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Short fieldwork report

Human remains from Berenike, Egypt, 2021–2024

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The ancient town of Berenike is located on the southern part of the Egyptian Red Sea coast (23°54'37"N, 35°28'32"E), approximately 400km south of Hurghada, near the modern settlement of Barnis (**Figure 1**). Berenike was one of the most important trade ports in this part of the world, facilitating the exchange of goods between the Mediterranean and the Indian Ocean basin from the 3rd century BCE to the 6th century CE (Sidebotham 2011). Over more than 20 years of ongoing research at the site, excavations have revealed a Hellenistic (3rd–1st century BCE) fort, a Roman (1st–3rd century CE) temple dedicated to the goddess Isis, and an extensive urban settlement primarily dated to the post-Roman period (4th–6th century CE). The latter includes houses, warehouses, and a structure associated with religious practices (Hense 2018; Sidebotham 2002; Woźniak 2022).

Throughout most of its history, Berenike was inhabited primarily by merchants and soldiers, many of whom resided there only part of their lives. This situation changed around the late 4th century CE, when control of the port shifted to the indigenous population of the region, known from written sources as the Blemmyes (Cuvigny 2022). With their arrival, distinctive tombs appeared on the western outskirts of the town, clearly standing out in the landscape (**Figure 1**). Among them, typical Blemmyan tumuli were identified, consisting of small mounds made of field stones, with nearly 900 recorded in the area (Gwiazda et al. 2025). In addition, more monumental chamber tombs arranged in rows, with entrances facing Berenike, were discovered in the necropolis along the main road leading to the town (**Figure 2**).

Between 2021 and 2024, the site's necropolis, including its chamber tombs, was intensively excavated. Archaeological investigations established its period of use as spanning the late 4th to early 6th centuries CE (Gwiazda et al. 2025). While widespread looting has severely limited the preservation of graves at Berenike in the past, the osteological material recovered allows for the examination of the local population in terms of demographics, health, and Blemmyan burial customs. In addition, a small number of simple pit graves were discovered during the excavations; these are linked

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to a Roman necropolis previously investigated as part of a separate project (Zych & Woźniak 2022).

Archaeological excavations were carried out in 15 chamber tombs and a few other contexts in the cemetery area (**Figure 1**). All these tombs contained assemblages of commingled human bones. Human remains from Berenike were studied in the excavation dig house in December 2024 by Nina Maaranen and Arkadiusz Sołtysiak. Preservation of the skeletal material was variable. Most elements came from com-

