

# PRELIMINARY REPORT ON THE 'AIN GHAZAL ARCHAEOLOGICAL SURVEY, 1987

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## Introduction

Over a four week period in June and July of 1987, an archaeological survey was conducted near the major Neolithic settlement of 'Ain Ghazal, located along Wadi ez-Zarqa in the northern suburbs of Amman. Two primary objectives structured this project: 1) to document whether or not 'Ain Ghazal was surrounded by smaller Neolithic satellite sites and 2) to document the range of human occupation in the project area.

Adding to the urgency of the project is the intense development that Amman is currently undergoing; construction is accelerating at an alarming pace, and the need to document archaeological occurrences in the Amman region before they are destroyed is critical.

## Background and Project Objectives

Four seasons of excavation at 'Ain Ghazal (1982, 1983, 1984, 1985) have revealed it to be one of the richest and most significant Neolithic settlements known in the Near East<sup>1</sup>. 'Ain Ghazal was a sophisticated settlement occupied from the aceramic (Pre-Pottery Neolithic B, or PPNB) Neolithic through the early ceramic Neolithic (Yarmoukian) periods. The range of materials recovered from the site is truly impressive, and its significance cannot be overestimated.

Of particular interest has been the documentation of a transitional phase between the PPNB and Yarmoukian periods: this has been termed the "PPNC," and has not been reported for any other site in the

region. Coupled with this and equally significant has been the suggestion, based on preliminary analyses, of a dramatic economic shift from the PPNB through the Yarmoukian. During the PPNB, a broad spectrum economy based on the domestication of a wide range of both plants and animals, supplemented by a large variety of wild resources, was in operation. By the Yarmoukian, however, this economic range had narrowed substantially, with a near exclusive emphasis on domestic goat/sheep. This has been interpreted as reflecting a change to pastoralism.<sup>2</sup>

Despite the wealth of data from 'Ain Ghazal, our knowledge of its surrounding area remained a vacuum, thus providing the stimulus for the survey reported upon here. A primary objective of the survey was to determine if 'Ain Ghazal was supported by small satellite sites, or if it operated as an independent entity. Of particular interest was the difficult task of determining the presence of late Neolithic pastoral sites. Such a presence would aid in confirming the postulated change to a pastoral economy. In any event, the documentation of any Neolithic sites in the area would help to define an 'Ain Ghazal community. This, in turn, would provide us with a better understanding of settlement patterns in a region adjacent to a major Neolithic center.

Another objective of the survey was to document the entire range of human occupation in the study area. This would aid in determining how land-use patterns have changed through time in the northern sector of greater Amman.

An allied objective was to provide

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1. Rollefson and Simmons (1985, 1986); Rollefson *et al.* (1985); Simmons and Rollefson (1984).

2. Köhler-Rollefson (1986).

documentation of archaeological sites in the study area so that proper management of these resources could be attempted. There has never been a previous systematic survey of the Amman area. The only former survey of the region was Nelson Glueck's, conducted in the 1930s, and the closest recent survey was to the southeast of the present study area, near Saḥab<sup>3</sup>. The present project was intended to supply information that might assist in the management and protection of significant sites. Minimally, the survey would provide systematically collected archaeological data for an area that is being rapidly developed.

A final objective was to continue geomorphologic research commenced at 'Ain Ghazal in 1983. The project geomorphologist, R. Mandel, was particularly interested in formation processes at both 'Ain Ghazal and at sites in the vicinity. Such information is useful in determining ancient settlement/landform preferences and in predicting site locations, as well as in indicating areas where geomorphic processes may have obscured the cultural record.

### Geographic Focus and Methodology

Six separate survey zones were investigated, four of which were contiguous. Zone 1 was considered a critical region to cover. It included portions of the area within a one kilometer radius of 'Ain Ghazal and is the region most likely to suffer from construction. The one kilometer distance could only be surveyed to the west and north of 'Ain Ghazal; commercial development has already obscured those regions to the east and south.

Zones 2-4 were contiguous to Zone 1 and represented the principal focus of coverage. These zones concentrated on the Wadi ez-Zarqa drainage to the north of 'Ain Ghazal. Zone 2 covered Wadi ez-Zarqa itself and its adjacent slopes up to a distance approximately four kilometers north of 'Ain Ghazal. Zone 3 concentrated

on the area around the confluence of Wadi ez-Zarqa and Wadi Ḥuweija and around the spring of 'Ain er-Rabaṭ. Zone 4 included an area surrounding the confluence of Wadi Zarbi and Wadi ez-Zarqa and around the spring of Ras el-'Ain. Zone 5 represented the north extension of the survey, and concentrated on an area along Wadi Akhu Barsh. Finally, Zone 6 was the eastern extension of the study area, concentrating on an area near the confluence of Wadi Marka and Wadi Umm Zabara.

In all instances, the wadi floodplains and adjacent terraces and slopes were investigated. In addition, the uplands of both Zones 2 and 3 were covered. A total of approximately 8.4 square kilometers was systematically surveyed.

The survey was completely pedestrian, and coverage of each zone was 100 percent. The survey team generally consisted of five individuals spaced at regular intervals. The distance between individuals varied depending upon the terrain, but in most cases was approximately 20-30 meters. In addition, the project geomorphologist frequently assisted with the actual survey as well as examining exposures and other areas of geological or geomorphic interest.

