KITES IN CONTEXT

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The Kites in Context project explores the relationship of Neolithic hunting and herding networks in the Black Desert of eastern Jordan. Our goal is to map the kites and their associated features with high precision and investigate kites and other structures through excavation, dating, and surface survey. We are specifically interested in (1) examining the collapse of the Pre-Pottery Neolithic B period in relation to the appearance of extensive networks of hunting traps (desert kites) for gazelle, (2) investigating the impact of the 8.2 kiloyear climate event on the study area, and (3) exploring potential links of the local Neolithic hunting and herding networks with regions farther away (e.g., Upper Mesopotamia, the Arabian Peninsula, and the western Levant/Palestine).

In early April 2025, we conducted a brief reconnaissance in an area known as Bakhita (fig. 1, 32°10′15.56″N, 37°54′51.86″E) to determine whether we could access the area and, if so, begin recording the area using drones. During this initial, successful reconnaissance visit, we examined structures for potential excavation and selected a large, undisturbed structure with very large basalt slabs, which we denoted as Building 1 (B-1).

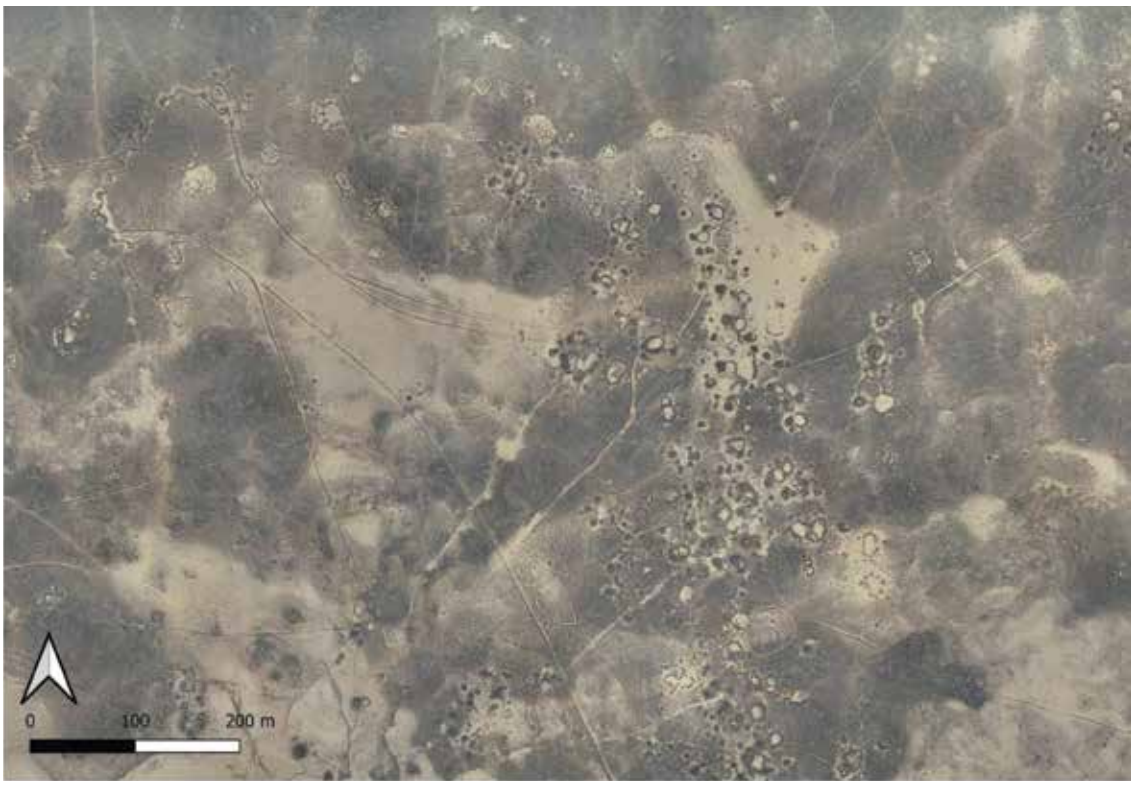

Figure 1. Orthophoto of the central area of Bakhita, with a desert kite in the upper left part of the image.

