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SUBSISTENCE OF EARLY PASTORAL NOMADISM IN THE SOUTHERN LEVANT: NEW DATA FROM EASTERN BAYIR [1]

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Résumé – À partir du Néolithique récent-début du Chalcolithique, le pastoralisme nomade spécialisé s'est imposé comme le mode de subsistence privilégié dans les régions désertiques du Levant Sud, bien qu'il semble peu représenté dans le nord-est de la Jordanie et le sud-est de la Syrie. Une des raisons permettant d'expliquer ces disparités tient à la nature des territoires concernés. Les périphéries désertiques du centre-est et du sud-est jordanien constituent en effet un environnement favorable au développement du mode de subsistance pastoral. La demande accrue pour les matières premières et les biens produits dans le désert, en particulier les racloirs tabulaires, a participé au développement de ces régions. La fabrication des racloirs tabulaires s'est intégrée dans un réseau d'échanges et dans les itinéraires de transhumance saisonniers couvrant le sud du Levant et le nord de l'Arabie. Les nouvelles recherches entreprises dans la région orientale du Wadi Bayir, aussi désignée sous le nom de Ardh as-Suwwan (le territoire du silex), ont permis de démontrer, grâce aux datations radiocarbone, une augmentation significative du nombre d'établissements de pasteurs nomades au cours du Néolithique récent/début du Chalcolithique. L'étude de cette ccupation pastorale nomade soulève la question de l'interaction avec les populations des régions voisines et en particulier avec les sociétés agricoles pratiquant d'autres formes d'élevage à proximité des agglomérations sédentaires. Un nomadisme pastoral enclavé est aussi possible dans les zones proches des villages agricoles, mais très peu de villages ont été trouvés dans le Levant Sud.

Mots-clés – Secteur occidental de Bayir, Chalcolithique, racloirs tabulaires, pastoralisme nomade.

Abstract – By the Late Neolithic-Early Chalcolithic period, specialized pastoral-nomadism became the dominant way of life in the desert regions of the southern Levant, but it was almost absent from north-eastern Jordan and south-eastern Syria. This shift from the north-eastern steppe to the central-eastern and south-eastern steppe/desert may be because the marginal landscapes of Jordan were more suitable for a predominantly pastoral lifestyle, and that the increasing demand for raw materials and goods produced in the desert, particularly tabular scarpers, made exploiting these areas viable. The production of tabular scrapers became an integral part of pastoral nomads' trade networks and seasonal movements between different regions in the southern Levant and northern Arabia. New investigations in the eastern Bayir region, also called Ardh-as-Suwwan (land of the flint), has proved, through carbon dating, that there are an increasing number of Late Neolithic-Early Chalcolithic sites in this area which were occupied by pastoral nomads. Studying the pastoral nomads raises the question of what kind of relationships they had with other regions, particularly with farmers who were also practicing herding near their villages. Dependant pastoral nomadism is also possible in the areas close to the farming villages, but very few villages sites were found in the southern Levant.

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Key-Words – Eastern Bayir, Chalcolithic, Tabular Scrapers, Pastoral Nomadism.

ملخّص – اصبحت البداوة الخالصة منذ نهاية العصر الحجري الحديث وبداية العصر الحجري النحاسي هي النمط السائد في منطقة جنوب شرق بلاد الشام بينما لم يعثر على أدلة على وجود هذا النمط في المنطقة الشمالية الشرقية من الأردن وجنوب شرق سوريا. هذا التحول من المنطقة الشمالية الشرقية الى المنطقة الوسطى والجنوبية الشرقية ربما يعود الى الاختلاف البيئي بين المنطقتين حيث تعتبر المنطقة الجنوبية اكثر ملائمة لهذا النمط المعيشي وكذلك توفر المواد الخام لصناعة السلع المهمة في منطقة البادية خاصة المكاشط المسطحة. ويبدوا أن تصنيع المكشاط المسطحة قد لعب دورا كبيراً في حياة البدو وكذلك طرق التجارة والتنقل الموسمي بين المناطق المختلفة في جنوب بلاد الشام وشمال الجزيرة العربية. وتشير نتائج تحليل الكربون المشع من منطقة باير (ارض الصوان) الى الإستيطان البدوي منذ الفترة المتأخرة من العصر الحجري الحديث وبداية العصر الحجري النحاسي. وتثير دراسة البداوة خلال هذا الفترة السؤال عن طبيعة العلاقة بين البدو الرحل وسكان المناطق الأخرى خاصة الفلاحين الذين مارسوا الرعي ايضا بالقرب من قراهم. ومن المحتمل أنه كان هناك تخييم للبدو الرحل بالقرب من قرى الفلاحين الزراعية, لكن عدد هذه القرى قليل جدا في منطقة جنوب بلاد الشام.

كلمات محورية – شرق باير, العصر الحجري النحاسي, مكاشط مسطحة, رعي بدوي.

Development of Pastoral Nomadism

The most recent researches suggest that pastoral nomadism started in the steppe region either in the Late Neolithic period or in the Early Chalcolithic period and was a herding-hunting economy [3]. The debate over the origins of nomadic pastoralism raised different issues such as the first appearance of pure pastoral nomadism, the role of the fertile land occupants in the development of specialized pastoralism and the relations between farmers and pastoralists, the question of long distance migration, exploitation of secondary products from animals, as well as the role of climate and environment in the development of pastoral nomadism. Some researchers favour the idea that farming land people provided the main impact for the creation of specialised nomadic pastoralism. This idea of the negative effect of animals on farming land was introduced by Rollefson and Köhler-Rollefson [4] in regard to the site of ‘Ain Ghazal. Köhler-Rollefson [5] suggested also in her model that animals were taken away from the farming land such as ‘Ain Ghazal into the desert sites since the late Neolithic period. The idea was backed to some extent by Levy’s [6] suggestion that the use of the agricultural land and the increased population in the northern Negev forced herders to keep sheep and goats away from the villages, thus creating the herding stations at Nahal Sekher and the surrounding wadis. Gilead [7] goes further in denying the existence of independent ”pure” pastoral nomads or semi-nomads in the northern Negev. He came to the same conclusion about the herding stations in the northern Negev, relating them again to the village sites.

The previous suggestions however, seem to focus on specific areas and aspects in their interpretations while disregarding other important factors. A different model has been introduced by a number of scholars [8]. They suggested that changes in economic strategies led to the introduction of domestic herds in combination with traditional hunting practices. This model of adaptation to the desert resources was paralleled by increased development in the agricultural villages. The survival of the desert Late Neolithic hunters-herders does not necessarily mean that they were dependant on the agricultural villages [9], but archaeological evidence from lithic assemblages and traded items indicates a degree of contact.

3. Kupper 1957; Brentjes 1968; Khazanov 1984; Martin 1999; Rosen 2002a; Betts 2007.
4. Köhler-Rollefson 1992; Rollefson & Köhler-Rollefson 1993.
5. Köhler-Rollefson 1992, p. 15.
6. Levy 1983.
7. Gilead 1992, p. 35.
8. Baird *et al*. 1992; Martin 1999; Rosen 2002a; Betts 2007.
9. Betts 2007.

It is now agreed to some extent that the emergence of specialised pastoral nomadism started in the Late Neolithic period and developed through the Chalcolithic period. Extensive surveys and excavations in north eastern Jordan have clarified the picture of the prehistoric occupation patterns there [10]. This development was mostly in the periods preceding the Chalcolithic period, particularly the Neolithic period. However, there were no large concentrations of Chalcolithic period pastoral nomad sites in north eastern Jordan [11] (**fig. 1**). The excavated Late Neolithic sites in the southern Levant also support the early emergence of the pastoral way of life from this period as suggested by Levy [12] and Rosen [13]. Rosen [14], suggested that the pre-camel pastoral nomads developed during a long period of time starting from the Late Neolithic through the Chalcolithic period and this is also backed by Betts [15].