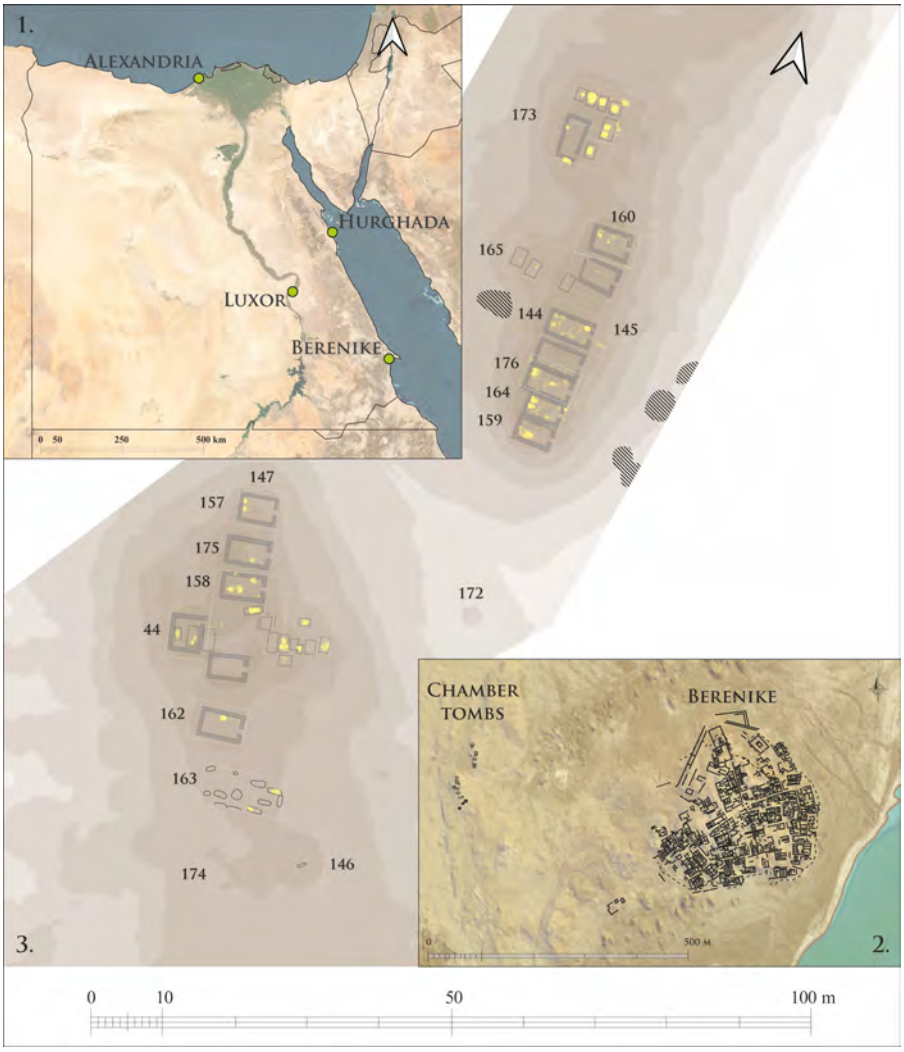

Figure 1. Plan of the chamber tomb cemetery at Berenike. Base map: Esri, USGS, drawing by P. Lech, M. Gwiazda, E. Smagur, P. Czernic and Sz. Popławski.

mingled assemblages and exhibited a high degree of fragmentation due to erosion, secondary crystalline deposits, and other taphonomic agents. Even tooth enamel was frequently fragmentary. However, in a few cases the preservation was very good, especially in the case of primary burials. All retrieved elements were mechanically cleaned and identified, with all possible measurements taken and pathological conditions noted following Buikstra and Ubelaker (1994) with some modifications (Sołtysiak et al. 2019).

In two tombs (trench BE24-158, many loci, and trench BE24-163, loci 13 and 23), several bones were slightly burned, as indicated by the colour ranging from brown through dark brown to black. No clear pattern was observed, as elements from all parts of the skeleton (from cranium to foot bones) were affected in both adult and subadult individuals (**Figure 3**). A small number of darkened elements were also retrieved from tombs in trenches BE21-44, BE23-159, and BE24-173. Such low-temperature burning, distinct from intentional cremation, may result from fires lit above skeletons buried in the shallow graves (cf. Sołtysiak 2010b for an example at Tell Barri). However, in most cases brown/black staining at Berenike was not accompanied by other clear signs of thermal alternation (like surface cracking), and it is also possible that the observed colour change was due to the presence of textiles in the grave (cf. Zych & Woźniak 2022). Another common taphonomic effect observed was the presence of insect burrow holes, noted in several contexts including trenches BE24-172 and BE24-173, particularly on femora (**Figure 4**).

Figure 2. Chamber tomb in trench BE23-157. Photograph by M. Gwiazda.

In total, 32 individuals were found in primary contexts, although some skeletal elements were occasionally missing (**Table 1**). An additional, fairly complete skeleton was retrieved from a secondary jar burial. Among the individuals in the primary burial contexts were 17 infants (mainly neonates), some of which were also buried in jars and therefore well-protected even when graves were re-opened and the skeletal remains rearranged.

