Geoffrey Clark
Department of Anthropology
Arizona State University
Tempe AZ 85287
USA

Geoffrey Clark

Wadi al-Ḥasa Palaeolithic Settlement Patterns: Negeb and South Jordan Models Compared

Introduction

The present essay is part of our continuing investigation of settlement pattern data, time-space systematics and archaeological variability in the earlier sites recorded by the Wadi al-Ḥasa Survey (WHS 1979-1983), directed by Burton MacDonald (MacDonald 1988). In previous papers, we described both general and regional models for hunter-gatherer positioning strategies (Clark 1984, Clark *et al.* 1986), synthesized Levantine palaeoenvironmental information pertinent to the 100-10 kyr BP interval (Clark *et al.* 1987), and generated idealized site placement models based on dichotomous relationships between site size and elevation in environments characterized by marked topographic relief (Coinman *et al.* 1988). Here I look at temporal distributions by time-stratigraphic units within and across tributary drainages to determine if correlations between site size and elevations indicate change over time related to regional palaeoenvironmental fluctuations, or whether they reflect altitudinally-determined site placement strategies that cross-cut episodes of environmental change — strategies tied to the exploitation of 'bands' of resources specific to particular elevations. Ethnographic information is also evaluated. As in previous work, the sample comprises 222 sites classified as Lower, Middle, Upper and Epipalaeolithic, and as Prepottery Neolithic, with various bracketing categories for mixed collections and for those in which temporal diagnostics were lacking (TABLE 1).

Ethnography-based Expectations

Any attempt to generate expected patterns of site location must be matched against the coarse 'grain' of the WHS archaeological record and must take into account known macroclimatic conditions and the NW/SE altitudinal gradient of al-Ḥasa itself, which is quite marked. Wadi al-Ḥasa empties into the Dead Sea depression near Aṣ-Ṣafi. At its western terminus, elevations vary from *c.* +1250m at the edge of the Jordan Graben, to *c.* −390m, near the confluence of the wadi and the Sea. The western part of its course intersected by Tributary Drainages 8-5 is characterized by very steep elevational gradients, on the order of 7-900m. East of Wadi Ja'iṣ, the profile of equilibrium of al-Ḥasa changes and gradually becomes more gentle, so

Table 1 Wadi al-Ḥasa Survey — Preceramic sites by time-stratigraphic unit and tributary drainage.

Analytical Units	Drainages 8 n	8 %	7 n	7 %	6 n	6 %	5 n	5 %	4 n	4 %	3 n	3 %	2 n	2 %	1 n	1 %	Total: No.	Total: %
PPN	1	07			2	05.5	2	04	12	31	2	07	3	15			22	10
EPI/PPN							16	35.5	13	33	1	04	3	15	2	08	35	16
UP/EPI	1	07	1	07	4	11	1	02	1	03	5	18	1	05	4	16	18	08
UPPER			2	13	5	14	7	15.5	4	10	3	11	2	10	7	28	30	13.5
MID/UP	2	14			10	28	8	18	2	05	2	07	1	05	3	12	28	12.5
MIDDLE	6	43	5	33	13	36	11	24	7	18	8	28	7	35	9	36	66	30
LOW/MID	4	29	7	47	2	05.5					7	25	3	15			23	10
Total:	**14**		**15**		**36**		**45**		**39**		**28**		**20**		**25**		**222**	**100**

Key to Drainages (West to East): 8 = Wadi 'Afra, 7 = Wadi ath-Thamad, 6 = Wadi al-La'ban, 5 = Wadi Ja'iṣ, Wadi 'Anmayn; 4 = Wadi al-'Ali, 3 = Wadi al-Aḥmar, 2 = Wadi al-Ḥasa lowlands, 1 = Wadi ar-Ruweiḥi.

Key to Analytical Units: PPN = Prepottery Neolithic, EPI/PPN = Epipalaeolithic/Prepottery Neolithic, UP/EPI = Upper Palaeolithic/Epipalaeolithic, UPPER = Upper Palaeolithic, MID/UP = Middle Palaeolithic/Upper Palaeolithic, MIDDLE = Middle Palaeolithic, LOW/MID = Lower Palaeolithic/Middle Palaeolithic.

that Drainages 4-1 have gradients on the order of 400m (Drainage 4, Wadi al-'Ali) to 100m (Drainage 1, Wadi ar-Ruweiḥi).