The specialized pastoral nomads of the Chalcolithic period occupied different regions which enjoyed a diversity of resources and environment during the year. Some regions were chosen carefully for pastoral camps during the heat of summer and others to protect against the freezing winter of the desert. The southern part of Jordan was one of the significant areas for the pastoral nomads, not only during the Early Chalcolithic period, but also during some parts of the following periods. The region consists of a rounded belt of mountains and a high altitude region surrounding the al-Jafr depression. These mountain ranges include the al-'Adhriyat Mountains in the north and the Ras an-Naqab heights in the south. These higher altitude regions were occupied during the peak of summer. In the winter season the lower region of Bayir to the north of the al-'Adhriyat Mountains and the Hisma region to the south of Ras an-Naqab in the south were occupied by specialised pastoral nomads. The interpretation of seasonal movement for the eastern Bayir region is supported by the location of sites in relation to rock face. Most of the Qe'an as-Siq sites in eastern Bayir region were located on the prevailing western side of the hill or terrace edges and face the western wind, which indicates that these sites were used in the summer season. In the summer the western breeze was desired to cool down the heat of the desert. Structures or tents should be placed in an open area facing the west. The other sites at Rijlat Salim and Fak Abu Ţaur were located in areas sheltered from the western wind and lie to the east of the terraces, which indicates a winter season of occupation. This model is similar to the Bedouin camps around Beidha where camps were built in an area open for the western wind in summer and sheltered from the west in winter [16].

This pattern of seasonal movement in southern Jordan could not be successful without the availability of pasture and water. These two main resources were available in the wadi systems in both regions and can be seen clearly in the eastern Bayir wadi systems. Most of the wadis in this region run from the edge of al-'Adhriyat Mountains in the south towards the as-Sirhan depression in the north (**fig. 1**). These wadis drain the rainfall in the southern mountainous area towards wadi as-Sirhan, which supports the vegetation cover within their courses and also creates water pools, 'Ghudran', that hold water for a long period of time. It is plausible that these wadis, with their diverse environment, which is caused by the rise in altitude from 400 m above sea level in the Wadi as-Sirhan basin to more than 1,000 m above sea level in the mountainous areas, were the reason for the successful pastoral nomadic economy of the Chalcolithic period. Thus specialized pastoral nomads adapted to the harsh desert and survived with their flocks by moving to the uplands in summer and to the lowlands in winter within the wadi system, which offered them pasture and water throughout most of the year. This system can be identified at Wadi Hudruj which measures about 60 km in its course before crossing the Saudi border to drain in Wadi as-Sirhan.

10. Betts 1998, 1989.
11. Betts 1992.
12. Levy 1983.
13. Rosen 1988.
14. Rosen 2002b.
15. Betts 2007.
16. Banning & Köhler-Rollefson 1992, p. 189.

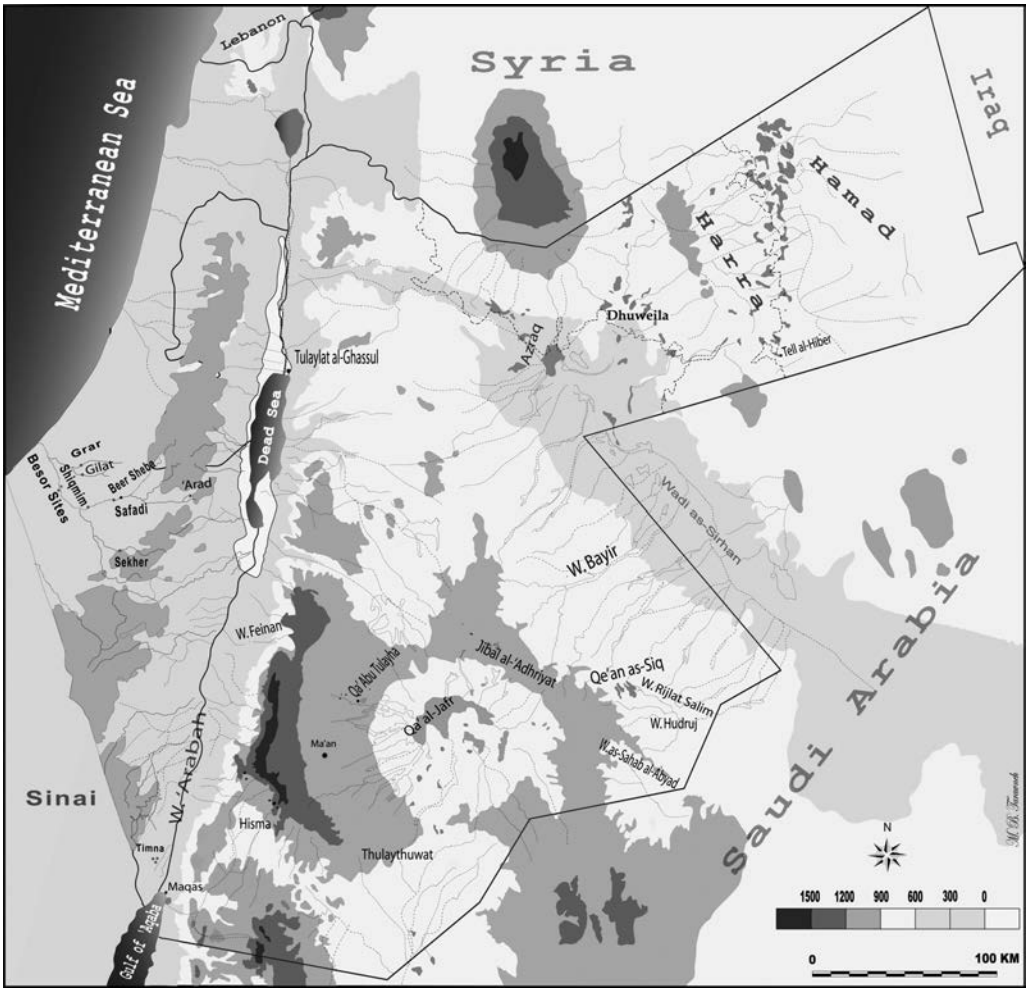

Figure 1. Map of Jordan showing the location of the study area (© M. Tarawneh).

The results of this project near the western part of Wadi Hudruj and the results of Wasse and Rollefson's [17] survey in the eastern part of this wadi confirm its use on a seasonal base. This is also supported by Henry's work in the Ras an-Naqab and Hisma region [18], Jobling's work in the same region [19], and also recently by a limited survey conducted near 'Aqaba [20]. This model is also supported by the location of similar sites in the low altitude region of Wadi as-Sirhan [21]. Other factors also came into place during some stage of the Chalcolithic period at Jibal al-'Adhriyat and Qa' Abu Tulayha west when the pastoral nomads developed other economic resources by exploiting the flint of this region. According to Quintero *et al.* [22] this region was exploited on an industrial scale, with the transportation of large numbers of tabular scrapers to other regions. It is plausible that the pastoral nomads of eastern Bayir who knew Jibal al-'Adhriyat were at least involved in this industry. This is supported by Quintero's suggestion that miners who worked in the flint industry were pastoral people who worked on a seasonal basis. The closest pastoral nomads to this region in date and location are those of the eastern Bayir.

17. Wasse & Rollefson 2005.
18. Henry *et al*. 1981, 1995.
19. Jobling 1981, 1989.
20. Khalil 1987, 2001.
21. Parr *et al*. 1978.
22. Quintero *et al*. 2002, p. 45.

In addition, since grazing was the main aspect of the pastoralist's life it is also possible that in some dry seasons longer term migration took place further east and north to find another region for the short term. This pattern is practiced by the Bedouin who also depend on the wadi courses to find water and pasture. The seasonal movement within the desert wadis was likely the main feature of the specialised pastoral nomads in the southern Levant during the Chalcolithic period but one cannot deny the possibility of long distance migration in some seasons, or at least in some dry years, to gain better resources near the agricultural land, such as in the Negev system. This suggestion is possible in southern Jordan, especially since no large permanent village sites have been found.

The Chalcolithic Period in North-Eastern Jordan

Many Neolithic sites have been found in the Harra and the Hamad regions [23]. Arrowheads are among the most common tools which reflect the nature of the hunting-based economy at these sites. In addition, scrapers of different types were also found in the Late Neolithic assemblages such as tabular scrapers, retouched semi-rounded thermal flakes and flake scrapers [24]. Despite the differences in economic resources between the Late Neolithic period, which was based on combination of hunting and herding, and the Chalcolithic period, which was based mainly on herding and secondary products, it is clear that the specialised pastoral way of life emerged from the Late Neolithic period and developed to a larger scale in the following period [25]. Tabular scrapers and semi-rounded thermal flakes began to replace arrowheads, but hunting did not disappear totally and kept its place as a secondary activity practiced at the right time and place.

