**Size, (mm)**
Epycond.D hum. dx	74.0	*D caput radii dx*	26.0
Epycond.D hum. sin	75.0	*D caput radii sin*	27.5
Vert D caput humeri dx	49.0	*Trans. D caput hum. dx*	46.5
Vert D caput humeri sin	48.0	*Trans. D caput hum. sin*	46.0
D caput femoris dx	52.0	*D caput femoris sin.*	52.0
Epycond.D fem. dx	93.0	*Epycond.D fem.sin*	93.0
L clavicula dx	177.0	*L clavicula sin*	178.0

The bones are very massive with strong relief on the lower limbs (strong development of the linea aspera) and weaker – on the upper limbs.

Stature: *average stature*: 177.02 cm[24]-tall
184.08±3.70 cm[25]-very tall
183.59±3.31* cm[26]-very tall-*reconstructed only by the length of lower limbs

Bone	Length, cm
Humerus dx	36.2
Humerus sin	36.0
Radius dx	28.4
Radius sin	-
Ulna dx	31.1
Ulna sin	-
Femur sin	51.0
Femur dx	50.5
Tibia dx	41.5
Tibia sin	42.4
Fibula dx	-
Fibula sin	42.2

Body weight: 78.87 kg (reconstructed by the diameter of the head of both femurs).
Dentition: permanent, incomplete.

Right															Left
8	7	6	5	4	3	X	X	-	-	-	-	-	-	-	-
8	7	6	5	4	3	X	X	X	2	3	X	X	6	7	8

4 – permanent tooth preserved in the alveolus with complete root growth; **-**tooth not found in the material and no preserved alveolus; X–tooth lost *post mortem*

Abrasion of the masticatory surface of the teeth-moderate–3rd degree.
Number of examined teeth: 17
Dentofacial pathology:
• Pitting enamel hypoplasia (PEH) of the lower right second and third molars;
• Caries of the lower sixth teeth and mandibular cyst in the area of lower right first molar (**Pl. 2.5–2.6**).

Skeletal pathology:
• Premature unilateral (left) synostosis of the *sutura coronalis* (2nd degree). It cannot be determined whether there is a deformation of the skull resulting from the premature synostosis, as the skull is highly fragmented;
• DJD (spondylitis) in the lumbar spine (3rd degree);
• Ossifying myositis on the lateral surface of the proximal end of the right tibia (**Pl. 2.7**).

Traces of cutting/hit (cut marks) *peri mortem* (**Pl. 2.8–2.9**) are registered on the skull of the male from Grave No. 9, excavated in 2020.

[24] PEARSON 1899.
[25] TROTTER, GLESER 1952.
[26] TROTTER, GLESER 1952.

Grave No. 10/2020 (Pl. 3.1; Pl. 6.5)

Burial construction: surrounded by stones of various sizes. A large vertically driven-in stone is in the skull area. Larger in size stones are vertically driven-in at the pelvic area as well. From the north, the stones are smaller and broken. From the south, the burial pit is disturbed and the stones are missing; width at the skull – 0.56 m; width at the lower limbs – 0.44 m; length 1.15 m.

Orientation: West-East

*Position of the skeleton***:** laid on its back with stretched lower limbs. The right femur is only halfway preserved. Its lower part is in grave No 9. The skull lies horizontally, slightly tilted to the north. The upper limbs are bent at the elbow joints and placed on the abdomen. The bones of the feet and the phalanges are missing.

Characteristics / note: it is disturbed by grave 9 in its eastern part. The right lower limb of the individual is preserved in situ, next to the knee joint. The left one has been removed and parts of the femur have fallen into the burial pit of grave No. 9. The other bones from the left lower limb are placed to the north of the right one. Four stones were cleared in the area of the knees and are at the same time the northern border stones of grave No. 9 and lye on the right limb, which is preserved *in situ*.

Position of the skeleton in situ: the field photograph shows that there are disturbances in the anatomical order: dislocations of the last two lumbar vertebrae, the distal end of the sacrum is turned to the left towards the proximal end of the *femur sinister*; *tibia dextra et sinistra* and *fibula dextra et sinistra* are found next to the *femur sinister*.

Condition of the bone material: skull and postcranial skeleton – fragmented and incompletely represented.

*Age at death***:** 40–50 years old *(maturus)*-determined by the degree of obliteration of the cranial sutures.

Sex: male (determined by pelvic girdle, skull features, limb measurements by BASS 2005, KÜHL 1985, ALEKSEEV 1966):

Bone	**Size, (mm)**	**Bone**	**Size, (mm)**
Epycond.D hum. dx	-	*D caput radii dx*	26.5
Epycond.D hum. sin	71.0	*D caput radii sin*	27.0
Vert D caput humeri dx	50.0	*Trans. D caput hum. dx*	50.0
Vert D caput humeri sin	-	*Trans. D caput hum. sin*	-
D caput femoris dx	56.5	*D caput femoris sin.*	56.5
Epycond.D fem. dx	90.0	*Epycond.D fem.sin*	89.0
L clavicula dex	162.0	*L clavicula sin*	163.0

The bones are very massive with moderate relief of the upper and lower limbs.

*Stature***:** *average stature***:** 176.46 cm[27] – tall

182.97±3.91 cm[28] *– very tall*

[27] PEARSON 1899.

[28] TROTTER, GLESER 1952.

184.21±3.37 cm*[29] *– very tall – *reconstructed only by the length of lower limbs*

Bone	**Length,cm**
Humerus dx	36.5
Humerus sin	-
Radius dx	27.2
Radius sin	-
Ulna dx	-
Ulna sin	-
Femur sin	-
Femur dx	-
Tibia dx	-
Tibia sin	41.9
Fibula dx	-
Fibula sin	-

Body weight: 89.97 kg *(reconstructed by the diameter of the head of both femurs).*
Dentition: permanent, incomplete.

Right																Left
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	0	0	R	X	3	X	0	0	X	3	4	5	0	0	0	

4 – permanent tooth preserved in the alveolus with complete root growth; – tooth not found in the material and no preserved alveolus; **0** – tooth lost *ante mortem* or tooth agenesis; **X–**tooth lost *post mortem*; **R** – root of permanent tooth. Abrasion of the masticatory surface of the teeth – moderate to severe – grade 4.

Number of examined teeth: 5

Dentofacial pathology:

• Caries of the left lower second premolar;

• Advanced edentulousness *ante mortem* and resulting mandibular deformity (**Pl. 3.2**).

Skeletal pathology:

• DJD (spondyloarthrosis) in the thoracic spine (2nd degree).

Grave No. 11/2020 (**Pl. 3.3; Pl. 6.6**)

*Burial construction***:** trapezoidal in shape, surrounded by large, flat stones, well stacked, vertically driven-in. Large stone at the skull area; width at skull – 0.54 m; width at lower limbs – 0.26 m; length 1.60 m.

Orientation: West-East

Position of the skeleton: laid on its back with stretched lower limbs. The skull is tilted to the south, on the humerus. The upper limbs are bent at the elbow joints and placed on the abdomen.

*Characteristics/note***:** 4–5 small stones were found on the skeleton, in the abdominal region. Two fragments of Late Antique pottery were found in the fill of the pit.

[29] TROTTER, GLESER 1952.

*Condition of the bone material***:** skull and postcranial skeleton – fragmented and incompletely represented.

*Age at death***:** approximately 10–11 years old (*infans II*)-determined by dental status.

Bone	**Length, cm**	**Attribute**	**Length,mm**
L humerus dx	215.0	*L humerus sin*	215.0
L ulna dx	177.0	*L ulna sin*	178.0
L radius dx	163.0	*L radius sin*	160.0
L clavicula dx	93.0	*L clavicula sin*	95.0
L femur dex	315.0	*L femur sin*	-
L tibia dx	-	*L tibia sin*	-
L fibula dx	270.0	*L fibula dx*	270.0

Sex: undetermined.

Dentition: mixed, incomplete.

Right														Left
-														-
	7°	**6**	**5°**	**4°**	-	**2**	**1**	**1**	-	3°↓	4°	V	6	**7°**	
	7°	6	5°	4°	X	2	1	1	2	3°↑	4°	5°	6	7°	
C															C

V – primary tooth preserved in the alveolus with completed root growth; **6**-permanent tooth preserved inside the alveolus with completed root growth; **6** -permanent tooth preserved outside the alveolus with completed root growth; **5°**-permanent tooth preserved in the alveolus with incomplete root growth;-tooth not found in the material and no preserved alveolus; **C**-embryo of a permanent tooth; X–tooth lost *post mortem*

Number of examined teeth: 27

Tubercle of Carabelli–3rd degree-a morphological dental trait occurring with higher frequency in Europids.

Dentofacial pathology:

• Pitting enamel hypoplasia (PEH) the lower left first and second molars, the result of short-term stress in the physical development of the individual in early infancy.

• Caries of the upper left second deciduous molar and the lower left second premolar.

Skeletal pathology: not identified.

Anatomical cranial variations: on the skull from Grave No. 11 is registered *os apicis multipartitum* (**Pl. 3.4**). *Os apicis* was found in 4% of 3522 examined modern Bulgarian skulls[30].

*Additional bone material***:** *ulna sinistra* (95.0 mm diaphyseal length) from a child about 1 year of age at death.

