

ARCHAEOLOGICAL AND PALEOENVIRONMENTAL REMAINS FROM THE SITE SP 07 ON SABALOKA EAST (CENTRAL SUDAN): NEW C14 DATING EVIDENCE

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ABSTRACT: This report presents an analysis of archaeological and paleoenvironmental remains recovered from site SP 07 in the eastern Sabaloka region of Sudan. The recovered archaeological artefacts suggest settlement during both the Mesolithic and Neolithic periods. Analysis of the faunal assemblage reveals a diverse range of species, including mammals (40 %), reptiles (6 %), birds (7 %), fish (23 %), molluscs (19 %), and a proportion of unidentified bone fragments (5 %). Furthermore, new radiocarbon (C14) dating obtained from two shell samples – one from *Pila werni* (operculum) and another from *Limicolaria cailliaudia* – provide chronological context. Sample No. 1 yielded a date of 7850±50 BP (ca. 6836–6570 cal BCE), while Sample No. 2 dates to 4935±35 BP (3781–3644 cal BCE). These data suggest a paleoenvironment characterised by forested and grassy, open savannah habitats. The availability of these diverse resources facilitated the development and adoption of a diffuse economy in eastern Sabaloka, Central Sudan, from the early 7th to the early 4th millennium cal BCE.

KEYWORDS: Sudan – Sabaloka – SP 07 – animal remains – C14 dating

Introduction

The Department of Archaeology at Al Neelain University has taken significant steps in furthering archaeological research through a dedicated project located in the Sabaloka region, which lies on the eastern bank of the Nile River. This area is situated between the imposing gorge mountains of the Sixth Cataract and the Hajr Alasal. The meticulous classification of the data that have been methodically collected during various survey and excavation activities indicates that the Sabaloka area was continuously inhabited from the Palaeolithic and extends through to the late Medieval period. This was noted over multiple seasons of research conducted from 2013 to 2022, where several archaeological sites have been reported, revealing a rich tapestry of archaeological occupation.

Amongst the notable sites excavated is site SP 07, strategically positioned on the eastern bank of the Sabaloka cataract, approximately 90 km north of Khartoum. This site, located 2.8 km to the east of the main Nile River, perched on a dirt hill that features some rocky outcrops at the northern edge of Wadi Ab Jadad. Locally, this significant archaeological location is referred to as the castle of Retij, known in the local dialect as ‘Gala el Retij’ [Figs. 1–2]. The initial identi-

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fication and exploration of the site took place between 2009 and 2010, spearheaded by the late Khidir Abdelkarim and Abdelgadir El Khazien, both esteemed members of the Department of Archaeology at the University of Al Neelain.

Subsequently, further reports regarding the site were issued by the late Amgad Bashir Khalid which contributed to the growing body of knowledge surrounding the archaeological site in the area between Hajr Alasal and El Geili.² In 2013, the archaeological team from the Department of Archaeology, University of Al Neelain, launched a comprehensive project aimed not only at conducting extensive research but also at facilitating the training of both graduate and postgraduate students. This initiative has fostered academic growth and encouraged hands-on experience in archaeological practice, contributing to archaeology in the region.