Despite the intensive archaeological research conducted in the Harra and the Hamad regions of north-eastern Jordan, only a few sites of the Chalcolithic period were recorded [26]. According to Betts [27], it is likely that many sites were unrecognised because of the lack of any diagnostic material such as pottery and flint. One of the recognized sites is "Maitland's Hillfort" [28] which possibly dates to part of the Chalcolithic period. This site consists of many corrals with some flint scatters where on rare occasions tabular scrapers were found [29].

Tell al-Hibr, another Chalcolithic site, lies in the heart of the north eastern desert. The site lies near the Saudi border, about 10 km to the east of the volcanic massif (Harra). The hill where the site is located provides good shelter and a look out for the surrounding area. The hill slope consists of material from different periods as early as the Middle Palaeolithic and also some inscriptions from the pre-Islamic period and modern time. A rock shelter was discovered with some disturbed burials from different periods. Some late Chalcolithic materials were found within the disturbed layers. Stone pavements were also recovered in the cave. Dating the lower phase in the cave was confirmed to the Late Chalcolithic/Early Bronze Age by many finds including pottery, and faunal remains [30]. According to Betts [31], some stages at this site are comparable to the Chalcolithic station of Nahal Sekher. The Chalcolithic pottery at this site has general parallels across the southern Levant including the Negev region, but the chipped stone tools are unusual and only a few aspects can be attributed to the Late Chalcolithic/Early Bronze Age period, such as the facetted butts of some flakes. The tools at this site consist of transverse arrowheads, burins,

23. Garrard *et al*. 1985; Garrard 1986; Betts 1998b.
24. McCartney & Betts 1998, p. 105.
25. Betts 2007.
26. Betts *et al*. 1991, p. 20.
27. Betts 1986, p. 272.
28. Maitland 1927.
29. Betts 1986.
30. Betts 1992, p. 7.
31. Betts 1992, p. 8.

scrapers, and borers. Tabular scrapers are absent from al-Hibr assemblage [32]. The tool assemblage from al-Hibr is based on a simple flakes technology exploiting the local flint resources in marked contrast to the industries of the [33] Judayid basin in Southern Jordan reported by Henry [34].

Some other sites were discovered in the Ruweishid area, consisting of semi-rounded structures similar to those in southern Jordan dated to the Chalcolithic period. These sites were built in sheltered locations beside a cliff or a terrace edge. They also consist of large semi-circular structures which range in internal diametres from a few metres up to more than 10 m. Small rooms were attached to some of these structures either from the inside or outside which is also typical of those found in southern Jordan as well as in the Negev and the Sinai regions. These small rooms were more likely used for storage purposes because of their small sizes which measure less than 5 m. The sizes of these sites are different from each other and contain a single structure in some cases or many structures separated or connected to each other. These sites show that it is possible that specialized pastoral activity was practiced at these sites at least on a smaller scale than in southern Jordan. This idea can be backed by the lack of chipped stone artefacts which indicate the short term use of these sites and the possibility that the economy was based on grazing and secondary products. However, these sites cannot be attributed confidently to any period because of the lack of diagnostic material. But based on some similarities with the pastoral nomads of the Chalcolithic period in the southern Levant such as their location and the similar structural remains, they might be attributed to the period from the Late Neolithic to the Early Bronze Age. Tabular flint waste and scatters of al-Jafr cores were found at several sites which were recorded during the Hamad survey. These sites are small in size and produced smaller numbers of chipped stone tools than those in southern Jordan [35].

The Eastern Bayir sites

Sites discovered in the eastern Bayir region were distinguished as specialized pastoral nomad sites for many reasons. These sites occur in large numbers within one region which is commonly used for modern nomad camps. The distribution of these sites across different regions but in similar locations indicates the importance of regular movement to areas with better resources. The simplicity and limited size of the larger structural remains at these sites probably indicates that they were used mainly as animal enclosures. Smaller structures found together with these large ones suggest their use for domestic activities and storage. The size of these irregular structures in many cases indicates that they were used for small numbers of people carrying limited equipment with them. Most importantly, these sites consist of shallow occupational deposits, in some cases less than 0.4 m, and do not contain dark layers similar to those found at permanent settlement sites. Chipped stone tools at these sites tend to support their use by pastoral nomads because they consist mainly of scrapers which probably indicate butchering and shearing processes. Finally, this hostile part of the Levant does not support permanent settlement because of its harsh and dry environment which limits its resources and chances of survival for its occupants. The sites in eastern Bayir were dated based on C_{14} results, flint tools, particularly tabular scrapers and retouched thermal flakes of the early Chalcolithic in the southern Levant, and also on architectural similarities with other regions in the southern Levant. The C_{14} dates are in a good sequence starting from the late Neolithic period at F.A.Ţ 2 through the early stages of the Chalcolithic period at other sites in the region. Carbon dates from the sites in eastern Bayir are contemporary to those from the Hisma sites [36], and also to the earliest dates at Qa' Abu Tulayha [37].

32. Betts 1992, p. 16.
33. Betts 1992, p. 15.
34. Henry 1983.
35. Betts 1993.
36. Henry 1995.
37. Fujii 1998, p. 137, 1999b, p. 74.

Bedouin and modern land use

The Bedouins have been living in the desert since pre-Islamic times, making them a useful comparative example for the archaeological evidence from this region in the Chalcolithic period. The choice of camping ground is affected by two main factors, the availability of water and pasture. Overgrazing sometimes forces the Bedouin groups to change their encampments to a new area with better pasture in the same season. Other reasons that occasionally push the Bedouins to change their camping area include social factors such as marriage or war, and natural factors such as drought or flooding. This area also attracted semi-nomadic groups in some seasons who migrated from their villages to the west looking for pasture in the steppe (**fig. 2**). Usually the shepherds started their journey earlier than the rest of the camp.

Some areas in eastern Bayir such as Wadi Rijlat Salim and Wadi Hudruj are more suitable for the Bedouin camps because of their long, wide wadis, and also because of their open landscape. These two wadis enjoy better vegetation in most years because of their east-west course, which gives them a better chance of being fed by rainfall than the western higher altitude areas. Some of the ancient sites suffered some disturbance by modern Bedouins who reused their stones and sometimes searched for hidden treasures.

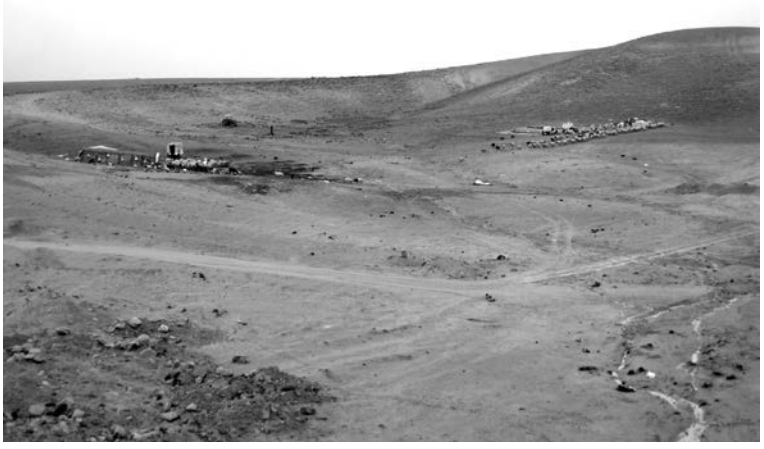

Figure 2. Modern semi-pastoral nomads near Qatrana during winter season (© M. Tarawneh).

Site location

The Eastern Bayir sites recorded in this study are located in similar positions which are in all cases beside a slope or a terrace edge (**fig. 3**). In one case, R.S. 25, the site was located on the higher area of the hill close to its top in the east, but even in this case it was sheltered from the prevailing western wind. It seems that the main reason for choosing this location was to find a more secure place overlooking the wadi and the surrounding area, as well as taking advantage of the available stone slabs on the upper part of the hill. The other sites were located at the wadi edges, beside the terraces in places which offered good shelter from the western and northern winds. The location of sites near the terrace edge is also because of the availability of rocks and stones which were eroded or collapsed from the terrace edges. These stones were used in the building of the structures. The distance between the terrace edges which provided stones and the structures themselves is only a few metres, making the task of building corrals and structures a lot easier. The location of structures close to each other may provide other evidence of the importance of stone resources. This can be seen in the large sites such as Rijlat Salim 1 and Rijlat Salim 2 where many structures are distributed along the terrace.