[30] KADANOV, MUTAFOV 1984, p. 127.

Grave No. 12/2020 (Pl. 4.1; Pl. 7.1)

*Burial construction***:** trapezoidal in shape, surrounded by stone blocks. Flat stones are vertically driven-in at the skull and lower limbs area; width at skull 0.44 m; preserved width at lower limbs 0.26 m; length 0.97 m.

Orientation: West-East

*Position of the skeleton***:** the bones are not well preserved. Laid on its back with stretched lower limbs. The skull is tilted to the north and lies on the humerus. The upper limbs are bent at the elbow joints and laid flat on the abdomen.

*Grave inventory***:** button, bronze

Characteristics/note: two fragments of Late Antique pottery were found in the fill of the pit.

*Condition of the bone material***:** skull and postcranial skeleton – fragmented and incompletely represented.

Age at death: 1–2 years old *(infans I)*-determined by dental status and by the length of long bones of the limbs:

Bone	**Length (diaphysam)**	**Attribute**	**Length (diaphysam)**
L humerus dx	117.0	*L humerus sin*	102.0
L ulna dx	-	*L ulna sin*	-
L radius dx	-	*L radius sin*	-
L clavicula dx	-	*L clavicula sin*	-
L femur dex	-	*L femur sin*	142.0
L tibia dx	-	*L tibia sin*	115.0
L fibula dx	-	*L fibula dx*	-

*Sex***:** it cannot be reconstructed. At this early age, sex identification by anthropological features of the skeleton is very difficult. At this early age, it is very difficult to determine sex from anthropological features of the skeleton.

Dentition: Deciduous, incomplete.

Right																Left
-	-	C	-	-	-	-	-	-	-	-	-	-	C	-	-	
			V°	IV°	III°	II°	I°	X	II°	III°	IV°	V°				
			V°	IV°	X	II°	I°	I°	X	X	IV°	V°				
-	-	C	-	-	-	-	-	-	-	-	-	-	C	-	-	

V° – primary tooth preserved in the alveolus with incomplete root growth; – tooth not found in the material and no preserved alveolus; **C**-primary tooth which is still in the jaw; **X–**tooth lost *post mortem*

Number of examined teeth: 20

Dentofacial pathology: not registered.

*Skeletal pathology***:** pathological changes of the distal end of the left humerus (the right one is unchanged)-most probable Differential Diagnosis 9DD)-trauma (**Pl. 4.2–4.3**).

Grave No. 13/2020 (Pl. 4.4; Pl. 7.2)

*Burial construction***:** pit, surrounded by stones of various sizes. Flat stones are vertically driven-in at the skull and lower limbs area. Some of the stones on the northern side (pelvic area) and southern side (lower limbs) are missing; width at skull 0.44 m; width at lower limbs 0.32 m; length 1.93 m.

Orientation: West-East

Position of the skeleton: laid on its back with stretched lower limbs. The skull lies tilted to the north, on the humerus. Upper limbs are bent at the elbow joints and left on the chest; the right one lies on the abdomen.

*Characteristics / note***:** fragments of Late Antique and Hellenistic pottery were found in the fill of the pit.

Condition of the bone material: skull-fragmented *cranium*. Postcranial skeleton – fragmented and incompletely represented.

Age at death: 5–6 years old *(infans I)*-determined by dental status.

Bone	**Length (diaphysam)**	**Attribute**	**Length (diaphysam)**
L humerus dx	152.0	*L humerus sin*	-
L ulna dx	-	*L ulna sin*	-
L radius dx	117.0	*L radius sin*	-
L clavicula dx	75.5	*L clavicula sin*	-
L femur dex	209.0	*L femur sin*	211.0
L tibia dx	171.0	*L tibia sin*	170.0
L fibula dx	-	*L fibula dx*	-

Sex: It cannot be reconstructed. At this early age, it is very difficult to determine sex from anthropological features of the skeleton.

Dentition: deciduous, incomplete.

Right																Left
-	-	C↓	-	-	-	-	-	-	-	-	-	-	C↓	-	-	
			V	IV	III	X	X	X	X	X	IV	V				
			V	IV	III	II	I	I	II	III	IV	V				
-	-	C↑	-	-	-	-	-	-	-	-	-	-	C↑	-	-	

V – primary tooth preserved in the alveolus with complete root growth; – tooth not found in the material and no preserved alveolus; **C**-primary tooth which is still in the jaw; **X–**tooth lost *post mortem*

Number of examined teeth: 19

Maxillofacial pathology: Not reported.

Skeletal pathology: cribra orbitalia-registered on the left orbit, on the right one-not reported. *Cribra orbitalia* is a pathological bone change that results from multiple nutritional deficiencies associated with anemia, scurvy, rickets, hemangiomas or trauma[31].

[31] WALKER *et alii* 2009.

Anatomical cranial variations: additional intrasutural bone (wormian bone)-in the left half of the lambdoid suture.

Grave No. 14/2020 (Pl. 5.1; Pl. 7.3)

*Burial construction***:** trapezoidal burial pit, surrounded by small stones, many of which were found not on the edge of the trench but in the interior of it. Blocks of larger size stones are vertically driven-in at the skull and lower limbs area; width at skull, 0.75 m; width at lower limbs, 0.43 m; length 1.92 m.

Orientation: West-East

Position of the skeleton: laid on its back with stretched lower limbs. Skull lying back (southwest, secondarily displaced by a root). Small stones are uncovered around the skull. Upper limbs are bent at the elbow joints and laid across the abdomen.

*Grave inventory***:** button, bronze, on the right shoulder bone

*Characteristics / note***:** Late Antique pottery fragments were found in the fill of the pit.

Condition of the bone material: good. Skull-cranium. Postcranial skeleton-fragmented and incompletely represented.

Age at death: 45–49 years old (*maturus*)-determined by the relief of the symphyseal surface of the pubic bone and by the degree of obliteration of the cranial sutures.

Sex: female (determined by pelvic and cranial features, limb measurements by BASS 2005, KÜHL 1985, ALEKSEEV 1966):

Bone	Size (mm)	Bone	Size, (mm)
Epycond.D hum. dx	56.0	*D caput radii dx*	21.5
Epycond.D hum. sin	53.0	*D caput radii sin*	21.0
Vert D caput humeri dx	40.0	*Trans. D caput hum. dx*	39.0
Vert D caput humeri sin	41.0	*Trans. D caput hum. sin*	39.0
D caput femoris dx	43.5	*D caput femoris sin.*	44.0
Epycond.D fem. dx	77.0	*Epycond.D fem.sin*	77.0
L clavicula dx	127.0	*L clavicula sin*	130.0

The bones are moderately massive with moderate relief.

Stature: average stature: 155.32 cm[32]-middle stature

159.61±4.03 cm[33]-tall

162.83±3.67* cm[34]-tall-*reconstructed only by the length of lower limbs

Bone	Length, cm
Humerus dx	30.4
Humerus sin	29.8
Radius dx	21.0
Radius sin	20.8
Ulna dx	23.5

[32] PEARSON 1899.

[33] TROTTER, GLESER 1952.

[34] TROTTER, GLESER 1952.

Ulna sin	23.3
Femur sin	43.2
Femur dx	43.9
Tibia dx	35.3
Tibia sin	35.7
Fibula dx	34.9
Fibula sin	-

*Body weight***:** 63.93 kg (reconstructed by the diameter of the head of the right femur).

Dentition: incomplete

Right															Left
0	7	0	5	X	X	X	X	X	0	3	4	R	0	0	0
0	7	0	5	4	3	2	X	X	2	3	4	5	6	7	0

4 – permanent tooth preserved in the alveolus; **0** – tooth lost *ante mortem*; **X–** tooth lost *post mortem*; **R**-root of permanent tooth

Abrasion of the masticatory surface of the teeth – moderate–4th degree.

Number of examined teeth: 16

Dentofacial pathology:

• *Ante mortem* edentulousness;

• Tartar – large amount on the lower teeth (**Pl. 5.2**);

• Linear enamel hypoplasia-two lines corresponding to 2 and 3 years of age, the result of stress in the physical development of the individual, most often due to a change in diet (transition from breastfeeding to common food).

Skeletal pathology:

• DJD (spondylitis) in the thoracolumbar spine (3rd degree);

• Lateral epicondylitis of the left humerus resulting from chronic, uniform and intense stress of the left upper extremity.

Anatomic cranial variations

• *Os incae multipartitum* (**Pl. 5.3**). Although in 1842 the English physician Bellamy described the Inca bone as typical of the Incas, this additional skull bone localized on *squama occipitalis* is registered as an anatomical variation in all world populations. In the series of modern Bulgarian skulls, the Inca bone occurs with a low frequency of 3.5%, but the type *os incae multipartitum* is identified in only 5 out of 3522 examined skulls[35].

• *Wormian bones–3 pieces each on the left and right;*

• *Os asteriacum–2 pieces each on left and right.*

Grave No. 15/2020 (Pl. 5.4; Pl. 7.4)

Burial construction: the burial pit is dug into the ancient stratum. The fill is the same as that of the layer0gray, ashy earth. The exact borders of the pit are uncertain.

[35] KADANOV, MUTAFOV 1984, p. 147–149.

Three vertically driven-in stones are preserved, in the area of the lower limbs; ca. width at skull-0.44 m; approx. width at lower limbs-0.35 m; approx. length 1.80 m.

