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The Jabal Hārūn Survey – Settlement History and Land Use in the Area

1. Introduction

The Finnish Jabal Hārūn Project (FJHP) is a multidisciplinary project focusing on the Jabal an-Nabī Hārūn (Mountain of Aaron) in southern Jordan, near Petra (FIG.1). The project is led by Professor Jaakko Frösén and has two components: an excavation and a survey. The ruins of the Byzantine Monastery of St. Aaron at the top of the mountain are excavated under the supervision of Zbigniew T. Fiema. In order to better understand how the monastery functioned in its environment, the slopes and foot of the mountain are surveyed intensively (FIG. 2). The survey is conducted by Mika Lavento and his team. A group of cartographers from the Helsinki University of Technology led by Katri Koistinen has been in charge of field mapping and constructing three-dimensional computer models from the archaeological data.

So far the FJHP has carried out three full two-month seasons. The main objective of the survey during the first season was to document an agricultural system that was assumed to be related to the Byzantine monastery. However, the survey finds showed that the area has a much longer settlement history. This raised new important questions, such as the possibility of separating certain habitation periods or the definition of the types of structures or sites related to certain archaeological periods. It is interesting to observe that some prehistoric periods are missing completely in the area surveyed so far. This paper presents the general habitation history on the basis of the survey data and attempts to explain the gaps in settlement. Possible reasons can be found in the survey strategy, environmental conditions, and erosional and sedimentation processes, but also in the cultural history of the area.