Elevation clearly affected not only resource zone distributions, but also the movement of humans and animals through the region in what is assumed for preagricultural periods to be a pattern of east/west transhumance. Transhumance influenced by topographic relief plays a role in all previous efforts to model Levantine hunter-gatherer adaptations (cf., e.g., Marks and Freidel 1977; Henry 1987). Henry is of the opinion that patterns of transhumance derived from 19th century Bedouin ethnographic data are of great antiquity, and possibly admit of some generalization (1984). The pastoral nomads of southern Jordan followed a seasonal cycle of movement, with mobile, relatively small, dispersed family camps located in lowland areas during the spring and early summer, migration during the early summer months to higher elevations, late summer/autumn camps in the uplands, and subsequent movement down into the intermediate piedmont for the winter months. Historically, the largest population aggregates occurred during the winter, in semi-sedentary camps representing multiple extended family groups, sometimes numbering more than 100 individuals.

Henry (1987) has proposed a test of this model for the Epipalaeolithic inhabitants of the south Jordan plateau and the adjacent Wadi Ḥisma lowlands. Because of moister climatic conditions over the 20-10 kyr BP interval there, he has essentially reversed the polarity of the model, arguing that the largest, deepest, semi-sedentary aggregation sites corresponding to the winter structural pose should be found in lowland areas, and that the small, shallow, dispersed sites corresponding to spring/autumn mobile settlements should be found in the piedmont. In the case of the Epipalaeolithic (Hamran) of southern Jordan, there is pretty good archaeological confirmation of this pattern, with site size and artifact diversity patterns basically corresponding to differences in the duration and intensity of occupation. Because of climatic differences, the elevational belt selected for the winter aggregation sites during the relatively wet Epipalaeolithic was much lower (i.e., in the Wadi Ḥisma lowlands) than that used by 19th century Bedouins (i.e., the piedmont).

To generalize this model and to apply it to Wadi al-Ḥasa (which has a NW/SE [vs a N/S] elevational gradient), during *mesic* intervals, winter aggregation sites would be expected to occur at relatively low elevations in tributary Drainages 3-1, and summer camps to be at intermediate-to-high elevations (i.e., 'downstream', in tributary Drainages 8-4). During *xeric* intervals, the expected pattern is reversed: Winter aggregation sites should be found primarily at moderate-to-high elevations (i.e., in tributary Drainages 8-6), and small summer camps should be located in the Wadi al-Ḥasa lowlands (i.e., Drainages 3-1). To make the study comparable to that of Henry, I have divided the 70km course of al-Ḥasa into three elevational zones, which roughly correspond to the uplands, the piedmont and the lowlands in the Henry model. From west to east, tributary Drainages 8-6 comprise the 'uplands', Drainages 5 and 4 the 'piedmont', and Drainages 3-1 the 'lowlands'. Site area data are presented below by tributary drainages and by time-stratigraphic unit, but they are analyzed by elevational zones (i.e., sites defined as upland, piedmont and lowland respectively are considered together) (TABLES 2-7).

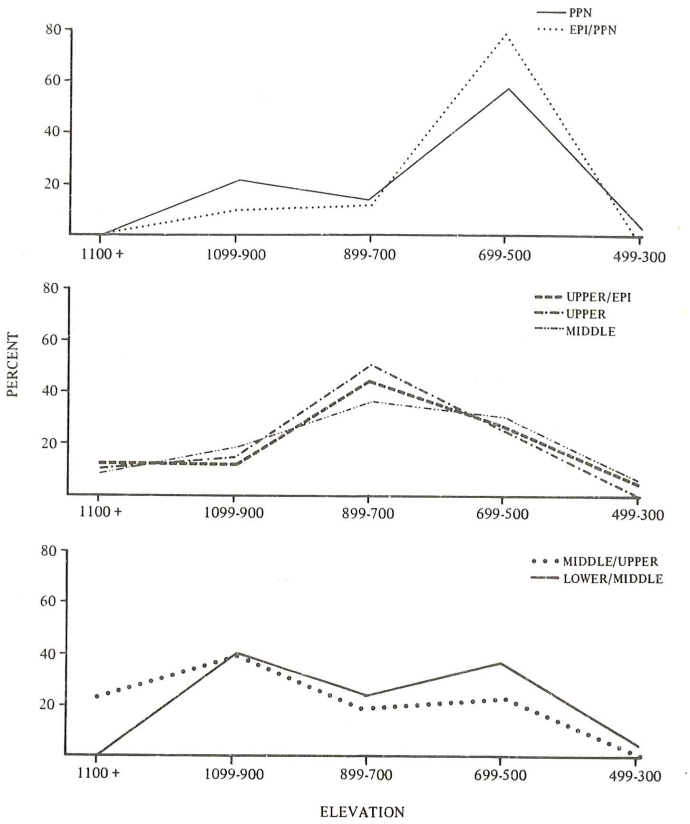
The Lower and Middle Palaeolithic Sample