Orientation: West-East

Position of the skeleton: laid on its back with extended lower limbs. The skull is tilted to the north and placed on the shoulder joint. Upper limbs bent at elbow joints and placed on the abdomen.

Grave inventory: 3 pieces whole and ½ bronze piece; 1 gold appliqué, in the skull area

Characteristics/note: in the pelvic area is found the toe of a Late Antique amphora, from the fill of the burial pit.

Condition of the bone material: skull and postcranial skeleton-fragmented and incompletely represented.

Age at death: 65–70 years old (*senilis*)-determined by the degree of obliteration of the cranial sutures.

Sex: male (determined by pelvic girdle and limb bone dimensions by BASS 2005, KÜHL 1985):

Bone	**Size, (mm)**	**Bone**	**Size, (mm)**
Epycond.D hum. dx	61.0	*D caput radii dx*	23.5
Epycond.D hum. sin	61.0	*D caput radii sin*	22.0
Vert D caput humeri dx	50.0	*Trans. D caput hum. dx*	45.0
Vert D caput humeri sin	-	*Trans. D caput hum. sin*	-
D caput femoris dx	-	*D caput femoris sin.*	48.5
Epycond.D fem. dx	-	*Epycond.D fem.sin*	82.0
L clavicula dx	-	*L clavicula sin*	-

The bones are moderately massive with moderate relief.

Stature: average stature: 167.43 cm[36]-over middle stature

172.28±3.82 cm[37]-tall

170.08±3.33* cm[38]-tall-*reconstructed only by the length of lower limbs.

Bone	**Length, cm**
Humerus dx	34.5
Humerus sin	34.0
Radius dx	-
Radius sin	23.9
Ulna dx	-
Ulna sin	-
Femur sin	-
Femur dx	-
Tibia dx	-
Tibia sin	36.8

[36] PEARSON 1899.

[37] TROTTER, GLESER 1952.

[38] TROTTER, GLESER 1952.

Fibula dx	-
Fibula sin	36.2

Body weight: 70.23 kg *(reconstructed by the diameter of the head of the left femur).*
Dentition: permanent, incomplete

Right															Left
-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
8	7	6	5	0	3	X	X	-	-	X	X	5	6	0	0

3 – permanent tooth preserved in the alveolus; **0** – tooth lost *ante mortem*; – tooth not found in the material; **X**–tooth lost *post mortem*; **R**-root of permanent tooth

Number of examined teeth: 8

Abrasion of the masticatory surface of the teeth-moderate–4th degree.

Dentofacial pathology:

• *Ante-mortem* tooth loss;

• Tartar.

Skeletal pathology:

• DJD (spondylitis) in the cervical thoracic spine (3rd degree);

Anatomical cranial variations: not observed.

Grave No. 16/2020 (Pl. 5.5; Pl. 7.5)

*Burial construction***:** rectangular in shape, surrounded by vertically driven-in stones. One stone is missing at the lower limbs to the north and the south. Pit breaches earlier wall (Late Antique?); width at skull 0.29 m; width at lower limbs 0.28 m; length 1.15 m.

Orientation: West-East

Position of the skeleton: laid on its back with stretched lower limbs. The skull is slightly inclined to the north and placed on the shoulder joint. The upper limbs are bent at the elbow joints; the right one is placed in the chest area and the left one in the stomach area.

Condition of the bone material: skull-fragmented and incompletely represented. Postcranial skeleton-fragmented and incompletely represented.

Age at death: 5–6 years old (*infans I*)-determined by dental status.

Bone	**Length (diaphysam)**	**Attribute**	**Length (diaphysam)**
L humerus dx	164.0	*L humerus sin*	-
L ulna dx	-	*L ulna sin*	130.0
L radius dx	-	*L radius sin*	120.0
L clavicula dx	85.0	*L clavicula sin*	83.0
L femur dex	-	*L femur sin*	220.0
L tibia dx	171.0	*L tibia sin*	173.0
L fibula dx	170.0	*L fibula dx*	170.0

Sex: it cannot be reconstituted.

Dentition: deciduous, incomplete.

Right																Left
-	-	C↓	-	-	-	-	C	-	-	C	-	C	C↓	C	-	
			V	IV	III	X	X	-	-	-	X	V				
		6°	V	IV	X	II	I	I	II	III	IV	V	6°			
-	-		-	-	-	-	-	-	-	-	-	-		-	-	

V – primary tooth preserved in the alveolus with complete root growth; 6° – permanent tooth preserved in the alveolus with incomplete root growth; – tooth not found in the material and no preserved alveolus; **C**-primary tooth which is still in the jaw; **X–**tooth lost post mortem.

Number of examined teeth: 21.

Tubercle of Carabelli (2nd degree)-a morphological dental trait with a high frequency in the Europoid anthropological type.

Dentofacial pathology: not registred.

Skeletal pathology: cribra orbitalia–1st degree on the left orbit, right orbit-cannot be reported because of its fragmentary state.

Anatomical cranial variations: not registered.

Additional material: fragment of an animal bone.

Grave No. 17/2020 (Pl. 5.6; Pl. 7.6)

*Burial construction***:** probably enclosed by vertically driven-in stones. Heavily disturbed at the moment of discovery. Border stones are preserved *in situ* in the area of the lower limbs. A north-south aligned wall in the northwest corner of the square was disturbed when the pit was dug out. The western part of the pit has an indistinct outline as the construction is cut into the ancient layer and the fill has the same characteristics as the soil-grey, ashy; width at lower limbs – 0.32m; length 1.52 m.

Orientation: West-East

*Position of the skeleton***:** upper part of the skeleton is missing. The remains are preserved from the abdomen to the lower limbs. Most of the ribs are also missing. The skeleton was laid on its back with stretched lower limbs.

*Skeletal parameters***:** length: approx. 1.18 m; width of pelvis: 0.30 m; length of femur: 0.38 m.

Condition of the bone material: skull-no. Postcranial skeleton-fragmented and incompletely represented.

Age at death: 16–17 years old (j*uvenis*)-determined by development of epiphyses.

Sex: male (determined by pelvic girdle and limb measurements by BASS 2005):

Bone	**Size, (mm)**	**Bone**	**Size, (mm)**
Epycond.D hum. dx	-	*D caput radii dx*	-
Epycond.D hum. sin	-	*D caput radii sin*	-
Vert D caput humeri dx	-	*Trans. D caput hum. dx*	-
Vert D caput humeri sin	-	*Trans. D caput hum. sin*	-
D caput femoris dx	44.5	*D caput femoris sin.*	-
Epycond.D fem. dx	-	*Epycond.D fem.sin*	-
L clavicula dx	-	*L clavicula sin*	-

Conclusions

Traces of trauma, interpreted as the result of cutting during a combat are found in the necropolises from this historical period in nowadays Bulgarian territory, including on male skulls from the Cape Chirakman excavated and studied in the 1970s, 1980s[39] and 2020 (Grave No. 9). Cases of survived traumas on cranial and postcranial skeletons are registered in the necropolis of Holy 40 Martys, from the ancient capital Tarnovo[40].

The calculated values according to one of the used formulas for the height of those buried in the studied necropolis, place one of the investigated females in the category of "under middle" and two-in the category of "middle" stature. Following this formula, males fell into the following categories: "under middle"-one individual, one case-in the category "over middle" and two men were defined as "tall". The stature results obtained using the other formula[41] were higher, placing the three studied females in the categories of "middle", "over middle" and "tall". One exception to stature ("under middle") is found only for the female from grave No. 6, when only the lengths of lower limbs are used. For males, calculated values after this formula for stature fell into the categories of "over middle", "tall" and "very tall". These results place the stature of the studied individuals close to and slightly above the published data for the synchronous necropolis from the northern suburb of the old Bulgarian capital Tarnovo[42]. The first records[43] of the stature of the living population in Bulgaria give an average value of the height of men even lower by 5.21 cm (the difference is statistically significant) than that calculated (by Pearson's formula) for the male skeletons excavated in 2020 on Cape Chirakman.

Enamel hypoplasia (EH) on the teeth surface was registered in 28.6% of the examined individuals. EH is a result of a temporary metabolic deficiency (which deficiency disrupts ameloblast physiology) in early childhood of the buried. Enamel hypoplasia is evidence of a change in diet (for example, a transition from breastfeeding to general nutrition) or long-term illness of the individual[44]. Two of the children aged 5–6 years (Graves No. 13 and 16) were distinguished with a pathological porotic bone change cribra orbitalia (CO) of the superior orbital roof as a result of subperiostal bleeding associated with deficiency of vitamin C and B12 predominately in childhood. Active forms of CO are mainly phenomena in childhood. Cribra orbitalia results from multiple nutritional deficiencies associated mainly with anemia (megaloblastic and hemolytic anemias), but also with scurvy, rickets, hemangiomas, or trauma[45].

This is a common paleopathological finding in human skulls from archaeological sites, including the Cape Chirakman necropolis.

[39] BOEV, KONDOVA, CHOLAKOV 1989, p. 159; KONDOVA *et alii* 1981, p. 122.

[40] RUSSEVA 2013, p. 377.

[41] TROTTER, GLESER 1952.

[42] RUSSEVA,MANOILOVA 2020, p. 106

[43] STOEV 2012.

