Donald O. Henry,
Department of Anthropology
University of Tulsa,
Tulsa, Oklahoma 74120
USA

Donald O. Henry

Seasonal Movements of Fourth Millennium Pastoral Nomads in Wadi Ḥisma

In conducting archaeological investigations over the last ten years along the southern edge of the Jordanian Plateau, I have noticed some remarkable parallels between contemporary land-use patterns and those present some 5-6000 years ago. These parallels are present in several domains of evidence that cross archaeological and ethnographic records. Within both of these temporal windows, the inhabitants of this mountainous region appear to have subsisted mainly on the herding of sheep and goats. They lived a nomadic existence and moved seasonally to different elevational belts in order to take advantage of available resources and more comfortable settings. And in addition to altering their mobility levels and environmental settings from season to season, they also appear to have adjusted the sizes of their groups on a seasonal basis in order to accommodate differences in the densities of critical resources.

Environmental Settings: Present and Past

The region is characterized by marked relief that in conjunction with major differences in bedrock creates three distinct physiographic units, with each of these corresponding to a distinct biotic zone. The uplands, found on the edge of the plateau between 1500-1700m (asl), receive some 200-350mm precipitation annually. Here limestone bedrock has been eroded into low rolling hills veneered by thin soils (including terra rosa) that support a severely overgrazed Mediterranean plant community. The piedmont, resting on the flanks of the plateau between 1300-1000m, receives some 100-200mm of rainfall annually. In the piedmont, sandstone bedrock has been eroded into steep cliffs and canyons with steppic plants predominating. The lowlands, located between 1000-700m on the floor of Wadi Ḥisma, receive less than 100mm of rainfall annually. The floor of this wide valley is covered in drift sand occasionally punctuated by steep sandstone inselbergs and playas. The lowlands support a true desert vegetation with plants often being widely separated.

With exception to several springs in the uplands (and a few isolated springs in the lowlands), natural surface water is available for only three to four months a year. Depending upon the variation in annual rainfall, water can be found in potholes in the dry, sandstone streambeds of the piedmont and lowlands from January to April. Ironically, the uplands receive considerably more precipitation than the adjacent piedmont or lowlands, yet surface water is generally unavailable in streambeds during the wet season because of the absence of potholes.

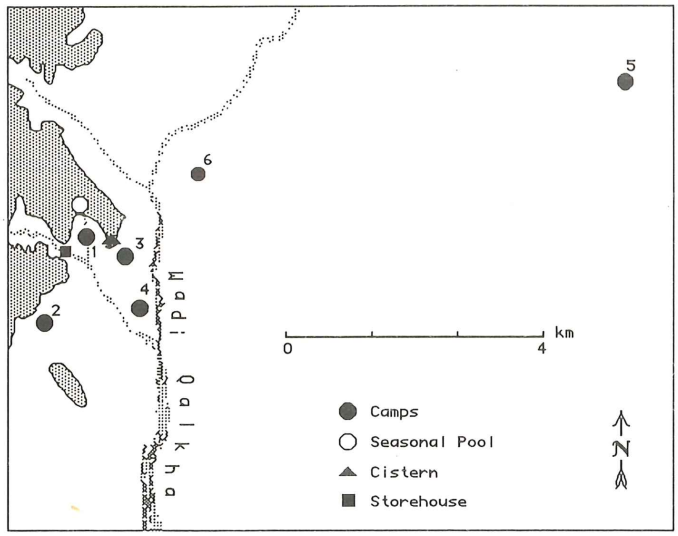
Mid-Late Holocene Climate

Direct evidence from the region points to an arid setting, not unlike today's, for the interval of 5000-6000 years ago. Pollen diagrams from Chalcolithic horizons at sites J8, J14 and J24 reflect a semi-desert halophilic flora dominated by chenopodiaceae (Henry *et al.* 1985). Interestingly, cereal type pollen is absent or scarce in these diagrams. Faunal evidence from site J14 is consistent with the pollen data in that gazelle constitute the large majority of remains of wild animals. A geomorphic study of the Judayid Basin near Ras an-Naqab also indicates an arid setting as reflected in the erosion of the basin's floor concurrent with the deposition of drift sand (containing Chalcolithic occupations) along its margins (Henry *et al.* 1983).