Site survey and excavation season 2022

The concentration of the archaeological artefacts extends across an area of approximately 260×170 m. The basic unit of observation in the survey of the site is the artefact and the quantification of recovered artefacts that was used to discern the site. The survey was done on foot for the whole site, a grid system planned for whole *kom* and divided into two sections: (eastern and western). This season focused on the eastern section; roughly parallel survey paths were walked for 2 m. Three main sampling strategies were employed according to type of the density of the artefacts; firstly, the prevailing method was to record all artefacts encountered along a survey walk-path to document and capture both the character of the artefacts and its variable density. Secondly, where artefact density became too high, or if time was a concern, a more selective strategy was followed, and lastly; this either prioritised collecting some artefacts or recorded unmovable features like unmovable stones and large fragments of animal bones. All artefacts were documented with the camera Nikon D60, non-removable features were measured and described in the field. All this information was recorded firstly in the field notebook and later transferred on to a computer. Some of the artefacts were recorded in the field in addition to their spatial location, recording entailed photographing some artefacts and putting them back in their original location after recording, and others represent the identity of the site or can help in identifying the cultural period were collected for more study, analysis, and dating. The surface systematic survey results collecting more artifacts and ecofacts. To reach the depth of the site's stratigraphy, two small trenches (T1) and (T2) in the western part were excavated. The excavation followed the stratigraphic method³ by 2×2 m, and a mechanical unit (measuring up to 10 cm) were used for each layer; main deposits, features, and sections were described and sampled for analysis and flotation was taken. The depth of trench T1 measured 40 cm with four layers. The depth of T2 reached the depth of between 10–30 cm, where the drilling process was obstructed by the stone outcrop which are common in the Sixth-Cataract area. The archaeological and biological data was recorded in both trenches are present in the following table [Tab. 1].

² Ali 2013.

³ Barker 1977.

		Pottery	Lithic tools	Grinding stones	Hammar stone	Gouge	Polish handaxe	Ring stone	Ostrich egg Beads	Human skeleton	Animal remains
T1	Surface	20	40	4	2	1	0	3	0	0	21
	Layer 1	40	30	5	3	0	1	2	1	0	89
	Layer 2	29	36	0	0	0	0	0	0	2	90
	Layer 3	95	39	6	0	0	0	1	2	0	150
	Layer 4	30	15	1	1	0	0	0	0	0	31
T2	Surface	28	18	0	1	2	0	2	0	0	16
	Layer 1	39	20	2	3	0	0	0	0	0	92
	Layer 2	43	29	1	0	0	0	0	1	0	136
	Layer 3	102	40	3	1	0	0	1	0	0	62
	Total	426	267	22	11	3	1	9	4	2	687

Tab. 1. Distribution of the archaeological and biological remains from trenches T1 and T2 at the site SP 07.

Stratigraphy, the site presented four distinct layers, differentiated by variations in soil composition and associated archaeological finds. The composition of these finds varied across the layers. Layer 1 consisted of a cohesive brown soil matrix incorporating sand. Layer 2 was characterised by a light grey soil intermixed with ash deposits. A transitional stratum separating the dark clay and hard grey soil revealed a substantial accumulation of occupational debris and a high density of Mesolithic artefacts, suggesting at least two distinct phases of settlement at the site, thus necessitating further dating analysis. Below this, layer 3 presented a grey soil profile and a stratum of combustion residue (ash). Layer 4 displayed a strong, cohesive grey soil which presented significant resistance to excavation. The underlying virgin soil comprised of a red, gravelly substrate with exposed outcrop bedrock beginning to emerge.

Archaeological artefacts

The archaeological artefacts discovered at site SP 07 have provided significant insights into the cultural history of the region, revealing a substantial quantity of archaeological remains that are characteristic of the area's past inhabitants. Amongst these remains, the pottery sherds stand out prominently. A key feature of these pottery fragments is their notably hard texture, which combines both inorganic and organic materials, reflective of skilled craftsmanship. The firing of the pottery appears to have been done to an excellent standard, as evidenced by the polished surfaces to enhance their aesthetic appeal. In terms of decoration, the pottery often exhibits elaborate designs that extend across the majority of their surfaces, showcasing a variety of ornamental motifs such as incised wavy lines, dotted wavy lines, straight lines, and zigzag patterns. The pottery recovered from the SP 07 site exhibit decorative motifs consistent with the Mesolithic

and Neolithic periods of Sudan. A prevalent motif is the wavy line, extensively documented by Arkell,⁴ and Caneva.⁵