The Lower/Middle Palaeolithic sample from al-Ḥasa is dominated by small (Class 1, 2) sites, which account for 74% of the site total of 88 (Table 2).[1] Class 1 sites are distributed about equally across the three elevational belts (20%/upland, 18%/piedmont, 25%/lowland), but only one other (large) site occurs in the piedmont, thus confirming the bimodal site distribution reported earlier (FIG. 1) and indicating (1) either little use of the piedmont in these earliest time ranges, or (2) systematic destruction of large Lower/Middle Palaeolithic piedmont sites (which seems unlikely). Large Class 5 sites are exactly twice as common in the uplands (8, 9%) as they are in the lowlands (4, 4.5%), lending a degree of asymmetry to what seems to be archaeological confirmation of some kind of a radiating pattern (i.e., site size differentiation by itself suggests a radiating rather than a circulating pattern). However, the observed distribution departs from expectations in that, during wet intervals, large winter aggregation sites should

Table 2 Wadi al-Ḥasa Survey — Lower and Middle Palaeolithic sites.

Site Size Classes	Drainages								Upland		Piedmont		Lowland		Total:	
	8	7	6	5	4	3	2	1	No.	%	No.	%	No.	%	No.	%
‹2500 m²	3	4	11	9	7	6	7	9	18	20	16	18	22	25	56	64
2500 - 4999		1	2			4	2		3	03.5			6	07	9	10
5000 - 7499	1	3	1			1	1		5	06			2	02	7	08
7500 - 9999	1		1			1			2	02			1	01	3	03
›9999	5	3		1		3		1	8	09	1	01	4	04.5	13	15
Total:									**36**	**41**	**17**	**19**	**35**	**40**	**88**	**100**

[1]Slight discrepancies between Tables 2-7 and Table 1 are due to missing or inconsistent site area data which did not allow for placement of sites in a particular size class.



1. Global site elevation distributions by time-stratigraphic units ignoring site size and tributary drainage. The graphs show the percentage of sites represented in each of five 200m elevational bands. Graphs of similar shape are grouped together.[2]

be concentrated more or less exclusively at low elevations. In fact they are twice as common in upland as they are in lowland drainages.

The Middle/Upper Palaeolithic Sample

There are 28 sites in the Middle/Upper Palaeolithic combined sample, of which 21 (75%) are small, Class 1 sites (TABLE 3). In some contrast to the Lower/Middle Palaeolithic distribution, small sites are concentrated in the piedmont (36%) and the uplands (25%). Overall site counts in these two elevational zones account for 79% of the site total, more than triple the site count for the lowlands (6 sites, 21%). There are no Class 4 and only two 'very large' Class 5 sites, both located in the lowlands. An asymmetrical, bimodal pattern is indicated, with small sites concentrated at higher and intermediate elevations. Since these are mostly mixed (rather than demonstrably transitional) assemblages, no clear-cut expectations about pattern are possible.