Although palaeoclimatic data drawn from the Negeb (Horowitz 1979; Goldberg and Bar-Yosef 1982) and the Lisan and Beisan lakes of the Rift Valley (Neev and Emory 1967; Koucky and Smith 1986) point to moister conditions from about 5400-4500 B.P., a recent pollen diagram from Lake Kinneret (Baruch 1986) suggests conditions similar to those of today. Even when a Chalcolithic moist interval is advanced, it is still recognized as a predominantly dry interval (Levy 1983). In the main it would appear then that for the last 5000-6000 years the environs of Wadi Ḥisma experienced climatic conditions not greatly unlike those of the region today.

Modern Land-Use Patterns

When examining the modern patterns of land-use, it is important to distinguish between "contemporary" and "historic" practices. The use of motorized vehicles and the



1. Map of the Jabal Ḥumeima area showing the six camp locations occupied by a tent family between November 1983 and October 1984. Note the locations of the storehouse, Nabataean cistern, and seasonal pool. Camp numbers indicate sequence of occupation.

emergence of new water sources over the last 50 years have significantly altered the mobility levels and annual schedules of groups inhabiting the area.

Contemporary

Detailed information on contemporary land-use strategies comes from data I collected in the summers of 1979 and 1980 in the Judayid Basin and over most of a year in 1983-1984 in the Jabal Ḥumeima area. During the course of an annual round (stretching from October 1983 through August of 1984) I noted six camp moves for a tent family living in the vicinity of Jabal Ḥumeima (FIG. 1). What is remarkable is that five of the camps were established within a radius of 2km of one another. The number of tents in the camps ranged from 1 to 4 with camp populations ranging from 4 to 21.

Camp 1 (November - December, 3-4 tents) was established near the confluence of two steep walled canyons. The primary water sources (after rain in December) were five large kettle holes located within 300m of the camp. Prior to the rains water was obtained from a tank mounted on a wagon and drawn by a tractor. Beyond the water the site was favored because of good grazing, ample fuel, and wind protection. Each of the tent families owns storage houses found within 100-200m of the camp. These stone structures are normally built in the rockshelters and overhangs that line the canyon walls. They are used to store grain, chaff and other bulky or heavy items (camel saddles, ploughs, winnowing forks, etc.) that are not carried by the family during most of the year.

Camp 2 (January - March, 1 tent) was established in order to gain better wind protection and a more plentiful fuel supply; and to reduce the distance to the primary grazing area now located about 1-2km southwest of Camp 1. The tent family consisted of a man ('Aeid), his wife (Faṭma), and two daughters (ages two and four). The main water source was still the kettle holes near Camp 1.

Camp 3 (April - June, 2 tents) was established near a large Nabataean cistern that now became the primary water source with the drying-up of the kettle holes near Camp 1. Grazing was supplemented with chaff from the store houses.

Camp 4 (July, 2 tents) was established about 1km south of Camp 3 in more open terrain close to barley fields. Water in the Nabataean cistern was depleted and now water was obtained from a tank mounted on a wagon. The tank was filled in Quweira about 20km to the south. Barley was harvested and the herds were grazed on the stubble fields. Sufficient fuel was hard to find within the grazing catchment of the camp so a large amount of brush was collected some 6-8km away and returned to camp by tractor.

Camp 5 (August - September, 2 tents) was established about 6km northeast of Camp 4. This move was not normally followed in the family's annual cycle. It was made in order for Faṭma, who was nearing the birth of a third child, to have some help from her brother's family whose camp they joined. Their water was obtained from a wagon-mounted tank.

Camp 6 (October, 2 tents) was established in the vicinity of the Nabataean cistern. Although I was not in the field in October, 'Aeid told me that he would move back to the stubble fields in that area for grazing after the child came. They would have again relied upon the tank for their water supply.

In reviewing the annual nomadic cycle of the family, it is noteworthy that were it not for the water from the wagon-mounted tank they would have been without water from July through November. They could not have occupied camps 1, 4, 5 and 6 during this time. Furthermore, without the water from the Nabataean cistern, Camp 3 could not have been sustained during April.

Historic

Prior to the use of tractors and pick-up trucks, the Bedouin herders of the region were more dependent upon the natural distribution of water. And this dependence was reflected in their annual scheduling of camp moves. According to my informants in the Judayid Basin, large tent camps were established during the winter in the piedmont. Here they took advantage of the runoff from rain and snow in the uplands and at the same time enjoyed the milder temperatures of the lower elevations. This segment of the annual nomadic cycle thus closely parallels the contemporary pattern.

