THE FINNISH JABAL HĀRŪN PROJECT SURVEY PRELIMINARY REPORT OF THE 2005 SEASON

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Southern Jordan, particularly the Petra region, has been the focus of much archaeological field research. However, intensive surveys have remained in a secondary role until recent years. Since 1998, a Finnish team under the leadership of Professor Jaakko Frösén has conducted excavations on the mountain of Jabal Hārūn. In connection with this project, a survey on the slopes of the mountain was begun, with the purpose of carefully documenting the hydraulic installations in the vicinity of the monastic complex on top of Jabal Hārūn. The final field season of the Finnish Jabal Hārūn Project (FJHP) survey was carried out in 2005. The basic research questions set at the beginning of the survey project have changed considerably in the course of the fieldwork (see Frösén *et al.* 1998, 1999, 2000, 2001, 2003, and 2004).

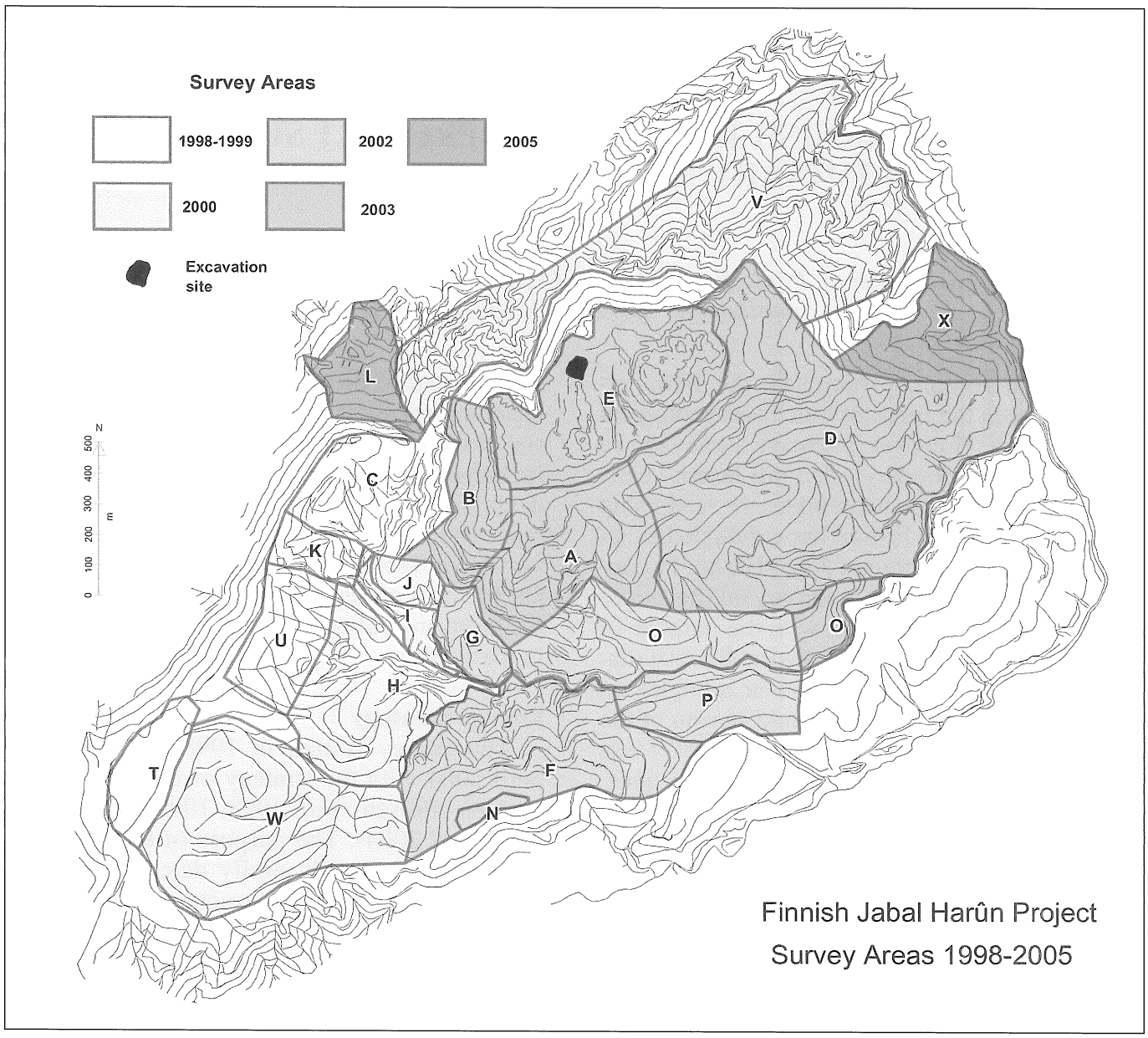
The 2005 field season of the FJHP survey had three objectives, partly differing from the previous seasons, which also necessitated the adoption of new methods and techniques. The first aim was to conclude the original intensive survey on the western and eastern sides of Jabal Hārūn (**Fig. 1**). Secondly, an extensive survey of the adjacent areas towards Wādī Ṣabrā and towards Petra itself was carried out, recording both new and previously known archaeological sites. The extensive survey technique enabled the team to gather information about human activity in these areas in order to relate the Jabal Hārūn area to its surroundings and to compare the different areas. The third objective was to follow ancient routes crossing the Jabal Hārūn area, one leading from Petra towards Abū Khushayba in the southwest and another going towards the west and north, to Umm Ratām, and to record the structures and sites related to these routes. In addition, geoarchaeological studies and research for flint material provenance were carried out. The 2005 team included six archaeologists and archaeology students from the University of Helsinki, as well as one cartography student from the Helsinki University of Technology and one local workman. Dr. Majdi Barjous, a specialist in the geology of the Petra area, also visited the team for two days in the field.