The locations of the sites in relation to each other, particularly R.S. 1-5, suggests that these sites were probably used together at least in one season. The large size of R.S. 1 and R.S. 2, and the close distance between both of them, would have pushed their occupants to use the same local resources such as water and pasture. This suggests that those two sites were used at the same time and not in two different seasons. Both sites are large in size and in a similar location on the terrace edge and have similar structures. One would assume that if a group of nomads built one site and returned in another season to the same area they would reuse their former structures instead of building new ones. The only exception to this assumption is if this site was being used by another group. This might lead them to build another site in the same vicinity. This is unlikely to be the case for social and grazing reasons. This leaves the possibility that these groups of sites, particularly R.S. 1 and 2, were used by the same group of people. This location at close distance to each other also offers better protection against predators.

No permanent water resources can be seen in this region today and it is more likely that the rainpools or 'Ghudran' were the main watering places. The distance between the sites and the wadis are different from one site to another and depend on the availability of building stones and terrace locations which offer good sheltered areas. In some cases, such as R.S. 28, the site is located only a few metres from the main wadi course, but in other cases the wadi is a few hundred metres from the site. Shelter for the pastoral people was more important than walking hundreds of metres during the day time to graze in the wadi course. In addition, locating the camps near the wadi means carrying stones further and may be dangerous during summer rainfall. The wadis are also the artery of life for small wild animals such

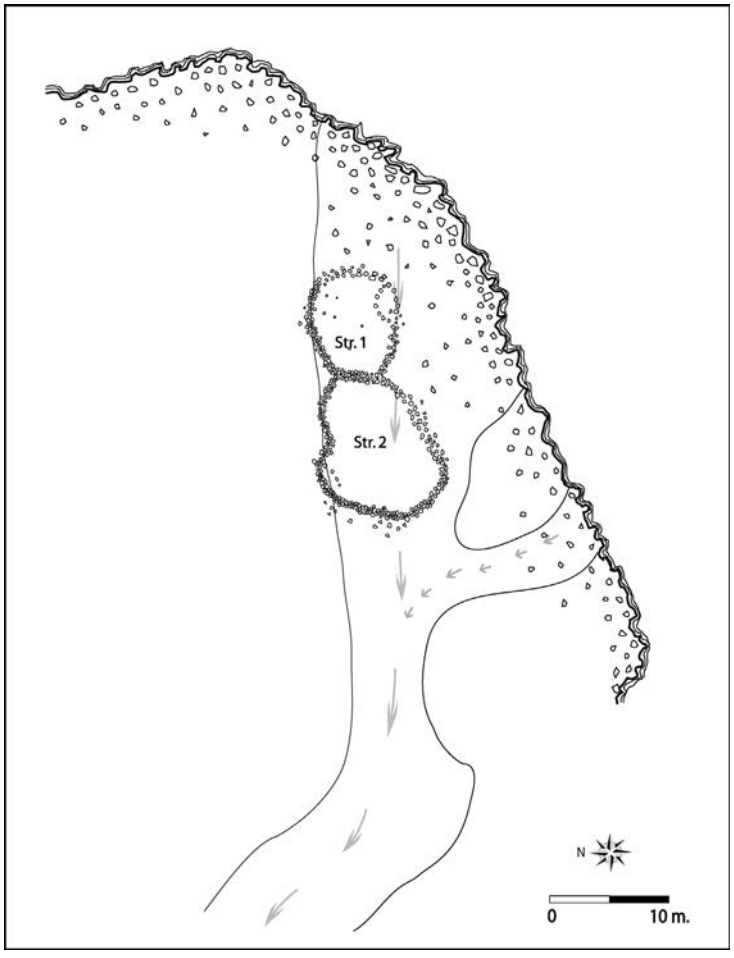

Figure 3. Qe'an as-Siq 10, plan showing distribution of architecture and the terrain setting (© M. Tarawneh).

as hare and jerboa. Particularly at night time, predators hunting these animals would mean unwanted danger for the pastoralists and their flocks.

Most of the sites in the region are located in areas sheltered from the western wind, lying to the east of a terrace or a hill side (**fig. 3**), except in the case of several sites at Qe'an as-Siq and also R.S. 2. In the case of R.S. 2 the unusual location was related to its relationship with R.S. 1 and may reflect the spatial adaptation and cooperation between the pastoralists of these sites. However, at the Qe'an as-Siq sites there are no signs of spatial distribution which could have played a major role in placing some sites like Q.S. 6 in a location facing the western wind. These sites would only have been comfortable in warm seasons when the western wind is not strong, and locating a site in a place facing west was not a problem. This is especially the case at Qe'an as-Siq region where mud flats cover the area and make sites facing west more affected in wet seasons. Looking at this area today, and judging from the site location in the more open area, one may suggest that these sites were used in the warm seasons such as summer and spring when the wind breeze was needed to cool down the extreme heat of the desert. But at the same time these sites are located beside the terrace which gave them the opportunity to stay in a sheltered area and take advantage of the available stones below the terrace edges.

Site locations in the eastern Bayir region are similar to their contemporary sites in other desert region of the southern Levant. The recorded sites from the Chalcolithic period in the Sinai peninsula were built in sheltered areas overlooking wadis which provided them with pastures [38]. These sites consist of single or several large semi-circular structures with smaller rooms attached to them from inside or outside. Structures are also similar to those from eastern Bayir in their sizes which range from a few metres up to more than 40 m in some cases. The larger of these structures were suggested to be animal enclosures and the smaller ones domestic areas, while small rooms which were attached to the main walls were more likely used for storage because of their small size. Internal divisions were also recorded from these sites [39]. Examples of these sites in the Sinai Peninsula include sites around Rahaya such as Sinai 1, 4, 60, 23, Ghoweil locality 14, 16 Tabieq locality including Sinai 32, 37, 38, 39, and Maaleq locality including Sinai 51, 54, 55, 56 and 57 [40], and sites 1180 and 1133 in south central Sinai [41].

Pastoral sites with similar locations in sheltered areas overlooking the wadi beds, and similar structural remains which also consist of large and small semi-circular structures with small rooms attached to them were also found in the Negev [42]. Example of these sites in the Negev are Nahal Sekher 102 and 104 [43], and the Nahal Besor sites [44].

Sites similar to those mentioned earlier were recorded in the Hisma region of southern Jordan. These were also located in sheltered areas and had similar structures, for example al-Jill [45]. Quintero *et al*. [46] recorded similar sites built of semi-circular structures with some upright slabs and some divisions in al-'Adhriyat region. These were located in sheltered areas overlooking the wadis. The authors linked them to the flint mining industry in the same area. Similarly, Qa' Abu Tulayha is also located near the wadi course [47].

In sum, sites in the eastern Bayir region are typical in their locations and types of structures to those found in the surrounding regions which were also interpreted as short term sites used by pastoral nomads during the Chalcolithic period.

38. Rothenberg 1971, p. 13.
39. Eddy & Wendorf 1999, p. 121; Bar-Yosef *et al*. 1986; Beit-Arieh 2003, p. 376.
40. Eddy & Wendorf 1999.
41. Beit-Arieh 2003, p. 376.
42. Rothenberg 1971; Alon & Levy 1980; Gilead 1992, 1979; Levy 1983.
43. Gilead 1992, p. 33.
44. Gophna 1979; Levy 1983.
45. Henry 1995.
46. Quintero *et al*. 2002.
47. Fujii 1998, p. 124.

Site elevations

The elevations of the sites were recorded in metres by using a Garmin GPS. The lowest altitude recorded is 664 m above sea level in the Wadi Abyad sites and the highest is 889 m above sea level at Qe'an as-Siq. These altitudes are less than those recorded at Qa' Abu Tulayha which reaches 980 m above sea level and the Jafr survey sites at Jibal al-'Adhiriyat which range between 900 to 1,000 m above sea level [48]. The southern sites between Ma'an and 'Aqaba range from 800 to 1,500 m above sea level [49]. In addition, the site altitude of the central Sinai survey ranges from 630 to 945 m above sea level. The difference in site altitude between the al-Jafr sites and the eastern Bayir indicates the seasonal movement of the pastoral nomads. This movement was based on grazing and water resources in its earliest stages in the Late Neolithic and/or Early Chalcolithic. Later on, the flint industry became the second main consideration for those pastoralists who were involved in this production and its transportation to other regions. Seasonal activities in al-Jafr region have been also suggested by Quintero *et al.* [50]. They suggested that the flint mines were exploited by pastoralists on a seasonal base because of the hostile environment of the desert and they connect the structures in the region to these pastoralists. Seasonal movements from higher to lower altitudes according to weather and availability of resources were also suggested by Henry [51] in the Hisma basin. Sites in the Hisma are broadly contemporaneous with the eastern Bayir sites.