Given that the Amman region has been occupied for at least the past 100,000 years, and probably a great deal longer, cultural remains are nearly ubiquitous in virtually any area examined. This, of course, led to difficulty in actually defining a "site." We did not record isolated chipped stone or ceramic artifacts as sites. To do so would have been prohibitive in terms of time and would have been of questionable value. To be recorded as a site, a locality had to exhibit some clear patterning and/or contain a density of artifacts greater than that of the surrounding area. In other words, four or five pieces of chipped stone did not constitute a site, since such an occurrence can be found nearly everywhere. On the other hand, several dozen chipped stone artifacts, for example, located in a fairly circumscribed

3. Glueck (1934, 1935); Ibrahim, Gaube, and Kafafi (forthcoming).

area was considered as a site. While not without difficulties, this procedure allowed for the relatively unambiguous definition of sites and provided a cohesive framework from which to document the presence of cultural remains. We should note that not all sites were considered as *in situ* cultural occurrences. This was especially true on the floodplain of Wadi ez-Zarqa, which represents relatively recent deposition.

Once a site was located, it was recorded on a standardized form. This form included information on environmental setting, site description, locational data, and site condition. On sites with substantial amounts of chipped stone materials, an infield analysis sheet was completed. This form, while not replacing analysis of systematically collected artifacts, served to characterize the nature of each assemblage. Data recorded on the form included documenting the presence of debris, debitage (flakes, blades, bladelets), cores, microflakes (i.e., retouch flakes), and tools. The latter category allowed for classification at the type level. In most cases, the lithic analysis forms represented a random characterization of chipped stone materials from the entire site area. In some instances, however, 1 x 10 meter long transects were carefully examined, with all materials in these being recorded. This generally occurred at sites with extremely dense concentrations of chipped stone.

The survey was primarily of a non-collection type. Small samples of ceramics and chipped stone were judgementally collected from some sites for the purposes of identification and illustration. These materials are stored at the Institute of Archaeology and Anthropology at Yarmouk University in Irbid.

## Results

Within the total area of some 8.4 square kilometers surveyed, 81 archaeological sites were recorded (Fig. 1). This included, as site number 1, 'Ain Ghazal itself. Site 1B represented the eastern section of 'Ain Ghazal. This area had been tested in 1984, as limited structu-

ral remains were visible. The survey confirmed the presence of additional, albeit limited, cultural exposures. Of the 81 sites, at least 108 components are represented. This division was made on the basis of artifacts observed in the field and should be considered as tentative. Confirmation of this classification will have to be dependent upon systematic collection and/or excavation.

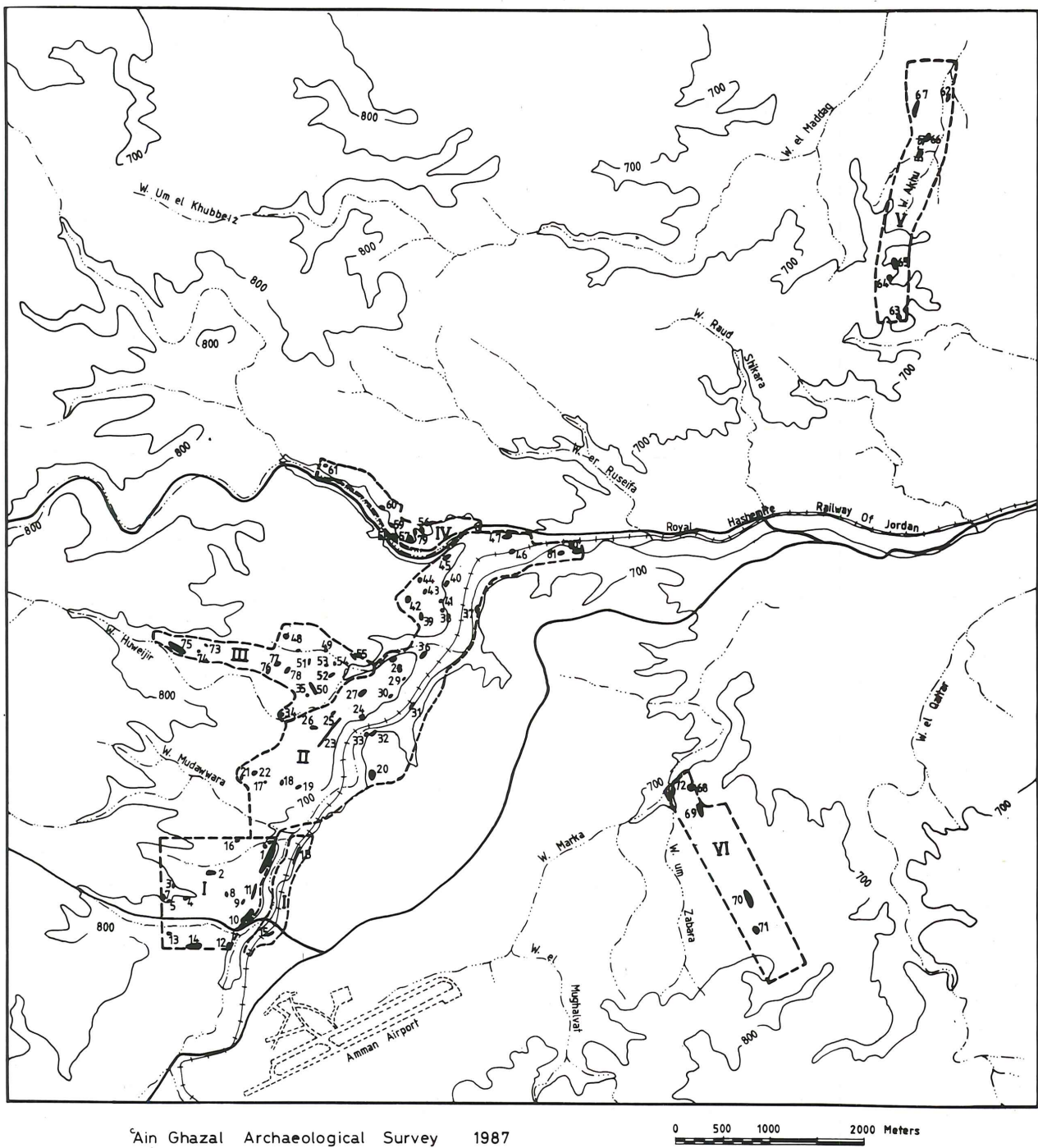
Table 1 shows the distribution of components recorded, and Table 2 provides information about principal site types. By "principal site types", we refer to the predominant feature(s) at those sites that are multiple component. For example, a site with a Middle Paleolithic lithic scatter component and a later structural component is noted in Table 2 only by the latter characterization.