Survey Strategy

The survey started in 1998 and continued until 2004 with the strategy of intensive investigation (Frösén *et al.* 1998, 1999, 2000, 2001, 2003, and 2004). The purpose of the fieldwork was to find not only easily detected sites but also smaller remains of structures and concentrations of material. The sites and related structures were also documented by measuring their details with a tachymeter and by taking a large number of photographs for later compilation of maps and 3-D models by computer. Photogrammetry was used for documenting the numerous terrace walls in the survey area, which allowed the measuring team to spend more time on the detailed documentation of other structures. The aim of the survey project has been to document all visible sites and structures in the area.

During the seasons 1998-2004, the team carried out an intensive survey strategy within an area of ca. 6km^2 with the purpose of finding all material visible on the soil surface. The 2005 strategy was changed in order to acquire a broader view of the environment. Comparing two different ways of uncovering sites and find concentrations can also help to better under-

1. formerly Mukkala



1. Map of Jabal Hārūn showing the areas surveyed each year by the FJHP team (by H. Junnilainen and P. Kouki).

stand the significance of an intensive survey as opposed to a survey that focuses only on specific places.

Already during the earlier field seasons some visits were made outside the primary survey area in the immediate vicinity of Jabal Hārūn. In 2005 it was deemed necessary to extend the surveyed area towards Wādī Ṣabrā and towards Petra itself in order to relate the Jabal Hārūn area to its surroundings. The survey of a relatively large geographical area in a limited time also required the adoption of different survey methods. The team was divided into three groups of two people moving on foot. One group concentrated on the ancient routes, while the other two groups covered the area from the borders of the intensive survey area up to Tulūl Muthaylija and Wādī al-Biṭāḥī in the south and to the Snake Monument in the direction of Petra. No tracts were walked in the extensively surveyed area. The locations of the observed sites were determined with hand-held GPS and the sites were documented with short written descriptions and digital photography. Small samples of lithics and diagnostic pottery sherds were collected for later examination in order to enable the dating of the sites. Parts of the areas were left unsurveyed, if they were deemed topographically unlikely to yield archaeological sites based on our earlier experience.

According to the original plan, aerial photographs would have been used to locate larger sites and structures; smaller sites were assumed to be visible only in the field. Unfortunately, because the new aerial photographs were not available before the field season, fieldwork was conducted by choosing very large areas to visit each day. However, some earlier aerial photographs and satellite images were available and preliminary plans could be made for the survey of the extended area (see later).

Geological Background

The 2005 survey area covered the eastern part of the Petra valley from the Snake Monument to Naqb ar-Rubā'ī and adjacent areas west of the Petra Rift valley escarpment. These areas represent two different environments where different human actions can be assumed to have taken place in the past. This is the result of different topographical as well as hydro-ecological patterns in these two areas.

The western part of the Petra valley is a gently rolling and relatively flat area situated approximately at an elevation of 1000-1100m asl. The survey areas west of the escarpment where Petra and Jabal Hārūn are located are at lower elevations at 700-1000m asl. In contrast to the Petra valley, the bedrock in the survey area consists mainly of limestone, conglomerate and volcanic rocks (GMD 1995). In the latter area the slopes in general are very steep and the topography is heavily broken to a degree that has a restricting effect on human mobility. Therefore human as well as animal movement is likely to have been channelled through certain areas that can be more easily traversed.

Cartographic Report (A. Erving, H. Junnilainen)

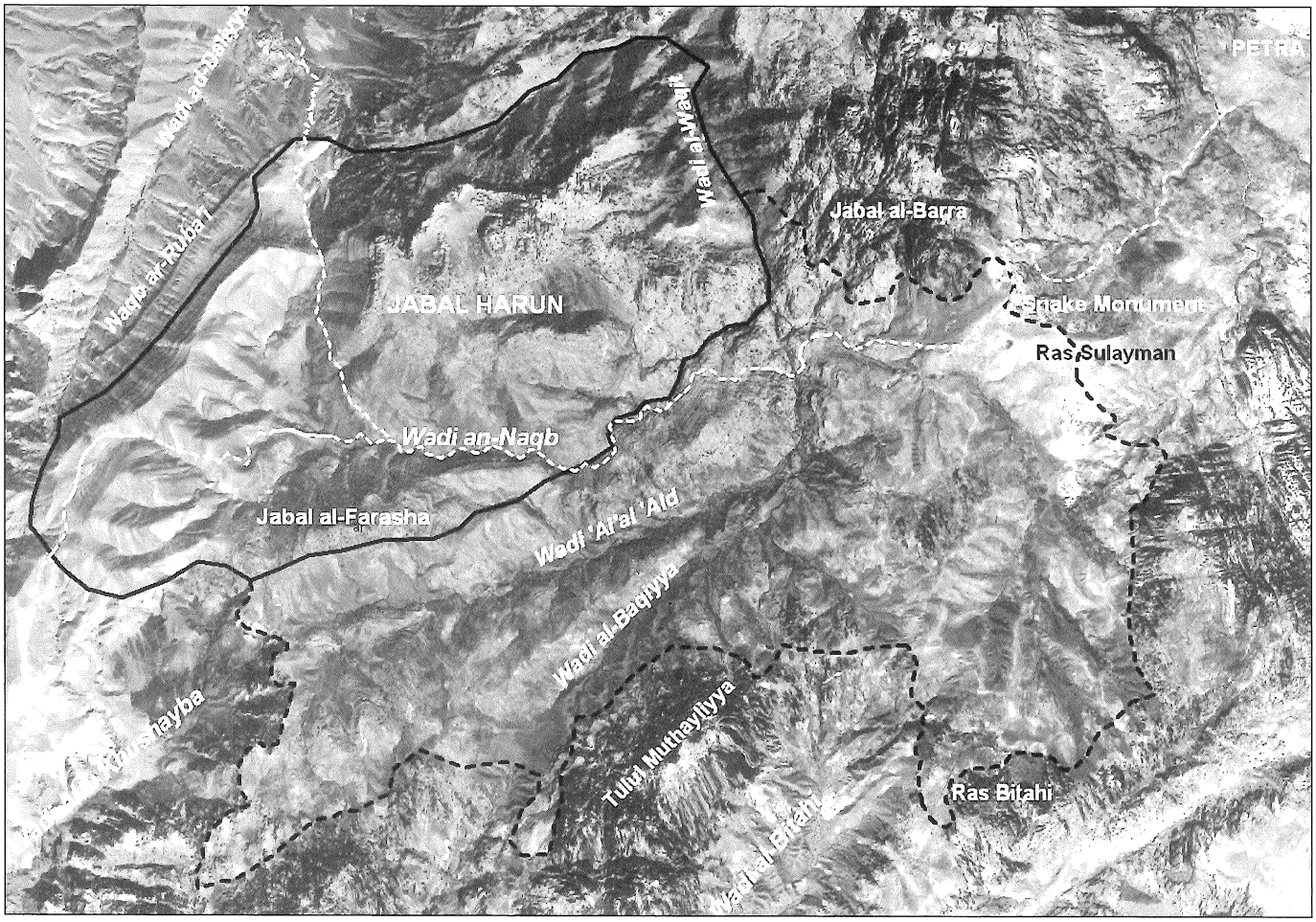
Due to the extension of the survey area in 2005, new approaches were applied in cartographic documentation. While maps, images, control points and the digital elevation model have covered the intensive survey area, no previous cartographic work had been done in the extensive survey area. Before the exploration of the extensive survey area, two sets of aerial stereo images were used to interpret the area visually. Images at scale 1:30,000, taken in 1992, provided a general overview of the areas near Jabal Hārūn. Archaeological sites were located on aerial images at scale 1:15,000, taken in 1981. Stereo viewing facilitated the interpretation greatly and sites such as terrace wall and barrage systems, drainages, roads, trails, and ruins were identified on the images. In addition, aerial images are used for creating a digital elevation model and topographic maps from the extensive area.

