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ORIGINAL ARTICLE

Prehistoric Rock Art of Jebel Shaqadud, Northwestern Butana (Sudan)

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Abstract The dating and meaning of petroglyphs constitute a challenge in African rock-art research. In this article, we present and discuss a recently found rock-art assemblage from the Shaqadud site complex (Sudan), a site aggregation that nicely documents Holocene prehistoric cultural adaptations in non-aquatic, deep-savanna environments in what is today the Eastern Sahel. The rock-art corpus contains 120 identifiable motifs with a clear predominance of giraffes ($n = 113$, 94.2%) that are of small dimensions (< 50 cm) and are shown in a limited number of compositions. The thematic and technological compactness of the assemblage suggests a chronological integrity of the local figurative rock art and a coherent thematic and technological mindset of its creators. The archaeological context and the general characteristics of the assemblage place the local figurative rock art between the beginning of the Holocene and the Late Neolithic, in absolute dates between ca. 8748–1639 cal BC. However, spatial and visual connections could suggest a narrower dating of the assemblage, to the late Khartoum Mesolithic, around 6421–6088 cal BC. The predominance of the giraffe in the Shaqadud rock art suggests that this species may have carried a special significance for the local prehistoric communities. At the same time, the lack of hunting scenes in the figurative assemblage indicates that the importance of the giraffe motif goes beyond subsistence.

Résumé La datation et la signification des pétroglyphes constituent un défi pour la recherche sur l'art rupestre africain. Dans cet article, nous présentons et discutons un assemblage d'art rupestre récemment découvert dans le complexe de sites de Shaqadud (Soudan), une agrégation de sites qui documente bien les adaptations culturelles préhistoriques de l'holocène dans des environnements non aquatiques de savane profonde dans ce qui est aujourd'hui le Sahel oriental. Le corpus rupestre contient 120 motifs identifiables avec une nette prédominance de girafes ($n = 113$, 94,2%) qui sont de petites dimensions (< 50 cm) et présentées dans un nombre limité de compositions. La compacité thématique et technologique de l'assemblage suggère une intégrité chronologique de l'art rupestre figuratif local et un état d'esprit thématique et technologique cohérent de ses créateurs.

Archaeological time period LSA, early and mid-Holocene, Khartoum Mesolithic, Khartoum Neolithic, Late Neolithic.

Country and region discussed Northeastern Africa, Eastern Sahel, central Sudan, northwestern Butana.

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Le contexte archéologique et les caractéristiques générales de l'ensemble situent l'art rupestre figuratif local entre le début de l'Holocène et le Néolithique supérieur, en dates absolues entre c. 8748–1639 cal BC. Cependant, les connexions spatiales et visuelles pourraient suggérer une datation plus étroite de l'assemblage, à la fin du Mésolithique de Khartoum, vers 6421–6088 cal BC. La nette prédominance de la girafe dans l'art rupestre de Shaqadud suggère que cette espèce aurait pu avoir une signification particulière pour les communautés préhistoriques locales. Dans le même temps, le manque de scènes de chasse dans l'assemblage figuratif pourrait indiquer que cette signification peut avoir atteint bien au-delà de la subsistance.

Keywords Eastern Sahel · Petroglyphs · Giraffe depictions · Iconography · Archaeological context · Dating

Introduction

Jebel Shaqadud, situated in northwestern Butana (ca. 115 km northeast of the confluence of the Blue and White Niles in Khartoum), is one of the most outstanding areas for prehistoric research in the Eastern Sahel (Fig. 1a). It was discovered and briefly explored by Karl-Heinz Otto in the early 1960s (Otto, 1963, 1964). However, it entered African archaeology textbooks (e.g., Phillipson, 2005) thanks to the scientific efforts of the Butana Archaeological Project of the University of Khartoum and Southern Methodist University in the early 1980s (Marks & Mohammed-Ali, 1991a). Over the course of two field campaigns, the Sudanese-American mission carried out excavations at the Shaqadud site complex, a dense cluster of prehistoric sites situated within and around a local box canyon (Fig. 1b), revealing seven meters of stratified archaeological deposits that contained materials associated with the Khartoum Mesolithic, Khartoum Neolithic, and post-Khartoum (Late) Neolithic cultures (Marks, 1991). In addition, reconnaissance of the broader vicinity of the box canyon brought to light more than twenty other locations with remains of prehistoric occupations (Elamin, 1992).

In 2021, the Shaqadud Archaeological Project, directed by L. Varadzin, renewed systematic field research in the area. The aim was to understand human resilience and adaptation to changing climatic and environmental conditions in non-aquatic regions of Northern Africa (Varadzin et al., 2022). In addition to archaeological and palaeoenvironmental survey, excavations, and sampling for a broad spectrum of analyses, the first two field campaigns in 2021 and 2022 also involved the documentation and study of a large assemblage of rock art that was found around the Shaqadud box canyon in 2021.

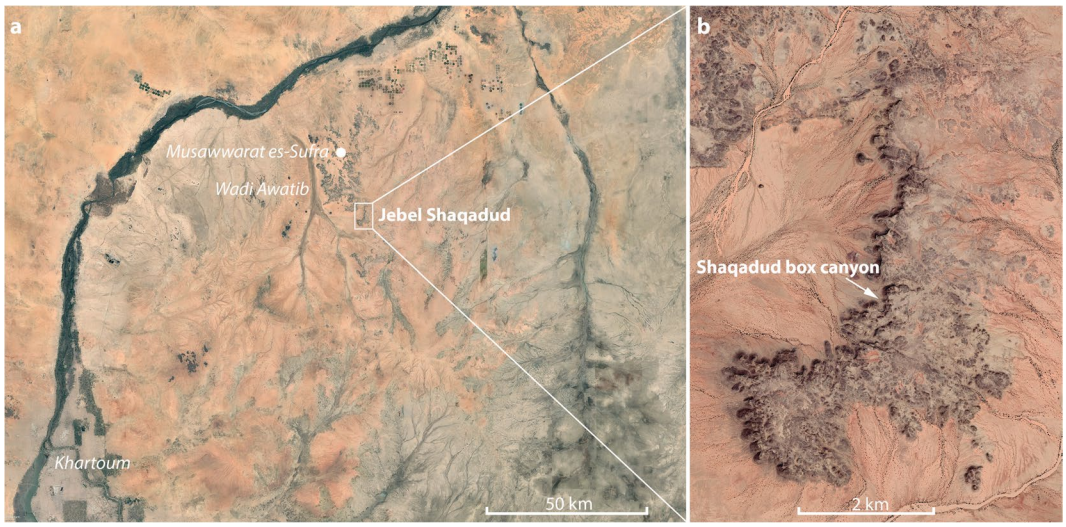

Fig. 1 Jebel Shaqadud: (**a**) location of the mountain in northwestern Butana; (**b**) detail with a marked position of the Shaqadud box canyon. Background: Google Earth 2022

While rock art has been reported from several locations in the Butana, delimited by the River Atbara to the northeast and east and the Main and Blue Niles to the north and west (e.g., Crowfoot, 1920; F. Hintze, 1959), Jebel Shaqadud is the first area in this vast region where detailed documentation and systematic examination of rock art has taken place and where robust archaeological data allow a thorough contextualization and well-founded evaluation of the rock-art evidence. Here we present and characterize the rock-art locations around the Shaqadud box canyon. We focus on local figurative rock art and outline its potential for prehistoric rock art research in Sudan and Northern Africa.

Research Area and Regional Chronology

Jebel Shaqadud (or Shaqadud Mountain) is situated 45 km southeast of the Nile (Fig. 1a). It forms part of uplands that run to the east of Wadi Awatib, which connects the interior of the western Butana to the south with the Nile Valley to the north. The mountain, part of the Nubian Sandstone Formation, resembles a massive plate uplifted ~35–50 m above the surrounding terrain. On the western, southern, and southeastern sides, the perimeter of the mountain is formed by escarpments that are dissected by numerous incisions, while on the eastern and northeastern sides, it merges gently into the lower plains (Fig. 1b). At present, the region is dry most of the year. It receives 150–200 mm of precipitation per year, on average, between July and September. Vegetation cover consists mostly of grasses and sparsely distributed bushes and trees (Magid, 1991, p. 25–29).

The Shaqadud site complex (Fig. 2) is located within and around a north–south oriented box canyon (~480 m asl) on the western side of the mountain. The canyon has a marked cliff face at its southern end and steep lateral walls formed by actively eroding bands of sandstone and conglomerate. The top of the mountain above the escarpments (~512 m asl) is generally flat but, at a closer look, has quite a rugged topography with numerous remnant sandstone outcrops and seasonal drainages. Two main flat areas extend from the rim of the box canyon: a smaller and lower plateau to the south and southwest (~17 m above the bottom of the canyon) and a larger and higher plateau to the east (~32 m above the canyon's floor).