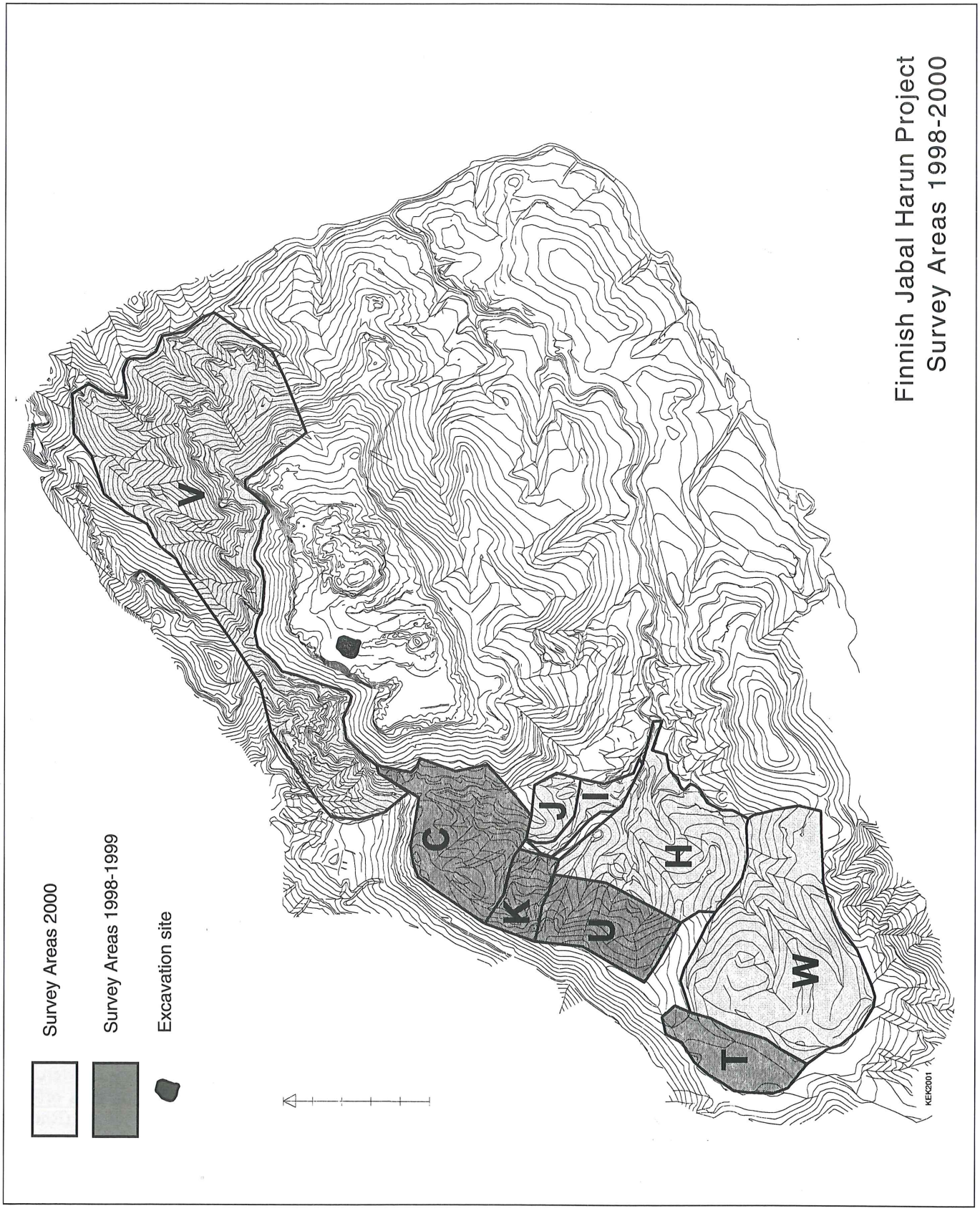
2. Methodology

The field survey strategy is intensive. This means that surveyors walk tracts of about 50 x 100m in size at a distance of about 10m from each other and collect all surface finds for further analysis. Any observed remains of human activity are documented by videotape, digital photographs, or ordinary photographs. Visible structures like remains of terrace walls, buildings, or roads are documented by total station. Major find concentrations or structures are defined as sites (FIG. 3). Some small soundings are also made to obtain further information about particularly important structures.

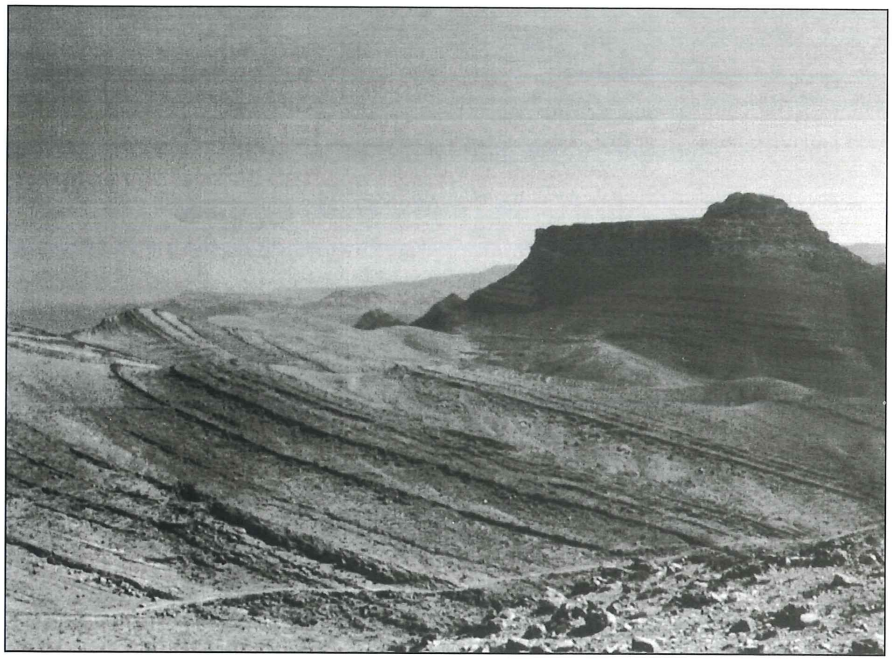
The surveyed area is relatively small, but the survey has a total coverage, regardless of artifact densities. This does not mean that the concept of site is abandoned completely, because it is evident that there are clearly defined artifact concentrations. However, a site is seldom defined and limited completely by clearly distinguishable borders. Often the artifact clusters are an anomaly in a continuous distribution and the surveyor must define the site borders more or less artificially by deciding on the appropriate artifact density.

In the Jabal Hārūn survey, a site is defined only as a concentration of artifacts or structures, like dams or terrace walls, observed during fieldwork or, sometimes, during post-fieldwork. When artifacts are discussed, the term "site" should be understood as an area with a higher than average density of artifacts in a more or less continuous distribution. One advantage of the survey strategy used by the FJHP is that it allows the detection of very small concentrations or large concentrations with diffuse borders.

As such the FJHP survey differs from some traditional surveys that defined a site as the basic unit for recognising human presence where activities were thought to have concentrated to a specific location. This approach, which limits human activity to more or less artificially defined borders, led to the rise of new approaches since the 1970s (Dunnell 1992: 34). Survey strategies were recently developed under different names, such as off-site archaeology (Foley 1981), non-site archaeology (Rhoads 1992), and regional or siteless survey (Dunnell *et al.* 1983; Kvamme 1998). All new approaches share the concept of the archaeological record as a continuous dis-



1. General map of the survey area.



2. Jabal Hārūn seen from the SW. The limestone hills of the western survey area in the front. An ancient route from Wādī 'Arabah to Petra runs on the lower slopes along a wadi (lower part of the picture) (Photo: P. Kouki).

tribution of artifacts over the landscape with variable densities (Dunnell *et al.* 1983: 272), and this approach is also followed by the FJHP survey.