Our third season of the Kites in Context project, which took place from May 16 to June 19, 2025, had two primary field goals. One major focus was mapping by means of drones (Phantom 4 RTK and DJI Mini Pro) in a wider area to build a database of 3D models, digital elevation data, and orthoimagery of sites and features in selected areas of the Black Desert to provide a contextual comparison with the extensive network of animal traps. The large volume of high-resolution data produced enables us to investigate the ways in which kites were constructed and functioned relative to local topography, wadi channels, and other geographic or human features. The second major goal of our season focused on survey and excavation, with a particular concentration on the kites and local Neolithic structures.

EXCAVATION OF BUILDING 1

Building 1 was selected for investigation for several reasons. First, it was large, with a thick layer of collapsed basalt stones covering the structure. This collapsed layer aids in the preservation of ancient features, sediment, and artifacts. Second, we could see two roughly circular features below the layer of collapsed stone that hinted at B-1's architectural integrity. Third, a feature attached to the northeastern side of the building seemed similar to one previously identified at Wisad Pools. And finally, the structure was within walking distance; the closest we could establish camp was 2 km away—a walk we made four times each day.

After taking overhead photography of the structures, we conducted a thorough surface collection of all material culture within 2 m around the building. We then removed loose stones and loose, windblown fill. It quickly became apparent that there was a second, smaller cell on the western side of the building. Over the course of the season, we exposed a more clearly constructed and articulated exterior wall than those found at buildings previously excavated. In places, this exterior wall still stood two or three courses high.

To the northeast of the main structure, an oval stone feature 3 m in diameter appeared to be attached. It was constructed of medium-sized, flat basalt slabs, with a perimeter defined by slightly larger slabs, and many fist-sized cobbles seemed to be placed (or tossed) atop the slabs as part of the construction. We termed this feature a "platform," comparable to one excavated at Wisad Pools (W66).

The upper construction of the western cell of B-1 was separated from the main cell by a massive, long slab clearly separating the circular wall construction of the main and western cells (fig. 2). A well-defined northeastern entryway to the main cell from the exterior of the building consisted of flat, upright slab stones along the northern wall of the entrance, with the southeastern wall of the entryway formed by the main cell wall (fig. 3). At each end of the entrance were threshold stones, one at the entrance to the interior of the main cell and the other at the outer limit of the threshold under the very edge of a stone that was a part of the eastern platform construction. This entryway was intentionally blocked in a later phase.

Figure 2. Middle-phase interior wall in the main cell, including massive, tumbled wall stone.

Figure 3. Northeastern entryway, rectilinear feature, and southeastern pavers.

Figure 4. Lower hearth in main cell.

A noticeable drop-off in constructed features within the main cell was evident in the earliest phase. However, the southeastern edge of the eastern wall's interior was bordered by very well-fit pavers. To the west of the northern standing stone of the main cell wall was a hard-packed surface, which included a few small, flat stones separating the northern surface from the upper part of a hearth inside the main cell, directly in front of the western threshold.

Below the upper hearth, a continuous, hard-packed surface ran west of the northern upright and the bedrock stone in the center of the main cell's floor. The continuous surface in the western half of the main cell was cut by a hearth containing an enormous amount of charcoal, ash, and a flat layer of small, heat-cracked stones (fig. 4). Below the pavers in the southeastern corner, this surface continued in the corner of the main cell, with similar flat-lying artifacts and sediment. These earliest surfaces in the main cell represent the earliest occupational phase of the structure (fig. 5).

At the threshold of the western cell, small paving stones were found at levels similar to those inside the main cell. Throughout the layer, fragmented pieces of a thin, red-and-white layered material (see Material Culture section below) was found at multiple elevations in the cell, along with a fair amount of charcoal mixed into the sediment.

The early phase in the western cell is represented by two sequential layers: an upper, hard-packed surface confined to the area near the threshold with the main cell, and a lower lens of pure, light-gray ash derived from within a line of stones separating an alcove of the western cell (fig. 6). The limited amount of ash in the alcove feature is evidence of clearing the hearth feature.

Figure 5. Orthophoto of Building 1. Platform (upper right), entrance, main cell, and western cell.