Following the winter rains, the large camp groups of the piedmont broke-up into smaller camp units of one or two

tents and moved to the lowlands. The spring and early summer is the time of year when the lowlands have their best pasturage and the greatest amount of water away from the few perennial springs. But even during the most favorable years, pasturage and water resources are sparse. In order to compensate for the low densities of resources, camp units were kept small and new camps and catchments were established frequently. This segment of the historic nomadic cycle differs from the contemporary pattern in two important ways. First, in lacking the water tanks and chaff for augmenting the grazing, historic Bedouins were obligated to move camps much more often. And secondly, such moves required them to exploit a much larger territory.

By early to mid-summer, the lowlands were abandoned because of poor grazing and insufficient water. From summer through autumn groups moved to progressively higher elevations through the piedmont and into the uplands. By the end of the dry season the only water available was from springs and grazing was confined to the uplands. Again the historic pattern of transhumance differs significantly from the contemporary pattern. During this segment, historic groups traversed each of the physiographic units and ultimately found themselves tethered to springs in the uplands. In contrast, 'Aeid's tent family remained in the piedmont and relied upon water from the wagon-mounted tank and chaff to augment the poor grazing.

With the coming of the winter rains and the colder temperatures, historic groups moved from the uplands to the piedmont. Here they had dependable water and good grazing for one to three months. They coalesced into larger tent groups and moved less often for this segment of their annual cycle. Historic and contemporary groups show quite similar patterns over this winter segment.

Prehistoric Land-Use Patterns: Chalcolithic Transhumance

During surveys conducted in the region, twenty-four sites were identified as Chalcolithic. Site placement was made on the basis of a shared set of artifacts and features including: tabular scrapers, lunates, triangular transverse arrowheads, small bi-polar cores, thick flint-tempered pottery, and oval stone structures with adjoining walls. Sixteen sites were found in the piedmont and eight in the lowlands. The eleven sites displaying architecture were restricted to the piedmont. Also site density was more than twice as high in the piedmont than in the lowlands (i.e. piedmont - 1 site/km^2; lowlands - 1 site/2.5km^2).

Chronology

Despite a great amount of ash and fire-cracked rock at many of the sites, the quantity of charcoal sufficient for dating was obtained only from Site J24 (Jabal Qeisa). A radiocarbon date of 5720+/−149 B.P. (SMU-804) was collected from a hearth near the base of the Chalcolithic horizon in Layer B.

Several of the characteristics of Jabal Qeisa and other sites in Wadi Ḥisma strongly resemble those described by Kozloff (1972/73; pers. comm. 1980) for Timnian sites in eastern Sinai. The thick, plain, flint-tempered pottery is common to both groups of sites as is the oval and curvilinear architecture. And the chipped stone assemblages from both areas share tabular scrapers, lunates and bi-polar cores. A comparison of the radiocarbon date from Site J24 with the eighteen dates from the Timnian shows that it falls near the center of the distribution (TABLE 1).

Rosen (1983) has recently argued that small lunates represent a useful chronological marker for Early Bronze I/II horizons falling near the end of the fourth millennium B.C. In that lunates are clearly associated with occupations in south Jordan and eastern Sinai dated to the beginning of the fourth millennium or when calibrated (Damon *et al.* 1974) even to the mid-fifth millennium B.C., it would seem that they were not exclusively associated with Early Bronze I/II occupations.

Table 1 Distribution of radiocarbon dates for the Timnian and Site J24 (Jabal Qeisa).

Site	Date	+/−	Lab Number
713 A	7037	232	SMU 836
649 EX	6843	62	SMU 702
649	6594	205	SMU 835
713	6403	76	SMU 641
332	5789	70	SMU 675
J24	**5720**	**149**	**SMU 804**
649 EX	5210	51	SMU 676
332	5708	81	SMU 809
650	5665	119	SMU 740
713	5654	57	SMU 742
650	5625	115	SMU 822
713	5523	73	SMU 788
332	5523	69	SMU 790
650	4427	68	SMU 743
699	4355	66	SMU 701
699 K	4267	65	SMU 677
699 K	4263	55	SMU 700
650 I	4251	64	SMU 642
713	4237	56	SMU 789