A few additional comments are of use in examining Table 2. Our site typology is based on the observation of surface remains. This resulted in the definition of twelve site types. These are briefly defined in Table 3.

While the information presented in these three tables is subject to modification after more detailed analysis of the survey data, it does serve to illustrate the general nature of the site types and time periods recorded. The following is a brief discussion of the preliminary survey results by time period.

### *Middle Paleolithic*

Of all prehistoric components recorded, those which probably date to the Middle Paleolithic are most common (15.9% of all components). Middle Paleolithic occurrences were identified by their distinctive technology: many pieces exhibited Levallois elements, and much of the debitage consisted of pieces with multifaceted platforms. Numerous Levallois flake and point cores were observed, but tools were not well represented. Of the tools observed, many are side scrapers, but several handaxes also were recorded. Nearly all Middle Paleolithic pieces observed are highly patinated. Many of the



Ain Ghazal Archaeological Survey 1987

0 500 1000 2000 Meters

Fig. 1. Map showing surveyed sites.

Middle Paleolithic occurrences are associated with later materials. All of the sites appear to be deflated surface occurrences with little or no evidence for stratified deposition. Most are located on slopes and benches; a few were on the floodplain of wadis, but these may well be redeposited.

*Upper Paleolithic*

Six possible Upper Paleolithic occurrences were recorded. These were primarily identified on the basis of debitage, which consisted of long, well-made blades. Tools included side and end scrapers, burins, and

**Table 1:** Site Chronology by Component (including 'Ain Ghazal).

<i>Time Period</i>	<i>No. of Components</i>	<i>Percent</i>
Middle Paleolithic	17	15.7
Upper Paleolithic	6	5.5
Epipaleolithic	6	5.5
Neolithic	12	11.1
Unknown, Probable Prehistoric	16	14.8
Chalcolithic/Early Bronze	4	3.7
Early Bronze	4	3.7
Iron Age	11	10.2
Roman	6	5.5
Byzantine	3	2.8
Umayyad	2	1.9
Unknown, Probable Historic	21	19.5
<b>Total</b>	<b>108</b>	<b>100.0</b>

**Table 2:** Site Types (including 'Ain Ghazal).

<i>Type</i>	<i>Number</i>	<i>Percent</i>
Artifact Scatter	34	42.0
Rock Shelter	4	4.9
<i>Rujm</i> , ceramics	1	1.2
<i>Rujm</i> , no ceramics	14	17.3
Tower, ceramics	2	2.5
Tower, no ceramics	1	1.2
Stone Ring	2	2.5
Single Structure	5	6.2
Multiple Structure	9	11.1
Kite and Associated Structures	2	2.5
Settlement	6	7.4
Terrace	1	1.0
<b>Total</b>	<b>81</b>	<b>100.0</b>

various retouched pieces. Five of the six components are surface scatters. One, however, is located in a cave that has been vandalized. Limited Upper Paleolithic elements were identified in the backdirt of this cave, and the potential of intact deposits cannot be dismissed.

#### *Epipaleolithic*

Six probable Epipaleolithic components also were recorded. As with the Upper Paleolithic materials, these were identified primarily by their debitage, which consisted of numerous bladelets and

bladelet cores. Tools were relatively rare, and microlithic tools were even less common. Several backed bladelets were observed at one site (AGAS 14), however. On the basis of surface inspection, none of the sites displayed the characteristics common to well-documented Epipaleolithic periods, such as the Kebaran or Natufian.

#### *Neolithic*

The documentation of Neolithic sites was one of the major goals of the project. Counting 'Ain Ghazal, 12 Neolithic components were identified. These fall into

**Table 3:** Site Typology Definitions.

<i>Type</i>	<i>Definition</i>
Artifact Scatter	Scatter of chipped stone and/or ceramic artifacts with no apparent associated features.
Rockshelter	Limestone cave or overhang.
<i>Rujm</i> , no ceramics	A <i>rujm</i> (plural, <i>rujūm</i> ) is simply a “pile of rocks;” many of these may represent the remains of towers or other structures, but without excavation no clear architectural patterns are discernible (in the definition used in this report).
<i>Rujm</i> , ceramics	Same as above, but containing associated ceramics.
Tower, no ceramics	Towers are essentially <i>rujūm</i> with clearly discernible architectural features; they often contain substantial rubble and appear to represent tower features.
Tower, ceramics	Same as above, but containing associated ceramics.
Stone Ring	These sites consist of a circular ring of roughly hewn, or unhewn stones; of the two recorded, their diameters varied dramatically, from ca. 30 meters to ca. 15 meters.
“Kite”/Associated Structures	These sites consist of a long row of stones forming a low wall; they have been interpreted as animal runs <sup>4</sup> ; of the two recorded, both are associated with circular or semi-circular structures at the higher end (i.e., on a ridge top) of the “kite”.
Single Structure	These consist of a single, usually rectangular, structure constructed of stone, most often unhewn.
Multiple Structure	These consist of contiguous rooms of stone, forming a single block of rooms anywhere from two to several units.
Settlement	These are large sites consisting of numerous non-contiguous blocks of rooms.
Terrace	The one terrace site recorded consisted of a badly disturbed series of walls at the base of a “box canyon”.