The lithic assemblage recovered from the site consists of small flakes and microliths, predominantly crafted from quartz, rhyolite, sandstone, basalt, and granite which are all available locally. The significant quantity of lithic material, encompassing both complete and incomplete tools alongside substantial debitage, implies the existence of an on-site lithic production area. Typological analysis reveals a range of tool types including scrapers, burins, borers, denticulate, geometrically shaped microliths, blades, flakes, gouges, polished hand axe, and associated debris, indicative of both Mesolithic and Neolithic technologies. Grinding stones and hammerstones were also recovered from surface contexts. Further investigation is required to fully elucidate the evolution of lithic technology at this site. Furthermore, the archaeological investigations have also led to the documentation of several human burials, two of them were found during this season, adding another layer to the understanding of the funerary practices of ancient prehistoric societies in this area.



Fig. 2. General view of site SP 07. (Photo: Hamad Mohamed Hamdeen).

Paleoenvironmental remains

The animal remains and archaeological materials that were excavated from site SP 07 offer a comprehensive insight into the faunal diversity present during the Early and Middle Holocene. These specimens were meticulously collected from multiple layers and contexts, culminating in a total of 687 fragments of animal bones, all of which underwent thorough examination. It is important to note that a number of these bones exhibit significant fragmentation, which presents challenges in the analysis process. The total weight of the fragments was recorded at 3.9 kg. During the excavation processing, all materials were systematically separated and subjected to sieving through 2 mm and 0.5 mm meshes to enhance the quality of the analysis. The identification of these animal remains primarily on a detailed anatomical examination of the oste-

⁴ Arkell 1949; Arkell 1953.

⁵ Caneva 1988.



Fig. 1. Location of the site SP 07 at the eastern Sabaloka.

ological fragments, supplemented by comparisons with reference materials to achieve a more accurate determination of the species represented.

The collection of these materials took place during the archaeological seasons spanning 2016–2022, with all samples analysed in-depth at the Department of Archaeology, University of Al Neelain. The preliminary findings from the analysis of the animal remains revealed a diverse assemblage of species. Notably, mammals constituted a significant 40 % of the total findings, which include notable species such as giraffes (*Giraffa camelopardalis*), rhinoceroses (Rhinocerotidae), medium-sized antelopes, large-sized antelopes, hippopotamuses (*Hippopotamus amphibius*), bovines (Bovidae), and hares (*Lepus* sp.). Reptiles accounted for 6 % of the specimens, with the Nile crocodile (*Crocodylus niloticus*) being amongst the identified species. Birds represented 7 % of the remains, including varieties like guinea fowl and ducks/geese, while ostrich eggs and beads were also found in the assemblage. Fish remains comprised 23 % of the total, with species such as Nile perch (*Lates niloticus*), catfish (*Synodontis*), as well as *Tilapia* sp. and *Clarias* sp. Additionally, molluscs made up 19 % of the findings, including species like *Pila wernei*, *Pila ovata*, *Bellamyia unicolor*, *Zootecus insularis*, *Limicolaria cailliaudi*, *Etheria elliptica*, and *Aspatharia* sp. Approximately 5 % of the material remains were categorised as unidentified bones [Figs. 3–4].⁶

Moreover, the initial analysis of plant impressions noted on the surfaces of the Mesolithic and Neolithic pottery sourced from site SP 07 shed light on the presence of the remains of wild grasses, particularly from the family Poaceae, which were identifiable in the samples collected.⁷ This multifaceted approach to examining both artifact and ecofact assemblages highlights the rich archaeological tapestry at site SP 07 and contributes significantly to our understanding of past human and environmental interactions in the region.