Sites recorded in Eastern Bayir, as well as near al-Jafr [52], suggests a seasonal movement during the year, and within the wadi systems, from upland regions in the south and south-west to the lowland regions in the north and north-east. This suggestion is backed by the similarity of site locations close to the wadi courses, and also the type of structures as discussed above in both upland and lowland regions. The wadi systems between as-Sirhan depression and al-'Adhriyat mountains covers a vast area, making a suitable environment for pastoralism because of its location in a range from almost sea level at as-Sirhan to more than 1,000 m above sea level at al-'Adhriyat.

Henry's work in the Hisma region of southern Jordan supports this suggestion by arguing that the pastoral nomads who occupied the region during the Chalcolithic period moved their camps between uplands to lowlands on a seasonal basis between summer and winter [53]. In the Negev and Sinai regions the seasonal movements were more likely between north and south as well as east and west, and were mainly based on the rainfall rather than on the elevation and its effect in summer and winter seasons. Rainfall in the Negev region is higher than in the eastern desert of Jordan. It reaches more than 200 mm around Nahal Sekher and Nahal Besor regions in winter and less than 100 mm in the south at Har Karkom, Elat and Timna. This pattern of movement is backed by the locations of the herding stations and the pastoral sites in the Nahal Besor and Nahal Sekher regions as well as in the southern region. Similar systems may have existed in the Sinai region which is surrounded by sea from most sides, with site locations near the coastal area in the north which have 100 mm of rainfall. In addition, the Sinai region contains some high areas which could have supported seasonal movement between Gebel at-Tih and the lower regions near the coastal areas. Eddy and Wendorf [54] also suggest long distance migration to gain pasture and enough waters in the Sinai region.

48. Fujii 1998, p. 123; Quintero *et al.* 2002, p. 20.
49. Henry 1995, p. 356.
50. Quintero *et al.* 2002, p. 46.
51. Henry 1995.
52. Quintero *et al.* 2002, p. 46.
53. Henry 1995.
54. Eddy & Wendorf 1999, p. 130.

Structural remains

Many differences can be seen in the structural remains of the discovered sites. This diversity is the result of adaptation to many aspects such as the desert weather, the number of occupants and their flocks, site function, and site location. This diversity can be seen in many aspects such as the type of structure, function of structure, type of walls, and access to structures.

Structure location

The structures were carefully built, considering many aspects such as protection from the wind, the availability of building materials, the location of the terrace edge from the structures, distance from the wadi, and possibly distance from other encampments in the region which would bring conflict in sharing the water and pasture. Some kind of management was noted in some sites. This can be seen from the top plan of some sites such as Rijlat Salim 1. The structures in the large compound share common walls which were clearly built intentionally in elongated shapes. This elongated shape gave them better opportunities to use the common wall, which could have saved them time and labour and also offered better efficiency for using the available rocks. Open-sided structures were noted at some sites such as Rijlat Salim 1. In this case one side of the structure was left open and without a wall. This open side is the one facing the terrace edge. This action may also present another method of building management which saved labour and building materials. Structures of these types were built in an area facing the steep part of the terrace which could have been used instead of building a wall. The side of the structure is high and rough enough to protect the internal part of the structure, especially an internally installed tent. Such an addition would make the structure look like it has a courtyard. Erosion of the open part which could have caused some damage is possible in some cases, but in some sites there are no indications of erosion or eroded stones on any scale. Quintero *et al*. [55] reported some structures with openings on one side, which is possibly similar to the examples in this study, especially since both structures have many common aspects.

Type of structure

Different types of structures were recorded during this survey including sites with a single structure, sites with compound structures, large and small structures separated and connected together. These structures are mostly circular or oval in shape and rarely have angles and straight walls. The sizes of the structures are also different and range from 5 to 50 m in internal diameter. These differences in structure sizes and numbers indicate the scale of occupation and also the number of flocks kept inside the corral structures. At some sites only a single structure was found (**fig. 4**), of a large or a small size. These may be an indication of small scale or short term occupation, where a small number of animals were kept inside the structure. The structures sometimes have a small installation or internal division. In the large compound sites which consist of small and large structures connected together, there are additional features which were built separate from them. The small features are more likely to have been used by the pastoralists as domestic areas, and also to separate the animals.

In the second type of structure which consists of large structures connected and separated from each other, some type of internal division was noticed (**fig. 5**). This phenomenon was found at some sites such as Rijlat Salim 2, 11, 15, and 17. The division wall is smaller in size and height than the main external wall of the structure. These internal divisions are built of one line of stones, separated from each other in most cases, and consisting of one course of stones. It seems that the locations of these divisions were carefully chosen in order to manage the size of each part. The height and scale of the partition wall are

55. Quintero *et al*. 2002, p. 2.

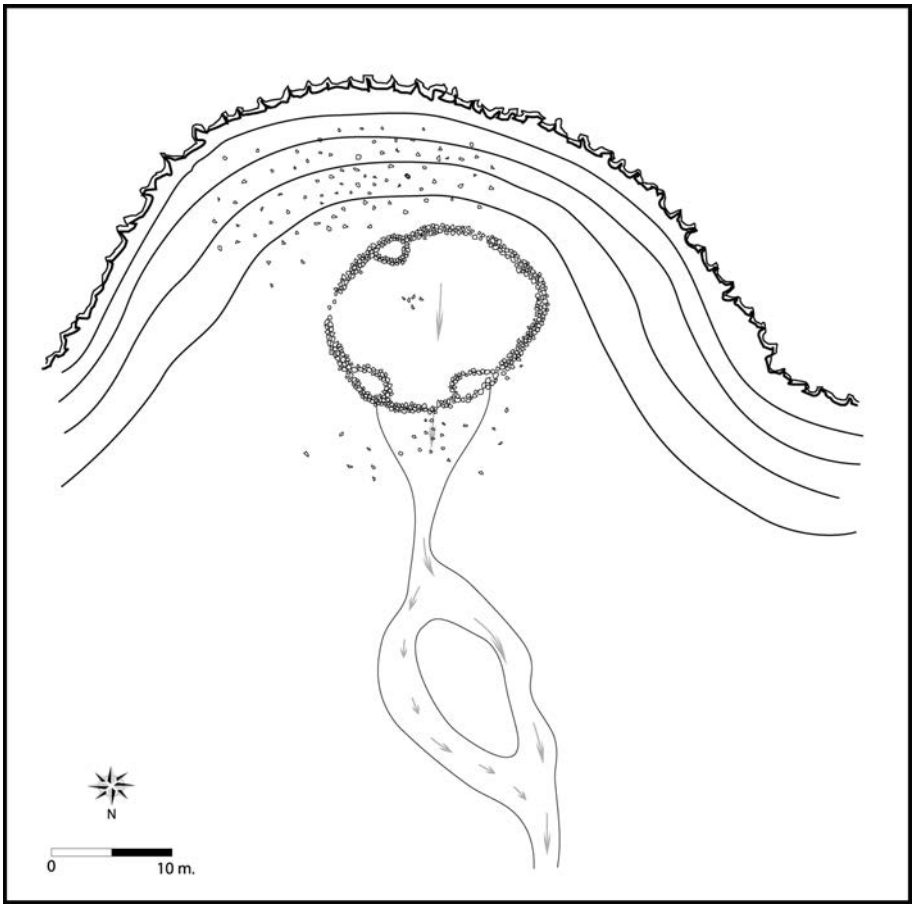

Figure 4. Rijlat Salim 24, plan showing distribution of architecture and the terrain setting (© M. Tarawneh).