MATERIAL CULTURE

The material culture recovered included chipped-stone debitage and tools (particularly burin spalls and drills), flaked basalt tools, beads and bead blanks, and a few ground-stone items (primarily handstones). Only a few projectile points were recovered from excavations of the building (fig. 7), while a few others were collected from the vicinity; these items were all geolocated. An additional chipped-stone find was probably a projectile point in the process of production.

Bead production was a significant activity here. In addition to 122 beads, at least 62 blanks or "roughouts" were recovered; unmodified material for making beads (carnelian, dabba marble, and red limestone) was also found (fig. 8). This evidence, coupled with the ample presence of burin spalls and drills, indicates that the production of beads was an important undertaking, along with flint-tool production. A few pieces of mother-of-pearl were recovered, including a bead and a pendant (fig. 9). An unusual red, cone-shaped object, probably of ochre, was found directly below some paving stones that were removed (fig. 10).

Figure 6. Hearth and ash in alcove of western cell.

Within the western cell, small patches of very thin, flat, white material were discovered with what may be red paint applied to only one side. Very fragile and much too thin to be plaster, the white flakes appeared to separate from the red-painted side very easily. These small patches were never more than 2–3 cm in size. This material should be analyzed with techniques such as X-ray fluorescence and Raman spectroscopy under high magnification.

GROUND SURVEY

In conjunction with the excavations and drone mapping, we recorded terrestrial-mapping data across the site using the Emlid RTK system. After establishing a base station near B-1 and setting up control points around the building, we built a database of features from the ground that could be quickly coded using the tools available in Emlid Flow, the native app. We recorded more than 4,000 points, resulting in a basic vector-data map of the site that can be further built out via digitization from the orthophoto. The database includes more than 120 buildings, more than 50 corrals, and more than 30 small "circular" features.

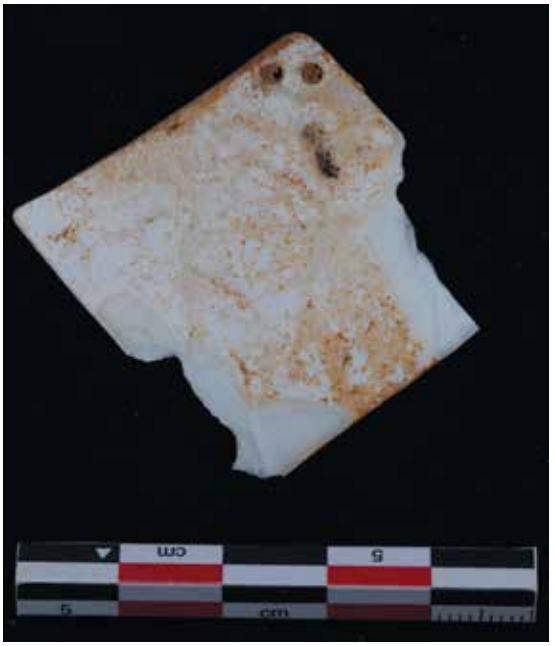

Figure 9. Mother-of-pearl pendant.

Figure 7. Projectile point.

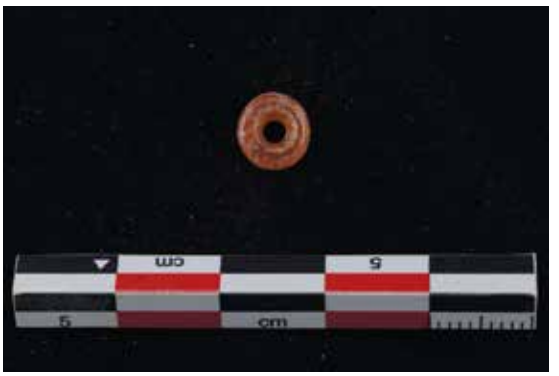

Figure 8. Carnelian(?) bead.

Figure 10. Red, cone-shaped object, probably of ochre, found under paving stones.