Since previous aerial stereo images are not in the map coordinate system, KVR-orthophoto, with pixel size 1.8 meters, was used as a base map for the survey. Individual sites were recorded by handheld Garmin GPS receivers and placed on the base map. An accuracy of 20 meters was achieved, as known control points were measured and used in coordinate adjustment.

The cartographic team also continued traditional tachymeter documentation in Areas D, F, L, O, W and X (**Fig. 1**). Structures found from Areas L and X were measured and documentation of the whole intensive survey area was completed. No new geodetic control points were established.

During the 2005 field season, a new photogrammetric documentation technique was introduced in certain structures in the survey area. In order to create photorealistic 3-D models, the watchtower in Area T (Frösén *et al.* 2000: 418) and a part of the ancient road in Area H (Frösén *et al.* 2001a: 389-390) were photographed by digital camera (Canon Powershot A 510 with an image resolution of 2048 x 1526 pixels). The photographs were taken convergently so that every point should be seen on at least two photographs and camera angles were carefully considered. In addition, lens distortions caused by camera were compensated for before modeling.

The images and measurement data are developed further at the Helsinki University of Technology. Terrace wall systems are measured from the stereo photographs, 3-D models of the survey area are produced, and photorealistic models of certain sites and structures will be created. The general map of the intensive survey areas (**Fig. 2**) and the map of tracts and sites were finished. The map of the barrage systems and terrace walls will be completed, as well as the thematic maps of lithics and pottery densities. General maps of the extensive area are produced and the extended digital elevation model will be used for analysis.



2. Map of the intensively and extensively surveyed areas and ancient routes on a satellite image (by P. Kouki and H. Junnilainen).

Survey Areas

Area L

Five tracts (242-244) were fieldwalked on a plateau and nearby low hilltops situated to the northwest of Jabal Hārūn. A path (Site 12) with some stone steps still visible in its uppermost parts descends to Area L and continues toward Wādī ad-Daliyya. The terraced fields in the area are still used for agriculture. Several rather fragmentary terrace walls were located on the lower slopes of the limestone ridge above Area L. In addition, terrace/barrage systems cover the entire area, except for a hillock situated in the northern part of the plateau. The structures appear to form a unified field system, which consists of two groups of parallel terrace/barrage systems and a few differently oriented structures.

The most obvious structure, also mentioned in Simms and Russell's (1996: 8) ethno-archaeological study of the Bedouin in Petra, is the well-preserved threshing floor upon a hillock (Site 13). It consists of a circular wall with one row of limestone blocks within another, semi-circular wall, where the stones are laid mostly in two rows. The inner circle has been laid with limestone slabs and is bare of sediment, indicating that the structure has been used relatively recently. Nearby, a small cavity under a big stone block has been enhanced with stonewalls, forming a Bedouin storage space most likely related to the threshing floor. Throughout the area there are stone piles related to the clearing of the fields. Finds from the area were scarce, but the threshing floor provided relatively abundant finds of pottery and lithics. Among the mainly first century Nabataean-Roman pottery were some third-fourth century sherds, as well as coarse, mineral-tempered ware, probably of late Islamic date and related to the Bedouin use of the area. On the east slope of the hillock there was a small concentration of lithic material (Site 14) with characteristically post-Palaeolithic

finds, suggesting a later prehistoric date.

Area X

This small area situated immediately to the east of Jabal Hārūn was the last to be surveyed intensively. Seven tracts (235-241) were walked (**Fig. 1**). The area had a relatively steep topography and only two tracts (238 and 239) were partly situated on bedrock saddle formation. Tract walking did not yield a large number of finds. The small amount of pottery and lithics seemed to indicate that the area was probably not used for occupation. The collected pottery included some Middle Islamic handmade painted pieces, which may indicate that the terraces in the area were used contemporary to the settlement at site 109 (Frösén *et al.* 2001b: 372-273). There is a Bedouin rock shelter in the middle of the area, documented previously by Simms and Russell (1996: Table 7.1, site 24), and some of the coarse hand-made pottery found on the tracts is probably related to its usage.