Calculation of the minimum number of individuals (MNI) for the assemblage was difficult given its fragmentary nature. For a preliminary MNI estimation (cf. Nikita & Lahr 2011), we used the proximal ends of femora, which are relatively easy to recognise even when preserved in small and eroded fragments. As a secondary approach to estimating the diversity of age-at-death categories within each tomb, we also recorded the presence or absence of skeletal elements belonging to a specific category, as well as dental age-at-death assessment for subadult individuals (AlQahtani et al. 2010).

Figure 3. Brown staining on a rib and a cuneiform from trench BE24-163 loc. 23. Scale bar 1cm. Photograph by A. Sołtysiak.

Taken together, these proxies allow at least the identification of tombs used to bury specific categories of the dead, i.e. adults only or neonate only. However, such data are insufficient for reliably assessing mortality profiles (cf. Sołtysiak 2013).

Table 2 presents the estimated MNI for individual tombs. A total of 45 adult and 45 subadult individuals were identified, yielding an average of three adults and three subadults per tomb. There is, however, considerable variability, with some tombs (145, 146, 175) yielding only the skeletons of single individuals in their primary context, whereas one tomb (158) presented large deposits of commingled human elements, representing c. 30% of the estimated MNI. Despite these differences, in all tombs with remains of more than two individuals, both adult and subadult elements were identified, even when their relative proportions differed. This pattern suggests that the cemetery served as a burial place for the whole local population rather than for selected age-at-death categories.

Among the more complete skeletons (**Table 1**), five individuals were identified as males and two as females. However, the standard method of sex estimation using pubic symphyses (Phenice 1969) indicated 10 males and only one female in the whole assemblage; one of the female individuals (from trench BE21-145) was misidentified as a male, although all other morphological features indicated female sex. Therefore, the use of this sex estimation method for this specific population may be misleading. Comparison of femoral head diameters from Berenike (N=43) with two sites from Northern Mesopotamia, Tell Barri (N=17, Bronze Age and later periods; Sołtysiak 2008) and Tell Majnuna (N=70, Late Chalcolithic; Sołtysiak 2010a) revealed that, although differences in average values are not statistically significant (Kruskal-Wallis

Figure 4. Trench BE24-173, loc. 60. Insect burrow holes in the proximal femur, focusing on the head. Photograph by N. Maaranen.

Table 1. Human remains found in their primary burial context.

Trench	Locus	PB	Sex[1]	Age-at-death	Completeness[2,3]				Comments
					Sk	Up	Tr	Lo	
44	6	60	–	9 years	1	2	2	2	
44	6	60	–	9 months	2	3	2	2	malformation of deciduous teeth
44	6	60	F	young adult	2	2	3	3	secondary burial in jar
144	11	8	–	38-40 weeks	1	1	1		amphora burial
144	14	28	M	adult		2	1	2	
144	18	29	–	7-8 years	2	2	2	2	commingled context, periosteal reaction
144	34	54	–	3-6 months	2	2	2	2	amphora burial
145	7	14	F	adult	3	2	2	1	missing legs below patellae
145	7	14	–	3 years	1	2	2	2	malformation of deciduous teeth
146	6	13	M**	adult	1	2	2		
153	17	14	M*	young adult	3				
159	7	19	M	adult		2	1	2	sacralised L5
159	8	21	–	9 months	1	1			malformation of deciduous teeth
159	8	21	–	1-3 years	1	1			
159	8	21	?	adolescent		1	1	1	
159	8	21	?	adult	1	1	1	2	
159	8	21	M*	young adult	1	1	1	2	multiple burial (5 individuals)
160	4	9	–	neonate			1	1	burial in jar
160	6	13	–	neonate+	1	1	1	1	
164	3	7	–	neonate	1	1	1	1	burial in jar
164	7	14	–	32-36 weeks	1	2	2	1	burial in front of the entrance to the tomb
164	19	27	–	foetus	2	2	1	2	
165	2	8	–	neonate		1	1	1	
165	11	35	–	neonate	1	1	1	1	
165	23	43	–	neonate+	1	1	1	1	
165	23	43	–	neonate	1	1	1	1	
173	1	4	–	neonate	1	1	1	1	
173	16	37	–	neonate	2	1	1	1	
173	29	67	–	12-15 years	2	2	2	2	
173	33	71	–	neonate	2	2	2	2	
175	38	37	?	adult	3				rocker mandible
176	5	15	?	adult	1	1	1	1	amphora burial