The Upper Palaeolithic Sample

Extrapolating from the central Negeb highlands, which are on approximately the same latitude as al-Ḥasa, the Ḥasa Upper Palaeolithic should have developed under initially wet, but increasingly drier conditions, interrupted by a humid episode of short duration *c.* 32-27 kyr BP. The early part of the Upper Palaeolithic (*c.* 45-30 kyr BP) is characterized by AP fractions on the order of 16% at Negeb sites D-22 and D-27, compared to *c.* 2% today (Horowitz 1979). Geomorphically and sedimentologically, there is a gradual decline in runoff energetics and an increase in the colluvial component of valley fills after *c.* 35 kyr BP. Climatically, Mediterranean phytogeographic associations are distributed *c.* 150km south of their present locations. The trend toward dessication becomes marked after *c.* 27 kyr BP, and maximum aridity is attained at about 16 kyr BP. Thus, the later Upper Palaeolithic (30-20 kyr BP) in the Negeb is quite arid, in sharp contrast with humid conditions in the northern Levant. There are 28 sites in the unmixed Upper Palaeolithic sample but, contrasted with the Middle/Upper Palaeolithic sample (which also contains 28 sites), the distributional centre of gravity has shifted to lower elevations and the M/U bimodal configuration is replaced by a unimodal one centred on the 7-900m elevational band. Most sites are again small (20, 71%) but there are single, very large sites in both elevational extremes (TABLE 4).

The Upper Palaeolithic sample does not 'fit' either the Marks or the Henry models. Under the expectations of the general model, during xeric intervals, large winter aggregation sites should be concentrated at higher elevations and small summer camps should be located in the lowlands.

Table 3 Wadi al-Ḥasa Survey — Middle and Upper Palaeolithic sites.

Site Size Classes	Drainages 8	7	6	5	4	3	2	1	Upland No.	%	Piedmont No.	%	Lowland No.	%	Total: No.	%
‹2500 m^2	1		6	8	2	1	1	2	7	25	10	36	4	14	21	75
2500 - 4999			2						2	07					2	07
5000 - 7499	1		1	1					2	07	1	03.5			3	10.5
7500 - 9999																
›9999						1		1					2	07	2	07
Total:									**11**	**39**	**11**	**39.5**	**6**	**21**	**28**	**99.5**

[2]In previous publications, the elevations on the horizontal axes of the graphs were inadvertently *reversed* in preparing the illustration. They are correct as shown in FIG. 1, with high elevations on the reader's left and low elevations on the reader's right. The shape of the graphs is not affected. Publications containing this error are Coinman *et al.* (1986, 1988) and Clark *et al.* (1986, 1987).

Table 4 Wadi al-Ḥasa Survey — Upper Palaeolithic sites.

Site Size Classes	Drainages 8	7	6	5	4	3	2	1	Upland No.	%	Piedmont No.	%	Lowland No.	%	Total: No.	%
‹2500 m^2		1	2	6	3	2	2	4	3	11	9	32	8	28	20	71
2500 - 4999			3						3	11					3	11
5000 - 7499					1			1			1	03.5	1	03.5	2	07
7500 - 9999								1					1	03.5	1	03.5
›9999		1				1			1	03.5			1	03.5	2	07
Total:									**7**	**25.5**	**10**	**35.5**	**11**	**38.5**	**28**	**99.5**

Table 5 Wadi al-Ḥasa Survey — Upper and Epipalaeolithic sites.

Site Size Classes	Drainages 8	7	6	5	4	3	2	1	Upland No.	%	Piedmont No.	%	Lowland No.	%	Total: No.	%
‹2500 m^2	1	1	2	1	1	4	1	2	4	23.5	2	12	7	41	13	76.5
2500 - 4999			1					1	1	06			1	06	2	12
5000 - 7499						1							1	06	1	06
7500 - 9999																
›9999								1					1	06	1	06
Total:									**5**	**29.5**	**2**	**12**	**10**	**59**	**17**	**100.5**

Table 6 Wadi al-Ḥasa Survey — Epipalaeolithic and Pre-Pottery Neolithic sites.

Site Size Classes	Drainages 8	7	6	5	4	3	2	1	Upland No.	%	Piedmont No.	%	Lowland No.	%	Total: No.	%
‹2500 m^2				12	13	1	3	2			25	73.5	6	18	31	91.5
2500 - 4999				3							3	09			3	09
5000 - 7499																
7500 - 9999																
›9999																
Total:											**28**	**82.5**	**6**	**18**	**34**	**100.5**

Instead, there is the unimodal pattern mentioned above, albeit skewed toward the lowlands, and more large sites in the lowlands than in the uplands. Small sites are, however, in fact concentrated in the piedmont and at lower elevations, corresponding to expectations under the model. The anomalous sites are large, lowland sites like WHS 618, located at *c.* 815m on the shore of a fossil lake and associated with a fossil spring.