Three water control installations were separated as sites (195, 186, and 187). In addition, a rock shelter was discovered outside the survey area, above Wādī al-Waqīṭ and south of Tracts 235 and 236. Unfortunately, apart from the few pieces of Nabataean fine ware, it did not provide enough evidence to make any further assumptions on its habitation history. Area X is adjacent to a group of building remains on the north side of Jabal Hārūn (Frösén *et al.* 2001b: 372), and to the Jabal al-Barra massif on the east side of Wādī al-Waqīṭ. From the opposing cliffs of Jabal al-Barra, a terrace system (situated outside the survey area) was observed on the northern slope of Jabal Hārūn. There is also a garden irrigated from a spring on the opposite side of Wādī al-Waqīṭ, at the foot of Jabal al-Barra. These sites strongly suggest an extensive usage of the northern parts of Jabal Hārūn both in antiquity and in modern times.

The Routes (E. Hertell, H. Ynnilä)

This part of the extensive survey area is characterized by unwalkably steep slopes, but there are two topographically more even areas that were surveyed: Wādī ad-Daliyya and a valley north of Wādī Arba'ī (**Fig. 2**). The upper part of Wādī ad-Daliyya, below Naqb ar-Rubā'ī and east of Jabal Hārūn, is a steep wadi running northwards. The Arba'ī valley is relatively small and shallow. These areas have a moonscape appearance and man-made terracing is scarce on the slopes. This is in marked contrast to the western part of the Petra escarpment, i.e., the slopes near Jabal Hārūn and Jabal al-Farāsha, where slopes and wadis are full of terrace and barrage structures. The minimal investment made in facilitating cultivation suggests that the building remains found in the area are not related to agricultural practices. Instead, they are rather to be associated with the routes that lead through the area.

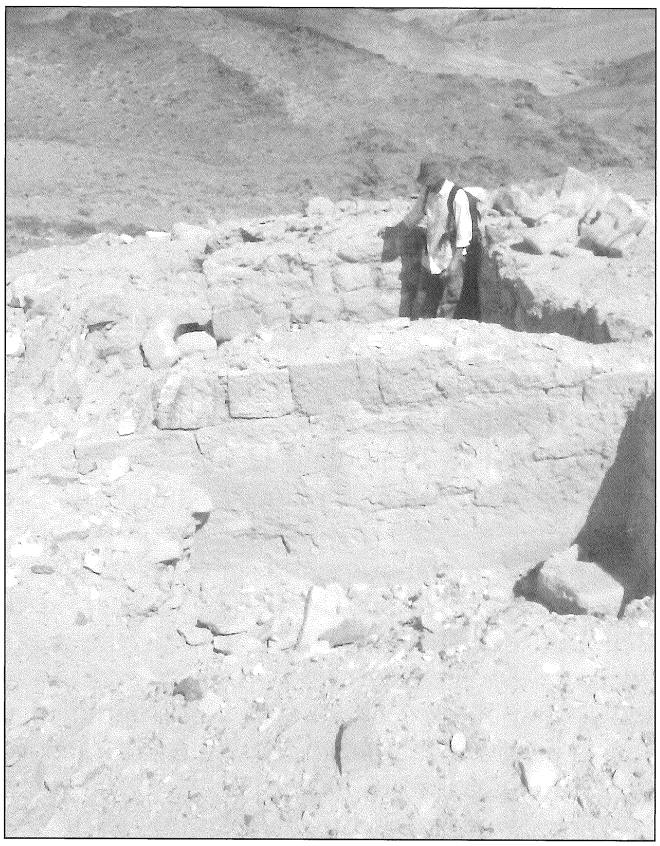
The road, which passes through the area south of Jabal Hārūn has been previously studied by the FJHP survey team in 1999 and 2000 (Frösén *et al.* 2000 and 2001a). During those seasons, the survey concentrated on Areas H, T and W southwest of the mountain (**Fig. 1**). In 2005, the fieldwork continued further to the southwest from Area T towards Wādī Abū Khushayba and Wādī Arba'ī and to the northwest of Jabal Hārūn towards Wādī ad-Daliyya, as well as to the east towards Petra (**Fig. 2**). The roads and associated structures were described and documented by drawings and photographs and GPS points were taken for mapping the routes. Several stretches of roads uniting and departing and utilizing different adaptations to environment were documented. The survey of the routes reinforces the prevailing image of Petra surrounded by a spiderweb of roads (e.g. Zayadine 1992; Graf 1992; particularly the road under discussion, see ben David 2005).

Lindner (1992, passim) has described Abū Khushayba in detail as a Nabataean settlement and a caravan station. The site is located directly above the wadi bed and is in danger of being swept away in a big flood. As Jarvis (1940: 145) already noticed in the early 20th century, the track between Abū Khushayba and the Petra plateau mostly lacks road structures and associated constructions before it reaches the slopes approaching Naqb ar-Rubā'ī (FJHP survey Area T). Along the way there are only some scant roadside supports, most of them seeming rather modern, loose constructions. The road southwest of Area T bears marks of side bordering. There are also associated structures, two of which were preliminarily identified as watchtowers. Two other sites contain structures that

could have served as limekilns. The possible watchtowers contained Nabataean-Roman commonware dated roughly to the first century AD. Visibility was excellent between them as well as to other sites further down towards Wādī ʿAraba. Unfortunately the watchtowers are severely damaged due to looting.

Sites located further down are situated along the route that departs from the course of Wādī Abū Khushayba at the lowermost tower southwest of Area T, and then leads further to the west. This route, the so-called Arbaʿī road, passes through a fairly closed and sheltered landscape that differs from the open, bare terrain towards Abū Khushayba. In small valleys there are remains of buildings and some cultivation terraces, among which there is a perfectly paved section of a road extending about 10 meters. The paving is made of limestone flagstones that are neatly fitted together. Further on, as the route reaches volcanic terrain towards Wādī ʿAraba, are the remains of a building located on a ridge and consisting of several rooms. This indicates a rather large domestic habitation complex. Looting has exposed two rooms (the walls of which are oriented NE-SW and NW-SE). The first room, measuring 4 x 4m, was completely exposed, and the other one was partly revealed (**Fig. 3**). The latter room had an intact plastered wall with engravings of leaves, a net, and a fish on it (**Fig. 4**). Fragments of household utensils such as basins, grinding stones, and ceramics were found. Some pottery sherds, lamp fragments, a coin, and a coin fragment were collected from the dirt piles next to the rooms. The sample of pottery collected included both Nabataean-Roman and Byzantine types. The surroundings of the site appear to be isolated; the path running below the ridge is too unclear to follow.