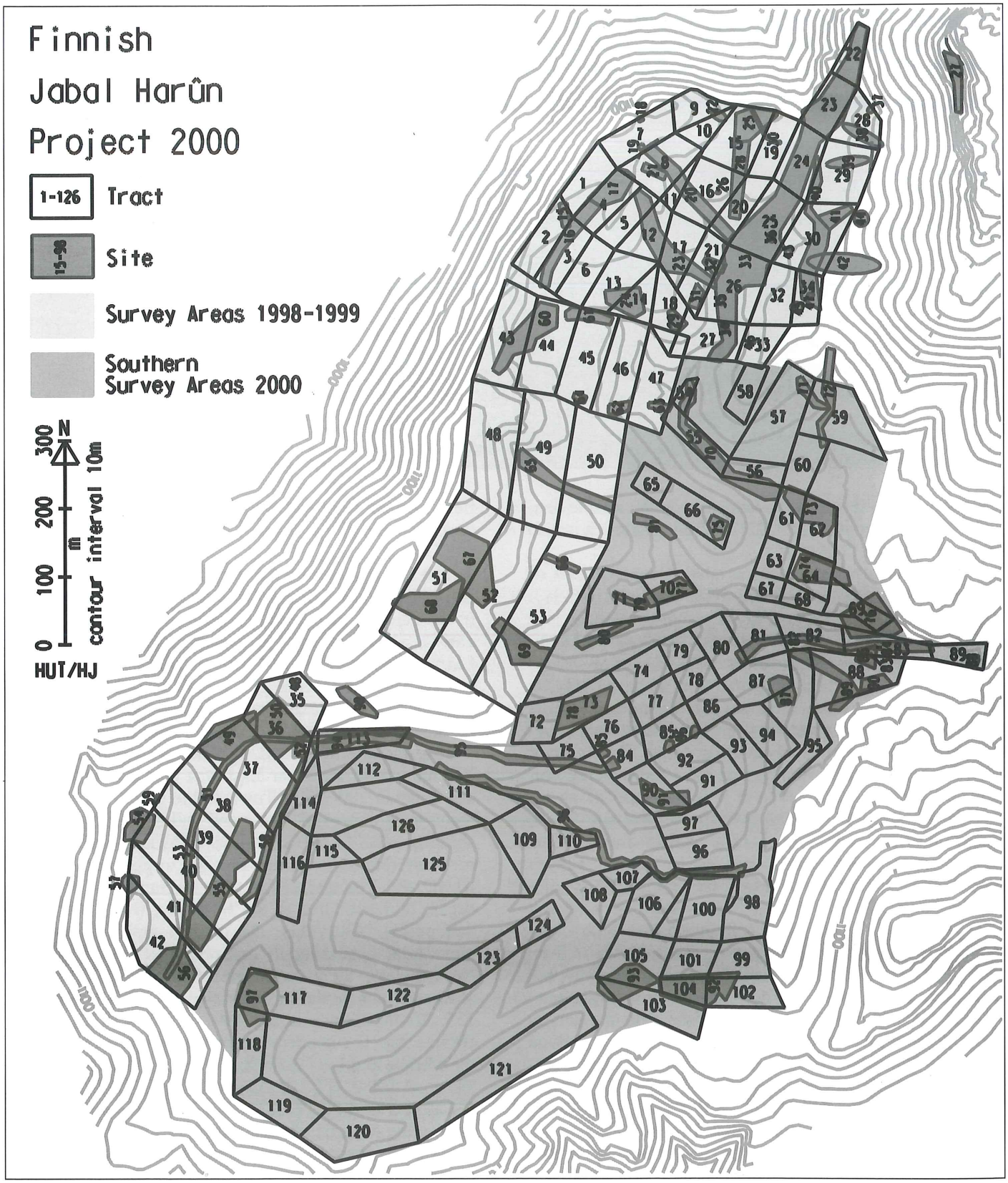
The archaeological record is also a consequence of sedimentary processes (Dunnell 1992: 35; Schiffer 1987: 199). The site as we see it today does not necessarily represent direct human activity, but can be a result of sedimentary and erosional processes. This can have serious effects on interpretation when the work is based only on surface finds, as in the FJHP survey. Therefore, the site context and environment must be considered very carefully before starting to analyse the material. The surveyor also has to estimate how representative the material collected from the site is, even if it is the yield of an intensive surface collection all over the defined site. These basic questions related to surface scatters around Jabal Hārūn can be frustratingly difficult to answer. Understanding site formation processes, the real limitations of a cluster or site, and other related issues might require several seasons of fieldwork. Experiments with contemporary material are also useful. The experience from Jabal Hārūn is that surface finds have good potential, but many traditional survey methods have to be re-evaluated.