[1] Sex assessment: M* – probably male, M** – more likely male than female
[2] Completeness: 1 – less than 50% present, 2 – more than 50% present, 3 – complete
[3] Completeness: Sk – the skull (including atlas), Up – upper extremity, Tr – trunk, Lo – lower extremity

test, H=4.40, p=0.11), femoral heads are slightly more gracile at Berenike than at Tell Majnuna. As expected, the distribution is bimodal and the midpoint between the two modes at Berenike, which may be used for sex discrimination, lies slightly below 42mm, compared to c. 43mm at Tell Majnuna (**Figure 5**).

A total of 416 permanent teeth from individuals and commingled (non-surface) contexts were complete enough to be identified and recorded. Generally, the count reflected the MNI estimates from the tombs. In addition to oral pathologies and odontometrics, dental non-metric traits were recorded for further analysis of biological distances. Some rare traits (**Figure 6**) were also noted, which might provide insight into local (intra-site) population structure and kinship.

Table 2. Estimated minimum number of individuals (MNI) for tombs at Berenike. Individuals listed in **Table 1** are included in parentheses. The total number of individuals is presented as both the estimated MNI (n) and the combined total (N) from **Table 1** as well.

Tomb	MNI		Age-at-death categories present					Dental age
	adults	subadults	0–2	3–7	8–14	adolescents	adults	
44	4(+1)	1(+2)	+	+	+		+	8-10, 11-12, 14-16 years
144	2(+1)	6(+3)	+	+	+	?	+	0.87, 4-5, 9-10, 10-12 years
145	0(+1)	0(+1)		+				2-3, 4-5, 7-8 years
146	0(+1)							
157	2						+	
158	15	11	+	+	+	+	+	0.75, 1.5, 2, 3-4, 5, 6-7 years
159	1(+3)	0(+3)	+		+		+	1-3 years
160	1	0(+2)	+		+		+	
162	2	1					+	2-3, 2-3 years
163	1				+		+	
164	1	1(+3)		+	+		+	1.5, 5-6, 8 years
165		0(+4)			+	+		
173	6	3(+4)	+	+	+	+	+	0, 0.75, 11-13, 14-16 years
175	0(+1)						+	
176	1(+1)						+	
Total	36(45)	23(45)						

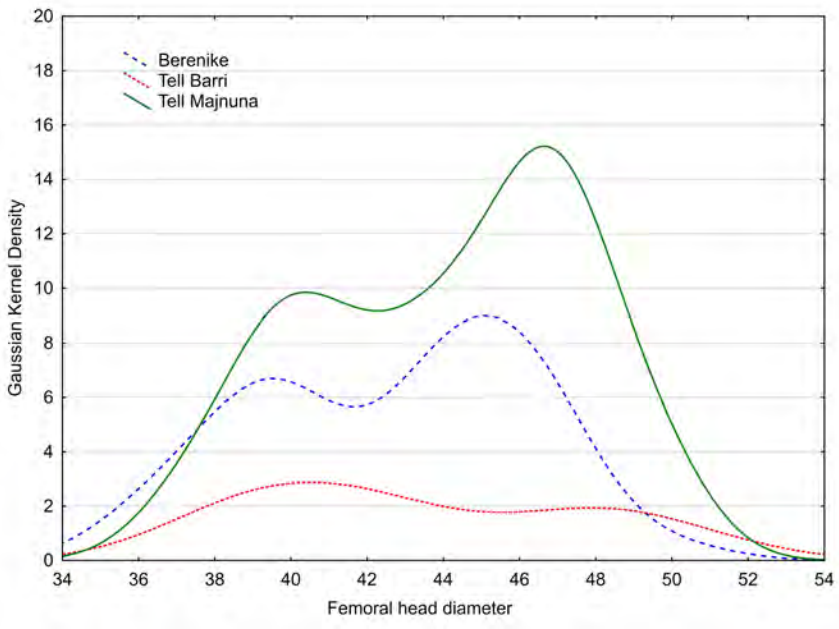

Figure 5. Gaussian Kernel Density plot for the femoral head diameter in the assemblages of human remains from Berenike, Tell Barri, and Tell Majnuna. Drawing by A. Soltysiak.