[44] AUFDERHEIDE, RODRIGUEZ-MARTIN 1998; RITZMAN, BAKER, SCHWARTZ 2008; STARLING, STOCK 2007.

[45] WALKER *et alii* 2009.

The majority of the established morphological changes on the examined skeletons are indicative for malnutrition and numerous infectious diseases in this Late Medieval society.

BIBLIOGRAPHY

ALEKSEEV, DEBETS 1964 – V. Alekseev, G. Debets, *Kraniometriya, Metodika antropologicheskih issledovaniy*, Moskva, 1964.

ALEKSEEV 1966 – V. Alekseev, *Osteometriya. Metodika antropologicheskih issledovaniy*, Moskva, 1966.

ATANASSOVA 2018 – N. Atanassova, *Sravnitelna harakteristika na antropologichni pokazateli na kostni ostanki ot Osmanskia period*, PhD. Thesis, Sofia, 2018.

AUFDERHEIDE, RODRIGUEZ-MARTIN 1998 – A. Aufderheide, C. Rodriguez-Martin, *The Cambridge encyclopedia of human paleopathology*, Cambridge, 1998.

BASS 2005 – W. Bass, *Human Osteology: A Laboratory and Field Manual (5th edition)*, Columbia, Missouri, 2005.

BOEV, KONDOVA, CHOLAKOV 1982 – P. Boev, N. Kondova, S. Cholakov, *Antropologichno prouchvane na srednovekovni nekropoli, Chirakman-Karvuna-Kavarna*, Sofia, 1982, p. 62–65.

BOEV, KONDOVA, CHOLAKOV 1989 – P. Boev, N. Kondova, S. Cholakov, *Demografska struktura, zabolyavaniya i rasova tipologiya na naselenieto na Kavarna prez kasnoto srednovekovie (po danni ot nekropola na Chirakman)*, Izvestiya na Narodnia muzey Varna 25 (1989), p. 156–166.

BONEV *et alii* 2021 – V. Bonev, E.Vasileva, K. Madzharov, Y. Dimitrova, *Antichna i srednovekovna krepost nos Chirakman*, Arheologicheski otkritiya i razkopki prez 2020 g., Sofia 2021, p. 1055–1059.

BONEV *et alii* 2022 – V. Bonev, E. Vasileva, K. Madzharov, Y. Dimitrova, R. Peevski, *Archaeological excavations at Cape Chirakman/Bizone, Kavarna 2016–2021*, Pontica 55 (2022), p. 55–114.

BROTHWELL 1965 – D. Brothwell, *Digging Up Bones*, British Museum of Natural History, London, 1965.

BUIKSTRA, UBELAKER 1994 – J. Buikstra, D. Ubelaker, *Standards for data collection from human skeletal remains,* Fayetteville, Arkansas, 1994.

CHOLAKOV, MIHAYLOV, NEYKOVA 1982 – S. Cholakov, M. Mihaylov, M. Neykova, *Prouchvane na kasnosrednovekevniya nekropol na nos Chirakman pri gr. Kavarna*, în: *Arheologicheski otkritiya i razkopki prez 1981 g.*, Mihaylovgrad, 1982, p. 109.

FEREMBACH, SCHWIDETZKY, STLOUKAL 1980 – D. Ferembach, I. Schwindezky, M. Stoukal, *Recommendations for age and sex diagnoses of skeletons*, Journal of Human Evolution 9 (1980), p. 517–549.

GATEV 2007 – Y. Gatev, *Terenni obhozhdaniya na teritoriyata na obshtina Kavarna prez 2006 g.*, in: *Arheologicheski otkritiya i razkopki prez 2006 g.*, Sofia, 2007, p. 597–598.

GERASIMOV 1955 – M. Gerasimov, *Vosstanovlenie litsa po cherepu: (sovremennayy i iskopaemayy chelovek)*, Moskva, 1955.

KADANOV, MUTAFOV 1984 – D. Kadanov, S. Mutafov, *Cherepat na choveka v mediko-biologichen aspekt,* Sofia, 1984.

KITOV 1973 – G. Kitov, *Trakiyska mogilna grobnitsa kray Kavarna*, in: *Rezyumeta na otcheti za razkopani obekti prez 1972 godina*, Sofia, 1973, p. 37.

KITOV 1990 – G. Kitov, *Kupolnite grobnitsi na nos Kaliakra i nos Chirakman kray Kavarna*, Terra Antiqua Balcanica 6 (1990), p. 116–121.

KITOV, PETKOV, SALKIN 1987 – G. Kitov, A. Petkov, A. Salkin, *Arheologiya i geofizika v prouchvaneto na trakiyska nadgrobna mogila kray s. Balgarevo, Tolbuhinski okrag*, in: *Arheologicheski otkritiya i razkopki prez 1986 g.*, Razgrad 1987, p. 101.

KONDOVA, BOEV, CHOLAKOV 1981 – N. Kondova, P. Boev, S. Cholakov, *Antropologichno prouchvane na srednovekoven nekropol, otkrit pri krepostnata stena na nos Chirakman kray gr*. Kavarna, Interdistsiplinarni izsledvaniya 7–8 (1981), p. 123–134.

KONDOVA, BOEV, CHOLAKOV 1982 – N. Kondova, P. Boev, S. Cholakov, *Danni za srednovekovnoto naselenie na Chirakman, Chirakman-Karvuna-Kavarna*, Sofia, 1982, p. 66–69.

KÜHL 1985 – R. Kühl, *Skelettreste aus prähistorische Brandbestattungen und ihre Aussagemöglichkeiten, mit Hinweisen auf spezielle Fragestellungen in Schleswig-Holstein*, Mitteilungen der Anthropologischen Gesellschaft in Wien (MAGW) 115 (1985), p. 113–137.

LAZARENKO 2006 – I. Lazarenko, *Spasitelni arheologicheski razkopki na podmogilno grobno saorazhenie ot elinisticheskiya nekropol pri s. Bozhurets, obshtina Kavarna*, in: *Arheologicheski otkritiya i razkopki prez 2005 g.*, Sofia, 2006, p. 223–225.

LAZARENKO, MIRCHEVA, DOBREV 2007 – I. Lazarenko, E. Mircheva, D. Dobrev, *Arheologicheski prouchvaniya na nadgrobna mogila pri s. Bozhurets, obshtina Kavarna, prez 2006 g.*, in: *Arheologicheski otkritiya i razkopki prez 2006 g.*, Sofia, 2007, p. 326–329.

LOVEJOY *et alii* 1985 – C. O. Lovejoy, R. Meindl, T. R. Prysbeck, R. Mensforth, *Chronological metamorphosis of the auricular surface of the ilium: a new method for the determination of adult skeletal age at death*, American Journal of Physical Anthropology 68/1 (1985), p. 15–28.

MARESH 1970 – M. Maresh, *Measurements from roentgenograms*, in: R. W. McCammon (ed.), *Human Growth and Development*, Springfield IL: C. C. Thomas, 1970, p. 157–200.

MĂRCULESCU 1934 – O. Mărculescu, *Bizone-Portul Cavarna*, Analele Dobrogei 15 (1934), p. 145–162.

MĂRCULESCU 1935 – O. Mărculescu, *Descoperiri arheologice dobrogene*, Analele Dobrogei 16 (1935), p. 119–129.

MIRCHEV, TONCHEVA, DIMITROV 1962 – M. Mirchev, G. Toncheva, D. Dimitrov, *Bizone-Karvuna*, Izvestiya na Varnenskoto arheologichesko druzhestvo 13 (1962), p. 21–109.

ORTNER, PUTSCHAR 1981 – D. Ortner, W. Putschar, *Identification of Pathological Conditions in Human Skeletal Remains*, Washington, 1981.

ORTNER 2003 – D. Ortner, *Identification of Pathological Conditions in Human Skeletal Remains, 2nd Edition,* San Diego, 2003.

PEARSON 1899 – K. Pearson, *Mathematical Contributions to the Theory of Evolution. V. On the Reconstruction of the Stature of Prehistoric Races*, Phil. Trans. Royal Soc. A 193 (1899), p. 169–244. doi:10.1098/rsta.1899.0004.

PINHASI, MAYS 2008 – R. Pinhasi, S. Mays (eds.), *Advances in human palaeopathology*, Hoboken, 2008.

RADICHKOV 1993 – G. Radichkov, *Kasnosrednovekoven nekropol ot XV–XVII vek na Kaliakra*, Dobrudza 10 (1993), p. 168–181.

RITZMAN, BAKER, SCHWARTZ 2008 – T. Ritzman, B. Baker, G. Schwartz, *A fine line: a comparison of methods for estimating ages of linear enamel hypoplasia formation*, American Journal of Physical Anthropology 135 (2008), p. 348–361.

RUFF, SCOTT, LIU 1991 – C. B. Ruff, W. W. Scott, A. Y. C. Liu, *Articular and diaphyseal remodeling of the proximal femur with changes in body mass in adults*, American Journal of Physical Anthropology 86/3 (1991), p. 397–413.

RUSSEVA 2010 – V. Russeva, *Distribution of Enamel Hypoplasia – new perspectives for Interpretation of the Anthropological Material from Archaeological Sites in Bulgaria (preliminary results)*, Interdisciplinarni izsledvania 22–23 (2010), p. 186–192.