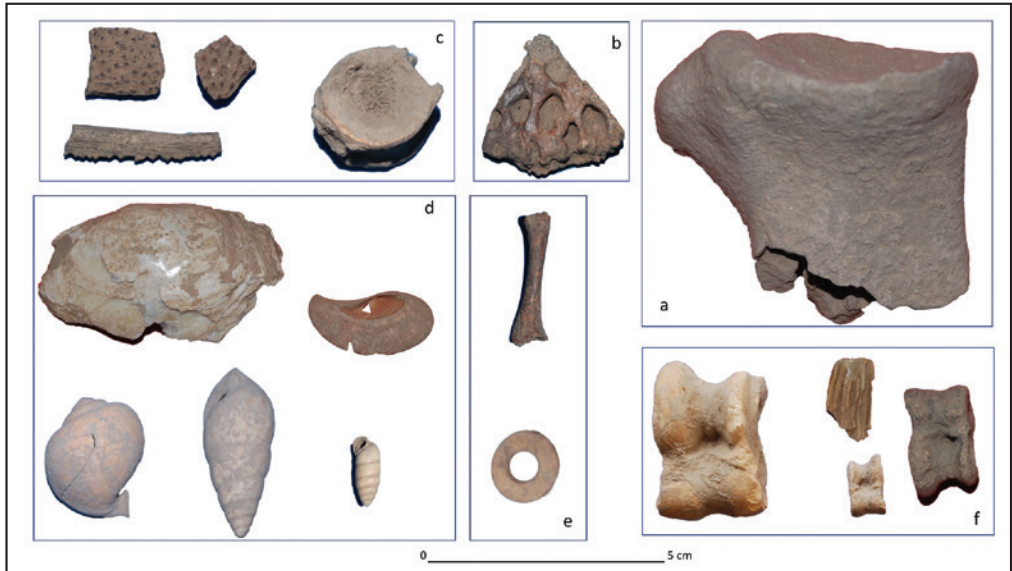


Fig. 1. Some animal remains from the site SP 07; a. hippopotamus, b. Nile crocodile, c. fish, d. molluscs, e. birds (bone and ostrich eggshell bead), f. medium–large sized of antelopes. (Photo: Hamad Mohamed Hamdeen).

⁶ Hamdeen and El Zaki 2013; Hamdeen and Šúvová 2023.

⁷ Hamdeen and Adil 2023.

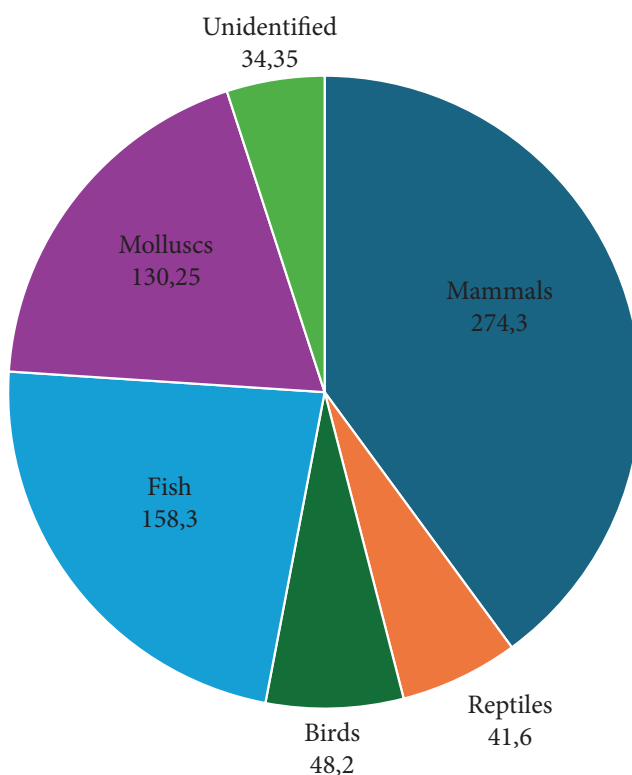


Fig. 4. Quantification of animals remains from site SP 07.