Elevational Patterns in Site Types

The sites from the piedmont and lowlands differ markedly in size, features, artifact densities and artifact inventories. The seven sites that were surface collected and test excavated reflect the overall pattern revealed in the survey, which shows the piedmont sites to be considerably larger with thicker cultural deposits often associated with architecture (TABLE 2). Lowland sites, located in the open and in shallow rockshelters, are usually confined to the surface or display thin shallowly buried cultural deposits. Although the lowland occupations are associated with deep hole conical mortars and pictographs, their artifact inventories are confined to chipped stone specimens and an occasional pottery sherd. In contrast, the artifact inventories of the piedmont sites include grinding slabs and mullers,

Table 2 Comparison of the various characteristics of Chalcolithic sites in the lowlands and uplands.

	LOWLAND				PIEDMONT		
SITE	J521	J408	J11	J14	J17	J20	J24
ELEVATION	880	940	1250	1185	1150	1100	1100
AREA m^2	115	140	1200	6000	8000	600	170
MORTARS	+	+	–	–	–	–	–
STRUCTURES	–	–	+	+	+	–	+
EXPOSURE	SW	O	E	S	SE	NE	NE

bone tools, ornamental objects of stone and shell, and a greater abundance of pottery and chipped stone items.

The stratigraphy and architecture revealed at sites J17, J14 (Jabal al-Jill) and J24 (Jabal Qeisa) point to camps of from 3-5 semi-subterranean stone-lined pithouses often positioned adjacent to a stone walled corral. Stratified hearths and ash layers (often 20-50cm thick) separated by culturally sterile windborne sand indicate periods of abandonment and reoccupation. At Site J14, a floor of compact sand within the Locus 7 pithouse perhaps indicates foot-traffic at a time when the floor was wet — most likely during the winter wet season. The location of a corral at J14 (and perhaps also at J17) is also consistent with a winter occupation, given the location downwind from the dwellings.

An examination of the chipped stone assemblages shows a number of patterned differences between the piedmont and lowland sites. Although the lowland sites are much more distant from raw material sources (confined to the piedmont and uplands) they show higher percentages of cores and primary elements (TABLE 3). While these data appear to indicate a greater emphasis upon initial processing activities in the lowland sites, tools (representing final steps in manufacturing) actually form a much higher proportion of the chipped stone inventories in the lowlands than in the piedmont (TABLE 3). This indicates that both cores and tools were imported to the lowland sites, whereas the occupants of the piedmont sites most likely conducted much of their initial processing at off-site locations near raw material sources. Blanks (blades and flakes) produced at such settings would then have been returned to camp for subsequent fabrication into tools.

Tool-kits also vary significantly between the piedmont and lowlands (TABLE 4). In general, the tool-kits of the lowland sites are somewhat specialized with only three classes (scrapers, retouched pieces and denticulates) accounting for 88% of the tools. The tool-kits from the piedmont sites are not only better balanced, but a number of classes are present that are absent from the lowland assemblages. Points, lunates, hammerstones and perforators are common to the piedmont sites, but rare or absent from the lowlands. These differences, parallelling those seen in other artifact categories (pottery, worked bone, groundstone), suggest that a wider range of activities was conducted in the piedmont than in the lowland encampments. This is in agreement with the proposed greater permanence of the camps in the piedmont for it is likely that with the longer period of occupation, the inhabitants would have engaged in a greater range of activities.

Table 3 Comparison of artifact inventories for lowland and piedmont assemblages.

	LOWLAND		PIEDMONT	
	N	%	N	%
TOOLS	52	16.20%	141	1.77%
DEBITAGE	116	36.14%	2229	27.91%
Cores	10	8.62%	42	1.88%
Blades	11	9.48%	434	19.47%
Flakes	77	66.38%	1687	75.68%
CrtrEl	0	0.00%	38	1.70%
PrimEl	18	15.52%	28	1.26%
MicroB	0	0.00%	0	0.00%
BurSpl	0	0.00%	0	0.00%
DEBRIS	153	47.66%	5615	70.32%
Chips	86	56.21%	4789	85.29%
Chunks	67	43.79%	826	14.71%
TOTAL ARTIFACTS	321		7985	
RATIOS				
Tool/Core	5.2		3.4	
Deb/Tool	2.2		15.8	
Debris/Tool	2.9		39.8	

Table 4 Comparison of tool classes for lowland and piedmont assemblages.