It is interesting to note how the road has been adapted to different environments. At present, the parts running northwest of Area T display support structures mostly only in places where they were required. The parts of the route passing through the FJHP survey areas studied in 1999 and 2000 are more frequently bordered by support structures. There are also more sites and structures near the course of the route here. The continuation of the route towards Petra is more difficult to determine due to increasing modern disturbance. Where the route is visible,



3. A building complex with two rooms exposed along Abū Khushayba route (Photo by E. Hertell).

4. Detail of the plaster decoration (Photo by H. Ynnilä).

much effort has been put into accommodating it, for example by means of bedrock carvings (see ben David 2005: 39). There are several closely situated burial sites, possible watchtowers, other building remains associated with the route, and habitation sites. Similar sites are found related to other routes around Petra (Kloner 1996 : 131).

The fourth route that was explored is located to the northeast of Jabal Hārūn. This route follows a constantly zigzagging course along a rather steep slope and is fortified by support structures in many places. The route supposedly finally leads to Umm Ratām, a Nabataean settlement. However, as the route reaches Wādī ad-Daliyya, it also seems to divide in two, with one branch heading to the northeast and the other to the northwest. Here, traces of human habitation are visible again after the bare and steep slopes at the beginning of the route.

The 2005 survey season provided an abundance of new information on the roads around Jabal Hārūn. However, it is unlikely that all communication lines in the area were recognized and studied in detail. As the survey method was changed, estimates of the scale of human activities related to the roads now visited cannot be compared to the occupational density of the intensive survey.

The Area Towards Petra and Tulūl Muthaylija (M. Lavento, P. Kouki, A. Mukkala, S. Silvonen)

This area (**Fig. 2**), covering ca. 6km^2, which consists of the gently sloping hills and ridges between Jabal al-Farāsha and Tulūl Muthaylija and includes the areas of Rās Sulaymān and Rās Biṭāḥī, has a strong agricultural character. Even today, it is used for cultivation and Bedouin camping. Also the southern slopes of Wādī al-Biṭāḥī in the south and the steep western slopes and the almost vertical cliffs of Jabal al-Barra, northeast of Jabal Hārūn, were included in the surveyed area.

Cisterns and Water Installations

There are several Nabataean cisterns in the area, usually situated in sandstone formations. One cistern is located below Jabal al-Farāsha immediately to the southwest of the mountain and another at the foot of the sandstone massifs of Tulūl Muthaylija. This cistern has been recently roofed and reused by locals. Another reused cistern is situated in the intensively used area next to the road from Jabal Hārūn to Umm Ṣayḥūn by the massif of al-Barra. This large (about 8 x 8m) cistern has carved steps and a doorway and had most likely already been constructed during the Nabataean period. The easternmost cistern is situated on the al-Manzā mountain, south of Rās Sulaymān. Here, water is collected from high above as runoff, but also the sand/limestone formation itself seems to contain water, judging by the presence of several trees and plants growing on the mountainside.

There are also several abandoned cisterns. One is located in a tributary of Wādī ʿIyāl ʿĪd, and it may be related to the remains of a small building on the ledge above it. A round rock-carved cistern and a related large barrage structure are located in Wādī al-Buqayʿ. The cistern has four arches, one of which is still intact, but the roof structure has collapsed (**Fig. 5**). There is mortar on the walls. The site has been illicitly excavated, and there is a large heap of well-made blocks next to the cistern, possibly parts of the cistern structure. Pottery finds were quite scarce.

A large cistern at the southernmost point of the survey area was especially distinctive. A small sandstone formation stands out in the sedimentary plain towards the ash-Sharā mountains. The form of the cistern follows rounded bedrock surfaces with several natural channels conducting water into it. The main entrance, with stairs leading inside the cistern, is in the northeast. At the foot of the stairs are a settling tank and a

5. A round cistern with intact arches situated in Wādī al-Buqayʿ (Photo by S. Silvonen).

channel. Inside the sediment-filled cistern there is a triple niche on one of the natural walls.

An exceptional formation was a site with six deep holes possibly used for water storage, situated in the sandstone massif on the south-south-east side of Wādī ʿIyāl ʿĪd. These holes, natural in origin and possibly later deliberately enlarged, were located on a small bedrock ledge that stays in the shade during most of the day. Above the holes there is a cistern, which has been recently cleaned and enforced with cement. There were also two channels directing runoff water towards the cistern.

In addition to cisterns, there are also other types of water installations in the area. A water channel with a length of about 20m has been carved into the bedrock in the foothills of Tulūl Muthaylija. There are two niches in the wall above the water channel and a configuration of 2 rows of 8 small cups, resembling a game board, carved in stone on the ledge under the niches. There are worn remains of possible rock-carved steps at the western end of the water channel.

Although the extensive survey area did not contain as many barrage and terrace wall systems as the intensive area, such structures are still present. Due to limited time and resources, they were not documented as thoroughly as during previous seasons. Therefore, this paper provides only a superficial overview of the water installations.

Barrages were observed in all wadis in the extensively surveyed area, but the most substantial structures are located in the Wādī ʿIyāl ʿĪd itself. These barrages, which are several metres wide and often more than one metre thick, have two carefully built retaining walls of large, worked blocks filled with rubble in between. They closely resemble the structures in Wādī as-Sāda in the Jabal Hārūn area (Frösén *et al.* 1999: 396-398) and can be proposed to be contemporary with them. There were also numerous terrace walls, particularly on the slopes to the northwest of Wādī ʿIyāl ʿĪd and on the hill slopes in the southwest end of the valley. The dating of these structures is problematic, as they have probably been built during various archaeological periods and their use has continued almost to the present day.