C14 dating results

C14 dating results can provide valuable insights into the chronology of archaeological sites. In this particular instance, two calibrated radiocarbon dates have been reported from the site. These dates were obtained from shell samples identified as *Pila werni* (operculum) and *Limicola cailliaudi*, both collected from trench T1 [Fig. 5]. The samples were recovered at depths of 20 cm and 45 cm, respectively, showcasing distinct layers of sediment. The excavation itself took place in December 2022. The C14 dating was done in Poznan Radiocarbon Laboratory, Poland. The results of the calibration of the radiocarbon dates provided indicate specific intervals of calendar ages, which are detailed in [Tab. 2; Figs. 6–7]. The dates were calibrated using OxCal software (version OxCal v4.4.2).⁸ The calibration process utilised atmospheric data provided by Reimer et al.,⁹ allowing for a reliable framework to interpret the radiocarbon ages in relation to the calendar years.

⁸ Bronk Ramsey 2020.

⁹ Reimer et al. 2020.

Sample	Trench	Layer	Types of material	Lab No	Date BP	Date cal BCE
Sample No. 1	T1	4	<i>Pila werni</i> (operculum)	Poz-126654	7850±50	6836±60
Sample No. 2	T1	2	<i>Limicolaria cailliaudi</i>	Poz-170479	4935±35	3781±50

Tab. 2. Details and results of the radiocarbon dating of the two shell samples from the site SP 07.



Fig. 5. Western section in the trench T1 showing the location of the samples;
Sample No. 1 – yellow dot, Sample No. 2 – red dot. (Photo: Hamad Mohamed Hamdeen).

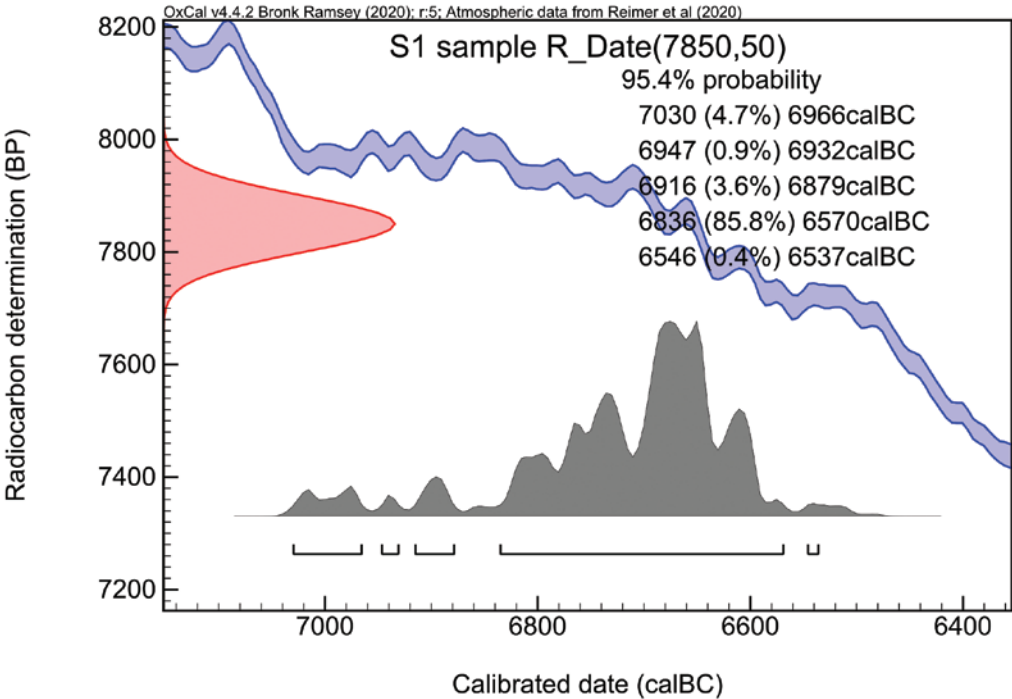


Fig. 6. C14 results for the Sample No. 1.