Almost all prehistoric artifacts located in the survey have been surface occurrences in a secondary or derived context. Chipped-stone surface scatters are an almost global phenomenon (Kvamme 1998: 127). Surface scatters from an area like Jabal Hārūn with a steep topography combined with heavy erosion that affects lateral movement are very demanding to study, and searching for patterns and evidence of prehistoric people has been considered almost useless. In the Jabal Hārūn survey, the field methodology and detailed contextual analysis tries to solve some of the problems.

3. The Environmental Constraints

Environmental conditions have played an important role in the patterns of human occupation in the Jabal Hārūn area. It is thus instructive to summarize environmental factors related to this area.

The Late Pleistocene climate of the Near East before the Last Glacial Maximum (LGM) appears to have been considerably wetter than at present (Abed 1985: 87-91). During and after the LGM, approximately 22,000-15,000 BP, climate in the Near East was cool and arid (Abed and Yaghan 2000: 30). Towards the end of the Ice Age the climate improved. The warm and humid phase ended abruptly at ca. 11,500 BP, followed by arid, cool climate, probably due to the global reversal to glacial conditions during the Younger Dryas. The beginning of the Holocene, corresponding to the Neolithic, was a warm and wet period. After this, the climate gradually became more arid, beginning to resemble that of the present. Nevertheless, there have been fluctuations within the semi-arid climate during the Holocene (Geyh 1994: 133-135; Bar-Matthews *et al.* 1997: 161-166). The Early Bronze Age is considered the most humid period during the Middle and Late Holocene (Bruins 1994: 304; Frumkin *et al.* 1994: 321-329; Moustafa *et al.* 2000: 742-749). It was followed by a period of desiccation connected to a large-scale climatic change also in North Africa and the Sahara. The trend towards a more arid climate continued through the Iron Age and the Persian and Hellenistic periods. From the Early Nabataean times, relatively humid



3. Sites and tracts 1998-2000.

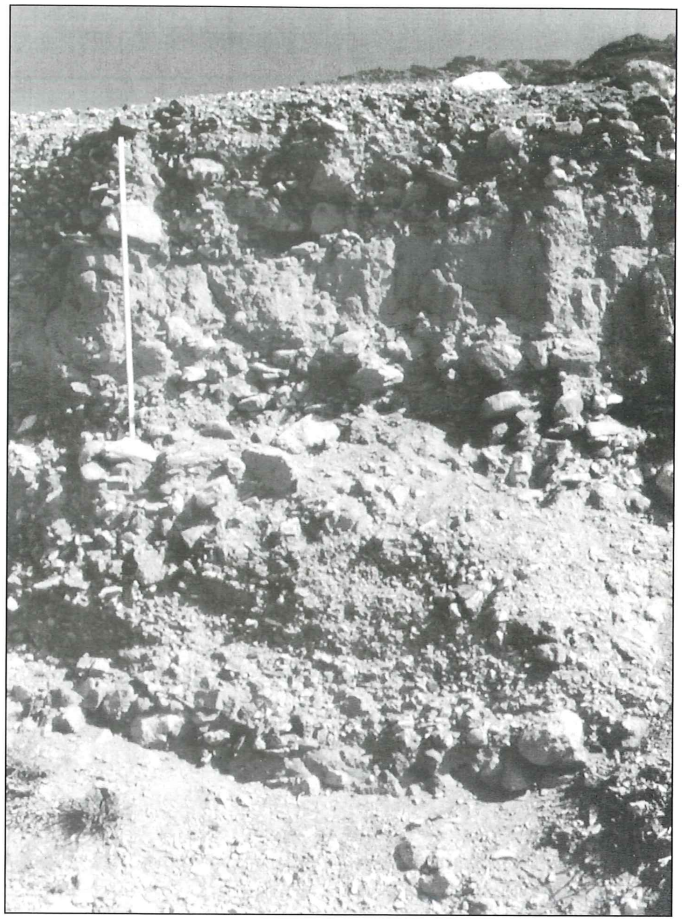
conditions prevailed until the Roman period. Throughout the Byzantine period and the first half of the Early Islamic period, the climate again became increasingly arid (Bruins 1994: 304-311).

The general vegetation history during the final stages of the Pleistocene and Holocene coincides with the fluctuations in climate. During the period from 30,000 to 24,000 BP, there were open forests in the Near East, but after 24,000 BP they were replaced by a forest steppe. Steppe indicators such as Artemisia and Chenopodiaceae increased as the conditions for tree growth became less favourable. The driest period is from 24,000 BP to 14,000 BP. After that, in the period from 14,000 to 10,000 BP, precipitation increased to allow the expansion of oak-dominated forest. This points to an amelioration of the climate. After 10,000 BP, open vegetation gained terrain again probably due to a rise in temperature. Precipitation increased after 7400 BP and forests expanded once again. It is likely that the present-day vegetation pattern established itself in northern Palestine during this period (Van Zeist and Bottema 1982: 277-323).