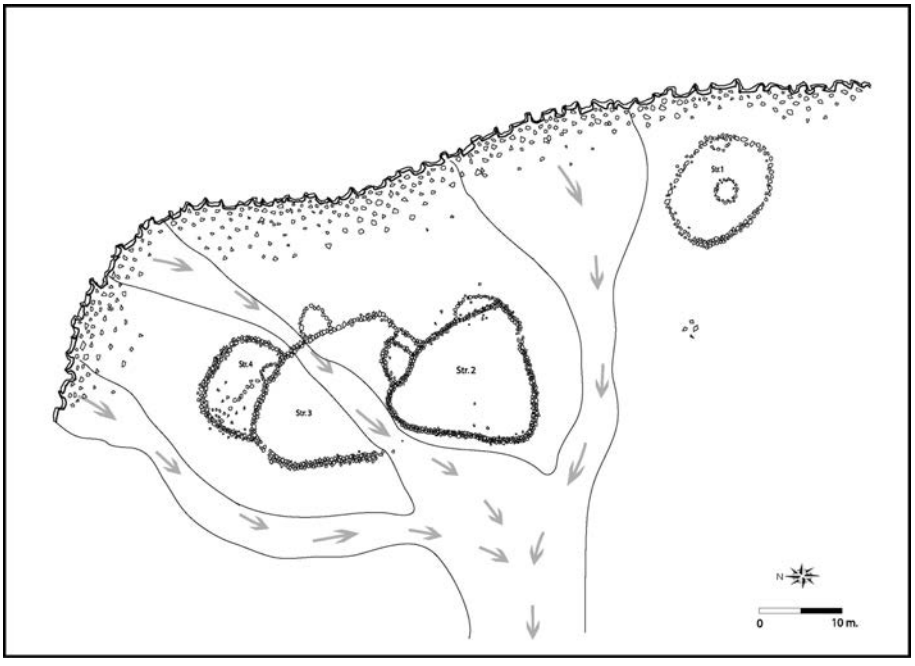

Figure 5. Qe'an as-Siq 5, plan showing distribution of architecture (© M. Tarawneh).

similar to the walls the modern Bedouins use today in order to hold down their tent sides. They also use large and medium sized stones, similar to the prehistoric ones in weight, to tighten their tents against strong winds and also to keep the sand out. It is unlikely that these internal walls were used alone to separate animals from each other or from the domestic area, because of their low height and gaps between the stones. For this reason it seems that the more plausible interpretation is that these stones were used as part of an internal tent division. These internal tents would have been installed inside the large structure in order to offer more security from predators and also better shelter from the wind. This also indicates that not all of the large corrals were used for large flocks. However, they were used like a courtyard in front of tents.

Some sites such as Rijlat Salim 1 and 2 were built on a large scale and with a number of structures organized in large compounds. There were some internal divisions inside some of the large structures. One possible interpretation for the small discontinuous lines of stones is that they were used for holding animals to be milked, especially sheep and goats. In order to milk a sheep or a goat, tight ropes connected to pegs or stones are needed. This is practiced by the Bedouin today, and is called "Rebg" or the tightening ropes. But this interpretation is less plausible in this case than the internal division because the milking process may take place outside the corrals unless there was a reason to do that inside the structures. At Qa' Abu Tulayha West a discontinuous inner wall was found and interpreted as a partition or post foundation [56]. However, the post foundation is less probable in this case because of the length of the discontinuous wall and the spaces between its stones which are more than 0.3 m in some parts. In addition, the location and shape of the division walls does not support the idea of their use as post foundations. More support for the idea of internal divisions comes from the northern part of al-Jafr where Quintero *et al*. [57] reported that many structures are compartmentalized. An internal partition was also recorded at the Sinai sites where straight cross-walls were used to divide structures [58]. It is more likely that these walls were used as internal division walls similar to the walls found at the eastern Bayir sites.

In addition to the large structures which range from about 5 up to 50 m in maximum internal dimensions, small rooms of different dimensions were recorded. These small rooms are mostly circular in shape and were found in large numbers and in different locations from the large main structure at the site. Some of these small rooms were attached to the main wall either as an internal or external room built outside the main wall of the structure (**fig. 4**, **5**). The ones attached to the main structure were usually located in the internal half of the structure which lies on the terrace side. This location was chosen because there would have been less movement in the internal side of the structure. Some of these small rooms were built as a stand-alone room at different distances and directions from the main structures.

The building stones for the structures were taken, at these sites, from escarpments or terraces surrounding the sites. The sizes of the sites are similar in most of these regions, which also reflects the short term occupation; especially at the sites consisting of single small structure. The small structures which were built away from the larger sites may reflect short term herding stations similar to those recorded in the northern Negev. It was suggested that these were used by herders who came from the larger settled sites [59]. The function and nature of the structural installations are similar, and consisted of tents built on top of wind break walls. The occupation type at most of these sites is of short term seasonal camps used by pastoral nomads, and in some cases in the Negev and Sinai accompanied by metallurgical activities. Similarities in structure function and installation such as domestic and animal use, as well as the tent installation, were suggested at many sites in the Negev, the Sinai, and the Hisma [60].

56. Fujii 1998, p. 130.

57. Quintero *et al*. 2002, p. 27.

58. Eddy & Wendorf 1999, p. 121.

59. Gilead & Goren 1986, p. 86

60. Rothenberg 1971; Beit-Arieh 1985; Levy 1983; Henry 1995; Jobling 1981; Eddy & Wendorf 1999; Fujii 2001, 2003; Quintero *et al*. 2002.

Distribution of sites and structures

The distance between the separated structures varies between a few metres and more than 80 m in some cases. In the case of R.S. 1 and 2 the close distance between the two sites is an indication that a large encampment took place. This suggests that there was a larger number of people compared to the other sites in the region and also the high possibility of separation between these groups of people. This is also another similarity to the modern nomads: groups of shepherd's camp together in the same region in some seasons when water and pasture ressources are sufficient for all the group. Such gathering of different pastoral groups is preferred because it provides more safety for their animals. It also allows companionship and offers opportunities to carry out other secondary activities such as hunting, shearing, sharing information and possibly limited trading, as well as social activities. Recent Bedouins build their tents separated from each other for privacy and for animal separation [61]. The distribution of sites and structures separated from each other along the terrace edge in relation to each other are similar to those found in the Negev and Sinai [62] because these sites are based on the same adaptive needs in both regions.

Function of structures

In addition to the internal tent divisions, there are other indications of domestic use. For example the hearths and their locations inside the structure can be used to differentiate the function of the structure. In some of the small structures a hearth was located in the centre of the internal part of the structure, which indicates a domestic type of use. However, in some other sites, particularly the larger structures, hearths were sometimes placed on the side of the wall or near one corner, such as at Qe'an as-Siq 6. This type suggests that the internal part of the structure was used as an animal corral. Moreover, the absence of the hearth inside a structure may also indicate its use as an animal enclosure and may also indicate that hearths were placed outside structures in warm seasons. In addition, more investigation of the hearth sizes may give an idea about the type of use of the hearth and possibly indicate the large or small number of hearth users. One may also ask if all these structures were covered by tents or tent-like installations. It is more likely that most of the small structures, especially the ones accompanied by the large corrals and also the internal division areas, were covered by tent installations for domestic use. This system was also mentioned in other regions by Fujii [63] and MacDonald [64]. It is unclear if there was a tent or shading installation for the flocks in order to protect them from the extreme heat of the midday sun in the desert, particularly young animals. Bedouin and peasants make simple shading installations in order to make a protected place, especially for new born and small animals, as recorded in the north eastern desert (Betts personal communications). If this was the case with the Chalcolithic pastoralists, it was more likely to have them inside the internal division areas placed within the large corrals. It is more likely that a tent was installed only on top of the small domestic area and on top of a small area inside the large enclosure, because of the transportation issue. Tents and other gear need to be in small sizes because they have to be carried when new camp sites are required. For this reasons it is unlikely that the large enclosures were covered with tents since that would make moving to another camp site a very hard and complicated task due to the large size of tents involved. In addition, animal enclosures do not require large covered areas.

Small rooms have been interpreted in some areas, such as at Qa' Abu Tulayha, as symbolic burials, which later led Fujii to suggest that the site was a spiritual or a holy place [65]. If this was the case then

61. Musil 1928, p. 149.
62. Rothenberg 1971; Eddy & Wendorf 1999.
63. Fujii 1998, p. 128.
64. MacDonald 1932.
65. Fujii 2000, p. 26; Fujii 2003, p. 198.

we may assume that most of the circular structures located during the Eastern Bayir survey were used as holy places, as well as many sites in the Negev and Sinai. However, at the Sinai sites these rooms were interpreted as sleeping quarters or sheds used for storage, depending on their size and location from the main structure [66]. These small rooms at the eastern Bayir sites also seem more likely to have been used as storage facility areas and possibly for sleeping or animal separation, depending on their size and location. The small rooms at the eastern Bayir sites range in their internal diametres from less than 1 m to more than 3 m in some cases. No doorways have been found in any of these small rooms either at the Sinai or at the Eastern Bayir sites. It is more likely that these rooms were accessed by a step-over wall, as suggested by Eddy and Wendorf [67]. This also supports their functional interpretation as storage or sleeping quarters since it is easier for humans to step- over low walls than for animals. But it is also possible that small animals were carried and placed inside these small rooms to separate them from the large animals and from the mothers to give the shepherds the opportunity to milk the mothers. Moreover, the location of these rooms in the internal half of the structure or as stand-alone rooms is also an indication that these installations were of use in daily life. From the spatial point of view we may not expect the builder to use part of the internal space of the structure for any purpose which is not related to any of the normal activities of daily life. Large numbers of the small rooms were recorded, in some cases reaching eight in total at the same site. They were built in most sites, and apparently a large amount of labour and time were used to build them. This is also evidence that these small rooms were not built without a practical function connected to the everyday life of the pastoralists in this region.

