Distribution, Sizes, Function and Heritage Importance of the Harrat Al Shaam Desert Kites: The Largest Prehistoric Stoneworks of Mankind?

by

Stephan Kempe¹ & Ahmad Al-Malabeh²

¹Institute of Applied Geosciences, University of Technology Darmstadt, Schnittspahnstr. 9, D-64287 Darmstadt, Germany, Kempe@geo.tu-darmstadt.de
²Hashemite University, Department of Earth and Environmental Sciences, P.O. Box 150459, Zarqa 13115, Jordan, a_malabeh@yahoo.com;

Abstract

The Harrat Al Shaam, the lava deserts of Jordan, features the largest concentration of desert kites so far analyzed (e.g., Kempe & Al-Malabeh, 2010a). Our Google Earth count runs to at least 530 such kites, while aerial photography counts yielded 1155 kites (Kennedy, 2011; Table 1). In Saudi Arabia we have counted 254 more and Kennedy (2011) counted 407 kites in Syria. Few kites occur also in Turkey, on the Sinai and in Usbekistan. This shows that the largest numbers of kites is concentrated in Jordan, forming a significant part of its prehistoric heritage.

Desert kites are km-long stone wall constructions, consisting of two or more widely gaping guiding walls that converge to an opening (gate) behind a small sill. Behind is a walled enclosure. In the early stages, these enclosures were bag-like, later clover-like and in the latest development, they attain a ha-sized, star-shaped shape. At the apexes of the inward curved enclosure walls, so called “blinds” were erected, 3 to 5 m wide stone circles. Some kites have well over a dozen of such circles. These circles were interpreted as “hides” for hunters to shoot gazelle. However, we argue that these were the actual traps. Once the gazelle had jumped into them, they could not jump out again lacking forward speed. More than 95% of the Jordanian kites open SE ward, arranged in eight chains extending N-S throughout the Harrat, thus effectively intercepting animal migration towards Syria and the Mediterranean Coast. In all probability, they were built in early Neolithic times to intercept gazelle (G. subgutturosa). We present statistical evaluation of two such chains: The Eastern Border Chain and the Usaykim-Safawi Chain. Both chains follow sections of the eastern Harrat border and are thus comparable in situation. Analysis shows that the kites of the Eastern Border Chain are significantly larger than those of the Usaykim-Safawi Chain, both concerning their guiding wall length as well as the sizes of their enclosures. However, the Usaykim-Safawi Chain has more of the older kite types (bag- and clover-shaped) and may therefore have been occupied first. The overall length of walls existing in this chain (including guiding walls, enclosure perimeters and the additional meander walls and meander section walls) amounts to 264 km. This allows estimating that the entire wall length exiting in the Harrat may be as much as 3780 km representing a stone volume half of that of the Cheops pyramid. Thus the Harrat Al-Sham desert kites are a most valuable and yet not well-known part of the heritage of Jordan. Many kites, however, have already been destroyed due to field clearing and bulldozing.

1. Introduction

Desert Kites is a term describing km-long stone wall patterns that occur throughout the Harrat Al-Shaam in Syria, Jordan and Saudi Arabia. A second area, where these structures are prominent is the Harrat Al-Khaybar another lava desert in Central Saudi Arabia. There we counted 207 kites already in an area of ca. 1000 km². Other areas, from which kites are known, are the Negev (Meshel, 2000; Bar-Oz et al., 2009), southern Turkey (Bar-Oz et al., 2011) and Usbekistan (e.g., Betts & Yagodin, 2000). The name “kite” derives from the similarity of the structure with a children’s kite: long walls converge on an enclosure just like tails are attached on the lower side of a flying kite. They were discovered in 1925 by aircraft pilots (Maitland, 1927; Poidebard, 1928). In fact, the Harrat kites are the largest stoneworks of mankind erected up to their time and still among the largest on record, comparable with the Nasca lines in the Andes. An overview of previous publications, almost all of them appeared in Near-East archeological magazines, is given in Kempe & Al-Malabeh (2010a). The terminology describing the kites is not well developed because these structures have not attained wide-spread attention. Figure 1 gives a scheme of features as evident in most of the kites of the final development stage: Pairs or triplets of km-long straight or gently curving guiding walls with a km-wide ga...
Fig. 1: Scheme of the features of a late-generation Harrat desert kite. Note that the lengths of the guiding walls (they may be multiple) are not in proportion to the enclosure. The number of blinds can be larger or smaller and the shape of the enclosure can vary considerably due to terrain constrains. Auxiliary kites have been found on a few kites, they apparently served to trap any part of the herd that escaped the enclosure. Mostly these have only one blind.