The background pottery scatter in the extensively surveyed area was generally Nabataean-Roman, mainly first century AD according to a preliminary examination, which conforms to the picture from the intensively surveyed area. However, there was also sporadic scatter of Late Roman and Byzantine pottery in the area closer to Petra, which is generally not present in the background scatter of the immediate surroundings of Jabal Hārūn. At some locations sherds of thick, coarse-tempered hand-made ware of most likely Ottoman or even later date were found, while very little of the collected pottery was datable to the early or middle Islamic periods. The densest background scatter of pottery was observed on the thick sandy deposits to the southeast of Wādī ʿIyāl ʿĪd.

Building Remains

The extensive survey area contained several significant building remains. Ancient human presence is evident in the building remains at Rās Sulaymān south of Jabal al-Barra. The largest building structure is a complex that included several rooms situated on a slope facing northwest. The ceramic material at the site was preliminarily dated as first century Nabataean-Roman. Extensive human presence was evident; several constructions were noted above the largest structure, but without further investigation separate buildings cannot be distinguished from each other. At the far end of the ridge, where visibility is good towards both ends of the valley between Petra and Jabal Hārūn, are the remains of a possible watchtower.

In connection with the ridge, descending towards the southeast, there is a large limestone quarry with several water channels next to a deep gorge in the al-Maṭāḥa Fault Zone. Further to the south, situated in the fluvial plains, an isolated structure (5 x 5m in size) with associated finds of (more closely undatable) Nabataean fine ware was located next to a route which is still in use.

The remains of a small building were situated overlooking the area between Wādī az-Zakara and Wādī ʿIyāl ʿĪd, where the location suggests a possible function as a watchtower. The date is uncertain, as very little pottery was associated with this structure, which has also been damaged by the illicit excavation of a large pit in the middle.

On top of a gently sloping ridge to the south

of Jabal al-Farāsha are the remains of a Nabataean building where wall lines are partly visible. The size of the structure is approximately 4,5 x 8,5m. Nabataean pottery (mainly first century AD) was scattered around the site, and clandestine pits have been dug below the site on a terrace.

The remains of a fairly large building were discovered on top of a ridge at the beginning of Wādī al-Buqay'. One possible wall line is visible among the rubble with large amount of very fragmented first century Nabataean pottery scattered around it. A large enclosure and shelter structure have been built next to the site recently, most probably utilizing stones from the building remains. The site has also been illicitly excavated. The remains of a smaller building are located about 20m to the north of the larger building. The building blocks at this site are more carefully made and include some diagonally dressed and semicircular blocks. Similar Nabataean pottery is also scattered around this site, which also shows evidence of illicit digging. On a small ledge slightly north of these two sites, there is a "game board" of 7 x 7 small cups carved in the bedrock.

Cultic Sites and Graves

Examples of monumental art in the extensive survey area include façades and doorways of tombs, such as a façade with a collapsed upper part and an engraved cross nearby. Rectangular shaft graves cut into the bedrock are mainly situated close to the modern car route from Petra to Jabal Hārūn. This seems to indicate that the car route may follow the course of the ancient road. In addition to rock-cut graves, there were also graves that had been dug into the soil and enhanced with stone slabs. All burials have been illicitly excavated but some surface finds of Nabataean-Roman pottery were collected around them. Preliminary examination indicates that the pottery mainly dates from the first century AD. In the al-'Ajja area, there was a small graveyard of three burials upon a hilltop. Another small concentration of three possible graves cut into the very hard and thick layer of calcium carbonate bedrock was found in the ridge area called Rās Sulaymān by the locals, near the Snake Monument. Finally, one open cave blackened by smoke from campfires may have been used as a tomb. Much further east and higher up the cliffs of Jabal al-Barra, there was a stone cairn on a small plateau. The size of the cairn was ca. 4.5 x 3m and it had a rectangular inner structure, but unfortunately there was nothing to indicate its age. A second cairn yielded first century AD Nabataean fine ware, and finally a possible burial/tomb constructed from slabs (2.3 x 0.6m) on a medium-high area of the massif.

A significant rock-cut Nabataean cultic installation is located at the edge of the survey area, southwest of Jabal al-Farāsha, on the ridge that drops down towards Wādī Abū Khushayba in the west. This is the only large bedrock outcrop in the immediate surroundings and is very clearly visible against the horizon. The installation consists of a niche carved into the rock with three betyl stones carved on both sides. The betyls are approximately 40-50cm high and 15-20cm wide. Such a tripartite configuration may have symbolized a trinity of gods in Nabataean mythology (e.g. Atiat 2005: 166). The niche has been partly walled in with sandstone blocks, perhaps as a recently used storage area. The site has previously been briefly described by Gunsam (1996: 36-37).

A few Nabataean rectangular rock-cut graves are located in sandstone outcrops at elevated points of the landscape, along the ridge to the southeast of Wādī ʿIyāl ʿĪd and on hilltops. In addition there are also a number of stone cairns that were interpreted as possible graves. Fragmented bones were found in connection with one of these cairns, which has been looted. Nabataean pottery (mainly first century AD) was also associated with this structure. Other stone cairns yielded no finds. The most interesting structure in this area is a possible shaft grave partially cut into the bedrock on top of a hill. The structure consists of a small chamber with diagonally dressed walls carved into the bedrock (**Fig. 6**). Traces of red paint are visible on the walls and the roof of the tomb is made of flat sandstone slabs. The site appears to have been looted relatively recently. A dirt pile next to the opened chamber contained small pieces of bone and pottery. Large blocks, including column drums and capitals, are scattered around the site, perhaps as the result of an earthquake.

On top of a round bedrock outcrop approximately halfway between Jabal al-Farāsha and

6. A possible shaft grave with the remains of a roofing structure (Photo by S. Silvonen).

the descent to Wādī Ṣabrā, there are also two rectangular rock-carved graves. The rock is located on top of a small hill and it is clearly visible to the surrounding area. Nabataean first century pottery and some diagonally dressed blocks were scattered around the rock.