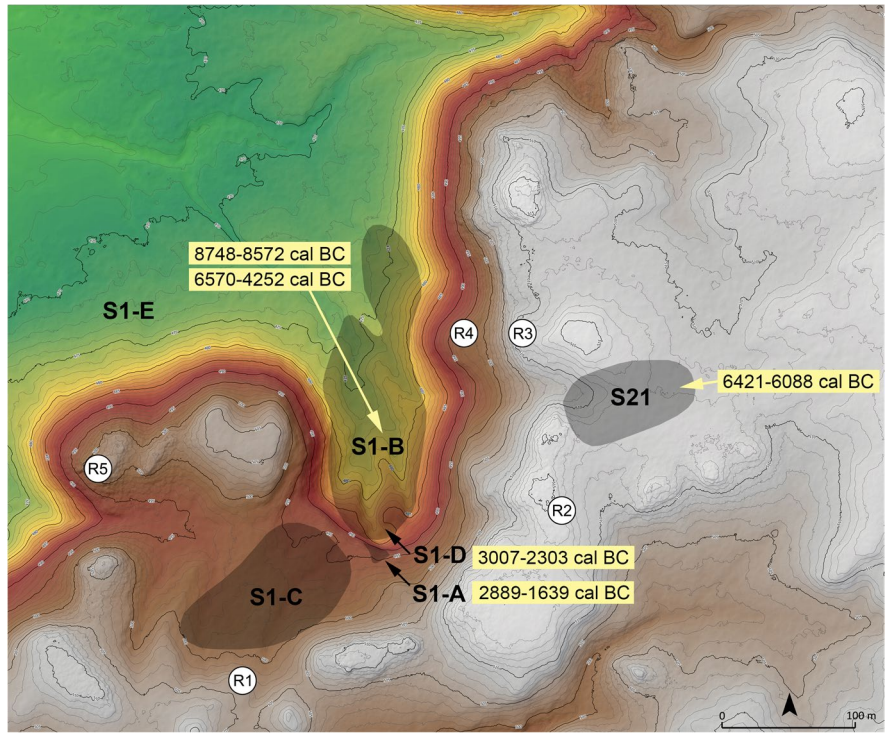

Fig. 2 Contour map of the Shaqadud site complex, showing the rock art locations (R1–R5) and the prehistoric settlements (S1-A through S1-E and S21) within and around the box canyon with their radiocarbon dates. After Marks (1991, tab. 4-1) and Varadzin et al. (2022). Background: satellite DTM, AW3D Enhanced

Based on the results of the Butana Archaeological Project, five settlements formed part of the Shaqadud site complex (Fig. 2). Three of these are situated within the box canyon and include remains of occupation inside the cave (S1-A) at the base of the southern cliff; thick cultural deposits (so-called "midden") at the bottom of the canyon (S1-B), partly used in prehistory also for human burials (Varadzin et al., 2022), and settlement remains in a small depression in front of the cave (S1-D). At an earlier stage of research, these three areas provided ten radiocarbon dates that attested to the occupation of the box canyon during the Khartoum Mesolithic (three dates from S1-B, from 6570–5365 to 4831–4362 cal BC), Khartoum Neolithic (two dates from S1-B, 5480–4252 and 4599–4264 cal BC), and Late Neolithic (six dates from S1-A and S1-D, from 3007–2303 to 2455–1639 cal BC; Marks, 1991, tab. 4-1; all dates presented in this paper were [re]calibrated in Calib 8.20 using the IntCal 20 Northern Hemisphere tree ring database [Reimer et al., 2020] and are given in 95.4% probability). More recently, a series of AMS radiocarbon dates obtained from S1-B in 2021 and 2022 has pushed the chronology of the box canyon's occupation by more than two millennia further back in time (Varadzin et al., 2022; Fig. 2).

The fourth site, S1-C, is located on the lower plateau above the southern end of the box canyon. The archaeological remains attest to the use of this area for settlement during the Khartoum Mesolithic, Khartoum Neolithic, and Late Neolithic periods (Marks, 1991). Numerous eroded and disturbed human burials provide evidence of the use of this sector also for human burials during the latter period (cf. Otto, 1963, p. 108). The fifth site, S21, occupies the higher plateau east of the box canyon. Here, excavations by the Butana Archaeological Project yielded evidence of intensive occupation only during the Khartoum Mesolithic, which is placed by a single radiocarbon date to around 6421–6088 cal BC (Marks, 1991, tab. 4-1; Mohammed-Ali, 1991). In addition, scatters of stone tumuli within and around the box canyon (Marks, 1991, p. 35) attest to some use of the broader area in historical periods.

The exploration at Shaqadud has attested to an economic focus of the local inhabitants exclusively on non-aquatic animal and plant resources throughout the Holocene (Marks & Mohammed-Ali, 1991b). This and the deeply stratified and well-preserved archaeological and palaeoenvironmental archives place Shaqadud among areas with the greatest potential for extending the understanding of hinterland regions, away from rivers and lakes, in what is today the Eastern Sahel (Varadzin et al., 2022).

Rock Art Localization and Documentation

Five rock art locations were recorded within the Shaqadud site complex in 2021 (Fig. 2). Two of them constituted accidental finds on the first two days of the renewed field research at Shaqadud. Location R1 was noted during the first reconnaissance of the research area, and Location R3 was recognized during the preparation of the local geodetic system (Fig. 3). The remaining three locations–R2, R4, and R5

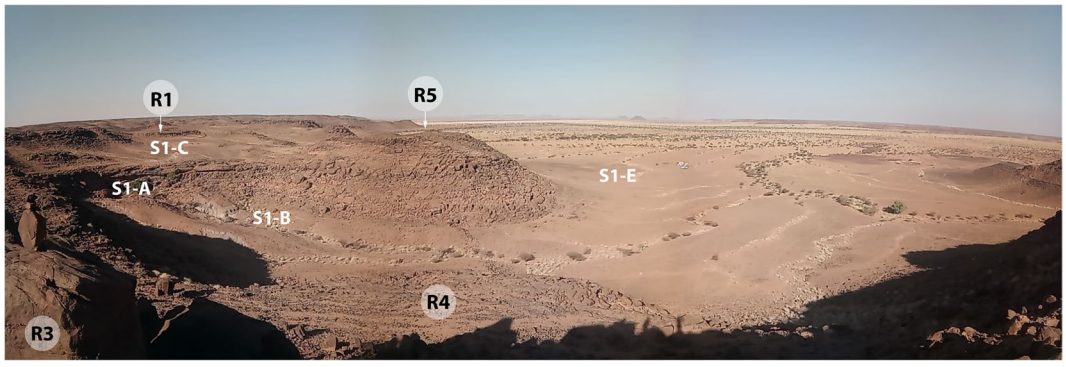

Fig. 3 View from the main geodetic point at Location R3, positioned at the eastern edge of the upper plateau above the box canyon, of prehistoric settlements S1-A, S1-B, S1-C, and S1-E, and Locations R1, R4, and R5. Photo by L. Varadzin

–were then detected during systematic inspection of rock surfaces for the presence of rock art (after the first two discoveries alerted us to do so) and artificial bedrock features, such as ground basin hollows (sensu Rosenberg & Nadel, 2017, p. 1).

Due to complete repatination, advanced weathering, and thus low visibility of most of the evidence, we surveyed the sites repeatedly at different times of the day to document the rock art in different lighting conditions. At Locations R3 and R4, which were documented together, every occurrence of man-made marks in the form of identifiable motifs, non-figurative marks, or bedrock features was assigned a unique field number (Z + serial number), with one such number referring either to an entire rock surface or to one of several "panels"–groups of petroglyphs with which spatial proximity could also mean a semantic association–occurring on the same surface. The sequence of these numbers reflects solely the order in which the panels were added to the corpus during repeated visits to these two locations in 2021 (60 panels) and 2022 (6 panels).

The rock art was documented by L. Varadzinová, who employed textual description, photography, and drawn sketches to capture the location, character, and positioning of the supports and surfaces, the thematic, stylistic, syntactic, and technical aspects, and the state of preservation of the rock art. Furthermore, two methods of digitization were used by J. Unger, aided in 2021 by M. Černý, to increase the accessibility and readability of the evidence and to secure its digital preservation. The first of these was the *Structure from Motion* (SfM) method of documentation (Bertilsson, 2015; Micheletti et al., 2015), within which a UAV Mavic Pro drone was employed to document the entire rock art locations; and terrestrial photography, using a Nikon D5300 digital camera, was applied to document individual rock art panels. Between 20 and 200 photographs were taken per panel. The photographs with at least 60% overlap between contiguous images were subsequently processed using the Agisoft Metashape Professional software, producing 3D models of the documented situations. In 2022, we also employed a 3D scanner, which captures color 3D data in real time with full freedom of motion. This, unlike the previous method, makes it possible to see, review, and edit the point cloud data on the tablet directly in the field. The Dot Product DPI8 handheld scanner used for this purpose ranges from 0.6 to 3.7 m and can capture up to 5 million points per scene/model. In addition, a surface survey was performed within and around the rock art locations to record any other remains of past human activities in the vicinity.

Rock Art Locations

All five rock art locations documented around the Shaqadud box canyon feature only petroglyphs. The locations differ in the character and number of supports, panels, and/or depictions and their state of preservation. On three of them, figurative rock art prevails. The other two locations are characterized by geometric rock art or non-figurative remains, which provide no visual information that contemporary humans would recognize as resembling the form of an object (Bednarik, 2003, p. 13; Table 1).