From the amount of rocks forming the now crumbled guiding and enclosure walls, one can estimate that the walls were about a meter high. In principle, gazelle should be able to jump them easily. If the trapped herd therefore converged towards an apex of the enclosure wall, the leading animals would have started to jump the wall, finding themselves in the stone ring of the blinds behind. Having lost speed and momentum and being hindered by others following them, some of them would be injured. The hunters would simply need to collect them after the bulk of the herd had escaped from the enclosure. Additionally, the hunters could send dogs into the enclosure through the gate, thus scaring the herd, dispersing them evenly into all of the blinds. The often elongated wings on the ventral side of the enclosure may in fact be useful in case that the herd is scared from the dorsal side of the enclosure, trying to escape backward. Here we find very often the elongated blinds, capable of trapping several dozen gazelles (Fig. 1, 3). That the blinds were not “hides” is also illustrated by blinds that were placed at a steep slope, for example at wadi shoulders, below the accompanying enclosure (such as seen on Kite 22 in the Usaykhim-Safawi Chain). From such a position shooting into the enclosure was impossible. Also, the single-pit traps excavated in the Negev (Bar-Oz et al., 2009), show that the blinds are actually traps. Calculation of energy needed to construct the kites (Kempe & Al-Malabeh, 2010a) shows that they must have been highly profitable in terms of calorific return. After the hunting period, kites were partly destroyed by houses and corrals build by later herders. Among them are “wheel” and “jelly fish” houses and other clearings, illustrating that the era of kite-hunting was largely discontinued.

Fig. 2: Northward view of part of the inward curved enclosure wall and two “blinds” of the isolated kite that is situated on the flat top of the “Kempe” shield volcano. The inset shows a broken club-like amphibolite artifact that was found in the blind where the persons are standing. The stone rings of the blinds appear to have had higher walls outward than inward to the enclosure, facilitating the gazelle to jump into the stone ring but not easily out of it.
Fig. 3: Kite No 18 (32° 5.719'N - 37° 6.525'E) of the Usaykhim Castle - Safawi Chain. The kite has clearly elongated ventral wings with elongated blinds along their apexes. It is well preserved and was built according to a clear design. Later alterations include a wall cutting off the northern wing to create an animal pen. The kite is the second structure at this place, to the north the walls of an earlier, unfinished kite is visible. Building started with the curved enclosure walls and some guiding wall sections. This kite had a straight ventral wall, perpendicular to the gate way. This apparently represents an earlier design that was abandoned and replaced by the design with ventral wings. In the older kite there is also a “circular path” of unknown purpose. Note that NE is up.

2. Methods

So far, kite research had to rely on field investigations, aerial photographs, or topographic maps. Betts (1998, c. fig. 10.10) evaluated the material available at the time, counting some 300 traps in the Jordanian Harrat. Now, GoogleEarth offers a new possibility to search for kites and to statistically evaluate them.