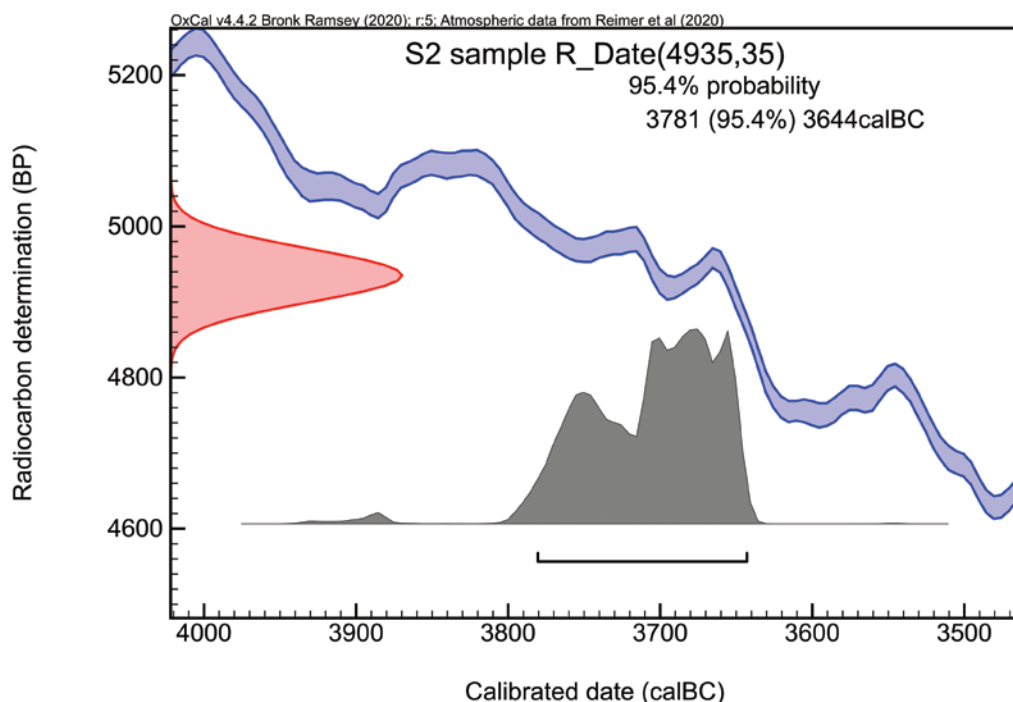


Fig. 7. C14 results for the Sample No. 2.

Discussion

The early to mid-Holocene prehistory of the middle Nile valley has been an area of considerable scholarly interest, leading to several comprehensive summaries that not only present archaeological findings but also engage with broader supra-regional chronologies.¹⁰ Radiocarbon dating results from sites in central Sudan reveal a significant number of settlements dating to the Early and Middle Holocene periods, primarily covering the Mesolithic era in this region. The analysis of C14 dating results from site SP 07 provides two dates. The older date corresponds to the Mesolithic period dates to approximately 7850 ± 50 BP (ca. 6836–6570 cal BCE) this dating places it contemporaneously with a significant of Mesolithic archaeological sites in central Sudan, whose origin corresponds chronologically to the emergence and the settlement of numerous Mesolithic locations. For instance, from the site of Sorourab 2 there are two C14 dating results; one was dated to 9370 ± 110 BP, which corresponds to approximately 7420 cal BCE and the second one which is from the 7th and 6th millennium BP.¹¹ Another important site, the Sphinx hill site located in the western Sabaloka region, was dated to between 8276 and 7965 BCE.¹² Additional findings from the Saggai site indicate dates ranging from 8130 BCE ± 110 to 5280 BCE,¹³ while

¹⁰ Arkell and Ucko 1965; Mohammed-Ali 1982; Mohammed-Ali and Khabir 2003; Sadig 2010; Wendorf 1968.

¹¹ Khabir 1981, pp. 160–161; Mohammed-Ali 1982, p. 173.

¹² Varadzinová and Varadzin 2017, p. 29.

¹³ Caneva 1983, p. 152.