RUSSEVA 2013 – V. Russeva, *Zdravoslovnoto sastoianie na individite, pogrebani v nekropola ot XIII–XIV v., pri carkvata "Sv. 40 Machenici", Veliko Tarnovo*, Izvestia na Regionalen istoricheski muzei Veliko Tarnovo, 27 (2012) [2013], p. 355–402.

RUSSEVA 2016 – V. Russeva, *Pogrebanite v nekropola-antropologichna harakteristika,* in: L. Doncheva-Petkova, K. Apostolov, V. Russeva (eds.), Rannobalgarskiat nekropol pri Balchik, Sofia, 2016, p. 511–581.

RUSSEVA, MANOILOVA 2020 – V. Russeva, L. Manoilova, *Demografski harakteristiki, fizichesko razvitie i patologichni izmenenia na populaciata, predstavena v srednovekovnia nekropol v severnoto podgradie na stolichnia Tarnovgrad*, Izvestia na Regionalen istoricheski muzei Veliko Târnovo 35 (2020), p. 99–120.

SALKIN, GEORGIEV 2004 – A. Salkin, P. Georgiev, *Podvodna arheologicheska ekspeditsiya „Kavarna–2003"*, in: *Arheologicheski otkritiya i razkopki prez 2003 g.*, Sofia, 2004, p. 119–120.

SALKIN, GEORGIEV 2006 – A. Salkin, P. Georgiev, *Podvodna arheologicheska ekspeditsiya- „Kavarna–2005"*, in: *Arheologicheski otkritiya i razkopki prez 2005 g.*, Sofia, 2006, p. 254–255.

SALKIN, ORACHEV 1989 – A. Salkin, A. Orachev, *Podvodna arheologicheska ekspeditsiya „Kavarna–88"*, in: *Arheologicheski otkritiya i razkopki prez 1988 g.*, Razgrad, 1989, p. 121–172.

SALKIN 1982 – A. Salkin, *Sledi ot antichnostta, Chirakman-Karvuna-Kavarna*, Sofia, 1982, p. 29–35.

SALKIN 1984 – A. Salkin, *Kavarna i rayonat prez drevnostta (II hil. pr. n. e.-IV v. ot n. e.), Kavarna ot drevnostta do Osvobozhdenieto*, Sofia, 1984, p. 44–61.

SALKIN 1986 – A. Salkin, *Evidence for the earlier foundation of Bizone colony*, Thracia Pontica 3 (1986), p. 251–255.

SALKIN 1987 – A. Salkin, *Podvodni arheologicheski prouchvaniya „Kavarna–86"*, in: *Arheologicheski otkritiya i razkopki prez 1986 g.*, Razgrad, 1987, p. 281.

SALKIN 1989 – A. Salkin, *Dva trakiyski groba ot okolnostite na Bizone*, Izvestiya na Narodniya muzey Varna 25/40 (1989), p. 9–12.

SALKIN 1996 – A. Salkin, *Podvodna arheologicheska ekspeditsiya „Kavarna–95"*, in: *Arheologicheski otkritiya i razkopki prez 1995 g.*, Sofia 1996, p. 114.

SALKIN 2007 – A. Salkin, *Bizone* in: V. Grammenos, E. Petropoulos (eds.), *Ancient Greek Colonies in the Black Sea*, Vol. 1, BAR International Series 1675), Oxford, 2007, p. 37–50.

SALKIN, GEORGIEV, DOBREV 2004 – A. Salkin, P. Georgiev, D. Dobrev, *Obhodna terennna ekspeditsiya „Kavarna-Shabla 2003"*, in: *Arheologicheski otkritiya i razkopki prez 2003 g.*, Sofia, 2004, p. 119.

SCHAEFER, BLACK, SCHEUER 2009 – M. Schaefer, S. Black, L. Scheuer, *Juvenile osteology: A laboratory and field manual*, San Diego, 2009.

SOTIROV, GATEV 1996 – I. Sotirov, Y. Gatev, *Spasitelni razkopki na kasnoantichen nekropol-Kavarna*, in: *Arheologicheski otkritiya i razkopki prez 1995 g.*, Sofia, 1996, p. 78.

SOTIROV, GATEV 2005 – I. Sotirov, Y. Gatev, *Razkopki na nos Chirakman, antichniya Bizone*, in: *Arheologicheski otkritiya i razkopki prez 2004 g.*, Sofia, 2005, p. 202–203.

SOTIROV, GATEV 2006 – I. Sotirov, Y. Gatev, *Razkopki na nos „Chirakman", antichniya Bizone*, in: *Arheologicheski otkritiya i razkopki prez 2005 g.*, Sofia, 2006, p. 255–257.

SOTIROV *et alii* 1990 – I. Sotirov, D. Toptanov, B. Petrunova, A. Salkin, *Razkopki na nos Chirakman kray gr. Kavarna*, in: *Arheologicheski otkritiya i razkopki prez, Kyustendil*, 1990, p. 162–164.

STARLING, STOCK 2007 – P. Starling, J. Stock, *Dental indicators of health and stress in Early Egyptian and Nubian agriculturalists: a difficult transition and gradual recovery*, American journal of Physical Anthropology 134 (2007), p. 520–528.

STOEV 2012 – R. Stoev, *Body height in recruits in Bulgaria (1897–1920),* Acta morphologica et anthropologica 18 (2012), p. 95–101.

THEODOSIEV 1994 – N. Theodosiev, *Thracian tumulus near the town of Kavarna*, Helis 3 (1994), p. 109–122.

TONKOVA, SALKIN 2005 – M. Tonkova, A. Salkin, *Balgaro-frenski proekt za arheologichesko prouchvane na ostankite ot Bizone na yuzhnite terasi na nos Chirakman, Kavarna*, in: *Arheologicheski otkritiya i razkopki prez 2004 g.*, Sofia, 2005, p. 136–137.

TONKOVA, SLAKIN, LAND 2004 – M. Tonkova, A. Salkin, K. Land, *Balgaro-frenski proekt za arheologicheski prouchvaniya na ostankite ot Bizone na yuzhnite terasi na nos Chirakman, Kavarna*, in: *Arheologicheski otkritiya i razkopki prez 2003 g.*, Sofia, 2004, p. 69.

TOPTANOV 1984 – D. Toptanov, *Kavarna i Kavarnenskiyat kray po vremeto na Rannovizantiiyskataimperiya (V–VI v.) i Parvoto balgarsko tsarstvo (VII-XI v.),* in: V. Vasilev *et alii* (eds.), *Kavarna ot drevnostta do osvobozhdenieto*, Sofia, 1984, p. 62–84.

TROTTER, GLESER 1952 – M. Trotter, G. Gleser, *Estimation of stature from long bones of American whites and Negroes*, American Journal of Physical Anthropology 10 (1952), p. 469–514.

VASILEV 1984 – V. Vasilev, *Razkopki na nos Chirakman do Kavarna*, in: *Arheologicheski otkritiya i razkopki prez 1983 g.*, Smolyan, 1984, p. 145.

VASILEV 1985 – V. Vasilev, *Chirakman*, Vekove 24/3 (1985), p. 13–23.

VASILEV *et alii.* 1973 – V. Vasilev, G. Kitov, G. Kuzmanov, I. Sotirov, A. Salkin, *Prouchvania na nos „Charakman" pri Kavarna,* XVIII Natsionalna arheologicheska konferentsiya, Sofia, 1973, p. 58–59.

VASILEV, SALKIN, SOTIROV 1976 – V. Vasilev, A. Salkin, I. Sotirov, *Razkopki pri nos „Charakman" pri gr. Kavarna*, XXI Natsionalna arheologicheska konferentsiya, Smolyan, 1976, p. 79–80.

VASILEV *et alii* 1977 – V. Vasilev, A. Salkin, V. Gerasimova, I. Sotirov, S. Cholakov, *Razkopki na nos Chirakman pri gr. Kavarna*, in: *Arheologicheski otkritiya i razkopki prez 1976 g.*, Sofia, 1977, p. 135–137.

VASILEV *et alii* 1978 – V. Vasilev, A. Salkin, V. Gerasimova, I. Sotirov, S. Cholakov, *Razkopki na nos Chirakman pri gr. Kavarna*, in: *Arheologicheski otkritiya i razkopki prez 1977 g.*, Sofia, 1978, p. 137–138.

VASILEV *et alii* 1979 – V. Vasilev, A. Salkin, I. Sotirov, S. Cholakov, N. Kondova, *Razkopki na Chirakman*, in: *Arheologicheski otkritiya i razkopki prez 1978 g.*, Sofia, 1979, p. 183–184.

VASILEV *et alii* 1981 – V. Vasilev, M. Mihaylov, G. Radichkov, M. Neykova, S. Cholakov, N. Kondova-Cholakova, *Razkopki na nos Chirakman pri gr. Kavarna*, in: *Arheologicheski otkritiya i razkopki prez 1980 g.*, Sofia, 1981, p. 153–154.

VASILEV, MIHAYLOV, CHOLAKOV 1985 – V. Vasilev, M. Mihaylov, S. Cholakov, *Razkopki na nos Chirakman*, in: *Arheologicheski otkritiya i razkopki prez 1984 g.*, Sliven, 1985, p. 248–250.