In the Jordan Valley and the whole Levant, very little is left of the natural plant cover as a result of the interference of humans over thousands of years. According to one hypothesis, agriculture spread within the fertile areas of the Levant, a fairly narrow strip extending south to Bayḍa and Baṣṭa between the arid areas of Negeb and Sinai in the west and eastern Jordanian and Syrian plateaus, during the early Neolithic (ca. 10,000 BP and 8000/7500 BP). The initial crops of the Early Neolithic consisted of cereals, pulses and flax, but only barley, emmer wheat, lentil and pea were consistently exploited within the area (Byrd 1992: 50).

The first experiments at domestication in the Petra area extend back to Natufian settlement at Bayḍa and Baṣṭa (Fall 1990: 275). Because the absolute minimum of average annual precipitation for dry farming is 200mm, prehistoric as well as modern farming in the Petra area could never have been reliably based on rain-fed crops alone. To enable rain-fed agriculture based on run-off water, check-dams were built to store water in the wadis (Bruins 1990: 88-92). Archaeological evidence from fields cultivated by Bdūl Bedouins in Petra suggests that some of the fields may date to the Medieval period, and in terms of topography, geology and cultivation practices they might be analogous even to prehistoric conditions (Simms and Russel 1996). Wheat and barley have been cultivated in the Petra area, and barley and lentils have been cultivated in the areas surrounding Jabal Hārūn for the last 100-120 years. Olives and grapes have been cultivated mainly in the Wādī Mūsā area (Frösén *et al.* 2001).

At present, erosion plays the most important role in changing the environment of Jabal Hārūn. In addition to the easily weathering limestone and sandstone bedrock of the area, the steepness of the slopes, seasonality of precipitation and lack of vegetation contribute to enhance the effect of erosion. The most important erosive force is rainwater, while wind has a lesser role. The situation has been the same as long as the climate has been relatively similar to that of the present day, i.e. since the end of the last Ice Age.



4. A section of the bank of a wadi in the western survey area, showing several sedimentation layers representing varying fluvial conditions and material flow from the slopes (Photo: P. Kouki).

The soil layer covering the bedrock is mostly thin, consisting of boulders, stones, gravel, sand and fines. The absence of development of soil profiles indicates that the rate of erosion and accumulation is higher than that of pedogenesis (Frösén *et al.* 1999: 394-396). However, at some places remains of older soils have been preserved. These soils contain deep carbonate-enriched horizons suggesting their formation under more humid climatic conditions than at present day (Cooke, Warren and Goudie 1993: 56-61; Khresat 2001: 150). The largest area of alluvial sedimentation is at the foot of Jabal Hārūn. These sediments seem to have accumulated at least partially as a result of the building of barrages and terrace walls (FIG. 4).

The impact of human activity in the past has probably both prevented and promoted erosion in the area. The building of terrace walls and barrages may have had a dual effect on erosion. Firstly, terrace walls may direct the flow of water to channels, thus enhancing rill erosion in places. There is also evidence of ancient farmers intentionally accelerating erosion on the slopes (Bruins 1990: 92-93). On the other hand, terraces prevent soil creep and diminish the effect of slope wash. Cultivated plants bind soil and preserve water on the terraces, as well as protect the soil from the erosive effects of rainfall. Barrages slow down the flow of water and degradation of channels. Therefore the construction of barrages and terrace walls probably leads to a period of decreased erosion and sedimentation during the time the area is under cultivation and the structures are maintained. After the abandonment of structures, erosion increases on wadi bottoms and slopes. Accumulated soil is mobilised anew. This period should therefore be reflected in the sedimentary record as a time of increasing erosion. Due to land clearance, natural vegetation was probably sparser than before cultivation. However, in particular the herding of goats and sheep in the earlier cultivated areas effectively prevents natural vegetation from spreading back to the area. Thus erosion can even speed up after the abandonment of the terraces compared to the situation before their construction (Pope and van Andel 1984: 297).

The other human activity which has quite probably had marked environmental consequences is the felling of trees for fuel and building material. This activity has continued for a very long time, but its effect may be difficult to discern. Air photos taken in the 1930s still show more trees growing in the Jabal Hārūn area than there are today. It can be assumed that especially the gathering of wood for fuel has caused this marked reduction of trees during the last century.