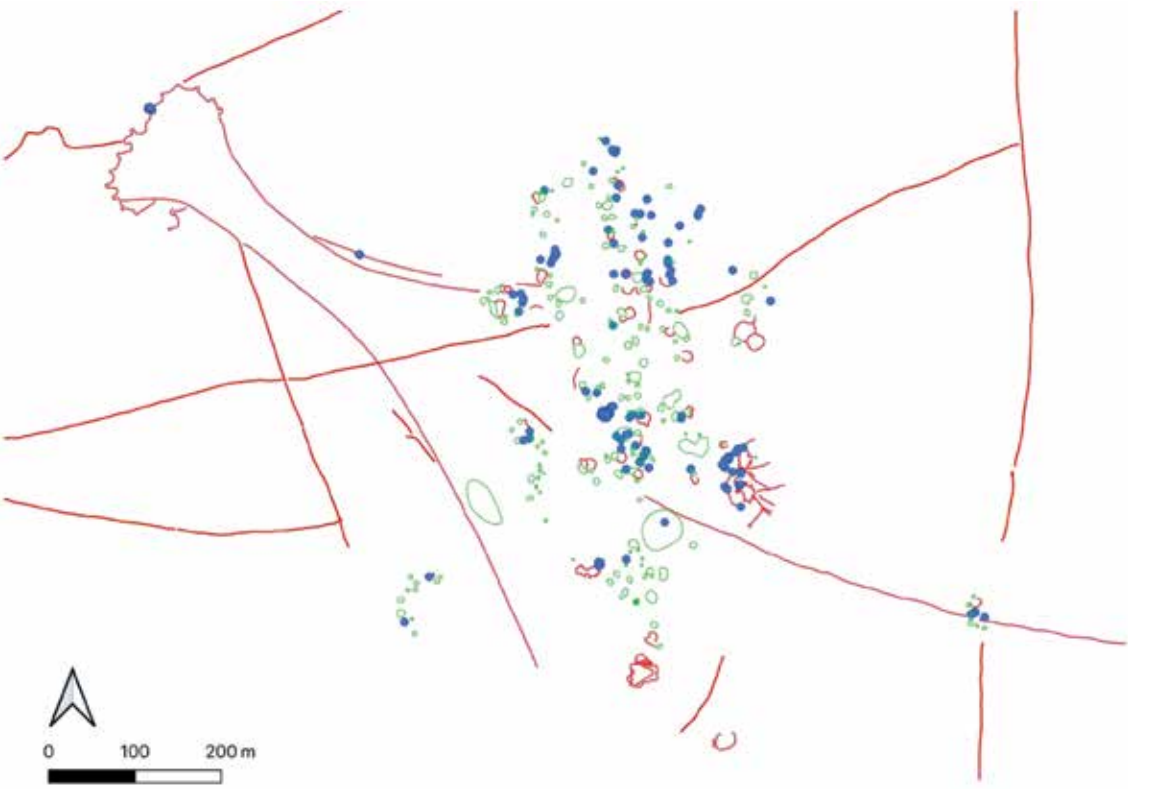

Figure 11. A simple vector map showing the locations of buildings, corrals, pens, cairns, kites, and circular features in the core area of Bakhita.

Figure 12. Oblique photo of a kite in the center of the *harra* between Safawi and Ruwaished.

Figure 13. Oblique photo of a kite near Azraq.

DRONE SURVEY

The 2025 aerial survey builds on the work of our earlier surveys at Wadi al-Qattafi and Wisad Pools as part of the Eastern Badia Archaeological Project and the two previous seasons of the Kites in Context project. Our drone surveys build a database of landscape features associated with kites at a significantly higher resolution than comparable satellite imagery, and they simultaneously record topographic 3D data that are otherwise unavailable. This level of recording is ideal for investigating the smaller Neolithic and prehistoric features dominating the landscape.

In 2025, our primary goal was to document Bakhita and extend the kite mapping around Bakhita and comparable areas in other parts of eastern Jordan (fig. 11). We surveyed an area of approximately 4 km^2 around Bakhita to serve as a comprehensive base map and source of high-resolution mapping data for the site. Second, we mapped approximately fifteen kites in the chain passing through Bakhita, thereby significantly expanding the recording of kite chains on the eastern boundary of the *harra* (rocky basalt). Additionally, our permission to fly in other parts of the Black Desert allowed us to map a broad selection of kites in other areas. They included approximately six kites in the center of the *harra*, accessible along the highway; more than thirty kites clustered together east of Safawi (fig. 12); and seventeen kites on the edge of the Azraq wetlands (fig. 13). Including the preseason survey and the ten days of mapping during the season, we recorded some 18,500 images with the two drones. This massive collection of drone imagery allows robust comparison of kite variability.