	LOWLAND SITES		PIEDMONT SITES	
Scr	12	20.69	29	20.42
Bur	0	0.00	1	0.70
Geo	0	0.00	8	5.63
NGm	1	1.72	20	14.08
Trc	1	1.72	2	1.41
RtP	31	53.45	49	34.51
Dnt	8	13.79	5	3.52
Nth	4	6.90	11	7.75
Pfr	1	1.72	7	4.93
Utp	0	0.00	5	3.52
Pt	0	0.00	5	3.52
	58		142	

Chalcolithic Transhumance

The site types and artifact inventories of the Chalcolithic occurrences in the region suggest a transhumant pattern similar to that practiced by Bedouin groups inhabiting the region in historic times.

Winter Camps: The large piedmont sites are thought to represent the winter segment of an annual transhumant cycle. They would have been associated with an aggregation of groups in semi-permanent camps. Beyond the larger sizes and markedly higher artifact densities of these piedmont sites, their architecture, thick cultural deposits,

and considerable artifact diversity point to relatively long-term encampments by large groups. The pottery (mainly in the form of large vessels with constricted openings) and the storage pits are also indicative of greater permanence. The lithic tool-kits suggest a wide range of activities including hunting (bifacial and transverse arrowheads, lunates).

Spring-Early Summer Camps: The lowland sites are interpreted as having been occupied during the spring and early summer by small, mobile groups. Without the artificial water sources of today, this, in fact, would have been the only time of the year when the lowlands could have been occupied. Water and pasturage are unavailable during the other parts of the year. These small, shallow sites with low artifact densities are what one would expect of such an ephemeral occupation of the lowlands. The specialized lithic tool-kits are also in keeping with the proposed high degree of mobility where activities at any one locus over a short period of time would have been limited.

Summer-Fall Camps: If the prehistoric pattern paralleled the historic cycle of transhumance, the summer - fall camps should be found in the piedmont and uplands. And like the lowland sites they should be relatively small with evidence for only ephemeral occupations. Such sites are present in the piedmont (e.g. Site J20) but similar data are unavailable from the uplands. Although the uplands were surveyed in 1979, it soon became evident that *in situ* occupations were absent or rare due to the extensive erosion. Even though artifacts ranging from Levantine Mousterian through Chalcolithic are common to the eroded surfaces of the uplands, especially in the vicinity of springs, surface concentrations or buried occupations were not found.

References

Baruch, U. 1986. The Late Holocene Vegetational History of Lake Kinneret (Sea of Galilee), Israel. *Paléorient* 12/2: 37-48.

Damon, P.E., Ferguson, C.W., Long, A. and Wallick, E.I. 1974. Dendrochronologic Calibration of the Radiocarbon Time Scale. *American Antiquity* 39: 2, 350-366.

Goldberg, P. and Bar-Yosef, O. 1982. Environmental and Archaeological Evidence for Climatic Change in the Southern Levant. In J.L.Bintliff and W. van Zeist(eds), *Paleoclimates, Paleoenvironments, and Human Communities in the Eastern Mediterranean in Later Prehistory.*

Henry, D.O., Hassan, F.A., Henry, K.C. and Jones, M. 1983. An Investigation of the Prehistory of Southern Jordan. *Palestine Exploration Quarterly* 115: 1-24.

Henry, D.O., Turnbull, P., Emery-Barbier, A. and Leroi-Gourhan, A. 1985. Archaeological and Faunal Remains from Natufian and Timnian sites in Southern Jordan. *Bulletin of the American Schools of Oriental Research* 257: 45-64.

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

Koucky, F. and Smith, R. 1986. Lake Beisan and the Prehistoric Settlement of the Northern Jordan Valley. *Paléorient* 12/2: 27-36.

Kozloff, B. 1972/73. A Brief Note on the Lithic Industry of Sinai. *Museum Ha'aretz Yearbook* 15/16: 35-49.

Levy, T. E. 1983. The Emergence of Specialized Pastoralism in the Southern Levant. *World Archaeology* 15/1: 15-36.

Neev, D. and Emory, K.O. 1967. The Dead Sea. *Bulletin of the Geological Survey of Israel* 41: 1-147.

Rosen, S.A. 1984. Kvish Harif: Preliminary Investigation at a Late Neolithic site in the Central Negev. *Paléorient* 10/2: 111-121.