two distinct groups. The first consists of three sites in the immediate vicinity of ‘Ain Ghazal, while the second group is composed of sites located a moderate distance from ‘Ain Ghazal.

In the first group, one site, AGAS 11, appears to actually represent an extension of the southern end of ‘Ain Ghazal itself. The site is located south of a series of garages and automotive shops that separate it from the southern boundary of ‘Ain Ghazal. AGAS 11 is situated on a relatively steep slope and numerous plastered floors and wall sections can be clearly discerned in exposures. Associated artifactual material also is very similar to that observed at ‘Ain Ghazal and there appears little doubt that AGAS 11 is an extension.

This increases the size of ‘Ain Ghazal by some 300 meters in a north-south direction. The size of the east-west expansion is more difficult to determine due to modern disturbance. It minimally covers 30 meters, but conceivably could stretch across Wadi ez-Zarqa, as in the northern sections of ‘Ain Ghazal. If this were the case, the east-west extension could cover, as an estimate, some 300 meters. In any event, the discovery of AGAS 11 makes an already enormous site even larger. The exposed materials appear to be related to the Pre-Pottery Neolithic B (PPNB) occupation of ‘Ain Ghazal.

AGAS 10 lies immediately south of AGAS 11 and, again, could represent an extension of ‘Ain Ghazal itself. However,

4. Betts (1984, 1985, 1986).

the Neolithic occupation documented here appears to be restricted to the Pottery Neolithic Yarmoukian phase, based on the presence of a limited number of Yarmoukian sherds. The main component of AGAS 10 consists of a large Early Bronze Age settlement that has been reported on by Petocz.<sup>5</sup> AGAS 10 has been badly damaged by modern development and intact deposits are very limited.

The last site in the first group of Neolithic occurrences is AGAS 12 and also is located on a relatively steep slope. It is south of AGAS 10 and is defined by the presence of a section of plastered floor similar to that seen at PPNB 'Ain Ghazal. The site is located on an exposure immediately beneath the Marka power plant. AGAS 12 has been severely damaged and beyond the floor exposure, no other cultural remains were observed.

The second group of Neolithic sites are located along Wadi ez-Zarqa and related smaller wadi drainages. Two probable Neolithic sites also were recorded in the two outlying transects (numbers 5 and 6). All of these sites are defined by the presence of a large number of burins. As such they resemble the burin sites known in the Black Desert<sup>6</sup>. Although most burin sites seem to be restricted to the desert areas of Jordan, at least one has been recorded in the Amman area at Umm Udheina<sup>7</sup>. The sites recorded during the present survey add to the number known in the Amman region.

The function, as well as the precise chronology, of these enigmatic sites is unknown. Most researchers feel that they date to either the late Pre-Pottery Neolithic or the Pottery Neolithic<sup>8</sup>. Unlike some of the burin sites in the desert, those recorded in the 'Ain Ghazal vicinity do not appear to contain diagnostic PPNB or later Neolithic projectile points. Systematic surface collection, however, might negate this statement. The associated debitage at the

sites consisted of both flakes and blades. Other tools were relatively rare and usually consisted of retouched pieces, although several perforators and, in a few instances, some adzes, were observed.

The burin site (AGAS 70) located in Transect 6, which is the easternmost area examined, differs somewhat from the other burin sites. The burins were manufactured on larger and thicker pieces of debitage. Otherwise, however, the site is similar to the others.

Most of the burin sites recorded are surface scatters without associated structures. Two sites, however, did contain *rujūm* that might be associated with the Neolithic occupations. One of these (AGAS 38) consisted of a single feature, while another (AGAS 57, Fig. 2) was composed of a series of *rujūm*, one of which was open at one end.

Also of interest here is the presence of two probable "kite" sites. These have been documented in the Black Desert, where they are often associated with Neolithic artifacts.<sup>9</sup> Of the two recorded here, however, one was associated with Chalcolithic/Early Bronze Age materials while another was undiagnostic. It could conceivably be Neolithic, but without associated artifacts this must remain conjecture. Excavation will be the only way to assess its true nature.