Location R1 consists of a single surface on a sandstone boulder at the edge of a small sandstone

Table 1 Petroglyphs recorded around the Shaqadud box canyon in 2021 and 2022*

Location	Surfaces	GD	NF	FM	Giraffes		Giraffes (?)		Antelopes		Quadrupeds		Total		BF
	n				*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	
R1	1	+													(+)
R2	2		+												+
R3	56 (+4)		+	+	91	82.7	13	11.8	3	2.7	3	2.7	110	91.7	+
R4	4 (+2)		+	+	3	100							3	2.5	+
R5	4		+	+	6	85.7					1	14.3	7	5.8	
Total	67 (+6)				100	83.3	13	10.8	3	2.5	4	3.3	120	100	

*Surfaces = the total of recorded spatial and/or semantic units per site (the numbers in brackets add the number of surfaces featuring only artificial bedrock features); *GD* Geometric designs; *NF* Non-figurative remains; *FM* Figurative motifs; *BF* Artificial bedrock features; + = present (also) on the same surfaces as petroglyphs; (+) = present only in the vicinity

Fig. 4 Location R1. View of the oblique, partly upward-facing surface of a boulder at the southern periphery of S1-C, marked with a symmetrical geometric composition consisting of overlapping pointed arches made of pecked single and/or double lines resting on a common baseline. Photo by L. Varadzin

outcrop to the south of site S1-C (Fig. 3). The oblique, partly upward-facing surface features a symmetrical composition consisting of a series of overlapping pointed arches formed by pecked single and double lines, all resting on one common baseline (the "crowns" of the arches are indicated by arrows in Fig. 4). The composition is partly damaged by exfoliation of the surface in the upper part of the boulder and by cracks in the rock. For now, no analogy can be put forward to provide a clue as to the age or meaning of this geometric design. The incomplete repatination of the pecked lines suggests a later dating of the composition compared to the fully repatinated figurative motifs documented at other locations. An isolated oval basin hollow was identified in the vicinity of the panel.

Location R2, situated within a small sandstone outcrop on the upper plateau east of the box canyon (Fig. 2), features two flat horizontal sandstone boulders in situ that bear pecked non-figurative lines and remains of shallow oval basin hollows. Some of the lines may constitute unfinished, incomplete, or effaced motifs. The fragmentary state of the bedrock surfaces at this location hampers the understanding of these lines and their association with the basin hollows. This occurrence of man-made marks on sandstone slabs also featuring oval basin hollows or other types of bedrock features is an exception neither in

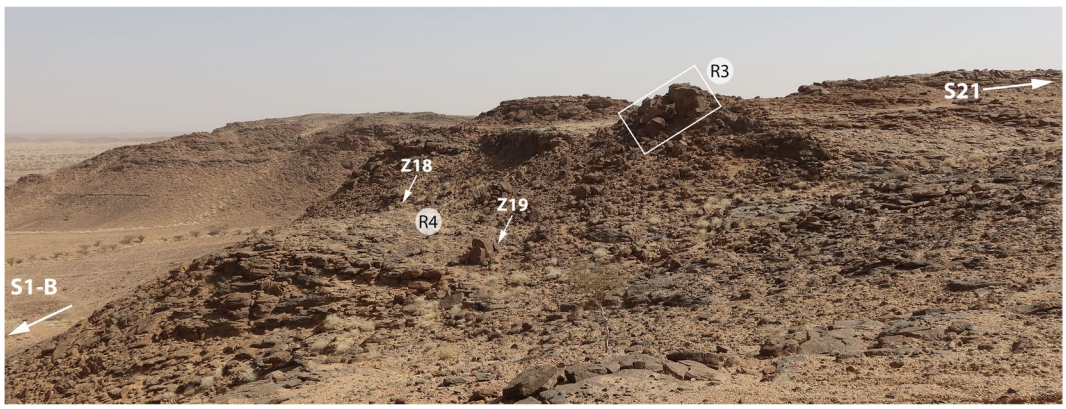

Fig. 5 View from the south of Location R3 (the Giraffes' Rock) at the edge of the upper plateau and Location R4 on a terrace in the slope below [The boulders Z18 and Z19 with giraffe depictions at R4 are indicated by arrows]. Photo by L. Varadzin

our area (see Locations R3 and R4 below) nor elsewhere in the Butana region (e.g., Bobrowski & Jórdeczka, 2006, p. 23, fig. 11). Still, the nature of this spatial association remains unknown.

The most outstanding of the locations with figurative rock art is Location R3, on the northeastern rim of the box canyon (Fig. 5). It has been dubbed the Giraffes' Rock after the omnipresent motif represented and is described in greater detail below. Location R4, a smaller group of rock art representations is situated on a terrace ~ 13 m below the Giraffes' Rock. It consists of two isolated sandstone boulders situated at the northern (field number Z18) and southern (field number Z19) ends of the terrace (Fig. 5). The northern boulder bears a panel with two giraffes oriented to the right, with clear indication of ossicones or ears; their different sizes suggest they probably represent an adult and a younger animal (Fig. 6). Other pecked marks are discernible next to and above the two figures. The southern boulder features an incomplete giraffe (the rear part of the body and legs are broken off) of the same style oriented to the right, surrounded by other faint pecked marks. The fully pecked and entirely repatinated giraffe depictions occupy the walls of the boulders that are oriented to the east and southeast, i.e., upslope towards the Giraffes' Rock and away from the box canyon. Two more boulders on this terrace–Z20 situated next to Z19 and Z16 located in a concentration of boulders in the central part of the terrace just above its eastern edge–were found to bear non-figurative marks on their surfaces. Moreover, five oval basin hollows were recorded in this area, one (Z17) in the upper part of the northern boulder (Z18; see Fig. 6) and the remaining four on a large horizontal slab below the western edge of the terrace (LS-062). Furthermore, two small circular depressions ("cupules" sensu Bednarik, 2008) marked the upper surface of another horizontal slab (Z66) situated just below Z18. Given the topographical position and character of the rock art at this site, it is likely that Location R4 forms part of one rock art complex with the Giraffes' Rock. Several fragments of weathered pottery of Khartoum Mesolithic or generally prehistoric dating, upper and lower grinders, stone rings, and loose scatters of lithics were noted along the eastern edge of the terrace and further up the slope between the terrace and the Giraffes' Rock, suggesting some use of the area also for activities other than rock art creation.

Fig. 6 Location R4. Panel Z18 at the northern end of the terrace with two giraffes differing in size, probably representing an adult and a young, and an elongated basin hollow on the top of the same boulder (Z17); scale = 20 cm. Photo by L. Varadzinová

Location R5 is situated ~ 150 m west of the box canyon and northwest of site S1-C (Fig. 3). It occupies a prominent position with a clear view of site S1-E, a large zone of occupation that stretches along the western margin of the mountain and is considered by the Shaqadud Archaeological Project an extension of the Shaqadud site complex (Varadzin et al., 2022), and, to the south, of one of the seasonal watercourses that drain off the plateau above the box canyon (Fig. 2). Within this sandstone outcrop, petroglyphs, all pecked or hammered, form two groups. One group is situated on the side of the outcrop close to S1-C and consists of a large boulder in an elevated position with two panels oriented to the south and the northeast, respectively. The panels bear two badly discernible depictions of giraffes and other non-figurative marks.

The other group at R5 is situated on the other side of the outcrop, occupying the walls of two large boulders oriented towards the plain below the mountain (Fig. 7). The boulder to the right, which faces west-north-west, bears at least four figures. Three fully pecked giraffes oriented to the left occupy a slightly inclined panel in the lower section of the boulder. They are positioned one behind the other and aligned along the panel's edge, with the feet of at least one of them using the surface features

of the sandstone as a baseline (Fig. 7d). On the same boulder, further up and to the left, there are remains of at least one (and possibly two) pecked indeterminate quadruped(s), partly damaged by fragmentation of the rock, and other pecked lines and marks that may constitute remains of other motifs (Fig. 7c). Perpendicular to this boulder, two separate petroglyphs are located on a vertical wall oriented to the southwest (Fig. 7a). To the right, there is a roughly hammered triangular design of uncertain representational value. It could be an incomplete outline depiction of a giraffe to the right, similar in form to one of the figures recorded at the Giraffes' Rock, with the head and neck missing (for comparison, see Figure 11a below), but other readings cannot be ruled out. One single and two convergent strokes are pecked to the right of the design (Fig. 7b). About 1.3 m to the left, a fully-pecked giraffe of the same type as those located on the lower section of the former boulder is depicted approximately at the same height as the triangular design (Fig. 7a). Other pecked marks in front of this weathered figure may represent remains of other motifs, now broken off. Location R5 is analogous to the Giraffes' Rock in its dominant position, subject matter, and small size of the giraffe depictions. However, R5 is smaller than the Giraffes' Rock as concerns the number of surfaces and motifs depicted. No archaeological debris was noted in the vicinity of this exposure.

Giraffes' Rock (Location R3)

This location overlaps with a ~ 50-m-long zone of remnant sandstone that extends along the eastern edge of the escarpment 510–512 m asl and ~ 32 m above the bottom of the box canyon (Fig. 5). It is situated ~ 60 m to the west of and no more than 2 m

Fig. 7 Location R5, with petroglyphs oriented towards site S1-E: (**a**) vertical wall of a large boulder with a roughly hammered triangular design of uncertain representational value (center) and a weathered depiction of a giraffe oriented to the right and other non-figurative marks (arrow); (**b**) detail of the triangular design and other marks to the right (arrows); (**c**) indeterminate quadruped(s) on the wall of an adjacent boulder; the black and white "x" signs mark connecting points with Figs. 7a and d, respectively; (**d**) three giraffes to the right along the edge of a small panel in the lower section of the same boulder. Photo by L. Varadzinová

below the prehistoric settlement at site S21 (Fig. 2). This location is the only one that can overlook all the components of the Shaqadud site complex at once. At the same time, it commands an excellent view of the vast plains west of the mountain (Fig. 3). With its large and peculiarly inclined sandstone boulders, the site forms a conspicuous and eye-catching feature above the box canyon (Fig. 5).