4. The Cultural Sequence in the Area of Jabal Hārūn

Jabal Hārūn is situated in a zone similar to Don Henry's Piedmont in the Petra region as classified by Hans Georg Gebel (Gebel 1992; Henry 1989: 22; 1995: 16). The access route to the mountain is a narrow ridge starting from the Wādī 'Arabah floor and ending at the plateau where the southern border of the survey area runs. The survey area itself is partly limestone with abundant chert sources. Just west of the survey area is a conglomerate formation also rich in chert. The cultural sequence of the area has been constructed on the basis of surface finds, chiefly lithics and pottery, in which the Lower/Middle Palaeolithic and Nabataean/Roman periods predominate.

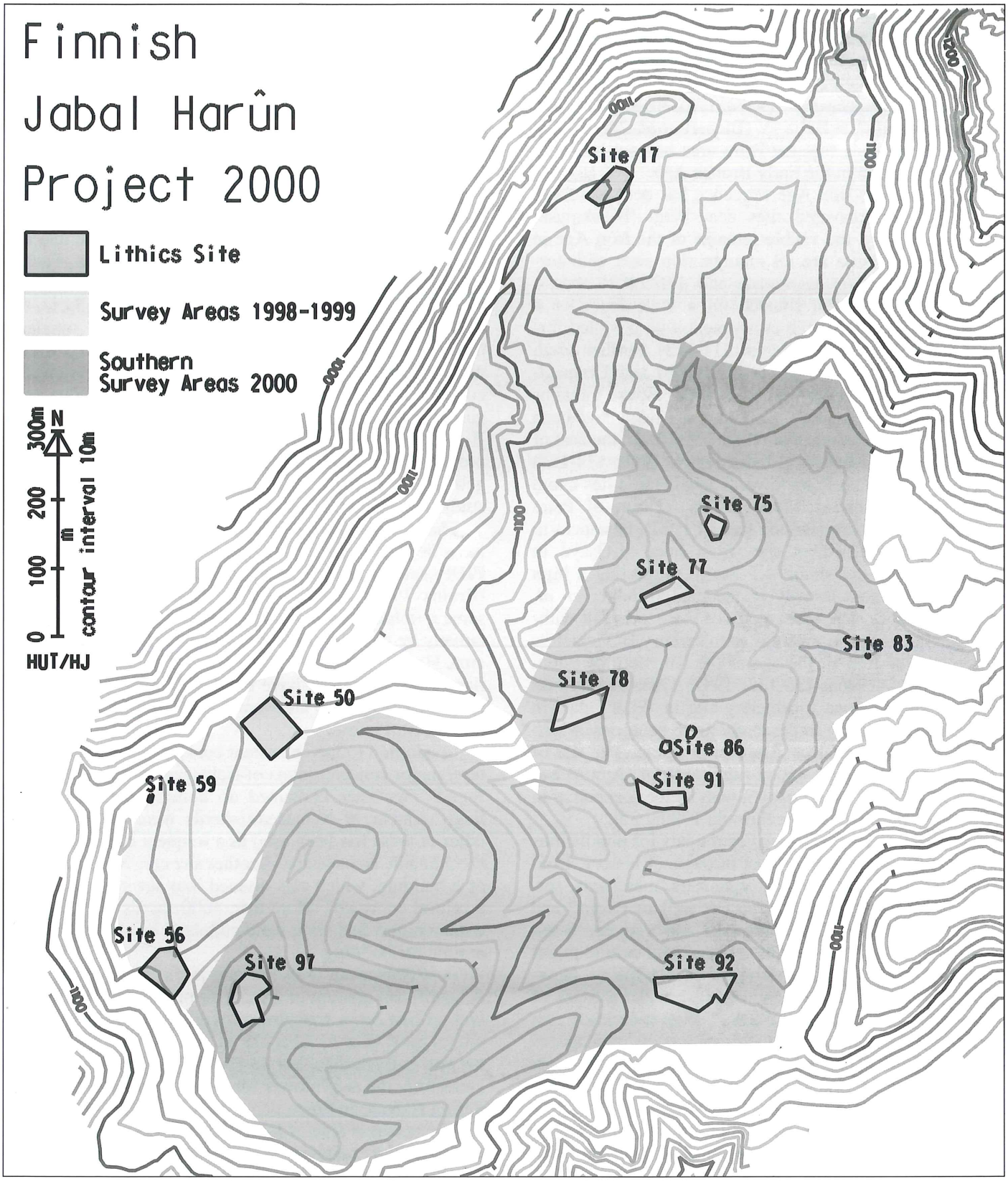
Approximately 26,000 lithic artifacts were surface collected during the first three seasons of fieldwork. Thirteen clusters with a higher than average density of artifacts have been distinguished. The smallest of these contains only 200-300 artifacts and the largest about 2500 artifacts (FIG. 5).