Type of wall

Different types of walls were built at Eastern Bayir sites. At some sites such as R.S. 20 a wall was built of five courses and stood up to 0.85 m in height. This wall consists of two lines of stones with some soil and small stones filled between them. Stones are undressed and were taken from the area surrounding the site. This type was also recorded at some other sites such as Rijlat Salim 1, 21, and 15, but with some differences such as the larger size of building stones at some sites. Some of these walls were built of large slabs making a single line and a multi course wall, while other walls were built of two lines but without filling. The second type of wall is the single line wall which was built of medium and large sized stones. It consists of one course in most cases. However, in some sites such as Rijlat Salim 28 and Rijlat Salim 6, it is possible that this type of wall had more than one course at least in some places. This type is made of large irregular stones separated from each other, especially in small structures, and gives the impression of being used as a tent weight rather than a tent wind-break wall. At some other sites, such as Rijlat Salim 6, the wall is connected and stands up to three courses. Another type of wall is the standing slabs type which was recorded at some sites such as Rijlat Salim 18. Structures built of this type are mostly small in size. This type of wall was built of large elongated slabs taken from the vicinity of the site and placed in an upright position up to a height of 1 m. These slabs were built facing the internal part of the structure in order to cover a larger area on the side. This required labour and fewer slabs. But this action made it difficult to place the slabs steady without falling down. This required some kind of foundation trench or/and lowering the internal floor below ground level and making the slabs rest on the side of the trench.

Another type of standing slab was recorded together with the multi-course type of walls at some sites such as at Rijlat Salim 1 and Fak Abu Ţaur 4. Standing slabs of this type are facing each other and standing next to each other on top of the ground surface. This type does not require any digging to hold it because of the slab shapes and their angle when leaning against each other. The slabs stand up to about 0.75 m in height and comprise only a small part of the whole wall, while the rest of the structure is built of multi-course walls. Why did the builders of this structure place the slabs in an upright position only

66. Eddy & Wendorf 1999, p. 286.
67. Eddy & Wendorf 1999, p. 286.

in a small part of the wall? It seems likely that there was a functional reason, possibly to create a gate or an access to the structure. Placing large slabs in an upright position, leaning against each other at a certain angle makes it easy to push some of these slabs or all of them at any time to create a gate for the flocks to exit. It is also easier to push them back to their original location at night time without any fear of disturbance from outside because of the height and rigidity of the slabs. These sorts of gates are used by Bedouins who use empty oil barrels with some stones inside to make them firm enough to block the opening.

The large standing slab type of wall also occurred with the other two types at the same site and in many cases in the same wall such as at R.S. 1 and F.A.Ţ. 4. Large standing slabs were built in a linear shape facing the internal part of the structure and were connected to the other two types. Standing slabs of this type were also found at other sites. In most cases they are standing alone without connection with the other walls, possibly because of the erosion and later disturbance to the walls. This type was also found in some small installations such as the one found at R.S. 2 and F.A.Ţ. 4 where a small room or small storage facility was found separate from the main structure. This type of standing slab was interpreted by Fujii [68] as part of a religious structure. He believes that they have something to do with the volcanic area in behind the site. He also suggested that they may have been used as wind screens. However, these standing stones have been recorded in many parts of the eastern Bayir region where there are no volcanic areas. In addition, it is unlikely that this type has any religious connections because they were found in most cases as part of the walls, and their function is more logically simply related to the walls.

Some of the sites are highly disturbed which makes it hard to determine their nature, especially those built of semi-rounded stones and small stones such as Fak Abu Ţaur 7. But it seems that most of these walls were standing at least up to 0.6 m because the large number of collapsed stones, if rebuilt, would make similar walls to those preserved in better conditions. At some sites the walls are mostly covered with wind blown sand, such as R.S. 14, 7, and Qe'an as-Siq 10, or with soil such as Rijlat Salim 28 and 15. These factors make it difficult to determine the type or height of these walls.

Most of the wall types which were found during this project are also similar to those found in southern Jordan, such as at Qa' Abu Tulayha [69], northern al-Jafr sites [70], and Jebel el-Jill [71]. The horizontal walls at Abu Tulayha were built directly on the surface without any base and Fujii [72] believes that they were standing up to 1 m. This type was also interpreted by Fujii as a windbreak wall, built under tents. In the Negev and Sinai the same type of wall was also recorded such as at Sinai 18 and Sinai 1 [73], and the Chalcolithic site near Serabit el-Khadim [74].

Access to structure

Beside the standing slabs, other doors or gates were also recorded at some sites, such as at Rijlat Salim 1, 20, and possibly 22. These gates were built in two different styles. The first one was built of two large slabs facing each other and separated by another slab placed between them as a lintel, such as the one at Rijlat Salim 1. This type was also recorded in the Sinai at site Sinai 10, which consists of a large and a small slab facing each other [75]. The second type was also found at Rijlat Salim 1 and 20. This type consists of multi course walls on each side. In some cases, such as at Rijlat Salim 20, one side consists

68. Fujii 2000, p. 153.
69. Fujii 1999b, p. 80.
70. Quintero *et al*. 2002, p. 27.
71. Henry 1995, p. 360.
72. Fujii 1998, p. 128, 1999a, p. 497.
73. Eddy & Wendorf 1999.
74. Beit-Arieh 1985, p. 48.
75. Eddy & Wendorf 1999, p. 176.

of a large standing slab and the second side of a multi-course wall. This different building style is more likely related to the availability of building stones. The short width of these doors, which reach up to 0.5 m, is evidence of their domestic type of use, since the narrow doors are not wide enough for sheep to pass. However, the standing slabs make a larger gate which can easily reach 2 m in width. It is more likely that most of the doorways to the structures, particularly the small structures, were eroded because of their location in the lower side of the wall where the runnels usually cross the structure causing severe damage. Doorways and other type of openings were recorded at northern al-Jafr sites by Quintero *et al*. [76].

Artefacts

Most of the recorded sites, particularly the large ones such as R.S. 1 and 2, yielded chipped stones and a small number of ground stone artefacts. No pottery or ornamental artefacts were found at any of these sites except a few undiagnostic sherds from later periods. Artefacts were collected from inside the structures and from the immediate vicinity around them. At some sites, such as F.A.Ţ. 2, tools were mainly concentrated in areas outside the structures. The larger flint assemblages were collected from the larger sites, such as Rijlat Salim 1 and 15. However, a very small number of chipped stones were found at the small sites, particularly the single small structures. This suggests that these sites had a short period of occupation and that limited ranged activities took place there. These were probably short term grazing sites from the larger occupation sites. It is also possible that these small sites were used for short periods by herders who had links with the mining sites to the south-west.

The collected chipped stone artefacts from the Eastern Bayir sites are different in many aspects from the general characteristics of the Chalcolithic period in southern Levantine pastoral sites. Retouched thermal flakes are the dominant tool type at these sites which were not discussed in previous literature, presumably because they were confused with tabular scrapers (**fig. 6**). Retouched thermal flakes were also found at some other sites of the Late Neolithic period such as in the Harra region and at Chalcolithic sites around al-Jafr region. Tabular scrapers were also found at these sites but in small numbers. Tabular scrapers and other tool numbers were affected by the size of the site and possibly also the short season of occupation (**fig. 7**, **8**). Thermal flakes and tabular scrapers mostly have simple retouch, in most cases placed on one edge. The dominance of thermal flakes and the simple production of tabular scrapers are part of the fact that these sites were occupied by pastoral nomads who moved seasonally and did not require more advanced type of tools in their daily use.