The sandstone in the exposure is of varied quality, including fine-grained variants, conglomerate bands, and joints filled with crystallized silica. It is broken into boulders of diverse shapes and sizes (Fig. 8; Table 2), forming two bands along the escarpment's edge. The upper band, to the east, consists of a series of large boulders aligned along the edge of the escarpment in a comparatively compact formation with occasional narrow corridors and cramped spaces between individual blocks; the eastern sides of the boulders enclose an open space ca. 10×20 m in size situated between the Giraffes' Rock and the prehistoric settlement at S21 (Figs. 3 and 8). To the west, the lower band consists of a series of boulders distributed in parallel to the former band right below the edge of the escarpment, creating a corridor that meanders through the central part of this sandstone outcrop. Further below, a talus slope with loosely scattered smaller pieces of sandstone separates the Giraffes' Rock from the lower terrace with Location R4 (Fig. 5).

The natural rock in both bands is mostly covered by a dark to very dark varnish, but a modern breakage reveals a light-colored body of the stone beneath. However, most of the marks are now entirely

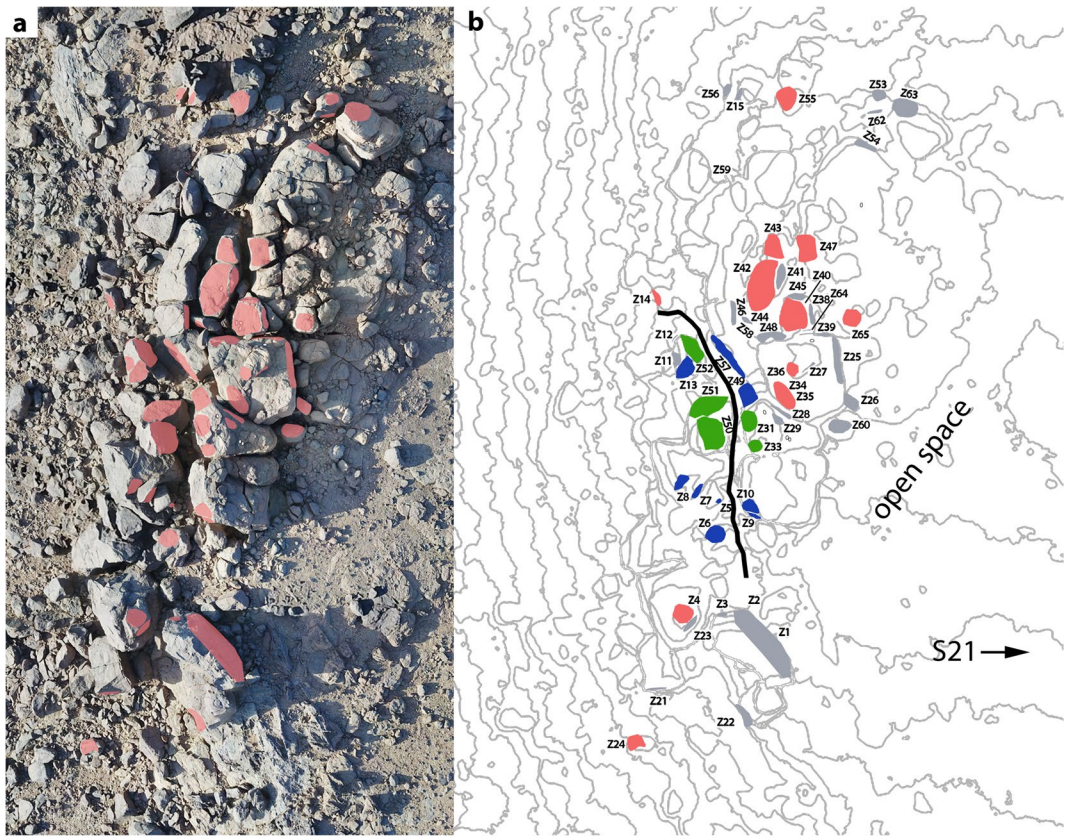

Fig. 8 Location R3: (**a**) ortophoto with locations of all rock art surfaces with figurative and/or non-figurative marks (in red); (**b**) contour plan (0.5 m intervals) with results of analysis of the visibility of rock art surfaces: red = visible only when standing right above the panels; blue = fully visible only inside the "gallery"; green = visible both from the "gallery" and when standing on the upper boulders to the east of it; grey = visible from other directions, and panels not in situ; black line = passage through the "gallery"; codes = numbers assigned to the panels in the field. For description of the panels, see Table 2. Photo, data processing, and spatial analysis by authors

Table 2 Location R3: Overview of surfaces with identified motifs ($n=46$) and non-figurative marks ($n=38$)**

Field no.	Surface	Subject-matter, techniques, state of preservation	Notes
Z1	side	• 6 giraffes to R, pecked, badly weathered and/or fragmented • 1 large and 1 small giraffe to R, fully pecked, weathered, and 1 giraffe (?) to R, pecked in outline, faint • other faint marks beneath and/or around the motifs, some possibly representing the remains of other figures (giraffes?)	Figure 13a
Z2	side	• 1 giraffe to R, fully pecked, body loosely, legs and neck densely • vertical stroke next to head, pecked marks beneath neck and behind back	Figure 13a
Z3	side	• 1 giraffe to L, fully pecked, body and legs rubbed out	Figures 9a and 13a
Z4	oblique	• 1 small and 1 large giraffe to R, fully pecked, weathered	Figure 13a, c
Z23	side	• 1 large and 1 small giraffe to R, fully pecked, weathered, and 1 undetermined quadruped to R, fully pecked, head and neck missing (broken off?)	
Z22	side	• 1 large giraffe and 1 small giraffe (?) to R, fully pecked, weathered	
Z21	side	• entirely effaced marks	
Z24	top	• 1 giraffe to R, fully pecked, body loosely, incomplete (broken off) • short, curved pecked line above back	Figure 9b
Z60	top?	• 1 giraffe (?) to L, pecked in outline, effaced • other faint marks	
Z26	top?	• 1 giraffe to R, pecked in outline, incomplete (broken off) • other faint marks	Figure 9c
Z25	side	• 3 giraffes to R, fully pecked, badly weathered • 1 large and 1 small giraffe to R, pecked, surface incorporation	Figure 9d
Z39	side	• 3 giraffes to R, fully pecked, weathered, incomplete (broken off) • 1 giraffe to L, fully pecked, legs rubbed out, weathered • other weathered marks	A (1)
Z48	side	• 1 giraffe (?) to L, loosely pecked, incomplete (broken off) • 1 giraffe (?) to R, coarsely pecked, badly weathered • 2 giraffes to R, fully pecked, badly weathered • other pecked marks and lines, incl. remains of other figures, badly weathered	
Z35	top	• 1 antelope with twisted horns, to L, fully pecked, partly smoothed	Figure 12
Z34	top	• non-figurative pecked lines and other marks	Figures 12 and 13d
Z27	side	• 1 giraffe to R, fully pecked, partly smoothed, weathered	Figure 12
Z36	oblique	• 1 giraffe to L, fully pecked, partly smoothed, badly weathered • other pecked lines and marks above the giraffe	Figure 12
Z28	side	• 1 giraffe to L, schematic, pecked • 1 giraffe to R, fully pecked	
Z29	side	• 1 large giraffe and 1 small giraffe (?) to R, fully pecked • other pecked marks	A (2)
Z31	top	• 1 giraffe to L, fully pecked, legs additionally incised • 1 giraffe to R, fully pecked, legs and tail not depicted – unfinished (?) • other pecked marks above and between both figures	Figure 9e A (1)
Z33	top	• 1 giraffe to L, finely pecked • other pecked marks above and behind the giraffe	Figure 9e
Z49	side	• 1 giraffe to R, large, elongated body, finely pecked and smoothed, head rubbed • other pecked marks above and further to the right	Figure 13c
Z9	side	• 3 giraffes to R (incl. 1 small, with a pecked stroke across neck), 1 giraffe to L, all pecked, three fully, one in outline – unfinished (?) • other faint pecked marks amidst and above the four figures	Figures 10 and 13b

Table 2 (continued)