#### *Chalcolithic/Early Bronze*

Four Chalcolithic/Early Bronze Age components were identified during the survey. These represent a wide variety of site types. Site AGAS 59 is a relatively large settlement consisting of several blocks of rooms. Another site, AGAS 51, is one of the two "kite" sites recorded that also contains a stone circle on a ridge top. Site AGAS 49 overlooks a small wadi and consists of substantial architectural remains. The site also contains an Iron Age

5. Petocz (1987).

6. Betts (1983, 1984, 1985, 1986); Garrard *et al.* (1987); Rollefson and Frohlich (1982).

7. Rollefson, Kaechele, and Kaechele (1982).

8. Betts (1985, 1986); Betts and Helms (1986); Rollefson and Frohlich (1982).

9. Betts (1985, 1986); Betts and Helms (1986).

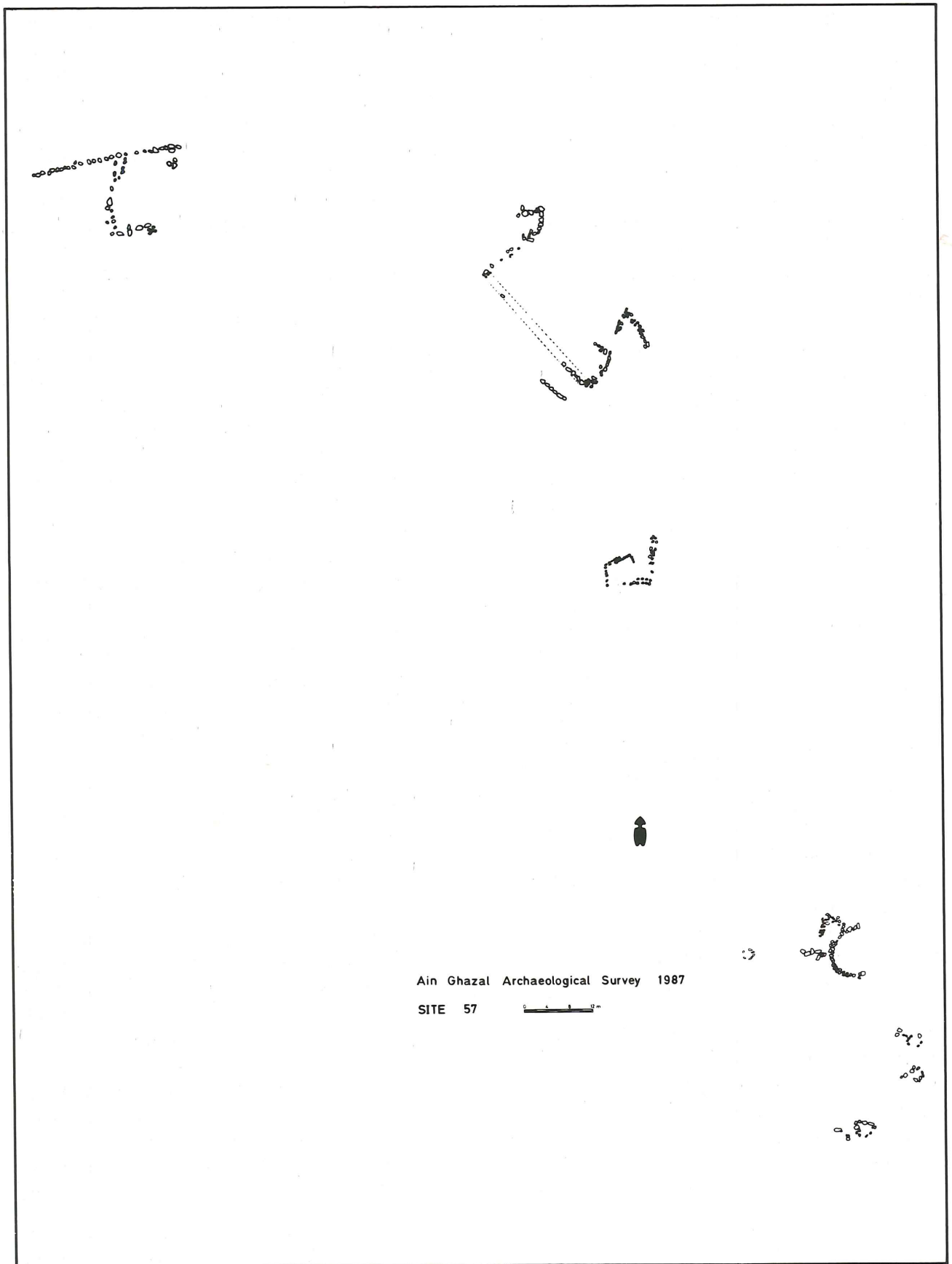


Fig. 2. Site map of AGAS 57.



component. Finally, the Chalcolithic/Early Bronze component of Site AGAS 54 consists of a single rectangular structure. Site 54 also contains a Neolithic component.

#### *Early Bronze Age*

Four Early Bronze Age components also were recorded. Of these, three were surface scatter with limited amounts of Early Bronze Age pottery. One site, however, AGAS 10, consisted of a relatively large settlement that has been badly disturbed by modern development. This site also contains a Yarmoukian Neolithic component. The site has previously been examined, albeit in a limited manner, by Petocz<sup>10</sup>.

#### *Iron Age*

Eleven Iron Age components were recorded. These included a wide variety of site types, consisting of two tower sites, two ceramic scatters, four multiple structure sites (Fig. 3), and one settlement, *rujm*, and one stone ring site. Ceramics from both Iron Age I and Iron Age II periods were recorded. At those sites containing structures, rectangular forms were the dominant morphology.

#### *Roman*

Roman sites are poorly represented, with six components being recorded. These were generally represented by only limited amounts of Roman ceramics mixed with artifacts from other periods. Only one substantial Roman site, AGAS 58, was recorded. This is a very badly disturbed, but large, settlement located at Ras el-'Ain.

#### *Byzantine*

Byzantine components also are very poorly represented, with only three occurrences being recorded. All three are artifact scatters containing Byzantine sherds

along with artifacts from other periods. Two of these sites are located in plowed fields, while the third is on a ridge top.