Rock Art

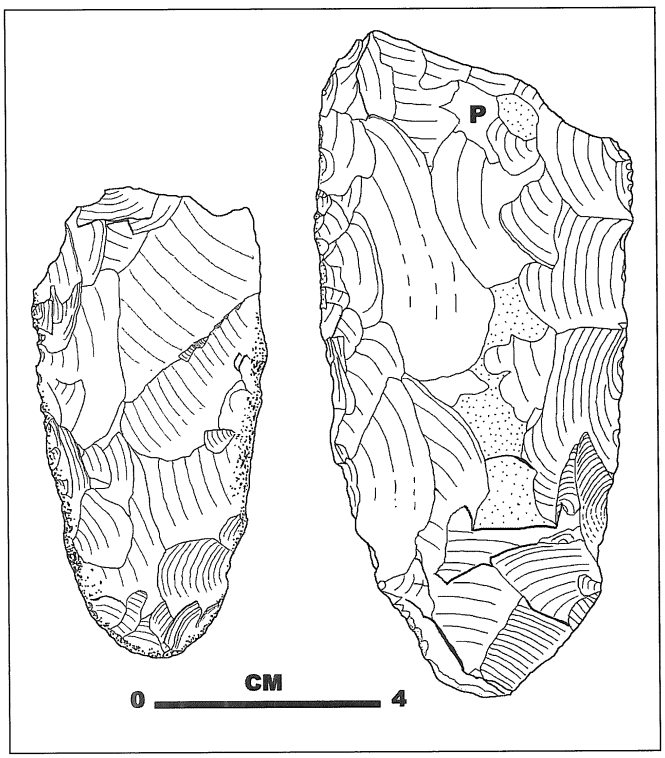
Rock engravings depicting footprints and ibexes, "game boards", cup-marked bedrocks, and Nabataean and modern Arabic inscriptions were located in several places in the entire extensive survey area. In addition to the common symbols of ibexes and footprints there is one unusual scene of two standing figures raising weapons on the south-southeast side of Jabal al-Barra. The figures face each other with possibly a shield in one hand and a sword or spear in the other (**Fig. 7**). The engraving resembles the one found earlier in the north side of Jabal Hārūn (Frösén *et al.* 2001b: 373), but the fighting motif is rather uncommon. The visibility at the site towards the west, south, and east is excellent, and the *weli* on top of Jabal Hārūn is also visible. The Epipalaeolithic site of Sunakh is located quite nearby in the east. Also adjacent are the crossroads of Wādī al-Waqīṭ, Wādī an-Naqb and the route to Petra. In addition, a nearby wadi, which is situated closer to Sunakh (see below), yielded another site where petroglyphs of ibex and footprints and a rock-carved pattern of small cups carved in the bedrock, resembling a game board were found in connection with a Nabataean site with water installations and a wall structure featuring diagonal dressing. A concentration of predominantly first century Nabataean pottery was also discovered. Other locations were to the southeast of Jabal al-Farāsha, upon a high rocky outcrop in the western foothills of Tulūl Muthaylija. The remains of an unstructured building are visible immediately to the north of the installation. Surface finds consist of Nabataean-Roman pottery (also mainly first century AD) and some lithic artefacts.

7. A rock engraving showing two opposing human figures holding shields and swords or spears (Photo by A. Eklund).

Lithic Finds

The surveyed area included the Epipalaeolithic site of Sunakh at the foot of Jabal al-Barra. As this site has already been investigated in detail by Danish archaeologists (Hoffman-Pedersen 1995), it will not be commented upon here. However, several other lithic concentrations were noted in the survey area. Although their sizes and find amounts were relatively small they were still classified as sites. Only one concentration, located on the scarp overlooking Wādī al-Biṭāḥī, could be defined as Epipalaeolithic. There is also another concentration about 20m to the northwest of the first, but the lithics appear to be of a different type. The small number of lithic concentrations found in 2005 is probably due to the extensive survey technique, which makes it difficult to notice small find concentrations.

Most interesting lithic finds of the 2005 field season were three broken axes. All of them were stray finds, one from area L and two from the extensively surveyed area. The axes are made of local cherts by bifacial flaking. The amount of pecking of the edges varies. The original blades do not exist but the largest fragment still has a



8. Two flint axe heads found in the survey area. The capital "P" points the area with polish as the result of grinding (Drawing by E. Hertell).

small polished section on its face (see **Fig. 8**). In the Petra area bifacial, pecked and polished chert axes are known from PPN Bayḍa (Kirkbride 1966: 35, fig. 10).

The axes imply the nature of activities in the surveyed area. There is good reason to suspect that the places where these broken axes were found were places where woodcutting took place. It seems likely that ruined axes were not carried along and these axes were abandoned shortly after they were broken. This implies that woodcutting took place at the slopes of Jabal Hārūn and in the upper part of Petra valley in general. If these axes were used by individuals living in the PPN villages several kilometres away, the question of the catchment area for wood procurement arises. A possible explanation for this large range can be the environmental degradation and shortage of wood, particularly timber for construction, near the villages, as has been suggested for the PPN period (Köhler-Rollefson and Rollefson 1990). In such a situation we would expect to see evidence for woodcutting and collecting to occur further and further away from the villages. Procuring wood several kilometres from a village does not appear to be an efficient strategy, unless the environmental degradation around villages was very severe. However, it can also be suggested that other activities such as hunting or herding were performed in connection to woodcutting expeditions.

Other Structures

Structures such as threshing floors, stone cairns and remains of campsites were observed in several locations. Upon the ridge above the route to Petra, on the southern side of Jabal Hārūn, there was another set of rock engravings that included a Nabataean inscription on a small vertical bedrock surface near a water channel. Altogether several dozen rock engravings were located farther south, to the south-southeast of Wādī ʿIyāl ʿĪd and to the east of Wādī al-Biṭāḥī.

It is worth mentioning that a small path was visible above Wādī al-Waqīṭ near Jabal al-Barra. Marked by small piles of stones, it runs along the wadi towards Wādī ʿIyāl ʿĪd. There was also a small, zigzagging path on the north side of Wādī al-Biṭāḥī, but a more significant route, running from northeast to southeast, was observed near the valley to the southeast of Wādī al-Biṭāḥī following the terraces of Rās Biṭāḥī. To the west of Rās Biṭāḥī, where the survey area ended, traces of three or four threshing floors could be seen on the plateau.