Field no.	Surface	Subject-matter, techniques, state of preservation	Notes
Z10	side	• 1 giraffe to R, pecked in outline, effaced • other faint pecked marks	Figure 13b
Z6	top	• faint pecked marks over a small circular area	Figure 13b
Z5	side	• 1 giraffe to R, loosely pecked, incomplete (broken off?)	Figure 13b
Z7	side	• 1 giraffe to R, fully pecked, effaced • other faint marks	Figure 13b
Z8	side	• 1 large and 1 small giraffe to R, fully pecked, and 1 giraffe to R beneath the feet of the former, pecked in outline	Figure 13b
Z50	side	• 3 giraffes to L and 2 giraffes to R, all fully pecked, surface incorporation • other pecked marks in the central and lower part of the surface	Figure 13c
Z51	oblique	• 7 giraffes to R, of different forms, all fully pecked, some partly smoothed, and 4 giraffes to L, incl. 1 large and 1 small giraffe forming a pair, 3 fully pecked, 1 pecked in outline • other pecked marks amidst the figures	Figures 11a and 13c
Z13	oblique	• 1 giraffe to L, fully pecked, only head and neck present – unfinished? (no. 1) • 3 giraffes to L, all loosely pecked, two incomplete (broken off), 2 oblique strokes by head of the uppermost of the three (nos. 2–4) • 1 pecked linear design – an anthropomorph in frontal view (?) (no. 5) • other pecked lines and marks	Figures 11b and 13c, d
Z11	side	• 1 antelope with horns curved sharply back, to R, fully pecked • other pecked marks to the left and above the antelope and further up the same surface – remains of other motifs?	
Z12	side	• 1 giraffe to L, fully pecked • other pecked marks to the left of the giraffe	
Z52	side	• 9 giraffes to R, incl. 2 large and 2 small giraffes in pairs, and 1 undetermined quadruped to L, all fully pecked, some partly smoothed	Figure 13d
Z14	top	• 1 antelope with horns curved sharply back, to R, fully pecked	Figure 13d
Z57	side	• 1 giraffe (?) to L, finely pecked • 1 giraffe (?) to R, coarsely pecked • other pecked marks in the vicinity of both figures, incl. 8 parallel lines – remains of quadrupeds?	Figure 13b, d
Z58	side	• 1 giraffe to R, large, finely pecked and smoothed, head rubbed out	Figures 11c and 13d
Z46	side	• 1 giraffe to R, fully pecked • 1 giraffe (?) to R, pecked in outline, effaced	Figure 13d
Z41	side	• 2 giraffes to R, fully pecked, weathered	Figures 11d and 13d
Z42	top	• 1 giraffe to L, pecked, effaced • numerous pecked marks, badly weathered	B (1) Figures 11d and 13d
Z44	side	• 1 large and 1 small giraffe to R, fully pecked, weathered	
Z43	top	• 1 giraffe (?) to L, fully pecked, weathered • other faint pecked marks	Figure 13d
Z38	side	• faint and weathered lines and marks – remains of 2 quadrupeds?	
Z40	top	• 2 giraffes to L, fully pecked and smoothed • 1 giraffe to R, fully pecked, incomplete (partly broken off)	B (3) Figure 13d

Table 2 (continued)

Field no.	Surface	Subject-matter, techniques, state of preservation	Notes
Z45	side	• 1 giraffe to R, fully pecked, weathered • other faint marks – remains of a quadruped?	
Z64	side	• 5 long parallel vertical lines and other pecked marks further to the left	
Z47	top	• 1 giraffe (?) to R, pecked in outline, faint • other faint pecked marks	C (1) Figure 13d
Z65	top	• faint pecked lines	
Z54	side	• 1 large and 1 small giraffe to R, pecked, badly weathered	Figure 11e
Z63	side	• numerous marks on badly weathered sandstone boulder	
Z53	side	• 1 undetermined quadruped to R, fully pecked, badly weathered • other faint pecked marks, weathered	
Z62	side	• 1 large giraffe and 1 small giraffe (?) to R, badly weathered	
Z55	top	• 2 series of parallel lines – remains of quadrupeds?	
Z59	side*	• a series of 4–5 parallel horizontal lines on the side of a toppled (?) boulder – remains of a quadruped?	
Z15	side*	• 2 series of parallel horizontal lines on the side of a toppled (?) boulder – remains of quadrupeds?	
Z56	top*	• 1 giraffe (?) to L, pecked in outline, faint • other faint marks	C (2)

**The surfaces are identified using their field numbers and presented in a sequence reflecting the spatial proximity. Thin dividing lines separate different boulders with petroglyphs. With types of surfaces, side = vertical wall of a boulder; oblique = surface facing partly upwards; top = upper, horizontal surface of a boulder; * = surface probably not in situ; top? = small-sized support capable of relocation by humans. With figurative remains, identified motifs, probable (?) motifs, orientation to the right (R) or left (L), technique of execution, and state of preservation are indicated. With non-figurative remains, their character is indicated where possible. Notes give reference to figures depicting the respective surfaces and/or motifs and, where applicable, indicate the presence of artificial bedrock features: A (n) = oval basin hollow(s) located on the same boulder (but not on the same surface); B (n) = circular or oval basin hollow(s) occurring on the same surface; C (n) = "cupule(s)" occurring on the same surface (cf. Figure 8b)

repatinated and show no difference in color from the surrounding unaltered rock surface (Figs. 9, 10, and 11). Furthermore, since some surfaces–particularly the exposed ones and those oriented to the north–have been severely weathered, they now contain almost entirely effaced man-made marks that are sometimes difficult to identify as motifs and, in some cases, difficult to differentiate from natural features of the sandstone (Figs. 9d and 11d, e). In other instances, exfoliation or fragmentation of the sandstone has left some motifs or scenes incomplete (Figs. 9c and 11b). Given this state of preservation, the numbers of supports, panels, and motifs provided for Location R3 should be considered only as minimum numbers.

During repeated visits to the site in 2021 and 2022, 33 boulders in the two bands were found to feature 56 surfaces with figurative motifs or non-figurative marks (Table 2; Fig. 8). Figurative motifs were identified on 46 panels (Figs. 9, 10, 11, 12, and 13). Non-figurative remains, some of which could represent effaced, fragmented, and/or unfinished motifs or seemingly random marks that may have been meaningful in the past, were recorded on 38 panels (Table 2). They either constituted the only noticeable remains on the surfaces ($n = 10$) or occurred in the vicinity of figurative motifs ($n = 28$; Figs. 9b, c, e, 10, 11b, and 12). In addition, three small "cupules" and nine oval or circular basin hollows were recorded on eight horizontal surfaces. All but one of these bedrock features occurred on the same supports as figurative or non-figurative marks, either right next to the identified motifs (Fig. 11d) or in their vicinity (Table 2; Fig. 8).

The surfaces bearing figurative and non-figurative marks show an uneven distribution through the site, reflecting only to some extent the availability of good-quality sandstone (Fig. 8a). Most of the surfaces ($n = 51$, 91.1%; Table 2) occupy the sides ($n = 34$, 66.7%) or the upper ($n = 13$, 25.5%) and upward-facing oblique ($n = 4$, 7.8%) surfaces of large, immovable

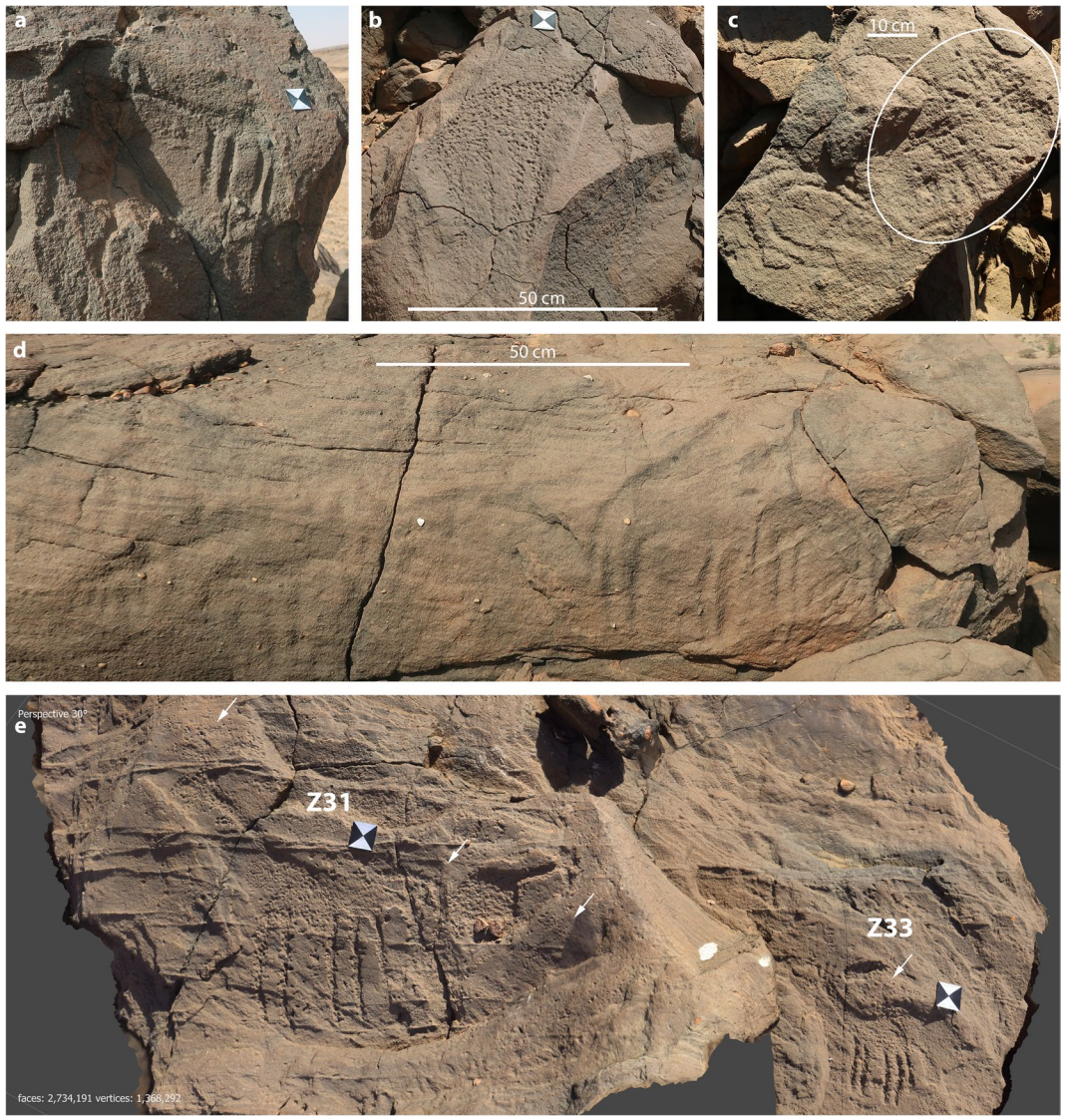

Fig. 9 Location R3: (**a**) panel Z3 on the side of a large inclined boulder; label width = 5 cm; (**b**) panel Z24 on a medium-sized block in the upper part of the talus slope; (**c**) panel Z26 with an incomplete giraffe in outline (left) and other non-figurative marks (circled); (**d**) panel Z25 beneath the upper surface of a large boulder, with a group of three giraffes of the same size (left) and a pair of giraffes of different sizes (right); (**e**) 3D model of the edge of one of the large boulders in the upper zone with panels Z31 (a giraffe and an incomplete giraffe) and Z33 (a giraffe); the arrows indicate other non-figurative marks; label width = 5 cm. Photo by L. Varadzinová, J. Unger, and L. Varadzin; data processing for 3D model by J. Unger

boulders or exposed surfaces of medium-sized blocks, on which the petroglyphs are always positioned parallel to the ground to make direct viewing possible when standing (e.g., Fig. 11a, b). This means that most panels recorded in both bands are still in situ, in places where they were made and meant to be by their makers. With three panels (5.4%) situated close to the northern end of the sandstone exposure (Z15, Z56, and Z59), the orientation and position of the remains vis-à-vis the ground suggest that the sandstone blocks may have moved sometime after their sides had been marked by humans (Table 2). For two more blocks (3.6%) situated in the upper band (Z26, Z60), the primary position cannot be determined as