#### *Umayyad*

Only two Umayyad occurrences were recorded. One of these, AGAS 6, was a single component Umayyad site consisting of an undetermined number of rooms. It is located immediately upslope from and adjacent to 'Ain Ghazal. The other Umayyad occurrence is represented by a scatter containing artifacts from several periods.

#### *Unknown Chronology*

A large number of components contained no diagnostic elements and therefore are chronological "floaters." There were two general categories of these "unknown" sites: lithic scatters and structure sites (Fig. 4). The structure sites are tentatively identified as "unknown historic" sites, while the lithic scatters are presumably prehistoric. The structure sites most often consisted of *rujūm*. One of the two "kite" sites also falls in the "unknown" category.

#### **Conclusions**

The 'Ain Ghazal survey documented a relatively high site density of 9.6 sites (12.8 components) per square kilometer. These sites covered a wide span of human occupation, with the earliest dating to the Middle Paleolithic and the latest to the Umayyad Period. Several observations can be made from even a preliminary evaluation of the survey data.

These data clearly point to a consistent and relatively dense occupation of the Amman area for the past several thousand years. The nature of these, however, varied considerably. The earliest, represented by Middle and Upper Paleolithic lithic scatters, conform to patterns observed at similar sites throughout the

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10. Petocz (1987).

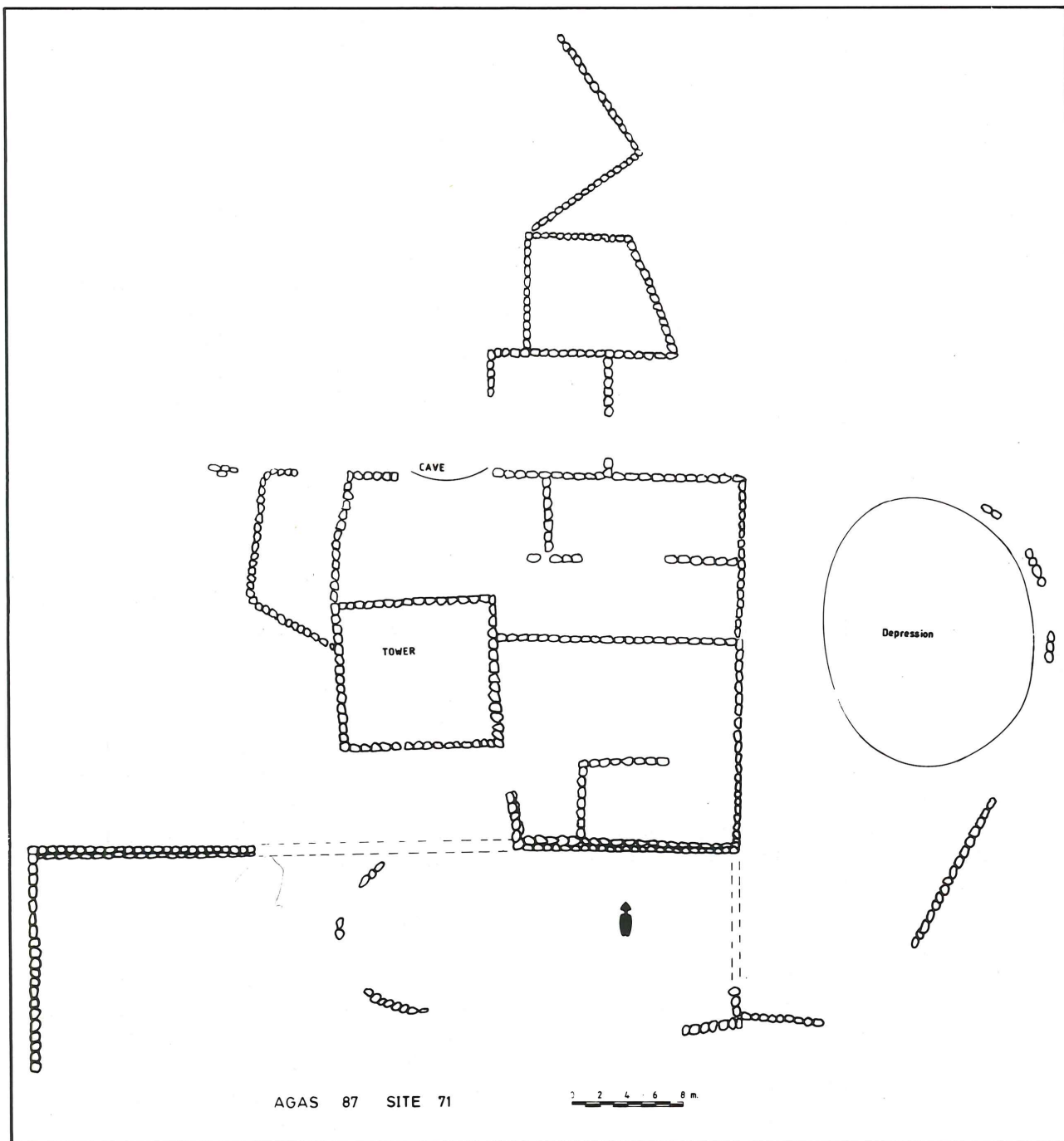


Fig. 3. Site map of AGAS 71.

Near East, with the exception that no long-term cave occupation has been documented. The presence of Epipaleolithic sites is of interest, especially since those recorded are not consistent with well known Epipaleolithic periods elsewhere.

Of particular interest to the project has been the documentation of Neolithic sites surrounding 'Ain Ghazal. The size of

'Ain Ghazal has been expanded as a result of the survey, and the presence of numerous burin sites has added to the complexity of Neolithic settlement in the area. It is tempting to consider the "kite" sites as Neolithic manifestations, but this interpretation lacks any support data, at least based on information recorded during the survey.