The general poor state of preservation made the identification of pathological conditions difficult. The most interesting observation was the unusual shape of the upper deciduous canines in an individual from trench BE21-145 loc. 7. The canines presented two roots and broad crowns resembling the first molars (**Figure 7**). In this individual and in two others (burials in tombs uncovered in trench BE23-159 loc. 8 and 61), several deciduous teeth exhibited massive enamel hypoplasia in the post-natal portions of the crowns (**Figure 8**).

In addition, two cases of carpal coalition were observed: fusion of the right capitate and hamate in trench BE24-158 loc. 95, and fusion of the right lunate and capitate in trench BE24-159 loc. 2 (**Figure 9**). The former is very rare in East African populations (0.14%) and the latter is even less common (DeFazio et al. 2013).

Figure 6. Trench BE21-144 loc. 14. An enamel pearl (left, circled)—a rare feature often associated with enamel extension, was visible on the root of an upper third molar. Although this tooth did not exhibit an enamel extension, the trait was present in the first and second molars (right, circled). Photograph by N. Maaranen.

Figure 7. Trench BE21-145 loc. 7. A rare two-rooted deciduous canine. Photograph by N. Maaranen.

One case of particularly extreme systemic infection was noted among the commingled remains of a subadult (late childhood) from the mass burial context in a tomb uncovered in trench BE21-144 (loci 6, 14, 17-23). Fragments attributed to this individual were matched across two loci (14 and 18), and additional elements may be present in other associated loci (6, 17, 19-23) as well. Plaques of porous new bone had formed on the ventral surfaces of the sacral bodies (**Figure 10**) and on some endocranial surfaces, likely belonging to the same individual. Periosteal reaction was

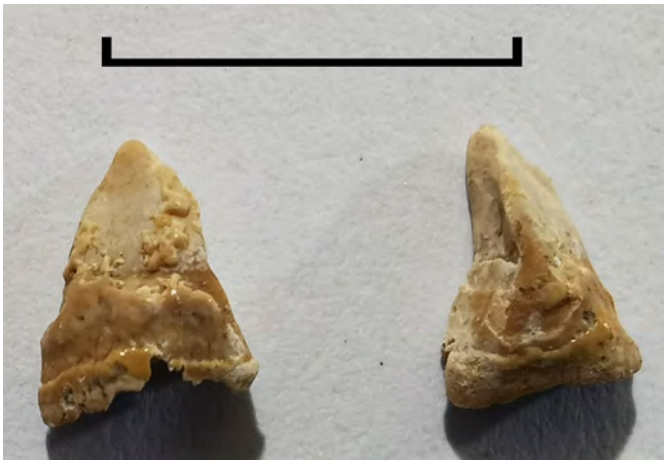

Figure 8. Enamel hypoplasia in deciduous teeth, trench BE24-159 loc. 61. Scale bar 1cm. Photograph by A. Sołtysiak.

Figure 9. Carpal coalitions at Berenike: (a) right lunate and capitate, trench BE24-159 loc. 2; (b) right hamate and capitate, trench BE24-158 loc. 95. Scale bars 1cm. Photographs by A. Sołtysiak.

Figure 10. Trench BE21-144, loci 14 and 18 (from mass grave context 144, loci 6+14+17-23). Plaques of new bone were observed on the ventral surfaces of sacral bodies. Photograph by N. Maaranen.

also noted on several other cranial and post-cranial elements; however, based on differences in size, these likely belonged to different individuals and require further analysis.

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