Fig. 10 Location R3. Panel Z9 on the slightly inclined wall of a large overhanging boulder in the "gallery", with one small and three large giraffes positioned on two different baselines, and other non-figurative marks (arrows). Photo by L. Varadzinová

they are of smaller dimensions and weight and, thus, potentially movable. Both were found horizontally, with the petroglyph surfaces facing up (Fig. 9c).

When the accessibility and the visibility of the petroglyphs found in their original location ($n=51$) are considered, three groups can be discerned based on our experience moving through the site and viewing and documenting the rock art. The first group contains 14 panels (27.5%) located on vertical, horizontal, or oblique surfaces of sandstone blocks along the winding corridor between the rocks in the lower zone of the sandstone outcrop. Of these, nine (64.3%) are fully visible inside this "gallery" (Fig. 8b: blue). The remaining five (35.7%) are visible also when looking down into the corridor from the edge of the large boulders in the upper zone (Fig. 8b: green). The second group is made up of 12 panels (23.5%) located on the upper or upward-facing oblique surfaces of boulders and blocks in the two bands of the sandstone outcrop that are fully visible only when standing above these panels (Fig. 8b: red). The remaining 25 panels (49%) that occupy the walls of the sandstone in the exposure are visible from other directions (Fig. 8b: grey). Nevertheless, the lack of space near eleven of these panels (45.8%) reduces their visibility to a close range. In sum, 37 rock art surfaces situated in situ (72.5%) can be viewed fully only from a close distance–either in the "gallery" or when standing right in front of or above the surfaces. This shows a marked constriction of visibility and accessibility of the rock art at R3.

On the 46 panels with figurative rock art, 110 motifs were identified, with 1–11 identifiable figures per panel. All of them are zoomorphic. They include 91 (82.7%) depictions of giraffes (*Giraffa camelopardalis*) on 37 panels, 13 (11.8%) depictions of probable giraffes on ten panels, three (2.7%) depictions of antelopes on three panels, and three (2.7%) undetermined quadrupeds on three panels (Table 1). The giraffes and probable giraffes, distinguished by their long necks and, in some cases, also the characteristic shape of the body and other diagnostic features (ears, ossicones, muzzle, etc.), are mostly of small dimensions, with the largest measuring around 50 cm at the most (Fig. 11c). Where recognizable, their depictions vary in form and style, which is most evident in the way the body and legs are depicted, the position of the neck, and the rendering of diverse diagnostic features of the species. Thus, we find simple, rather schematic specimens with long, horizontal necks and legs indicated as four parallel lines (Figs. 9a and 11a, e), and also individuals with oblique necks, clearly shown ears, ossicones, and muzzles (Figs. 9b, e, 10, and 11a–c), sometimes captured in postures characteristic of the behavior of this species (Figs. 9b, 10, and 11b). In several instances, surface features of the sandstone are incorporated in the depiction as register lines or to render some parts of the species (Fig. 9d).

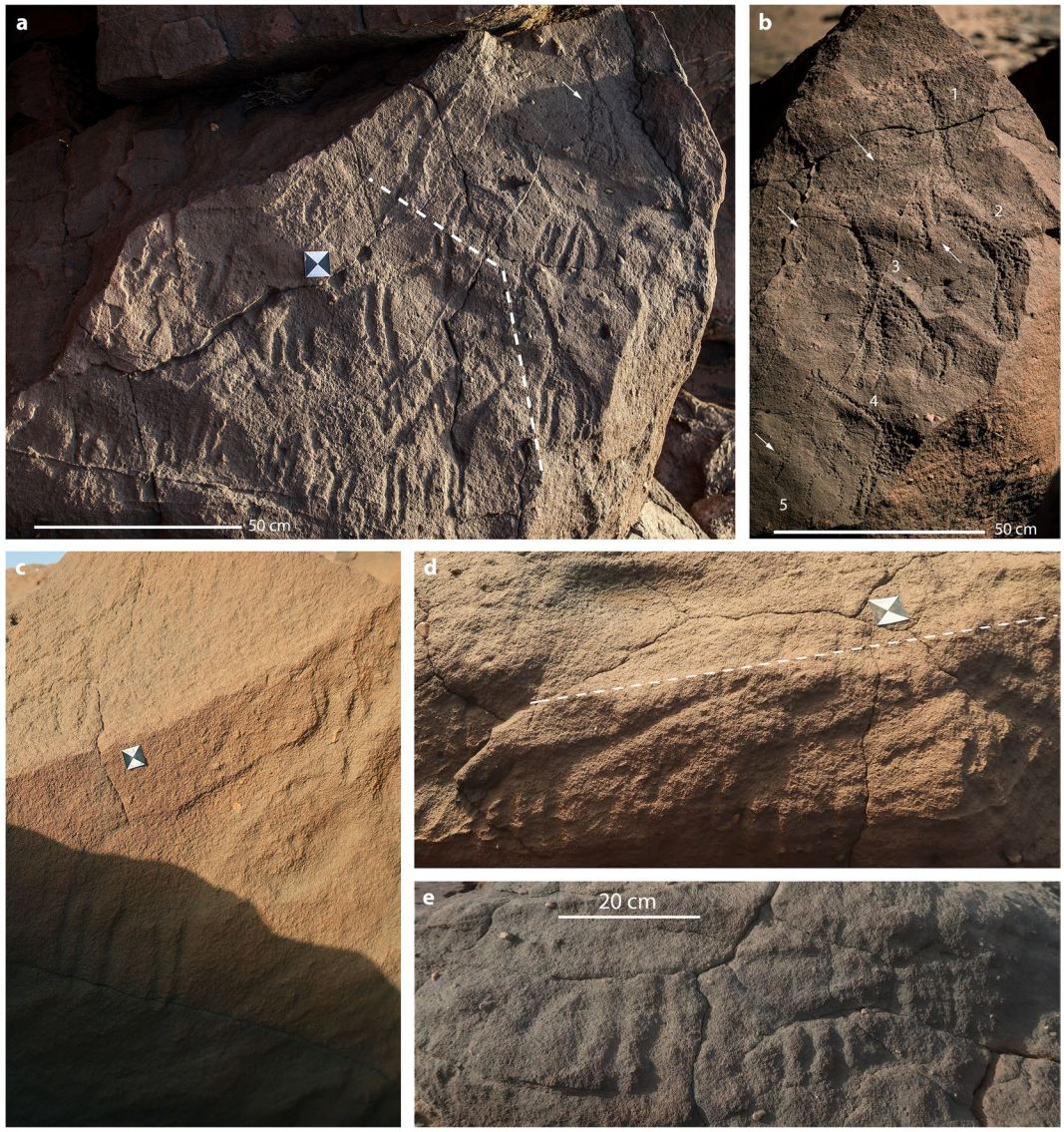

Fig. 11 Location R3: (**a**) panel Z51 on an oblique surface of a boulder; the arrow points to a giraffe in outline; the dashed line separates giraffes of different orientations; (**b**) panel Z13 opposite Z51, with one complete (no. 3), one incomplete (no. 1) and two fragmented (nos. 2, 4) giraffes, a pecked linear design (no. 5), and other non-figurative marks (arrows); (**c**) panel Z58, blocked from a direct view by the long slab with panel Z57, with one of the largest giraffe depictions at the site; (**d**) panel Z41 with two giraffes in a zone below the edge of the upper surface of a large boulder (indicated by a dashed line), and part of panel Z42 with an oval basin hollow; (**e**) panel Z54 on the side of a boulder with two weathered giraffes of different sizes. Photo by Petr Pokorný (a, b) and L. Varadzinová (c–e)

On 19 panels, giraffes and probable giraffes are found as isolated individuals (4 panels; Figs. 9a and 11c) or single figures with other, non-figurative remains in the vicinity (15 panels; Fig. 9b, c, e – Z33). At least two giraffes are found on 23 surfaces. On 16 panels, the giraffes form pairs characterized by consistent orientation and involving either two individuals of the same size (3 panels; Fig. 11d) or one

large and one small giraffe, most probably representing an adult and a calf or adolescent giraffe (13 panels; Table 2). On all but one (Z4) of the latter panels, the smaller giraffe is always in front of the larger one (Figs. 9d and 11a, e; see also Fig. 6 from Location R4). Most of the paired giraffes of both types (87.5%) are oriented to the right. The paired giraffes are part of groups numbering between three and 11 figures (11 cases) on six surfaces. On five of the latter panels, the figures show the same orientation to the right (4 cases; Fig. 9d) or to the left (1 case; Fig. 11b). The remaining six surfaces feature figures, sometimes of differing styles, oriented both to the right and left. On four of these panels, the giraffes are always turned towards the center of the panels and thus facing the opposite individuals (Figs. 10 and 11a). On two surfaces (Z48, Z52), there is always one figure that shows a differing orientation (to the left) compared to the rest of the group (to the right); the position of these single figures at the very edge of the two scenes and, in the case of Z48, employment of a different technique of execution for this figure, could indicate a different relationship with the main group.