The earliest finds are bifaces (handaxes) belonging to the Acheulean tradition dating to the Lower Palaeolithic. All but one have been found outside the find concentrations. The bifaces are often found in connection with large, thick, heavily abraded and patinated flakes. The diachronic connection between these should still be approached carefully. Middle Palaeolithic evidence in the form of Levallois technology and points is present everywhere in the survey area and forms the largest group of material in the assemblages. No clearly Upper Palaeolithic evidence has been found. Some possible elements of Epipalaeolithic presence, such as arched backed bladelets and other elements, are present in the material of one site. Several arrowheads, one of which is a Khiamian, one an ovate type, and one a Helwan type, found on the top of the mountain next to the Byzantine ruins indicate Early Neolithic presence.

Some concentrations located during the 2000 season are in places where raw material was worked and primary production took place. No Lower Palaeolithic artifacts have been found in these concentrations. None of the 16 Levallois points collected came from the sites, but Levallois point cores were found at several sites. This cannot be explained by geomorphological processes.

Only one exhausted naviform core was found on a site that otherwise had a concentration of Epipalaeolithic finds. The remaining Neolithic material consists of isolated arrowheads found outside of concentrations. Most diagnostic Epipalaeolithic finds are of a non-local raw material. This evidence supports a model under which the survey area was used seasonally or for transit during the Palaeolithic, and the procurement of raw material was important. During the Epipalaeolithic and the Neolithic, the area was used seasonally and the raw material was less important. The type of chert chosen also seems to have changed.

During the three seasons of fieldwork, no archaeological remains dating to the Bronze Age have been found. The lack of Middle and Late Bronze remains does not seem surprising considering that sites of these periods are relatively sparse in Southern Jordan in general. There is also no evidence of settled occupation in the area of later Edom during MBA-LBA. Apparently the area has been inhabited by pastoralists (Bienkowski 2001a: 266; Bienkowski and van der Steen 2001: 23-24). However, for the Early Bronze Age the picture looks different. Extensive EBA settlement is known from Wādī 'Arabah, where settlement continues from the Chalcolithic period and is connected with the mining and smelting of copper (Niemi and Smith 1999: 799-803; Rothenberg and Glass 1992: 141-142). In Wādī Faynān, a great deal of evidence of mining and other activities has been recorded in recent



5. Lithic surface scatters.

surveys (Barker *et al.* 2000: 28-37). There are two EBA sites in Ṣabra (Lindner 1992: 199-200) and one settlement in Wādī as-Sādah only 13km from Jabal Hārūn (Lindner 1990: 77-79), as well as four other EBA sites in the greater Petra area (Lindner *et al.* 1997a: 178). EBA pottery has also been reported at Ba'ja IV (Bienert *et al.* 2000: 122). These sites indicate that the Petra area has not been devoid of population in the Early Bronze Age.

No continuous Iron Age sequence has been observed at any of the excavated sites near Petra (Bienkowski 1995: 29). Today, the visible remains of the Iron Age in the vicinity of Petra are all mountaintop sites with fortifications, natural or man-made and difficult to access. Khirbat al-Mu'allaq is situated on a wide ledge or a shoulder of the ash-Sharāh escarpment with a walled fortification (Lindner et al. 1996a: 111-113). Further south lie Jabal al-Qṣayr (Lindner *et al.* 1996b) and Umm al-'Ala (as-Sādah) (Lindner *et al.* 1990). House remains similar to those of the Edomite Umm al-Biyāra have been found in Petra (Lindner *et al.* 1988: 79-80). To the east of Petra is Jabal al-Khubtha (Lindner *et al.* 1997: 177-181) and on the way from Petra towards Jabal Hārūn lies Umm al-Biyāra (Bienkowski 1990b: 91-95). North of Petra there is Ba'ja III (Lindner and Farajat 1987). Distances to other Edomite settlement sites from Jabal al-Qṣayr in southern Jordan are small, 4.5-14km, suggesting a high Edomite settlement activity in the area (Lindner *et al.* 1996b: 151-152). The chronology of these sites fall within an era between the seventh/ sixth century BC which is also known as Iron II, the age of the Kingdom of Edom (Lindner *et al.* 1996a: 130-132; 1997: 178). Bienkowski (2001: 266) mentions a cemetery site in Wādī Fīdān in northern Edom dating to the tenth/ ninth centuries, which would be the earliest Iron Age site in Edom. The site of Ṭawīlān, situated in the hills to the north of 'Ayn Mūsā, has an unfortified Edomite town with major occupation in the seventh century BC (Bienkowski 1990a: 37).

Mountain areas have served as retreats for populations under pressure in the Near East throughout history. Bedouins participated in trade as organizers, merchants, servants and protectors of pilgrims, as well as raiding and robbing rival villages (Bienkowski and van der Steen 2001: 32-33). Regional variation in material culture might result from the varying potential of each territory. However, it might suggest an underlying broader system of each settlement forming a "citadel" of an individual clan or tribe, in a constant struggle against its neighbours (Lindner 1996b: 162). For the capital of Edom, Buṣayra stands out with its unique architecture and pottery (Bienkowski 2001: 268).