We had expected, even anticipated,

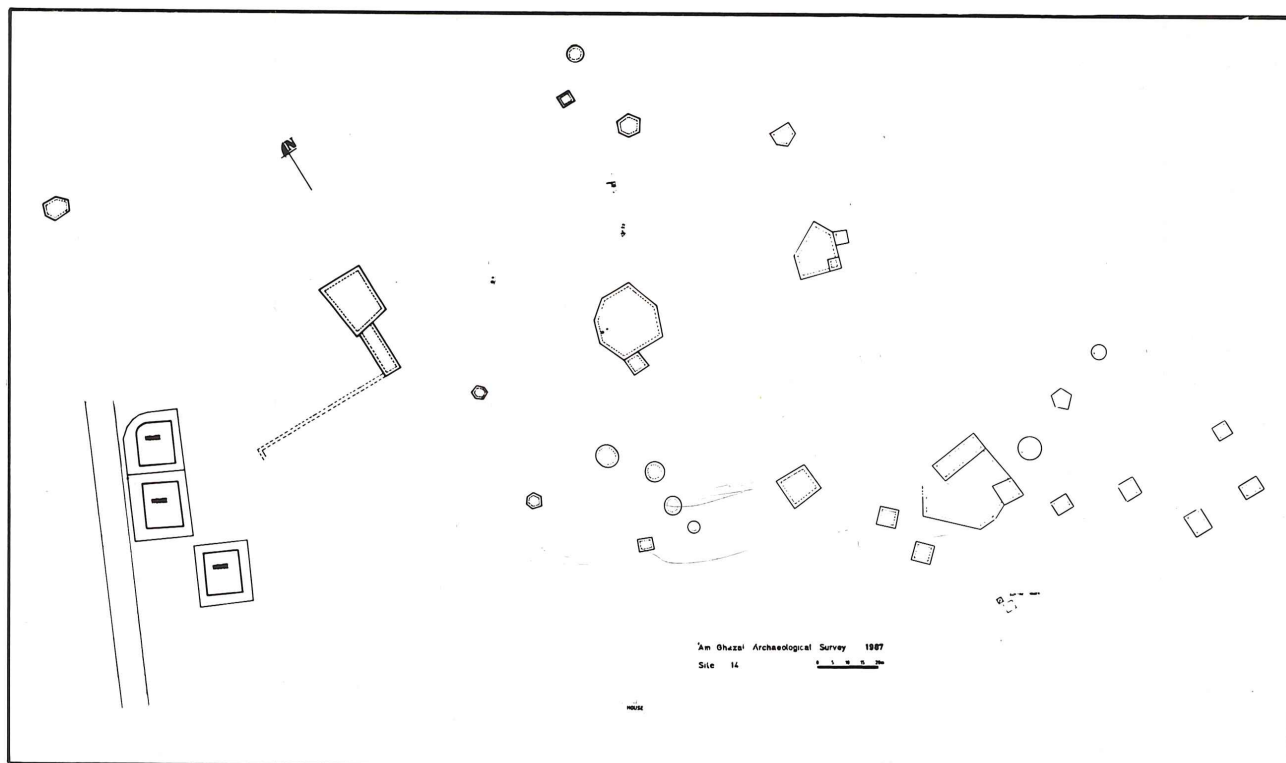


Fig. 4. Site map of AGAS 14.

finding smaller Neolithic villages, farmsteads, or pastoral sites. This was not the case, unless some of the chronologically ambiguous lithic scatters and *rujūm* or structure sites are Neolithic. This appears unlikely, since no Neolithic artifacts were associated with these sites. Indeed, one question posed by the survey is the presence of the numerous *rujūm* sites throughout the Amman area. Many of these may well represent communication towers of some sort and may be contemporary. The nature of these sites, however, can only be answered by excavation.

In any event, it now appears that 'Ain Ghazal did, in fact, operate as a relatively independent settlement and that major support sites were not a part of its settlement system. Playing Devil's Advocate for the moment, however, substantial Neolithic sites may be buried under relatively recent deposition. The tendency for such sites to be located on low slopes near major wadi systems may have rendered them nearly invisible to conventional archaeological survey. It should be recalled that if road construction had not exposed portions of 'Ain Ghazal, the site would not

have appeared very substantial on the basis of surface remains alone. In the areas that we surveyed, this must remain a possibility. On the other hand, we thoroughly investigated the numerous exposures present around Wadi ez-Zarqa and some of its tributaries and found no evidence for any buried Neolithic materials. To complicate matters even further, it must be remembered that the area immediately adjacent to 'Ain Ghazal has been severely impacted by modern development, which could have totally destroyed any traces of Neolithic (or other) sites in the immediate vicinity.

On the basis of the survey data, however, we may conclude that there are no major Neolithic sites located in the areas that were investigated. The presence of smaller, specialized activity sites attests to a Neolithic presence in the 'Ain Ghazal hinterlands, but this appears to have been of a limited nature.

Upon entering the "historic" periods, several interesting patterns emerge upon examination of the survey data. Overall, the earlier (i.e., prehistoric) periods are better represented than many of the later periods. This may be due to the

tremendously longer time span of the prehistoric periods, thus allowing for the accumulation of more sites. On the other hand, later sites have a better chance of being preserved in the archaeological record. Thus their relative scarcity during some of the historic periods may well be an accurate representation.