Interestingly, superimpositions seem extremely rare, if not absent, at this rock art complex. Where figures of different types or styles occur, they are always adjacent to, rather than superimposed over, each other (Fig. 11a). This also seems to be the case for the other six zoomorphs identified in the corpus wherever they occur on surfaces with other figures. The antelopes are differentiated from the giraffes by the presence of larger horns, a shorter neck, and different body shapes. Based on the shape of the horns, the figure with large twisted horns facing left could represent a greater kudu (*Tragelaphus strepsiceros*) (Table 2: Z35; Fig. 12), and the other two figures facing right, with horns curved sharply back, could represent a hartebeest (*Alcelaphus buselaphus*) with its horns shown in profile (Table 2: Z11, Z14). With the other three animals, the lack of any diagnostic characteristics renders closer determination impossible, leaving these motifs classified for the time being simply as undetermined quadrupeds. So far, no motifs other than zoomorphs have been identified at R3. Nevertheless, on one panel (Z13), a linear design beneath the head of the lowermost of the giraffes might represent an anthropomorph (Fig. 11b: no. 5); if other options (such as an indeterminate zoomorph) are ruled out, this figure would make the only non-zoomorphic motif in the entire collection.

Where recognizable, surface pecking and/or hammering predominate among the techniques of execution, with both blunt and sharp tools used and the surface pecked to a different depth, coarsely or finely, loosely or in a greater density (cf. Figs. 9b, e: Z33, 10, and 11b). Fully-pecked figures prevail. Incision, smoothing, and abrasion/rubbing are less common and often constitute supplementary techniques for treating the surface of the bodies or legs of the giraffes (Figs. 9a, e: Z31, and 11a, c). Giraffes pecked only in outline are rare ($n = 10$, 9.6%; Table 2). On five panels, these outline depictions constitute the only identifiable motifs; they are accompanied by non-figurative lines and marks (Z10, Z26, Z60; Fig. 9c) and, in two

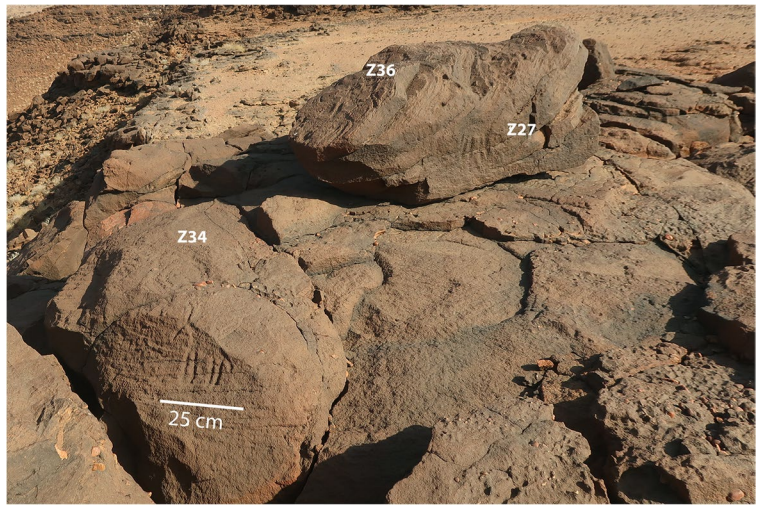

Fig. 12 Location R3. Panel Z35 (above the scale) on the upper surface of one of the large boulders with a depiction of a large antelope with twisted horns–possibly a greater kudu; the field numbers indicate the location of other panels in the vicinity. Photo by L. Varadzinová

cases, by one or two cupules (Z47, Z56). In two other cases (Z1, Z8), small giraffes in outline, oriented to the right, are adjacent to paired giraffes of different sizes oriented to the right. In both these cases, the outline figures are fitted into whatever space remains in front of or below the smaller of the two giraffes, which indicates that their association with the two compositions may be only secondary (for location of the two panels, see Fig. 13a, b). In the cases of Z9 and Z51, single giraffes in outline occur at the periphery of the panels and could thus constitute simple additions to the existing scenes. In one of these cases (Z51), the outline giraffe also differs from the rest of the group depicted on the panel in its form (Fig. 11a: top left). Nevertheless, on panel Z9, the giraffe in outline is identical in shape to the other giraffes on the panel and could thus represent an individual that was part of the original design but remained unfinished, thus providing evidence on the process of creating fully-pecked giraffes beginning with an outline (Fig. 10).

In addition to figurative and non-figurative remains on the sandstone surfaces, other remains of former human presence from this rock-art location include surface finds of weathered sherds of Khartoum Mesolithic or generally prehistoric pottery, fragmented lower and upper grinders, and sparse scatters of flaked stone industry that were recorded in the open space to the east of the sandstone exposure and, to a lesser extent, among the boulders in the lower band (Fig. 8). As all these finds may be outside their primary contexts, no direct chronological or other association can be claimed to exist between them and the rock art.

Chronology and Meaning of Figurative Rock Art at Shaqadud

The five locations presented in this paper represent all of the currently known rock art occurrences around the Shaqadud box canyon. Figurative rock art predominates in the assemblage, showing a central focus on the giraffe (Table 1). With this focus, the Shaqadud corpus fits well into the rock art of Africa, where giraffes are one of the most frequently portrayed wild animals (Coulson & Campbell, 2001). This is also the case for the Nile Valley and the deserts to the east and west of the river in Egypt and Sudan, where differing chronologies have been proposed for this motif (e.g., Chlebowski & Drzewiecki, 2019; Crowfoot, 1920; Červíček, 1974, 1986; Hellström & Langballe, 1970; Judd, 2006; Karberg, 2019; Kleinitz, 2007, 2012; Le Quellec et al., 2005; Polkowski, 2018b; Riemer, 2009; Váhala & Červíček, 1999; Winkler, 1938; Zboray, 2018).

In the Eastern Sahara, the giraffe (*Giraffa camelopardalis*) was generally tied to more humid climates that characterized the early and mid-Holocene (e.g., Jousse, 2017; Peters, 1988; Van Neer & Uerpmann, 1989), and depictions of the species are usually considered the work of mid-Holocene pastro-foraging communities (e.g., Kuper, 2016; Riemer, 2006, 2011; cf. Zboray, 2018). Along the Nile and in the savannas of what is today the Eastern Sahel, on the other hand, giraffes seem to have persisted until the late Holocene (e.g., Chaix, 2019; Jousse, 2017; Peters, 1992). This finds expression also in the rock art along the Sudanese Nile, where a greater date range of the motif, spanning both prehistoric and historical periods, has been proposed based on the marked variability of the formal and technical traits of the depictions, different degrees of patination, spatial, stylistic, and chronological proximity of the giraffe to other motifs (e.g., cattle), and stylistic similarity of some specimens with the artistic repertoire of the Meroitic period (~ 300 BC–AD 350) (e.g., Kleinitz, 2007, 2012). Some 21 km northwest of Shaqadud, several giraffe depictions also occur among the graffiti in the built environment of the Great Enclosure at Musawwarat es-Sufra dated to the Meroitic period (e.g., Kleinitz, 2007, 2014; U. Hintze, 1979; see Fig. 1a).

The Shaqadud figurative assemblage is characterized by the smaller size of the figures and the use of rock art techniques involving reductive processes. These characteristics are typical of most Holocene rock art in the Nile Valley and the adjacent deserts (e.g., Varadzinová, 2017). Nevertheless, there are also clear differences between the latter regions and Shaqadud, which could be cultural or chronological. Strikingly, the figurative corpus at Shaqadud ($n = 120$) is overwhelmingly dominated by depictions of the giraffe ($n = 113$, 94.2%), which represent between 85.7% and 100% of motifs identified at the three locations with figurative rock art (Table 1). The remaining representations include large antelopes ($n = 3$, 2.5%) and undetermined quadrupeds ($n = 4$,

3.3%) at the Giraffes' Rock and the latter motif also at Location R5. Other motifs typical of figurative rock art elsewhere in Egypt and Sudan–such as other wild and domesticated animals, human figures, and boats (Karberg, 2019; Varadzinová, 2017) –seem absent in the Shaqadud assemblage.