Within the high-resolution strips, most kite walls are visible as dark streaks and can be clearly differentiated from trails, truck ruts and bulldozer tracks. Not all of the Harrat is covered in this mode though, so that a final count of kites cannot be given as yet. So far we identified some 530 kites. Kennedy (2011) reports an even higher number, but it is not yet clear what his count contains, because the pouches of so called “meander walls” could be included in his count. In detail we evaluated a high-resolution strip along the eastern border of the Harrat (Kempe & Al-Malabeh, 2010a,b) first. Now we have additionally evaluated a strip of a similar geological situation, containing the kite chain between the Roman castle of Usaykhim and the southern end of the airport of Safawi. In both areas, the kites mark the eastern border of the Harrat, i.e. the gazelle herds would enter the lava fields after leaving the flat covered Tertiary Hamad plains.

3. Kite Chains

Other than the kites in the Negev and also the kites in the Harrat Al Khaybar, the Jordanian desert kites are not distributed irregularly throughout the Harrat; rarely one encounters a kite that is not accompanied by adjacent neighbors. Some of those kites that are not part of a chain occupy specific positions. There is, for example, a small kite near the Roman castle of Burqu (32° 36.106'N 37° 57.383'E) because it (and the castle) was constructed on a small outlier of the basaltic Harrat. Also the kite on the Kempe-shield volcano is not part of a chain, because the terrain was so inviting, that a kite had to be built on the playa that occupies the flat volcano top (32° 17.299'N 37° 34.957'E). The majority of kites, however, appear to be members of chains (Fig. 4), these are directed N-S or NE-SW. Google Earth does not provide for high resolution Images for much of the Harrat. In some parts, only the most prominent star-shaped kites are therefore visible.

Furthermore, lichens cover the basalt blocks increasingly towards the west, thereby decreasing the contrast between rocks and the underlying loess, which makes it more and more difficult to follow the walls of the kites in the western portion of the Harrat than in eastern sections. In addition, bulldozing has destroyed a substantial part of the original surface, a process decreasing eastward. From west to east, there are three groups of chains, one in the west with at least three chains, one in the center of the Harrat with another set of three chains and one in the east with two chains. Kites occur also further south into Saudi Arabia and further north into Syria but they are not dealt with here.

1. The first chain is only 9 km long and has seven kites. Its southern end begins 14 km NW of Azraq (not shown on Fig. 4) (W-Azraq Chain).

2. The next chain consists of about 220 kites (light blue pins) that form several separate branches. It extends from Azraq all the way to the Syrian border north of Jawa (Azraq-Jawa Chain) extending for 66 km. It is the densest chain of the Harrat. Alone around Azraq it forms a crescent composed of 35 kites illustrating the former importance of the oasis for the Neolithic hunters. South of Azraq, on an isolated lava knoll there are remains of four smaller kites as well. From Azraq a chain of 33 kites leads northward, where several parallel branches with rest of the kites reach past the Bronze Age city of Jawa into Syria.
3. The next chain extends from the Roman castle of Usaykhim to the southern end of the airfield at Safawi (dark blue pins) (Usaykhim-Safawi Chain). It is 31 km long, running NE-SW following the eastern border of the Harrat. It has some 50 kites of various ages and will be discussed below in more detail.

4. The next chain partly follows the eastern border of the Al-Fahda Flow field, the youngest lava field in Jordan (Al-Fahda Chain). It is 68 km long striking NNE-SSW and contains probably more than 90 kites. It extends from the southern border of the Harrat to the Syrian border (green, blue and red pins).

5. The next chain, striking NE-SW, is probably at least 91 km long (red pins), containing at least 55 kites and runs from the Quaa Mejalla at the southern border of the Harrat to the Hasad Volcano and beyond (Mejalla-Hasad Chain).

6. Due to the low resolution of the GoogleEarth images in this area this chain is only poorly visible, it is at least 21 km long containing less than 20 kites so far (magenta pins) (Eastern Central Chain).

7. After a 23 to 37 km wide gap, the next chain (yellow pins, white pins) extends for over 81 km N-S (Interior Eastern Chain). It begins at the Saudi Border and has at least 49 kites ending at the eastern border of the Harrat north of National Road 10. In the lower section a small separate chain of three kites is situated between this chain and the next one.