VASILEV *et alii* 1986 – V. Vasilev, M. Mihaylov, S. Cholakov, S. Goshev, *Razkopki na nos Chirakman*, in: *Arheologicheski otkritiya i razkopki prez 1985 g.*, Veliko Târnovo, 1986, p. 189–192.

VASILEVA *et alii* 2017 – E. Vasileva, V. Bonev, K. Madzharov, Y. Gatev, *Arheologichesko prouchvane na nos Chirakman, obshtina Kavarna*, in: *Arheologicheski otkritiya i razkopki prez 2016 g.*, Sofia, 2017, p. 591–594.

VASILEVA, BONEV, MADZHAROV 2018a – E. Vasileva, V. Bonev, K. Madzharov, *Arheologichesko prouchvane na nos Chirakman, obshtina Kavarna,* in: *Arheologicheski otkritiya i razkopki prez 2017 g.*, Sofia, 2018, p. 518–522.

VASILEVA *et alii* 2018b – E. Vasileva, V. Bonev, K. Madzharov, S. Stoychev, D. Dobrev, B. Totev, *Terenni izdirvaniya v obshtina Kavarna*, in: *Arheologicheski otkritiya i razkopki prez 2017 g.*, Sofia, 2018, p. 599–601.

VASILEVA, BONEV, MADZHAROV 2019 – E. Vasileva, V. Bonev, K. Madzharov, *Arheologichesko prouchvane na antichna i srednovekovna krepost nos Chirakman, gr. Kavarna*, in: *Arheologicheski otkritiya i razkopki prez 2018 g.*, Sofia, 2019, p. 498–500.

VASILEVA *et alii* 2020 – E. Vasileva, V. Bonev, K. Madzharov, Y. Dimitrova, *Antichna i srednovekovna krepost nos Chirakman*, in: *Arheologicheski otkritiya i razkopki prez 2019 g.*, Sofia, 2020, p. 1155–1159.

WALKER *et alii* 2009 – P. L. Walker, R. R. Bathurst, R. Richman, T. Gjerdrum, V. A. Andrushko, *The causes of Porotic Hyperostosis and Cribra Orbitalia: A Reappraisal of the Iron-Deficiency-Anemia Hypothesis*, American Journal of Physical Anthropology 139 (2009), p. 109–125.

ZUBOV 1968 – A. Zubov, *Odontologiya. Metodika antropologicheskih issledovaniy*, Moskva, 1968.

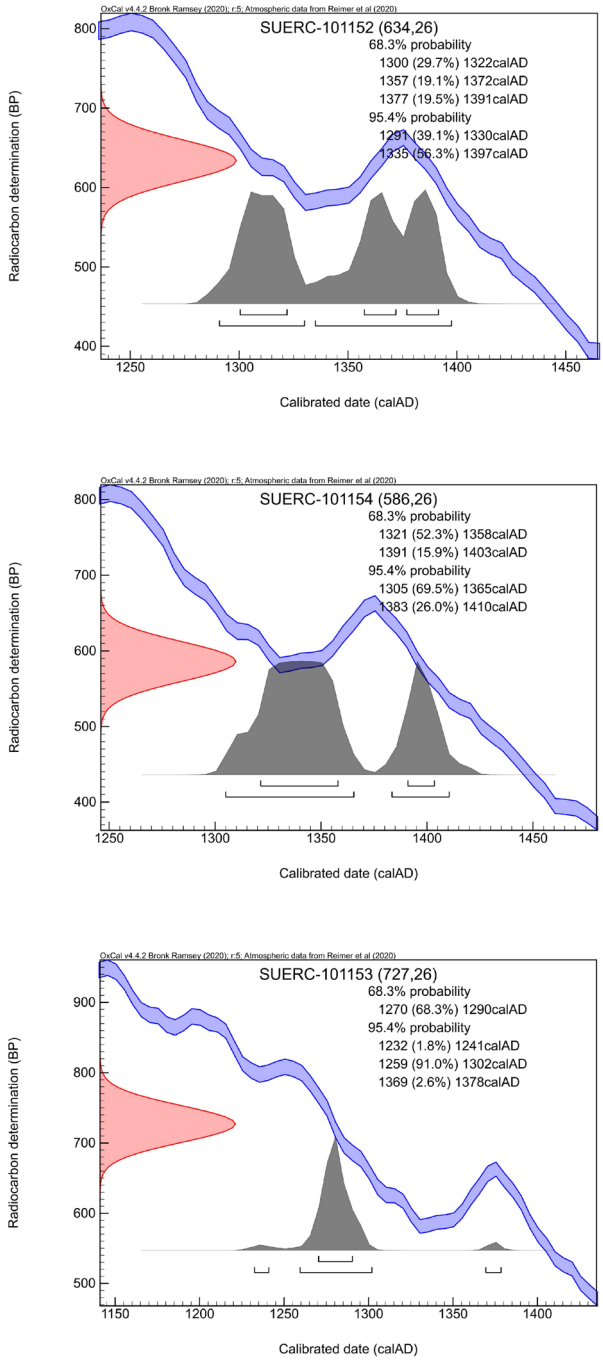
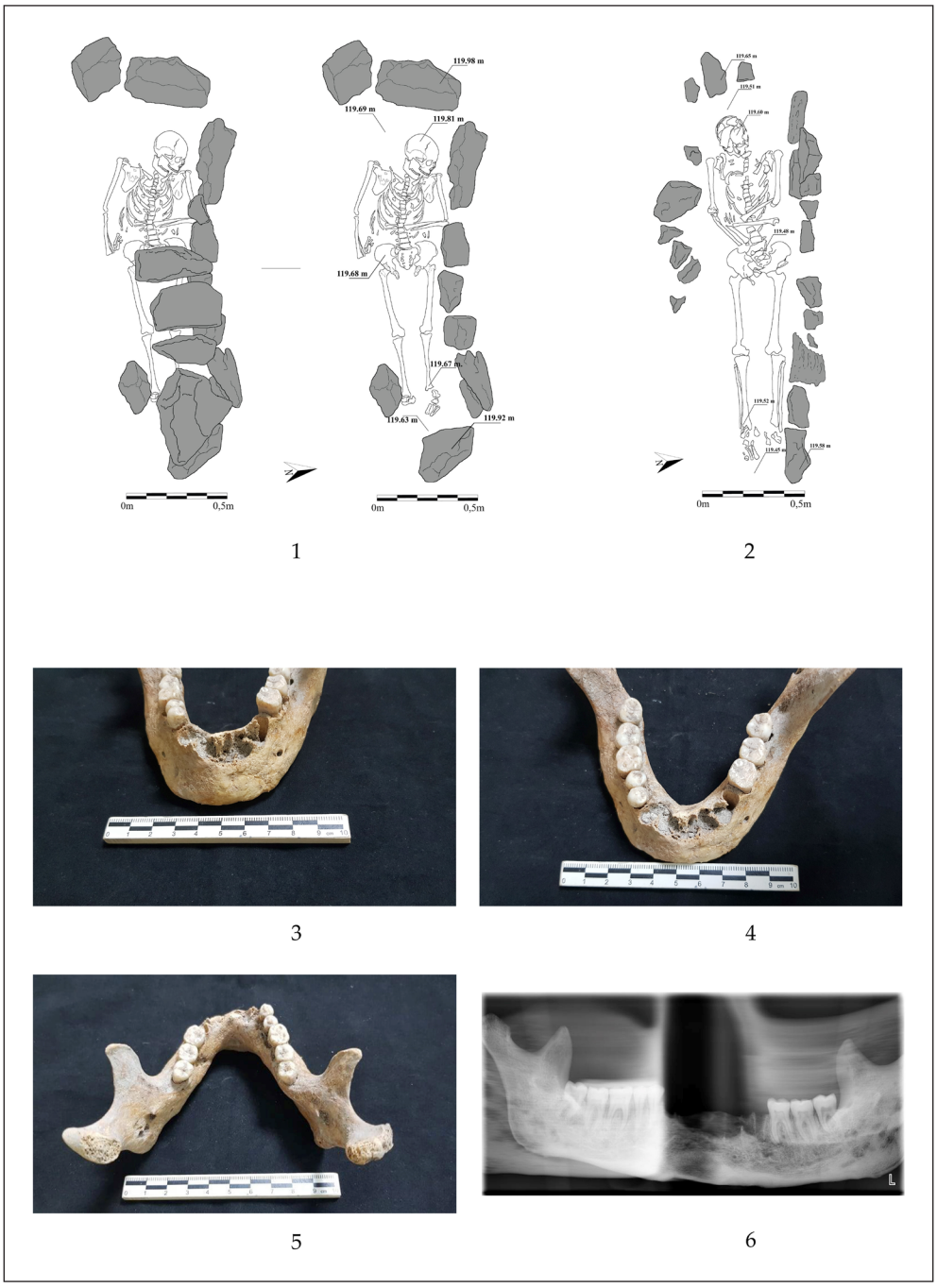
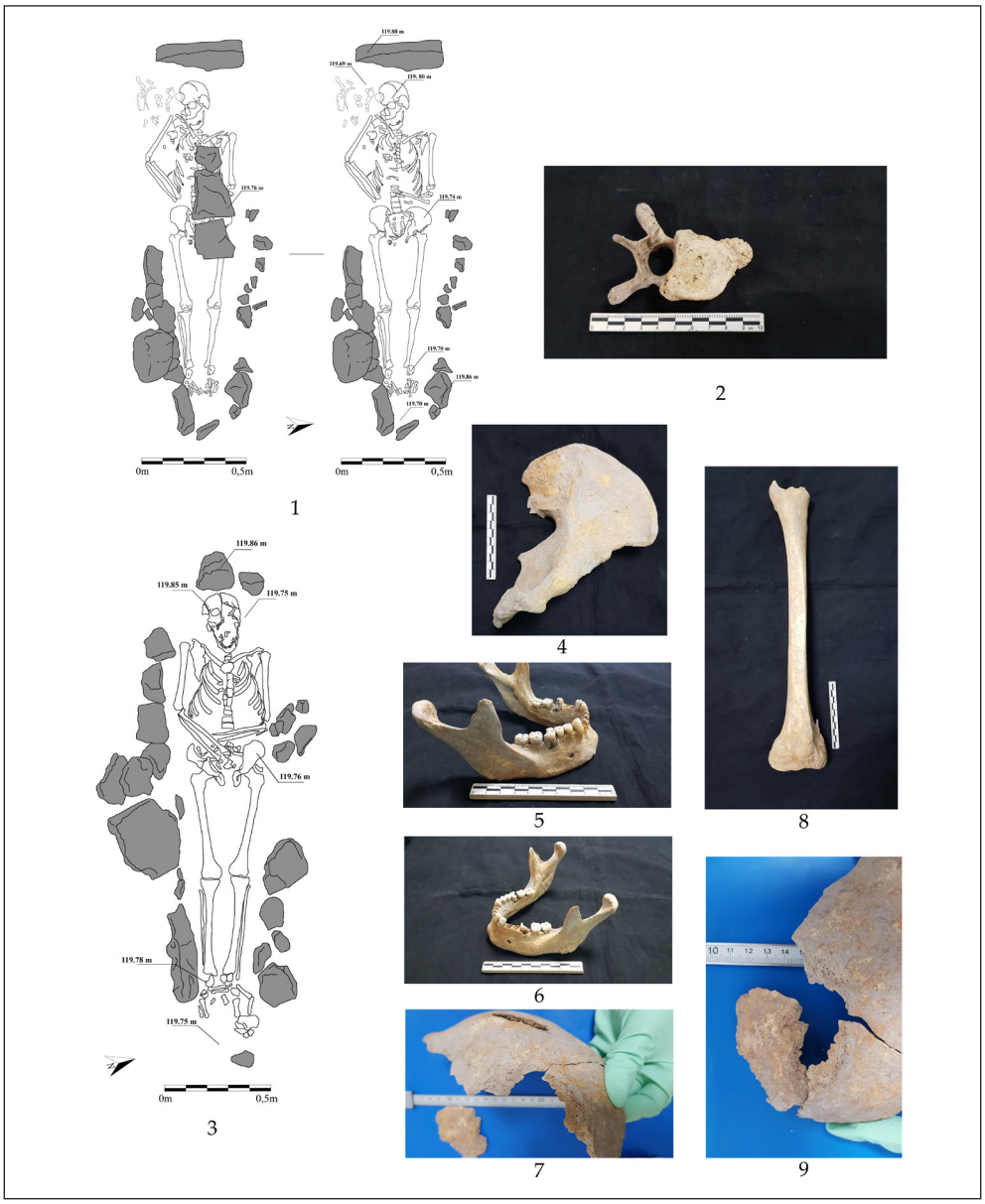