Of the diverse compositions involving the giraffe known from northeastern African rock art, only two are represented at Shaqadud: groups or herds of giraffes and the adult-and-young motif (cf. Judd, 2009; Kleinitz, 2012; Polkowski, 2020; Riemer, 2009; Suková, 2011; Váhala & Červíček, 1999). Other themes or elements attested elsewhere seem to be absent from the Shaqadud assemblage. The latter include the giraffe-and-tree/the browsing giraffe motif (Hellström & Langballe, 1970; Kleinitz, 2007, 2012, 2014; Le Quellec et al., 2005), "sitting giraffes" (Deregowski & Berger, 1997; Hallier, 1995; Ikram, 2009; Polkowski, 2018a; Van Hoek, 2005), giraffes on a leash or tether (Ikram, 2009; Krzyżaniak, 1990; Polkowski, 2018b; Riemer, 2011; Váhala & Červíček, 1999; Van Hoek, 2003; Zboray, 2018), giraffes with tufted tails (Judd, 2009; Kleinitz, 2014; Lankester, 2013; Polkowski et al., 2013; Riemer, 2009; Winkler, 1939), hunting scenes involving giraffes, humans and dogs (Krzyżaniak, 1987; Lankester, 2013; Le Quellec et al., 2005; Polkowski, 2018a, 2020; Polkowski et al., 2013; Váhala & Červíček, 1999; Zboray, 2018), and giraffes in other interactions with humans and other animals (Le Quellec et al., 2005; Váhala & Červíček, 1999; Zboray, 2018; but see Fig. 11b: no. 5). This limited range of motifs and compositions is typical of the Shaqadud corpus.

From a technological point of view, pecking and hammering constitute the primary techniques of production of the Shaqadud rock art. Incision, smoothing, and abrasion/rubbing also appear, but only as subsidiary methods used after pecking or hammering and only selectively on some parts of the figures. This marked technological and thematic uniformity suggests that a coherent mindset governed the formation of the Shaqadud rock art. On the other hand, there are clear differences in the rendering of the body, neck, and legs of the giraffe figures, in the amount of detail provided, and in the degree of stylization of the figures. It is thus evident that different individuals made these depictions. The varied forms and styles and the large number of figures indicate a longer-term or intensive formation of the Shaqadud corpus.

The characteristics mentioned above propose an association of the local figurative rock art with some of the intensive settlement activities attested within the Shaqadud site complex. Based on the current state of knowledge, four periods of occupation have been identified in the area. The earliest one overlaps with the beginning of the Holocene (8748–8572 cal BC; Varadzin et al., 2022) and is followed by the Khartoum Mesolithic (locally attested 6570–4362 cal BC), the Khartoum Neolithic (5480–4264 cal BC), and the Late Neolithic (3007–1639 cal BC) periods (Marks, 1991). The dating of the Shaqadud figurative rock art to a period before ca. 2000 cal BC is consistent with the full repatination and marked weathering of the figures and with the absence of technical and stylistic traits characteristic of the artistic repertoire of the historical periods in this region (cf. Kleinitz, 2012, 2014).

Further chronological clues may be provided by the locational aspects of the Giraffes' Rock, the most significant rock art location in the area. Although situated in a prominent position (Figs. 2 and 5), the rock art could not be seen from the settlements in the box canyon and in the lower plain due to the small size of the figures and their peculiar distribution: of the total of 51 panels in situ, 47 panels, including the largest groups of figures at this site (panels Z1, Z50, Z51, and Z52), are concealed in constricted spaces between the rocks or occupy the sides of the boulders turned away from the box canyon or the surfaces facing upwards where they can be viewed only when standing right next to or above the panels (Figs. 8 and 13b–d). Furthermore, this location is difficult to approach from the lower sites in the box canyon separated from the rock art by steep talus slopes. By contrast, the Giraffes' Rock could be easily accessed from site S21, which is 60 m to the east and separated from this sandstone outcrop by only a gentle slope (Figs. 2 and 5). Furthermore, the most conspicuous rock art panel at the Giraffes' Rock (Z1), which is located on the massive inclined boulder standing at the mouth of the "gallery" in the lower band of the sandstone exposure and contains at least nine giraffes, is oriented right towards S21 (Fig. 13a). Prior to repatination and weathering, the giraffes on this panel must have been well visible from the edge of S21. This spatial and visual accessibility between the Giraffes' Rock and S21 indicates their possible

Fig. 13 Location R3: (**a**) large inclined boulder at the southern end of the site with panel Z1 oriented towards S21; (**b**) winding corridor between the two bands of sandstone (view from the south); (**c**) middle part of the same corridor (view from the north); (**d**) northern part of the same corridor and other narrow passages and constricted spaces with rock art (view from the south). The rock-art panels are identified with their field numbers. Photo by L. Varadzinová

functional and chronological association. The hitherto excavation at S21 attested to an intensive occupation of this site only by the Khartoum Mesolithic hunter-gatherers around 6421–6088 cal BC (Marks, 1991). The dating of the giraffe depictions in the Shaqadud site complex to the Khartoum Mesolithic is a working hypothesis to be further tested.

The analysis of statistically robust faunal assemblages from the archaeological contexts in Shaqadud excavated by the Butana Archaeological Project has shown the presence and consumption of numerous large, medium, and small vertebrates, including antelopes, during the climatically more favorable periods of the early and mid-Holocene (Peters, 1991). Among the hunted animals, the giraffe remains were always clearly outnumbered by the bones of other species, especially small, medium, and large antelopes, such as oribi (*Ourebia ourebi*), greater kudu (*Tragelaphus strepsiceros*), roan antelope (*Hippotragus equinus*), and topi and/or hartebeest (*Damaliscus lunatus*/*Alcelaphus buselaphus*). The remains of the antelopes represent 81%, 67.9%, and 40.9% of all identified mammal bones from the Khartoum Mesolithic ($n = 153$, site S21), Khartoum Neolithic ($n = 168$, site S1-B, level III), and Late Neolithic ($n = 340$, site S1-A), respectively, compared to 1.3%, 0.6%, and 22.4% of bones of the giraffe from these three periods (Peters, 1991, tab. 10–8). On the other hand, the representation of the species in the rock art is quite the opposite, with the giraffe accounting for 94.2% of all figurative motifs as compared to 5.8% represented by antelopes and undetermined quadrupeds. This disproportion between the number of giraffes compared to other mammals signifies a clear selectivity in the content of local rock art.

A similar preponderance of certain species in the subject matter of the rock art as compared with their natural occurrence or representation in the archaeological record is also attested in other parts of Africa, with the dominant species varying by region and including the giraffe in Tanzania, the kudu in Zimbabwe, the eland in Drakensberg of southern Africa (Le Quellec, 2018), and the giraffe and the oryx

antelope in mid-Holocene Eastern Sahara (Ikram, 2009; Polkowski, 2020; Riemer, 2009). In all these cases, the rock art depicts neither the natural proportions between environmental elements nor the full spectrum of hunted animals. Instead, it seems that larger and rarer animals may have been preferred for their social significance or possible metaphysical properties when it comes to storytelling, status, or religious concerns (cf. Coulson & Campbell, 2001; Riemer, 2009; Smith, 2013). In this respect, the lack of hunting scenes in the Shaqadud rock art could be especially telling, suggesting that the giraffe could have been more than just a hunted game for the local communities.

Significance of the Shaqadud Rock Art

In the vast region of the Butana situated between the Atbara and the Main and Blue Niles, rock art depicting giraffes, cattle, humans, and other motifs has been reported at several locations during previous field surveys, in some cases even in the vicinity of prehistoric occupation sites (e.g., Crowfoot, 1920; F. Hintze, 1959). However, none of these locations have been subjected to a detailed investigation that focuses on rock art and its spatially associated archaeological remains. In that respect, the Shaqadud site complex constitutes an exceptional case where rock art documented from the point of view of thematic, syntactic, technical, and other aspects can be evaluated against a well-established archaeological context.

This study has provided the first presentation of this new evidence focusing on the figurative rock art recorded in the area. In conclusion, the regional and supra-regional significance of the Shaqadud assemblage can be summarized as follows. First, while elsewhere in Sudan, a greater date range spanning both prehistoric and historical periods has been proposed for depictions of giraffes (e.g., Kleinitz, 2007, 2012), no traits are present at the Shaqadud site complex that would suggest historical dating of the local figurative rock art. The thematic, technological, and formal aspects of the local assemblage indicate a chronological integrity of the Shaqadud giraffe depictions and a coherent thematic and technological mindset of its creators. The archaeological context sets the local figurative rock art somewhere between the beginning of the Holocene and the Late Neolithic, in absolute dates between the ninth and the third millennia BC. The spatial and possible visual connection between the Giraffes' Rock, which contains 91.7% of all identifiable motifs in the area, and the partly excavated settlement site S21 allows putting forward a working hypothesis that the figurative rock art at Shaqadud dates to the Khartoum Mesolithic, specifically to the later seventh millennium BC. If confirmed, such an early dating would constitute a new impetus and reference point for rock art research elsewhere in the Eastern Sahel and generally in northeastern Africa, where petroglyphs of wild fauna with a predominance of the giraffes have been attributed to pastro-foraging communities of the mid-Holocene Neolithic (e.g., Polkowski, 2018b; Riemer, 2006).

Second, among the broad spectrum of archaeological sources that are used for reconstructions of human history in any region, rock art constitutes a direct testimony left behind by people of themselves and their lived and thought worlds as they experienced them and conceived them (Chippindale & Nash, 2004, p. 1). Until now, such testimony has been lacking for the area of Shaqadud, where only small numbers of ostrich eggshell beads (Masucci, 1991) had the potential to inform us of the expression of social identity and interactions among the prehistoric inhabitants of the region. In that respect, the newly found figurative rock art at Shaqadud and its preoccupation with the giraffe, seen not as a mere hunted game, provides an important insight into the lives and worlds of the people who occupied this part of the northern African savanna in a distant past.

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Data Availability The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Conflicts of Interests/Competing Interests There are no conflicts of interests or competing interests.

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