8. The eastern-most chain (yellow pins) follows the eastern border of the Harrat N-S for 54 km, 12 to 14 km from the Interior Eastern Chain and has 38 kites (Kempe & Al-Malabeh, 2010a,b) (Eastern Border Chain). It extends into Saudi Arabia (green pins) were it splits into two parallel chains containing an additional 10 and 4 kites.

An interesting discovery is the fact, that the chains themselves are connected by extra-long guiding walls. The first of these walls discovered was a 10 km long wall that runs in between the Kite 40 of the Eastern Border Chain and the second most southern kite of the Eastern Interior Chain (from 31° 47.944'N/37° 54.269'E to 31° 48.288'N/38° 0.420'E). Likewise walls close the 3.5 km-wide gap.
between Kite 16 of the Usaykhim-Safawi Chain with a complex kite of the Al-Fahda Chain (32° 6.090'N/37° 8.056'E to 32° 5.370'N 37°/10.142'E; Fig. 5). Similarly the 8.5 km distance between a kite in the Azraq-Jawa Chain (32° 2.856'N/36° 56.479'E) and Kite 42 (31° 59.849'N/37° 0.556'E) of the Usaykhim-Safawi Chain is almost entirely closed by walls (Fig. 6).

4. Eastern Border Chain

Within the high resolution strip along the eastern border of the Harrat we recorded and evaluated statistically 44 kites, many more than previously known there (Kempe & Al-Malabeh, 2010a, b). Of these 33 star-shaped kites belong to the N-S oriented Eastern Border Chain. Their average distance amounts to 1.62±0.94 km, covering 42 km N-S (not including the kites in Saudi Arabia).

Northern, central and southern guiding walls average 1.81±1.29 km (N=33), 0.87±1.06 (N=23) and 1.95±1.35 km (N=33), respectively. The enclosures, all situated behind a low sill to hide them from view of approaching gazelle, are star-shaped and 1.82 ± 0.89 ha (from 4.27 to 0.23 ha) in size with circumferences of 633 ± 193 m (1056 to 228 m). Enclosures have up to 14 “blinds”. The total length of all walls amounts to >150 km. Analysis of overlapping walls allows deducing a structural stratigraphy of trap construction in the area, beginning with meander walls, proceeded with bag-like traps and culminated with construction of the kite chain. Later some kites were decommissioned by extension of guiding walls of adjacent kites. This process was repeated twice and only 19 kites remained functioning from the original 36.

Fig. 6: Google Earth picture showing the 8.5 km long connective wall between two kite chains, the Azraq-Jawa Chain (kite at 31°59.849'N/37°0.556'E) in the west and the Usaykhim-Safawi Chain (Kite 42; 32°2.856'N/36°56.479'E).

Fig. 7: Overview of the locations of kites (blue pins) of the Usaykhim-Safawi Kite Chain on GoogleEarth. Note the airfield of Safawi to the right and its destruction of prehistoric sites in between Kite 4 and 5. The red line marks the eastern border of the Harrat with the Harrat to the right and the Hammad to the left. Yellow lines mark the National Highways 10 and 5. Blue line marks the trace of the former Trans-Arabian Pipeline. Note that north is to the right.
5. Usaykhim-Safawi Chain

Here we present for the first time the statistical evaluation of another kite chain that runs from north of the airfield of Safawi (Kite 1: 32° 10.789'N/ 37° 9.316'E) to Kite 51 (31° 57.434'N/ 36° 57.152'E), located 1.2 km north of the Roman Limes Arabica Castellum of Usaykhim (Fig. 7 to 9). In this chain 37 star-shape kites occur. 30 of these form the “front” line (1, 2, 3, 4, 5, 6, 7, 10, 13, 14, 15, 16, 17, 18, 20, 21, 23, 24, 27, 32, 37, 40, 42, 43, 45, 46, 48, 49, 50, 51) with an added distance of 40.5 km and an average distance of 1.40 ± 0.66 km between kites (min: 0.38, max: 3.0 km). Thus this chain is shorter and the kites are overall more densely spaced than in the Eastern Border Chain.