The Upper/Epipalaeolithic Sample

The Upper/Epipalaeolithic analytical unit probably retains a degree of compositional and temporal integrity because it is based in part on vectored or directional changes in the characteristics of Levantine Upper Palaeolithic assemblages over time — changes that supposedly can be generalized (see, e.g., Bergman and Goring-Morris 1987). This means that the sample probably consists of sites that date to the later (rather than the earlier) phases of the Upper Palaeolithic, and sites that fall in the Epipalaeolithic time interval (*c.* 20-12 kyr BP). The Ḥasa sample is overall quite similar to that of the Upper Palaeolithic, with only a single, large lowland site and with numerous small sites (13, 76.5%) distributed more or less evenly across all three elevational bands (TABLE 5). The distribution is essentially a unimodal one, with the centre of gravity shifted more toward the lowlands than previously (59% of the Upper/Epi sites occur there, vs 38.5% Upper Palaeolithic ones). There are no large sites in the upland or piedmont drainages, and only two small sites in the piedmont. Given the similarity with the Upper Palaeolithic pattern, a similar explanation is offered: The lowland lakes and springs probably attracted a more sustained human presence during xeric intervals than would otherwise have been the case.

The Epipalaeolithic/Pre-Pottery Neolithic sample

The Epipalaeolithic/Pre-pottery Neolithic sample in al-Ḥasa differs markedly from earlier samples in that there is an apparent total abandonment of the upland drainages, and concentration of sites in piedmont Drainages 4 and 5 (31 sites, 91.5%) (TABLE 6). There are no Epi/PPN sites larger than 5000m^2, and all but three (of 34 sites) are ‹2500m^2. Based on normative characterizations of assemblage types, the Epi/PPN combined sample is a fairly

Table 7 Wadi al-Ḥasa Survey — Pre-Pottery Neolithic sites.

Site Size Classes	Drainages 8	7	6	5	4	3	2	1	Upland No.	%	Piedmont No.	%	Lowland No.	%	Total: No.	%
‹2500 m²	1		1	1	6		3		2	09.5	7	33	3	14.5	12	57
2500 - 4999			1	1	1				1	05	2	09.5			3	145
5000 - 7499					3	2					3	14.5	2	09.5	5	24
7500 - 9999					1						1	05			1	05
›9999																
Total:									**3**	**14.5**	**13**	**62**	**5**	**24**	**21**	**100.5**

credible transitional one, and would probably date to *c.* 17-10 kyr BP. The numerous Ḥasa Epi/PPN sites are all relatively small, and are located at relatively low elevations in the eastern 'half' of the main wadi system. The site distribution corresponds most closely to a circulating pattern in the Marks model. Since there are no really large sites, it does not agree with either configuration of the generalized Henry model, nor with his test case of that model using Epipalaeolithic data from southern Jordan (Henry 1987).

The Pre-Pottery Neolithic sample

The PPN sample is generally similar to that of the Epi/PPN, with predominantly small sites heavily concentrated in the piedmont (13 sites, 62%) and secondarily in the lowlands (5 sites, 24%) (TABLE 7). There are, however, three small Class 1 and 2 sites in the uplands, and a single Class 4 site in the piedmont, indicating better size and locational differentiation than during the Epi/PPN. Two clusters of PPNB 'burin' sites occur in the piedmont and the lowlands respectively, underscoring the uniformity of this distinctive kind of assemblage type over vast stretches of the Syro-Arabian desert (Betts 1987).

Conclusions

The question posed at the beginning of this essay was couched in terms of two alternatives: Can Wadi al-Ḥasa site characteristics and distributions be correlated with and explained by pan-Levantine episodes of macroclimatic change, or do site distributions behave independently of macroclimatic change? It would appear that, while the Henry model and its generalization are better supported than that of Marks, the 'goodness of fit' achieved is overall rather poor. Transhumance, and a shadowy kind of cyclical (probably seasonal) aggregation and dispersion are documented throughout the sequence, but there were few unambiguous matches between predicted and observed patterns. There are two reasons for this apparent lack of fit.