Conclusions

The combined results of the intensive and extensive survey work indicate that during the Nabataean and Roman periods, the Jabal Hārūn area had a different, more peripheral character as compared to the adjacent areas towards Petra and the Wādī Ṣabrā. The use of the Jabal Hārūn area was mainly agricultural, and, according to a preliminary comparison of the find material, the Nabataean activity in the Jabal Hārūn area seems to concentrate largely on the first century AD (excluding the monastery on the top of the mountain). This means that the period of settlement in the area seems to have been shorter and ended earlier than in the areas towards the Wādī Ṣabrā and closer to Petra, where pottery dating to the late Roman and Byzantine periods has been found. Although barrages and terrace walls seem to concentrate mainly in the intensively surveyed area around Jabal Hārūn, almost all cisterns found are located in the extensively

surveyed area, which underlines the different character of these areas. The presence of cisterns also indicates the possibility of permanent settlement in the extensively surveyed area, but the Jabal Hārūn area appears to have been used mainly for agriculture through the adoption of water harvesting techniques.

In the westernmost part of the Petra escarpment, i.e. near Jabal Hārūn and Jabal al-Farāsha, the topography is relatively steep in comparison to the extensively surveyed area towards Petra and the Wādī Ṣabrā. As a response to this, the agricultural practices in these areas seem to have been somewhat different. In the Jabal Hārūn area, large-scale construction of terraces and barrages for water harvesting and soil management has taken place as a response to the steep topography and lack of fertile soil. This resulted in a small maximum field size between the terrace constructions, with the largest field areas to be found in the bottom of the small tributaries. The investment in maintaining the system must have been relatively high in terms of labour, with construction of new structures and constant repair of the existing ones. This pattern differs from the general picture in the lowlands of the Petra escarpment, including the extensively surveyed area, where there has been no need to construct terraces on the gently rolling slopes and the topographic potential for water harvesting is low. Due to the relatively level ground, much larger fields can be cultivated. In short, the areas differ in their potential for arable agriculture and most likely also in the effort needed to maintain and cultivate the fields. In other words, the returns for the agricultural practices in these two environments are different, which bears implications for the differences in land use and human settlement in these areas.

In contrast to the Petra escarpment, the areas to the west of Jabal Hārūn, below the escarpment, are lacking evidence of agricultural structures. This is not surprising as the topography is steep and heavily dissected in many places. However, also, the valley-like formations lack evidence of terracing. This suggests that not much agriculture was practised in this area although some building remains are present. At least a partial explanation for the apparent lack of agricultural activity in the western fringes of the escarpment is probably the orographic nature of rainfall in the Petra region, which means that the amount of rainfall decreases considerably towards the bottom of the Wādī ʿAraba.

There is at least one ancient road passing through the Jabal Hārūn area to the west, and another route has apparently continued northwards through the pass to the northwest of the mountain. The existence of roads in the area may be explained by the topographical setting. The Jabal Hārūn area forms a natural route for ascending from the Wādī ʿAraba towards Petra. The hilltops of the western part of the area offer good visibility towards the west, enabling the surveillance of vast stretches of landscape towards the Wādī ʿAraba, which may have also influenced the establishment of a more formalised road in the area. Most of the building remains in the Jabal Hārūn area concentrate in the vicinity of the road and it can be suggested they are related to it. The structures have been mostly dated to the first century AD, based on the pottery finds. A similar phenomenon, namely that structures with associated Nabataean pottery are situated close to the course of the ancient road, can also be seen in the eastern part of the extensively surveyed area, i.e. closer to the city of Petra.

Settlement in the Jabal Hārūn area seems to have lasted only for a short period compared to the surrounding area. Considering the apparent relationship between the building remains and the ancient road in the area, it seems that the activity in the area was closely connected to the use of the road. The background pottery in the area with the water-harvesting structures is also almost exclusively dated to the first century AD based on the typology of Nabataean painted fine ware developed by Schmid (2000). It is thought that the background pottery is related to agricultural practices, mainly manuring (e.g. Bintliff 2000: 209; Wilkinson 1989: 43-44), and indicates the original building date of the water-harvesting system in the Jabal Hārūn area (Lavento *et al.* forthcoming). Notably, the period of activity in the Jabal Hārūn area corresponds to the most intensive period in the Nabataean trade. The intensification of trade through Petra required also the intensification of agricultural production, which in its turn encouraged sedentism (Fiema 1991: 74-75; Friedman and Rowland 1977: 233). It can therefore be suggested that the short-lived period of intensive

cultivation and associated settlement in the Jabal Hārūn area is a by-product of the peak of the Nabataean involvement in trade.

The prehistoric lithic scatters found in the FJHP survey show yet another pattern. Not surprisingly, the application of intensive or extensive survey strategies seems to result in a marked difference in detecting lithic scatter sites. As expected, only a few lithic scatters were located in the extensive survey, whereas the intensive survey resulted in many sites. This dichotomy is particularly strong with the Middle Paleolithic material, which is strikingly abundant in the Jabal Hārūn area compared to the extensively surveyed areas.

Some Epipaleolithic sites were located in the survey. The sites are neither numerous nor large, but together with the existing data from the Petra region (e.g. Hoffman-Pedersen 1995; Gebel 1988), they suggest an even site distribution in the landscape. Currently it seems that Upper Paleolithic and Neolithic materials are poorly represented in the survey finds. Sites consisting mainly of small flakes and flake tools seem to be relatively common in the survey material and are likely to be connected with the late prehistoric activity in the area.

Other reasons besides survey strategies can be proposed to explain the differences in the distribution of lithic scatters, such as the availability of flint raw material as well as topography with the associated processes of erosion and accumulation, but more detailed analyses of the lithic material and the regional site distribution are needed to understand the emerging settlement and land use patterns.

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