A relatively substantial Chalcolithic/Early Bronze Age occupation has been documented. In light of this, the lack of Middle Bronze and Late Bronze Age sites is surprising. Iron Age sites are well represented, but again the total lack of remains dating to the "Classic" Hellenistic period of Amman's antiquity is curious. For whatever reasons, Hellenistic occupation appears not to have expanded north from the Amman Citadel area.

One possibility that should be considered in interpreting the lack of major later sites is that after approximately two thousand years of successful exploitation during the Neolithic, the immediate environment of the area was depleted and unsuitable for agricultural economies. Unlike many major Neolithic sites, there is no substantial later occupation of 'Ain Ghazal. It is possible that the success of the Neolithic could have rendered the 'Ain Ghazal vicinity marginal for any major agricultural activity. This could account for the relatively specialized and ephemeral nature of many of the later sites. The dates of the numerous presumed "historic" *rujūm* sites would be of considerable interest here.

In conclusion, the 'Ain Ghazal Archaeological Survey has documented a rich and diverse human occupation of the area north of Amman. The study has demonstrated the utility of a systematically conducted survey, recording *all* cultural occurrences, and not those relating only to specific periods. This information can provide a substantial data base that should be of interest to a wide range of researchers and planners.

#### Acknowledgements

The 'Ain Ghazal Archaeological Survey was a joint project undertaken by the

Desert Research Institute of the University of Nevada System and by the Institute of Archaeology and Anthropology at Yarmouk University. The two authors served as co-directors of the project. We would like to express our thanks to the numerous individuals and organizations that made the project successful. Dr. Adnan Hadidi, former Director General of the Department of Antiquities of Jordan, once again made for a smooth project and his cooperation throughout the study is gratefully acknowledged. Mr. Emsaytīf Suleiman of the Department served as our Departmental Representative, and his participation and knowledge of local archaeology is very much appreciated. Team members Deborah Olszewski and Karen Wright, and project geomorphologist Rolfe Mandel, made for an efficient and congenial group. Mr. Mefleḥ el-Luzi (Abu Ahmad), our driver from Yarmouk University greatly enlivened our early mornings. Dr. Mo'awiyah Ibrahim, Director of Yarmouk University's Institute of Archaeology and Anthropology is gratefully acknowledged for his support of the project, as is Dr. David McCreery, former Director of the American Center for Oriental Research in Amman (ACOR). We also would like to thank the staff of the Mater Ecclesiae Church in Marka for providing us with pleasant accommodations and conversation. Last, but certainly not least, we are very grateful to the AMOCO Foundation for its support of this project through a research grant. In addition, Mr. Ralph Schofield and his staff at AMOCO-Jordan were very enthusiastic and helpful throughout the project.

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### Bibliography

Betts, A.

- 1983 'Black Desert Survey, Jordan: First Preliminary Report.' *Levant* 15, p. 1-10.
- 1984 'Black Desert Survey, Jordan: Second Preliminary Report.' *Levant* 16, p. 25-34.
- 1985 'Black Desert Survey, Jordan: Third Preliminary Report.' *Levant* 17, p. 29-52.
- 1986 *The Prehistory of the Basalt Desert, Eastern Jordan: An Analysis*. Unpublished Ph.D. thesis, University of London.

Betts, A. and S. Helms

- 1986 'Rock Art in Eastern Jordan: Kite "Carvings?"' *Paléorient* 12, p. 67-72.

Garrard, A. *et al.*

- 1987 'Prehistoric Environment and Settlement in the Azraq Basin: An Interim Report on the 1985 Excavation Season.' *Levant* 19, p. 5-25.

Glueck, N.

- 1934 *Explorations in Eastern Palestine*, I. AASOR Vol. 14.
- 1935 *Explorations in Eastern Palestine*, II. AASOR Vol. 15.

Ibrahim, M.; C. Gaube, H. Gaube and Z. Kafafi

(forth- *Archaeological Survey in the Area of Sahab Southeast of Amman*, 1983. coming)

Köhler-Rollefson, I.

- 1986 *Resolving the Revolution: Late Neolithic Refinements of Economic Strategies in the Eastern Levant*. Paper presented at the International Congress on Archaeo-zoology Conference. Bordeaux, France.

Petocz, D.

- 1987 'An Early Bronze Age Site at 'Ain Ghazal, Amman.' *Levant* 19, p. 27-32.

Rollefson, G. and B. Frohlich

- 1982 'A PPNB Burin Site on Jabal 'Uweinid, Eastern Jordan.' *ADAJ* 26, p. 263-247.

Rollefson, G.; Z. Kaechele, and J. Kaechele

- 1982 'A Burin Site in the Umm Utheina District, Jabal Amman.' *ADAJ* 26, p. 243-247.

Rollefson, G. and A. Simmons

- 1985 'The Early Neolithic Village of 'Ain Ghazal, Jordan: Preliminary Report on the 1983 Season.' *BASOR*, Supplement No. 23, p. 35-52.
- 1986 'The Neolithic Village of 'Ain Ghazal, Jordan: Preliminary Report on the 1984 Season.' *BASOR*, Supplement no. 24, p. 145-164.

Rollefson, G. *et al.*

- 1985 'Excavations at the Pre-Pottery Neolithic B Village of 'Ain Ghazal (Jordan), 1983.' *Mitteilungen der Deutschen Orient-Gesellschaft* 117, p. 69-116.

Simmons, A. and G. Rollefson

- 1984 'Neolithic 'Ain Ghazal (Jordan): Interim Report on the First Two Seasons, 1982-1983.' *Journal of Field Archaeology* 11, p. 387-395.