The first and most obvious one is simply that Levantine hunter-gatherer site placement models are too coarse grained to be useful in any particular situation other than that from which they were derived. A survey of settlement pattern data from seven ethnohistoric nomadic pastoralist groups in southwestern Asia is given in TABLE 8 (from Lindly 1987). The rationale for looking at these data is simply that they suggest certain seasonal regularities in site location, group size, and duration of occupation. In general, winter camps tend to be located at low altitudes, have large group sizes, are usually occupied for the entire season, and are reoccupied on a yearly basis over a period of several years. Summer camps tend to be located at higher elevations, are composed of small dispersed extended family groups, are occupied for short periods of time, and are seldom reoccupied. However, as Lindly (1987) has pointed out, these generalizations do not always hold. Pastoralists move about the landscape to position themselves and their flocks relative to water and prime grazing areas, the locations of which can vary locally over the short run according to the season and the prevailing rainfall pattern. Hunter-gatherers position themselves based on decisions about the availability of key plant and animal resources which, in the desert regions of the Levant, are likely to have a 'patchy' distribution, strongly correlated with springs and seasonal lakes. Topography exerts a significant influence that is superimposed on these positioning strategies. Previous, 'wadi-wide' analyses produced overall weak (occasionally strong) positive correlations between site size and elevation, and between site size and artifact scatter density, and overall strong positive correlations between site size and proximity to water sources (i.e., wadi courses, springs [where locations could be determined], and Pleistocene Lake Ḥasa). Assuming that the WHS data themselves are at least adequate for this kind of inquiry, it is likely that departures from the generalized Henry model are due in large part to the necessity for balancing 'optimal' locational decisions against temporally and spatially variable key resource distributions and a secure source of water.

Acknowledgements

This is Contribution No. 8 of the Wadi al-Ḥasa Palaeolithic Project, supported by the National Science Foundation (Grant No. BNS-8405601), the National Geographic Society (Grant No. 2914-84) and the College of Liberal Arts & Sciences, Arizona State University.

Table 8 Settlement pattern data for nomadic pastoralists in southwestern Asia (from Lindly 1987).

Group & Location	Winter	Spring	Summer	Fall	Source
Bedouin Southern Jordan	- piedmont - large groups - low mobility - reuse of sites	- lowlands - small groups - high mobility - no site reuse	- highlands - small groups - moderate mobility - some site reuse	N/A	Henry 1984
al-Murrah Badu Saudi Arabia	- large camps - moderate mobility - seasonal pasture	- small camps - high mobility - sites clustered around semi-permanent wells	- large camps - no mobility - sites clustered around semi-permanent wells	- small camps - high mobility	Cole 1975
Bedouin Oman	- aggregation near water sources - large groups - sedentism (no mobility)	N/A	- dispersal in uplands - small groups - high mobility	N/A	Wilkinson 1977
Bedouin Negeb Desert	- aggregation in lowlands - moderate sized groups - no mobility	- dispersal to pastures - small groups - high mobility	- dispersal, then aggregation - small, then large groups - high, then low mobility	N/A	Marx 1967
Rwala Badu Syria and Jordan	- plateau - dispersed - small camps - high mobility	- plateau - dispersed - small camps - high mobility	- lowlands - aggregated - large camps - no mobility	N/A	Musil 1928
Basserri Iran	- lowlands - dispersed - small camps - high mobility	- low to medium elevations - aggregated - large camps - moderate mobility	- highlands - aggregated - large camps - moderate mobility	- varies with group	Barth 1964
Arab pastoralists Afghanistan	- lowlands - aggregated - large camps - no mobility	- steppe - dispersed - small camps - high mobility	- highlands - dispersed - small camps - high mobility	- varies with group	Barfield 1981

References

Barfield, T. 1981. *The Central Asian Arabs of Afghanistan: Pastoral Nomadism in Transition*. Austin: University of Texas Press.

Barth, F. 1964. *Nomads of South Persia: The Basseri Tribe of the Khamseh Confedecracy*. Oslo: Universitetsforlaget.

Bergman, C. and Goring-Morris, N. 1987. Synopsis of the Conference: The Levantine Aurignacian with Special Reference to K'sar Akil, Lebanon. *Paléorient* 13(1): 142-147.