The overall lengths for guiding walls (marked in white in Figs. 7 and 8) are: North walls (N=36; no 5 partly destroyed by Safawi runway) 1020±843m (20 to 4050 m); central walls (N=26; kites 1,8,9,10,11,15,22,32,50,51 do not have central walls and no 5 is destroyed by the Safawi runway) 1038±855 m (75 to 3300 m), and south walls (N=36; in Kite 51 the southern wall is not visible) 892± 630 m (20 to 2840 m). North and south walls are therefore very much shorter than those of the Eastern Border Chain, while the central wall is longer and comparable to the length of the other walls. When calculating the total wall length we obtain (N=37) 3755±3208 m (40 to 10799 m) summing up to 125.7 km. The average gape width becomes (N=28) 1226±824 m (300 to 3800 m) and the gate width (N=27) amounts to 16.8±5.9 m (7 to 37 m). The enclosure sizes (N=27) become 0.865±0.426 ha (0.147 to 1.63 ha) and the perimeter (N=27) becomes 442±143m (153 to 652 m). Thus the front line kites are somewhat larger than the kites not in front. The direction of the openings become (N=30) 106°±26°N (10° to 150°N), because the WWN-opening Kite 8 (which actually is only a small auxiliary kite to Kite 7) is influencing the mean of the measurement strongly.

The kite chain features not only the star-shaped kites, but a series of other, apparently older kite structures. These can be classified as bag-shaped (nos. 25a, 39, 40a, 43a, 47), clover-shaped (nos. 24b, 26, 28, 29, 31, 33, 34, 36, 38, 44, 52), or odd-shaped (nos. 25, 30). These represent 16.9, 3.57 and 1.82 km of walls, respectively. None of these have blinds. In addition, their guiding walls are much shorter and their gate width much smaller than the star-shaped kites. However, they have relatively wide gate ways. All these kites are older than the star-shaped kite generation; in places, the older walls were deliberately opened to allow the animals to pass through. Moreover, the chain also contains other wall types, best described...

![Fig. 8: Overview of the kite walls (guiding walls, white; meander walls yellow; older structure in blue and pink) of the Usaykhim-Safawi Kite Chain on GoogleEarth. Explanation as in Fig. 7.](image-url)
as meander walls and meander cut-off walls. These amount to 75.5 and 3.9 km of walls, respectively, as compared with the 162.3 km of guiding walls of all types of kites. In addition, the perimeters of the kite enclosures sum up to 22.3 km of walls. This amounts to a total sum of 264 km of walls in the Usaykhim-Safawi Chain.

A riddle is still the purpose of the large number and length of “meander walls” (marked in yellow in Figs. 8 and 9). In the analysis of the Eastern Border Chain (Kempe & Al-Malabeh, 2010a, b) we suggested that they were older than the kites because they were transected by the kite guiding walls (Fig. 10 upper center). The meander walls appear in part to be distributed along the wadis and seem to have had the function to block easy exits out of the wadis (Fig. 10).

![Fig. 9: Detailed view of all walls and features of the Usaykhim-Safawi Kite Chain. Guiding walls are marked in white, meander walls in yellow and walls of older kites in blue, pink and green. The figure gives also situation of a number of other archeological features: CP = circular paths, WH = wheel houses, JH jelly fish houses.](image)
Fig. 10: Google Earth picture of a section of the Eastern Border Chain (yellow pin= Kite 21) showing the transgression of a kite wall across a meander wall and the placement of meander walls along easy excess out of the wadi. The black line marks a fault that gave rise to the wadi course.