The lack of Iron Age material in the data collected by the survey team is not surprising considering the fact that "This strong regionalism in Iron Age Jordan leads to problems with surface surveys: if a project is surveying an unknown region, then what can it base its pottery dating on?" (Bienkowski 2001: 271). Also, the survey has not yet been conducted in an area with typical Edomite topography, i.e. on a mountaintop.

The FJHP survey area provides a large amount of evidence of an intensive Nabataean presence. The overwhelming majority of the pottery in the survey area is Nabataean common and fine ware, which can be dated to the second half of the first century AD (Schmid's Phase 3, Schmid 2000: 150-152).

This was a time of the intensification of trade and agricultural production in the Nabataean kingdom. Facing the challenge of cheap seaborne transport from South Arabia and the rival trading networks in Egypt and Syria, the Nabataeans intensified their participation in overland trade. The increase of commercial exchange and traffic through Petra, southern Jordan and the Negeb required a concomitant increase in food production. It is often suggested that the policy of the last Nabataean king, Rabbel II (AD 71-106) was instrumental in expanding and improving the agricultural and hydraulic systems in the Negeb and in Jordan. The Nabataean finds from the FJHP study area seem to reflect this overall development.

The agricultural systems built under Rabbel II that have been studied in the Negeb resemble those in the FJHP survey area in structure and perceived function (Bruins 1990: 87-99; Zohary 1954: 20-21). Thus, the same *terminus post quem* dating as for the pottery can tentatively be applied to the water installations in the survey area. However, dating them is not without problems. Similar terrace structures have been built since the Iron Age (Oleson 1995: 709), and some installations in the survey area are still in use.

In addition to the consistent background scatter of pottery, major concentrations of Nabataean pottery were also found. Two sites contained no building remains, but a large number of Nabataean sherds were collected. The other of these has been used as a frequent camping site by the nomadic Nabataeans. Another site consists of the ruins of a building, which was divided into several rooms with a central courtyard. More than 4600 sherds of Nabataean common and fine ware were collected inside and directly around the building.

Post-Nabataean finds are rare in the main survey area. A significant amount of Byzantine pottery has been found only at Site 54, a watchtower overlooking Wādī 'Arabah with a good view to Jabal Hārūn. Most of the pottery from the site is Byzantine, but on the basis of details in the architecture, the watchtower may already have been in use during Nabataean times.

The northern side of Jabal Hārūn contains a small concentration of building remains from which Ayyubid-Mamluk pottery was found (comparable to Khadija 1992: 345-356). This would thus indicate a dating of 12th cen-

tury AD at the earliest for this site, synchronous with the Crusader entry into southern Jordan (Hammond 1973: 56). Coarse, thick sherds have also been found throughout the survey area. These have been tentatively labelled as Ottoman.

Conclusions

The FJHP survey has focused on the interpretation of visible structures, surface concentrations of finds and their applicability in archaeological research. Despite many difficulties, some preliminary results can be presented about the long-time settlement history of Jabal Hārūn.

There is evidence of Palaeolithic habitation all over the area. Although finds have been preserved in relatively stable conditions in the saddle-like formations between hills, several "sites" are on slopes or wadi bottoms in clearly secondary position, their location being the result of erosional and accumulation processes.

It is particularly puzzling that the Neolithic, Bronze Age and Iron Age periods are almost totally missing so far. In this connection one particular consideration deserves to be borne in mind, namely the availability of water for people, animals and cultivation. There was no permanent source of water nearby in the Jabal Hārūn area. Before the adoption of rain-fed agriculture based on using run-off water and storing water in wadis or cisterns, farming in the area was impractical. This process did not happen around Jabal Hārūn until the Nabataean period. At this time, a large system of barrages was built. It was reused during the Byzantine period, and parts of it were in use until the beginning of the 20th century.

However, considering the settlement in the region it seems unlikely that the Jabal Hārūn area would have been completely unused by people for the whole long period of time from the Neolithic to the Nabataean. One possible explanation for the lack of finds is that the area was only visited from the settlements in more favourable locations, and it has been used for such activities that leave little material remains. It can also be argued that the sites have probably been small and temporary, and they have been destroyed by the erosional processes and later intensive Nabataean activity, thus becoming archaeologically invisible.

This attempt at interpretation must be considered tentative as none of these suggestions can be proved so far. Therefore, further field research is certainly needed. Interpretative models must also be critically discussed and new alternatives must be taken into consideration. In practice, this means sharpening both methodology and documentation, and keeping an open mind.

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