Betts, A. 1987. Recent Discoveries Relating to the Neolithic Periods in Eastern Jordan. Pp. 225-230 in A. Hadidi (ed), *Studies in the History and Archaeology of Jordan, III*. Amman: Department of Antiquities of Jordan.

Clark, G. 1984. The Negev Model for Paleoclimatic Change and Human Adaptation in the Levant. *Annual of the Department of Antiquities of Jordan* 28: 225-248.

Clark, G., Coinman, N. and Lindly, J. 1986. Paleolithic Site Placement in the Wadi Hasa, West-Central Jordan. *Annual of the Department of Antiquities of Jordan* 30: 23-39.

Clark, G., Coinman, N., Lindly, J. and Donaldson, M. 1987. A Diachronic Study of Paleolithic and Aceramic Neolithic Settlement Patterns in the Wadi Hasa, West-Central Jordan. Pp. 215-223 in A. Hadidi (ed), *Studies in the History and Archaeology of Jordan, III*. Amman: Department of Antiquities of Jordan.

Clark, G., Lindly, J., Donaldson, M., Garrard, A., Coinman, N., Schuldenrein, J., Fish, S. and Olszewski, D. 1987. Paleolithic Archaeology in the Southern Levant. *Annual of the Department of Antiquities of Jordan* 31: 19-78.

—— 1988. Excavations at Middle, Upper and Epipaleolithic Sites in the Wadi Hasa, West-Central Jordan. Pp. 209-285 in A. Garrard and H.G. Nissen (eds), *The Prehistory of Jordan*. Oxford: BAR Int. Ser. 396 (i).

Coinman, N., Clark, G. and Lindly, J. 1986. Prehistoric Hunter-Gatherer Settlement in the Wadi Hasa, West-Central Jordan. Pp. 129-169 in L. Straus (ed), *The End of the Paleolithic in the Old World.* Oxford: BAR Int. Ser. 284.

—— 1988. A Diachronic Study of Paleolithic and Early Neolithic Site Placement Patterns in the Southern Tributaries of the Wadi Hasa. Pp. 48-86 in B. MacDonald (ed), *The Wadi el-Ḥasa Archaeological Survey (1979-1983).* Waterloo: Wilfrid Laurier University Press.

Cole, D. 1975. *Nomads of the Nomads: The al'Murrah Bedouin of the Empty Quarter.* Chicago: Aldine.

Goldberg, P. 1981. Later Quaternary Stratigraphy in Israel: An Eclectic View. Pp. 55-66 in J. Cauvin and P. Sanlaville (eds), *Préhistoire du Levant.* Paris: CNRS.

Henry, D. 1984. Patterns of Transhumance in Southern Jordan: Ethnographic and Archaeological Analogs. Paper presented at the Annual Meeting of the American Schools of Oriental Research (Chicago, December 1984).

—— 1987. Topographic Influences on Epipaleolithic Land-use Patterns in Southern Jordan. Pp. 21-27 in A. Hadidi (ed), *Studies in the History and Archaeology of Jordan, III.* Amman: Department of Antiquities of Jordan.

Horowitz, A. 1979. *The Quaternary of Israel.* New York: Academic Press.

Lindly, J. 1987. An Examination of the Ethnographic Evidence for Seasonal Migration of Nomadic Pastoralists: Contributions Toward Understanding Middle Paleolithic Settlement Patterns in the Wadi Hasa, West-Central Jordan. Manuscript on file with author, Department of Anthropology, Arizona State University.

MacDonald, B. 1988. *The Wadi el-Ḥasa Archaeological Survey 1979-1983, West-Central Jordan.* Waterloo: Wilfrid Laurier University Press.

Marks, A. and Freidel, D. 1977. Prehistoric Settlement Patterns in the Avdat/Aqev Area. Pp. 131-159 in A. Marks (ed), *Prehistory and Paleoenvironments in the Central Negev*, vol. 2. Dallas: SMU Press.

Marx, E. 1967. *Bedouin of the Negev.* Manchester: Manchester University Press.

Musil, A. 1928. *The Manners and Customs of the Rwala Bedouin.* Washington, DC: American Geographic Society Oriental Explorations and Studies No. 6.

Wilkinson, J. 1977. *Water and Tribal Settlement in South-East Arabia: A Study of the Aflaj of Oman.* Oxford: Clarendon Press.