

THE CISTERNS OF THE AL-KARAK PLATEAU

by

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There is a growing interest among archaeologists to investigate the ways in which ancient people of the Middle East exploited the natural resources of their environment. This effort is motivated not only by antiquarian interests but out of a concern to contribute to the future development of the natural resources of the growing nations of this area. Since water is and has been the crucial natural resource underlying life in this part of the world, it is understandable that a great deal of attention is beginning to be directed toward the role that water management has played in the daily lives of the inhabitants of the Middle East throughout history. In a sense archaeology is becoming equally as interested in viewing the physical remains of the ancient world as a key to understanding more about the reciprocal relationship between people and their environment as it all along has been in reconstructing historical events of the past.

Lawrence Stager's study of the role of water management systems in the Judean desert represents a pioneering effort in this sort of research in Israel. He describes evidence where "floodwater farmers" in the Buqe'ah basin in the northeastern part of the Judean desert harvested water in catchment areas consisting of a series of stone walls for distribution to individual plots (Stager 1976: 157). The experimental research of Evenari, Shanan, and Tadmor in the Negev has become a model for integrating the study of water usage with the life systems of the people of a particular area. Their project actually simulated ancient runoff agriculture by reconstructing water diversion systems. They were thus able to observe the flow of water and measure the amounts

produced for irrigation.

In Jordan, we have reports from Jāwā (Helms 1981), al-Ḥumayma (Oleson 1995), the Mādabā Plains Project (Lacelle 1986; Cole 1989), Gadara/Umm Qays (Weber 1991), Abila (Mare 1995), and al-Lajjūn (De Vries 1987) that offer new insight into what archaeology has to tell us about the use of water among the ancient people of those areas. Most recently David Kennedy has shed light on water management in the Southern Ḥawrān at Dayr al-Kahf and Umm al-Quṭṭayn. Kennedy draws attention to how much can be found about the "variety and sophistication" as well as the "considerable success attainable" in ancient water collection methods (Kennedy 1995: 288).

Except in the case of al-Lajjūn, little effort has been made to advance our understanding of the water management systems of the al-Karak Plateau. Of course the existence of cisterns and other structures for water storage was noted in the journals of early explorers in that area. Glueck (1933-39) and more recently the Miller-Pinkerton survey of the al-Karak Plateau (1978-82) have called our attention to the continued existence of such facilities. However there is a need for more detailed studies of water management on the plateau, and it is to this task that the al-Karak Resources Project focused much of its attention in its survey of 1995.

In modern and surely in ancient times a major source of water must have been the peripheral wadis delineating the plateau, especially al-Mūjib, which forms the north and northeast boundary of the territory. The western side of the plateau receives the

most rain, an average of 350 mm a year. Since the plateau slopes downward toward the al-Mūjib, much of the runoff eventually drains there (Koucky 1987: 30). The water that percolates into the karstic limestone of the area flows horizontally when it meets less porous strata and reappears as springs on the wadi slopes (Mattingly 1983: 604; Miller 1991: 3). Today there is a sufficient supply of water in al-Mūjib during the summer to provide irrigation for tomato crops on the terraces above the stream. Water is pumped to plastic lined reservoirs where it is distributed to cultivated rows through plastic pipes. In ancient times, however, the distance between the plateau and the wadi floor undoubtedly made this source less practical than it is today. Survival on the plateau in the dry summer months depended primarily upon the population's ability to collect, store, and distribute the abundant water of the winter rains. Their ability to do this became evident immediately during the survey of the al-Karak Resources Project.

The al-Karak Resources Project focused its survey on seventeen sites previously recorded by the Miller-Pinkerton survey (see G. Mattingly, in this volume): Umm al-Habaj, al-Ḥmaymāt NW, al-Ḥmaymāt SW, al-Ḥmaymāt SE, Khirbat al-Mdaynah al-ʿĀliyah, Khirbat al-Qaryatayn, Khirbat al-Ḥawiyah, Kfarāz, al-Mraygha, Khirbat In-shanīsh, Khirbat al-Batrā, a nameless site (Miller Site 364), Nakhl, Khirbat al-ʿAkkūzah, Rujum al-ʿAbdah, Khirbat al-ʿAbdah/Kfeir, and al-Muḍaybiʿ. On these sites we took the time to study and record 63 well preserved water storage facilities or cisterns.

These structures vary in size and appearance, and consistent terminology to describe them has yet to be developed. The categories offered by R. Abujaber are the most useful and will be adopted here (Abujaber 1995: 742). They are the *qiʿ* or "ditch," the *biʿr* or "well," and the *khazzān*

or "reservoir."