Umm Marahi provided dates of 8920 ± 180 BP ($8282-7812$ cal BCE) and 8240 ± 120 BP (corresponding to $7451-7084$ cal BCE).¹⁴ Moreover, the Jebel Shaqdud site in Butana was dated back to the period of $6250 \pm 90-4880 \pm 330$ BCE,¹⁵ with new findings suggesting even earlier dates from the various mechanical units of Square B with typical settlement deposits (pottery fragments, lithics and faunal remains) fall into $8677-7586$ cal BCE.¹⁶ This pushes human occupation at the Shaqdud site complex back by more than 2,000 years.¹⁷ In the northern reaches of Atbara, specifically at Abu Darbein, el-Damer, and Aneibis, samples yielded dates ranging from 8640 ± 120 BP (equivalent to 7760 ± 158 cal BCE) down to 7700 ± 140 BP (which corresponds to 6598 ± 151 cal BCE).¹⁸ To the south of Sabaloka along the White Nile, radiocarbon dating from Al Khiday indicates a timeframe of $7050-4450$ BCE,¹⁹ the findings from Shabona reveal dates of $5100 \text{ BCE} \pm 120$ and $5520 \text{ BCE} \pm 240$.²⁰ The Tagra site was dated to $6420 \text{ BCE} \pm 350$ and $6180 \text{ BCE} \pm 225$.²¹

While the younger dating from site SP 07 dates back to 4935 ± 35 BP ($3781-3644$ cal BCE), these datings position it within the same time frame as a considerable number of Neolithic sites situated in the central regions of Sudan. Specifically, the period in which the development of numerous Neolithic settlements across central Sudan. This date aligns with the established timeline of the Neolithic period in Sudan, as evidenced by the fact that radiocarbon dating of Central Sudanese Neolithic sites reveals a timespan from 4985 ± 142 to 1988 ± 126 cal BCE, covering roughly 3,000 years. Most sites flourished during the 5th millennium BCE, with some persisting longer. For example, Shaqdud and Islang 2 extended into the early 3rd millennium BCE, while Jebel Tomat continued through the late 2nd millennium BCE. Jebel Moya maintained a presence until the end of the 1st millennium BCE.²²

Sadig notes considerable variability in the Neolithic period's duration across Central Sudan. Sites in the Khartoum region exhibit significant structural, chronological, and temporal differences, particularly between west and east bank locations. West bank sites (e.g. Esh Shaheinab, Islang, Nofalab), dominated by early Neolithic material, lasted approximately 860 years. East bank sites, such as Kadero I,²³ show evidence of a longer settlement, around 1,000 years. Despite similar microenvironments and Neolithic lifestyles, the shorter duration of west bank sites may be due to factors beyond environmental influence, potentially reflecting limitations in the archaeological record. Generally, Central Sudan's Neolithic period comprises four assemblages. The first two phases represent the Early Neolithic (5th millennium BCE) in the Middle Nile Valley, while the third and fourth phase mark the Late Neolithic (4th to early 3rd millennium BCE). Despite gaps in our understanding of later prehistory, the Late Neolithic appears to have persisted longer in parts of the Middle Nile Valley.²⁴

Accordingly, the available dates from site SP 07 indicate that the settlement of this site spans a significant temporal range from the early seventh to the early 4th millennium BCE, which aligns closely with the dating of most other Mesolithic and Neolithic sites found in Central Sudan.

¹⁴ El Amin and Mohammed-Ali 2004.

¹⁵ Marks and Mohamed Ail 1991, p. 60.

¹⁶ Hošek et al., 2024.

¹⁷ Varadzin et al. 2022.

¹⁸ Haaland and Magid 1992, p. 23.

¹⁹ Usai et al. 2010.

²⁰ Clark 1989.

²¹ Adamson et al. 1974, p.120.

²² Sadig 2013.

²³ Krzyzaniak 1978.

²⁴ Sadig 2015.