The retouched flint assemblages which were recorded in the Hisma Basin have small tool numbers, especially at the short term of occupation sites [77]. They are similar in their general features to the Eastern Bayir assemblage. The tabular scrapers of the Late Neolithic and the early Chalcolithic periods from other regions are also similar in many respects. In the late Neolithic phase of the Harra sites many tabular scrapers and rounded thermal flakes were recorded [78]. They are similar in their retouch location and general type to those recorded at eastern Bayir. The use of rounded thermal flakes was also recorded in many regions such as at Qa' Abu Tulayha [79] and the Harra [80] as well as in the eastern Bayir sites. This supports the suggestion that the Qa' Abu Tulayha site was used as early as the Late Neolithic period, the earliest dates produced from this site by Fujii [81]. This is a good indication that the Qa' Abu Tulayha sites and the Eastern Bayir site were contemporary with each other and most likely with the flint mine sites near al-Jafr.

76. Quintero *et al*. 2002, p. 27.
77. Henry 1995, p. 362.
78. McCartney & Betts 1998, p. 105-107.
79. Fujii 1999a, 1999b.
80. McCartney & Betts 1998, p. 105-107.
81. Fujii 1998, p. 137, 1999a, p. 74.

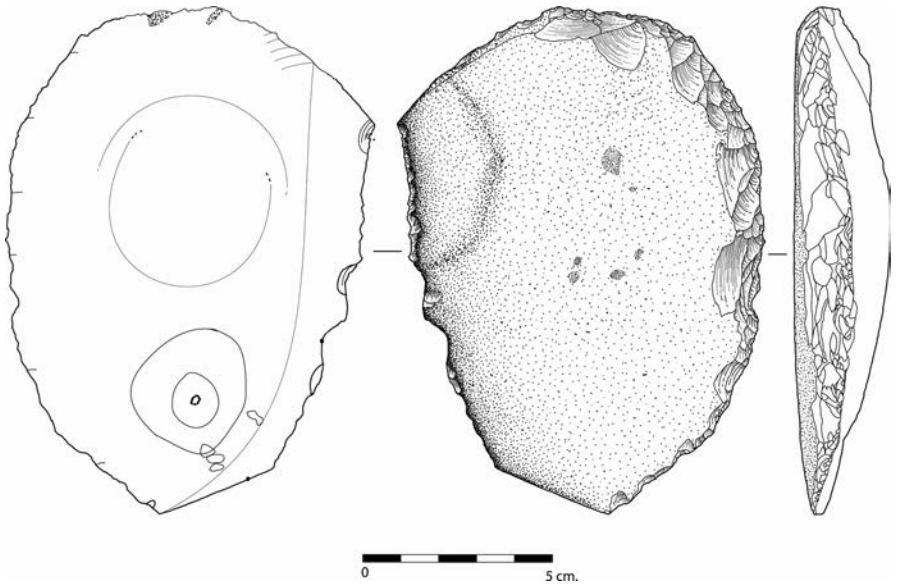

Figure 6. Retouched thermal flake from Qe'an as-Siq 6 (© M. Tarawneh).

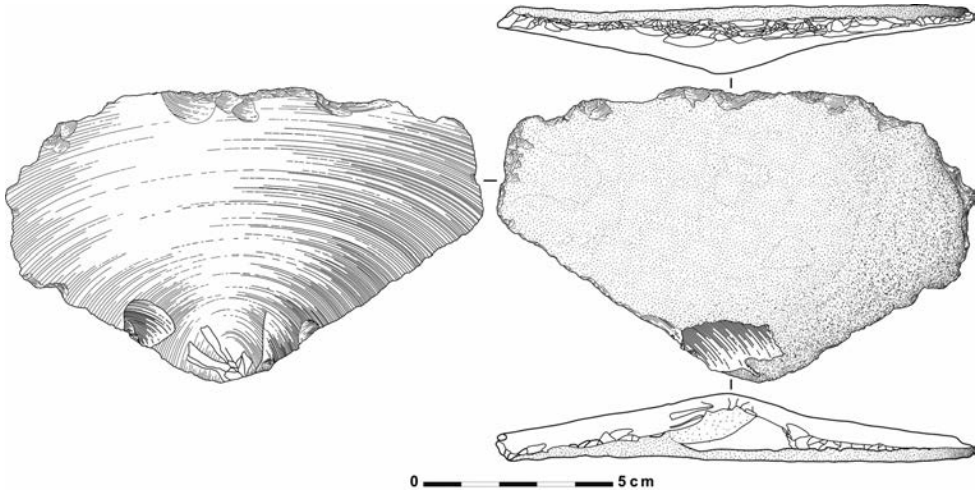

Figure 7. Tabular scraper from Qe'an as-Siq 1 (© M. Tarawneh).

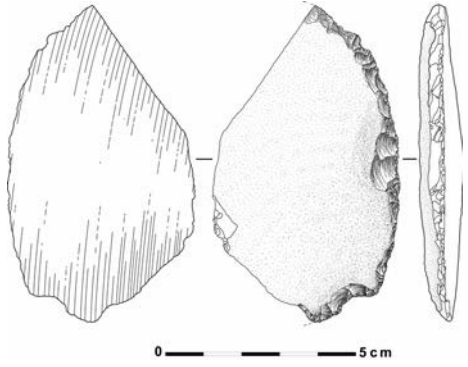

Figure 8. Broken tabular scraper from Qe'an as Siq 1 (© M. Tarawneh).

The published data related to tabular scrapers in southern Jordan and in the Negev and Sinai show that less care in preparation was practiced in making the tabular scrapers in the late Neolithic-Early Chalcolithic period. This can be seen from many aspects including the rare examples of bulbar thinning, the lack of striking platform faceting, and the irregular thickness. The length of the retouched area is also smaller than in the later periods. The irregularity of tool shape and the use of retouched semi-rounded thermal flakes support this. In addition, no incised tools were found. The Early Bronze age tabular scraper, as described by Rosen and Gopher [82], became more advanced, with bulbar thinning, striking platform faceting, and a larger area of retouch and thinner body, which all indicate greater care in preparation. The retouched semi-rounded thermal flakes may represent an early stage in the development of tabular scrapers, or the transition stage between the bifacial knife and the tabular scraper. Thermal flakes and tabular scrapers require less retouch and also provide better tools, especially when used for butchering. The cortical face makes the tool less slippery when combined with meat and blood. In addition, there were no arrowheads found at these sites which reflect the change in economic emphasis from a hunting to a pastoral way of life. At the same time, the lack of arrowheads does not mean a total disappearance of the hunting process and it is possible that animals were hunted by using other methods such as traps.

Conclusions

This research proves that Chalcolithic groups occupied the southern Levant, particularly the desert regions. These groups were probably moving seasonally from the lowland wadis near as-Sirhan to the highland regions of Jibal al-'Adhriyat to the south of al-Jafr. There is no evidence that these groups practiced any agricultural activities. They were living as pastoralists or pastoralist hunters which was proved by evidence from sites in the steppe region [83]. They have possible connections to other groups from the Negev and north-eastern Sinai near 'Aqaba, which may have been based on animal trading and probably flint trade as well [84].

The development from a hunter-gatherer economy to a dependant pastoral economy took place during a long period of time starting from the Late Neolithic through the Chalcolithic period [85]. Development of tabular tools, which first appear in the late Neolithic period together with arrowheads, also supports the idea that the hunting-herding economy started in the Neolithic period. This is the time when retouched-thermal flakes and tabular scrapers started to appear, possibly because of the increased need for a new tool which could be used comfortably with the new economic resource. The apparent decline in village sites in the Chalcolithic period particularly in the south-eastern Levant may suggest a further change as herding became increasingly the dominant lifestyle and hunting deteriorated gradually.

The specialized pastoral nomads of the Chalcolithic period occupied different regions which enjoyed a diversity of resources and environment during the year. Some regions such as eastern Bayir were chosen carefully for pastoral camps during the heat of summer and others to protect against the freezing winter of the desert. The southern part of Jordan was one of the significant areas for the pastoral nomads, not only during the Early Chalcolithic period, but also during some parts of the following periods. This pattern of seasonal movement in southern Jordan could not be successful without the availability of pasture and water. These two main resources were available in the wadi systems in both regions and can be seen clearly in the eastern Bayir wadi systems.

82. Rosen & Gopher 2003, p. 185.
83. Levy 1983; Rosen 1987; 1988, Henry 1995; Eddy & Wendorf 1999; Fujii 2002; Quintero *et al*. 2002.
84. Rosen 1983, 1997.
85. Rosen 2002b, 1987, p. 301; Betts 2007.

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