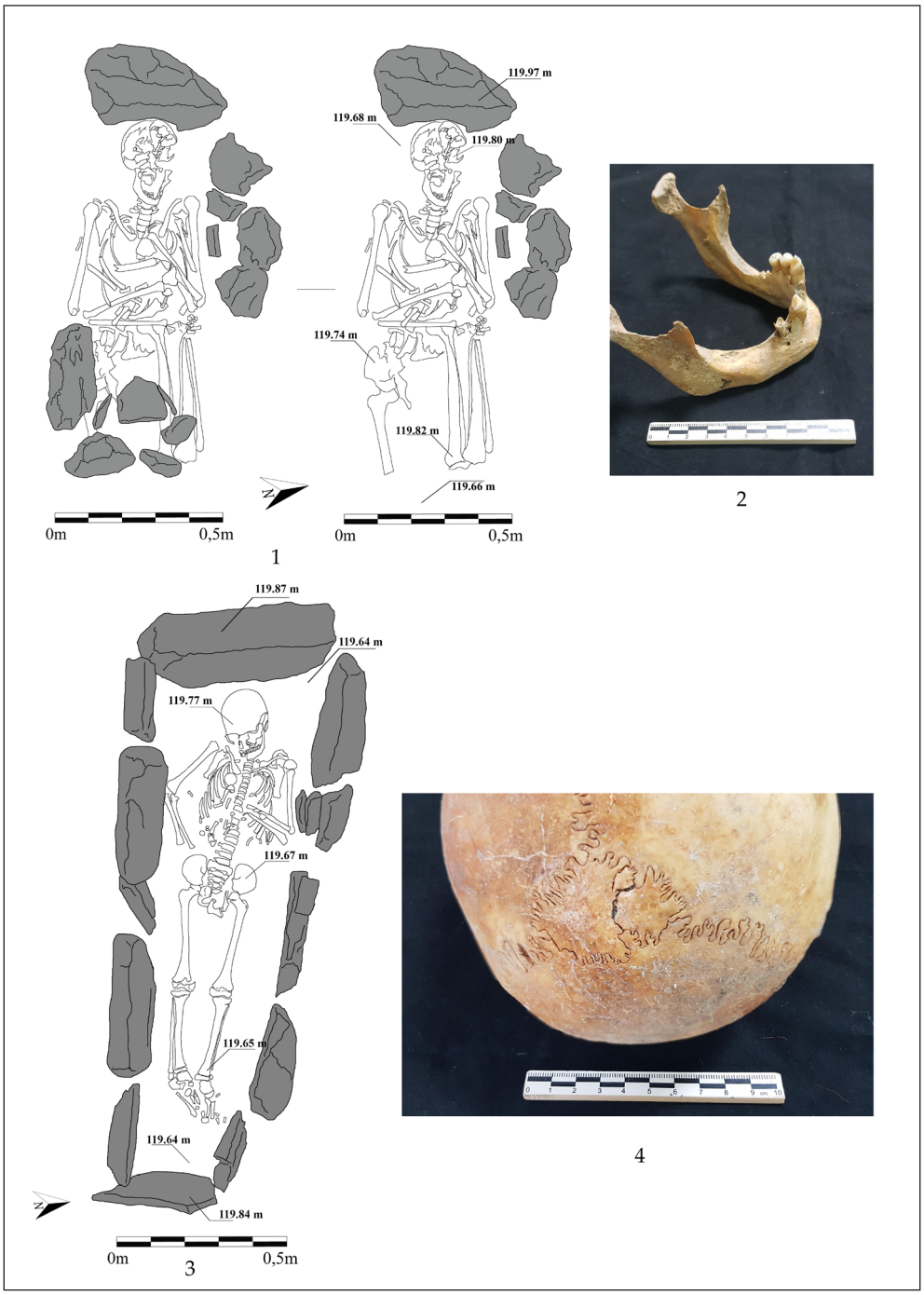
Fig. 1. Radiocarbon dating diagrams.