The *qiʿ* or "ditch" is an open excavation or a natural cave which was adapted to hold water (Fig.1). One *qiʿ* at Khirbat al-ʿAbdah/Kfeir was constructed with steps leading down to the water level (Fig. 2). The fact that these cisterns were unroofed made them subject to pollution (Abujaber 1995: 743). Undoubtedly they had to be protected against livestock which could easily fall into them as evidenced by the carcass of a donkey that we observed in one at al-Muḍaybiʿ.

A *biʿr* or "well" is bottle or pear-shaped cistern cut into the rock. These are capped by wellheads or "collars" with circular openings about 1-1.5 m in diameter. Often watering troughs still lie beside them (Fig. 3). Some of these wellheads must have been ornate as evidenced by the beautiful example of workmanship on one at ar-Rabbah (Fig. 4). Low stone walls channelled water



1. Cave cistern at Khirbat al- 'Akkūzah.



2. Stepped cistern at Khirbat al- 'Abdah/Kfeir.



3. Cistern with collar and trough at Khirbat al-'Abdah/Kfeir.



4. Ornate basalt collar at ar-Rabbah.

to inlets at the base of the collars which allowed runoff to enter and replenish the cistern. Collapsed cisterns continue to collect water and can easily be detected by the undergrowth around them and sometimes even trees growing in them. Many cisterns remain in use, having been capped in concrete and fitted with steel doors as covers. Wellheads could be reused for other purposes. One can be seen at the abandoned village of Sul serving as a window of a house.

It is not unusual to find several layers of plaster lining these rock-cut cisterns (Fig. 5). The workmen who plastered them often used designs such as dot impressions or "herringbone" patterns (Fig. 6). Apparently these patterns resulted from different techniques of applying plaster so that it would adhere to the interiors of the cisterns.

A third type of water storage facility is the *khazzān* or "reservoir" sometimes called a *birka* or "pool". These were usually the



5. Layers of plaster in cistern neck at al-Ḥmaymāt NW.



6. Herringbone pattern in plastered cistern at Kfarāz.

result of a communal effort (Abujaber 1995: 743). They were often constructed by building dams in low areas to collect runoff from surrounding hills. The al-Karak Resources Project survey recorded a modern *khazzān* in the wadi beside al-Muḏaybī'. No ancient ones were noticed, and it is likely that they were replaced by the modern structures or lie beneath them. The quality of water contained in this kind of storage facility is ques-

tionable. Abujaber notes that it "became unfit for human consumption in April or May of every year and therefore ended up being used for building requirements and watering of animals" (Abujaber 1995: 743). It appears, therefore, that of the three types of cisterns the *bi'r* or "well" served as the major source for human drinking water.

The modern inhabitants of the plateau are well aware of the location and potential of these cisterns. Many continue to be used today. "What the older generations of antiquity provided, was put to good use indeed by farmers of the same system a few thousand years later" (Abujaber 1995: 744). At al-Ḥumaymāt SW we came across a group of local youths reclaiming an ancient cistern (Mattingly, *infra* Fig. 2).

Two conclusions are clear from this initial survey. First, water was not scarce on the plateau. We were surprised by the number of cisterns that we found. Certainly there was an equal number that we did not see because they either appeared simply as depressions or were totally concealed by the debris of the ruins. Only excavation will reveal more about them. Second, the inhabitants, particularly in Nabataean and Byzantine times knew where to locate water, and this determined where they lived. Water storage facilities are located in karstic limestone formations, and this is precisely where the population settled. Dora Crouch in her study of water management

in ancient Greek cities points out that the Greeks intentionally considered the water retaining properties of the terrain when they selected sites for their cities. She calls this "geological determinism" (Crouch 1993: 341). It appears that the settlers of the plateau also knew the value of karst formations, and we should consider this when we explain the location of occupied sites in that area. The relationship between geological setting and urbanization is an area crying out for further study.

One productive application of archaeological research is to use this information to revive the ancient technology of water management, and "wed" it to current technology to produce what Øystein LaBianca calls a "blended technology" that may help solve the water problems of the future (LaBianca 1995: 771). This is being done in the Mādabā Plains by "Project Rainkeep" (LaBianca 1995: 775). This project will excavate and restore ancient cisterns so that their water can be used for irrigating crops. It is "just one way in which ancient archaeology can benefit modern life" (Hendrix 1995: 4). The al-Karak Resources Project has merely begun to delve into such matters in its territory. Much remains to be done.

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