In terms of paleoenvironment contexts in Central Sudan, the faunal remains excavated from Early Khartoum sites substantially contributed to our understanding of how hunter-gatherer communities exploited the central Sudanese environment approximately 9,000 to 7,000 years ago.²⁵ The analysis of animal remains from site SP 07 provided insights indicating that the subsistence strategies of the Mesolithic and Neolithic inhabitants were primarily focused on the Nile River and its immediate surroundings, similar to patterns observed in other Mesolithic sites located in the south Sixth Cataract and the Atbara region.²⁶ The following points can be named: firstly, the fish fauna discovered at the site is predominantly composed of open water species, suggesting that fishing activities were concentrated during times when the deeper parts of the river were more accessible. Secondly, the mammal assemblage reflects a high proportion of grazing species that prefer alluvial grasslands, indicating that the presence of fresh sprouting grasses may have attracted antelopes and other animal species. Thirdly, the presence of freshwater snails further illustrates the ecological diversity of the area.

For the paleo-diet strategy, based on the available evidence, it is apparent that the Mesolithic and Neolithic populations of eastern Sabaloka employed a mixed subsistence strategy centered on hunting, fishing, and gathering. Faunal remains suggest mammals and fish were important sources of animal protein, likely supplemented by Mollusca. However, the precise contribution of each component to the overall diet is currently unclear, owing to limited data concerning the consumption of other potential food resources, such as vegetables, seeds, fruits, honey, and avian eggs.

Gathering activities undoubtedly encompassed the collection of plant foods, including cereals (as suggested by the presence of grinding stones), molluscs, and ostrich eggs. It is assumed that the plant species and resources utilised were locally available in their wild forms. There is no clear evidence of animal or plant domestication. While quantifying the relative importance of individual food items is challenging given the current data, it is evident that the bio-environment offered diverse resources, enabling the adoption of a diffuse economy as described by Cleland.²⁷ This strategy is typically characterised by meticulous temporal and spatial scheduling to optimise the exploitation of available resources. Several exploitation models can currently be proposed, including seasonal or year-round settlement, though potential dietary differences between the Early Mesolithic and Neolithic periods prior to the introduction of domestication remain unclear.

The catchment area of the site included not only the River Nile itself but also the riverine zone characterised by woodland and possibly forests, along with open grass savannah that drained by khors into the Nile. The faunal composition of the assemblages found at site SP 07 suggests that the environmental conditions during the Mesolithic and Neolithic period were more humid than those observed in the present-day environment. This is consistent with the characterisation of Mesolithic and Neolithic faunas as belonging to a period known as the African Humid Phase. Notably, most of the animal species discovered at site SP 07 in the Jebel Sabaloka area are still present in Southern Sudan or were historically found there until relatively recently, although they are generally not found north of the more humid low rainfall savanna belt as described by Wickens.²⁸ Overall, this complex and varied environment provided a wealth of resources that enabled the people of the early and middle Holocene to adopt a diverse economic strategy along the eastern bank of Sabaloka.

²⁵ Bate 1949; Gautier 1983; Peters 1986; Peters 1993.

²⁶ Peters 1993.

²⁷ Cleland 1976.

²⁸ Wickens 1975.

Conclusions

Radiocarbon analysis of samples from site SP 07 suggests a period of settlement extending from the early 7th to the early 4th millennium BCE. This temporal range aligns with dating results obtained from other Mesolithic and Neolithic sites in Central Sudan. These dates are corroborated by archaeological material recovered from the stratified context of the site, exhibiting characteristics consistent with established Mesolithic and Neolithic cultural assemblages in Sudan. Analysis of faunal remains indicates that inhabitants of east Sabaloka during the Mesolithic and Neolithic periods employed a mixed subsistence strategy, relying on hunting, fishing, and gathering. This strategy likely necessitated meticulous temporal and spatial planning to optimise resource exploitation within the prevailing savanna environment of the region during that time.

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