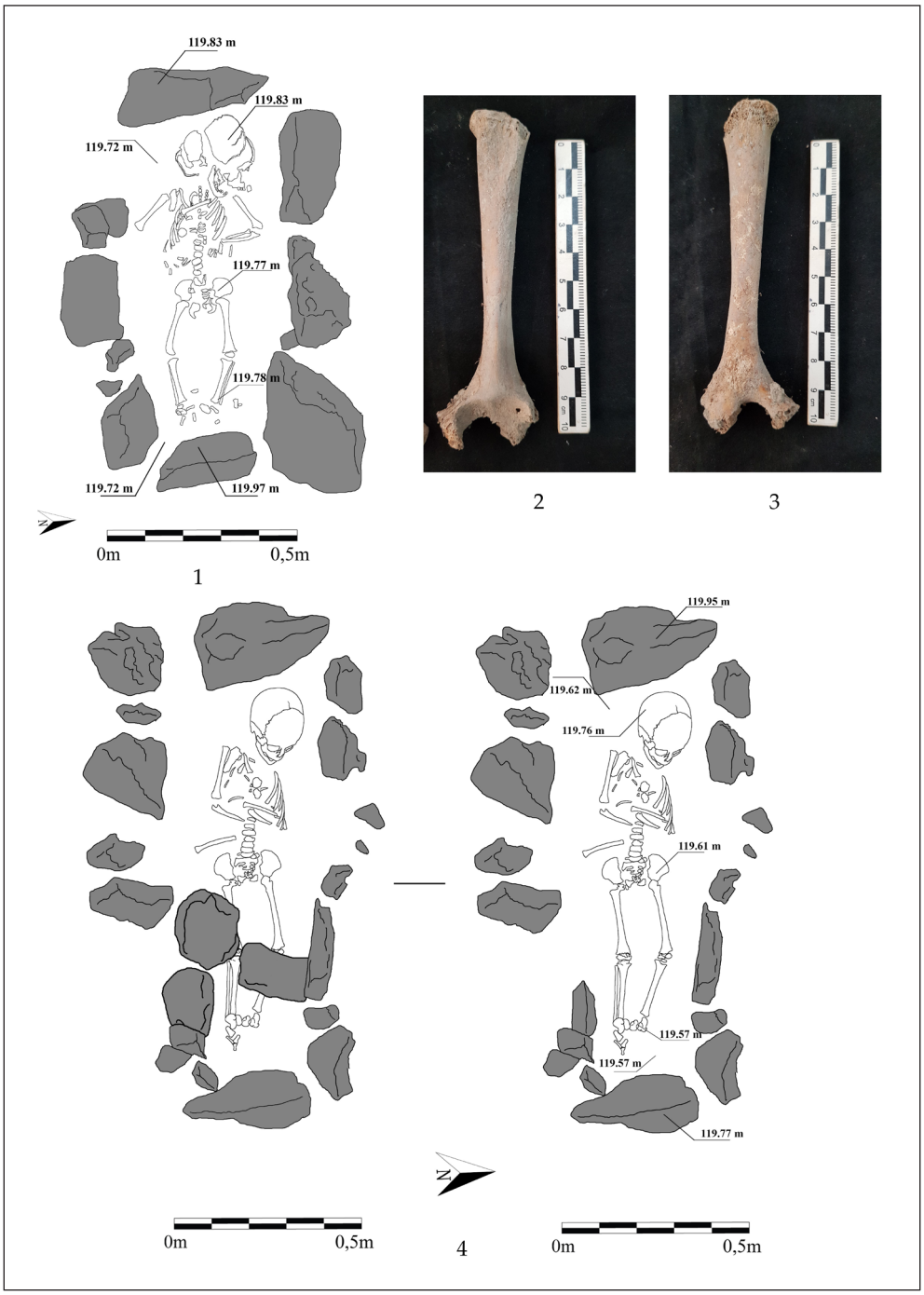
Pl. 1. Graves No. 6 and No. 7. 1.1. Grave No. 6. Female (40–50 years old). Drawing; 1.2. Grave No. 7. Male (40–50 years old). Drawing; 1.3. Grave No. 7. Male (40–50 years old). *Mandible with a strong thickening of the body of bone;* 1.4. Grave No. 7. Male (40–50 years old). *Mandible bone-anterior view;* 1.5. Grave No. 7. Male (40–50 years old). *Mandible bone-lingual surface view;* 1.6. Grave No. 7. Male (40–50 years old). *Mandible bone–X–ray.*



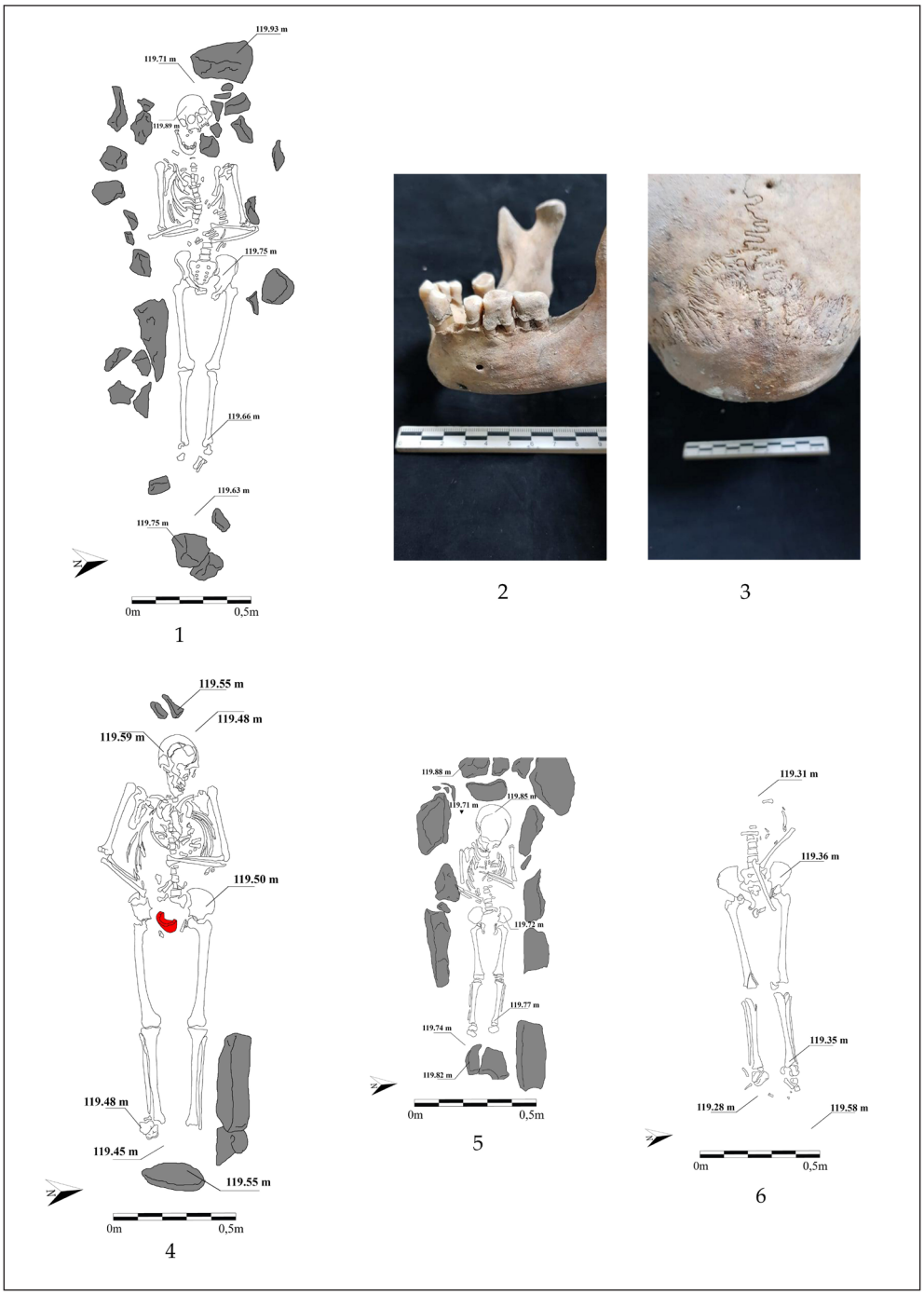
Pl. 2. Graves No. 8, No. 8A and No. 9. 2.1 Grave No. 8. Female (40–50 years old). Drawing; 2.2 Grave No. 8A. Adult individual (30–35 years old) with undetermined sex. *Thoracic vertebra with degenerative-dystrophic changes;* 2.3 Grave No. 9. Young adult male individual (25–26 years old). Drawing; 2.4 Grave No. 9. Young adult male individual (25–26 years old). *Left ilium with a narrow ischial notch*; 2.5 Grave No. 9. Young adult male individual (25–26 years old). *Mandible bone-caries and cyst (right view)*; 2.6 Grave No. 9. Young adult male individual (25–26 years old). *Mandible bone-caries (left view)*; 2.7 Grave No. 9. Young adult male individual (25–26 years old). *Right tibia-Myositis Ossificans on the lateral surface of the proximal bone end*; 2.8 Grave No. 9. Young adult male individual (25–26 years old). *Peri mortem trauma on the left half of the skull*; 2.9 Grave No. 9. Young adult male individual (25–26 years old). *Peri mortem trauma on the left half of the skull.*



Pl. 3. Graves No. 10–11. 3.1 Grave No. 10. Male (40–50 years old). Drawing; 3.2 Grave No. 10. Male (40–50 years old). *Mandible=edentulous ante mortem*; 3.3 Grave No. 11. Child *Infans II* (10–11 years old). Drawing; 3.4 Grave No. 11. Child *Infans II* (10–11 years old). *Os apicis multipartitum.*



Pl. 4. Graves No. 6–7. 4.1 Grave No. 12. Child *Infans I* (1–2 years old). Drawing; 4.2 Grave No. 12. Child *Infans I* (1–2 years old). *Left humerus-anterior view;* 4.3 Grave No. 12. Child *Infans I* (1–2 years old). *Left humerus-posterior view*; 4.4 Grave No. 13. Child *Infans I* (5–6 years old). Drawing.



Pl. 5. Graves No. 14–17. 5.1 Grave No. 14. Female (45–49 years old). Drawing; 5.2 Grave No. 14. Female (45–49 years old). *Tartar*; 5.3 Grave No. 14. Female (45–49 years old). *Os incae multipartitum*; 5.4 Grave No. 15. Male (65–70 years old). Drawing; 5.5 Grave No. 16. Child *Infans I* (5–6 years old). Drawing; 5.6 Grave No. 17. Male (16–17 years old). Drawing.

Pl. 6. Graves No. 6–11. 6.1 Grave No. 6. Photo; 6.2 Grave No. 7. Photo; 6.3 Grave No. 8. Photo; 6.4 Grave No. 9. Photo; 6.5 Grave No. 10. Photo; 6.6 Grave No. 11. Photo.

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Pl. 7. Graves No. 12–17. 7.1 Grave No. 12. Photo; 7.2 Grave No. 13. Photo; 7.3 Grave No. 14. Photo; 7.4 Grave No. 15. Photo; 7.5 Grave No. 16. Photo; 7.6 Grave No. 17. Photo.