Fig. 11: Google Earth picture of a section of the Usaykhim-Safawi Kite Chain in the area of Kite 17 and 18 displaying various meander walls. Some appear to be older trap-like structures (center left), and others seem to connect the ends of guiding walls (upper right). Still others cut across the gape of the guiding walls (lower right) but close-up inspection on Google Earth suggest that they are older than the kite walls cutting them.

Typically, they have an open rectangular shape with the long side meandering back and forth. Possibly these “pouches” served to concentrate gazelle and forced them to jump the walls at a number of distinct places, causing their injury.

In case of the Usaykhim-Safawi chain, meander walls seem to display a different pattern. In the N (Fig. 9) there is a long section of wall following a playa border. Towards the south some of the walls seem to connect guiding walls of adjacent kites and therefore could be contemporary with the kites. However, there appear to be also older sections that display the rectangular pattern with wavy walls at their long sides (Fig. 11). Many of these meanders were later cut-off by straight walls, possibly in a trial to elongate guiding walls of the later kites.

6. Other Features

The most enigmatic structures found throughout the Harrat are “circular paths”, alone 100 were found within the Eastern Boundary Chain, on average 43.3±17.7 m long and 31.7±13.7 m wide (N=103). Many were also located in the Usaykhim-Safawi Chain area (Fig. 9, marked “CP”). A particular clear one is found within the unfinished Kite 18a (Fig. 3). The paths seem to be very old features, since they are crossed by guiding walls in a few places. These circular, oval or dumbbell shaped courses are 1 to 1.5 m wide that double back on themselves. Nothing is found inside and the inner area is not cleared from stones. One can only speculate about their purposes.
Other features are the well-structured “wheel houses” (stone circles with radial walls like “spokes” inside), some accompanied by a ring of stone circles not unlike the blinds. That these “house” (more likely “kraals” of early herders) postdate the kites is clearly show by many of these that are built across guiding walls, or within the runways of the kites or inside the former enclosure. A good example is Kite 15 (Fig. 12) where the enclosure itself was transformed into a wheelhouse, thereby showing that the kite was of no service anymore. Less well structured “houses” are the “jelly fish houses” and other later structures.

All these structures form a rich heritage, unique worldwide, that is not only a challenge for further ground-based archaeological study but also urgently needs protection against further bulldozing and the spread of “civilization” into this area.

7. Conclusions

Our kite chain data show that the kites of the Usaykhim-Safawi Chain are significantly smaller on average and more closely spaced compared to the Eastern Border Chain. This may have to do with the fact that the herds, once they reached the west of the Harrat had already been diminished considerably by the more eastern kites and therefore smaller structures would suffice. Other interpretations are possible also, for example that the kites in the western chain are be older than those in the east. This conclusion could be substantiated by the fact that the western chain has many more older kites types (bag-, clover-, odd-shaped) than the eastern one that has actually only two (nos. 37, 42) kites that are different and smaller. Therefore, the eastern kites could have been planned on a larger scale, using the experience of the western chain that has seen more trial and error evolution.

In case of the Usaykhim-Safawi Chain for the first time, we have measured the total amount of walls present. This sum is 264 km of walls. Considering that the chain contains about 37 kites of star-shaped design and that most of the kites identified on GoogleEarth are star-shaped, then 530* 264/37 = 3780 km of walls could exist on the Jordanian Harrat. If the walls are 1 m high, 0.5 m wide, and having a porosity of 0.3, then the amount of stones moved is 3780000*1*0.5*0.7 = 1.32 10^6 m^3 of stones. This is half of the volume of the Cheops pyramid of 2.58 10^6 m^3 (Lehner, 1997). Thus the kites of the Harrat that, according to archeological evidence (reviewed in Kempe & Al-Malabeh, 2010a), date to the pre-pottery Neolithic, form the largest body of stone works of mankind up to that time. It is more than worth preserving and a yet hidden treasure of Jordan.

References:


