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Paleolithic Adaptive Strategies in Southern Jordan: Results of the 1979 Field Season

One of the current fundamental concerns of anthropology is in understanding the dynamics of human adaptive strategies, that is, the ways in which populations select and secure resources from their environments. An important aspect of the problem relates to defining man's past responses to critical situations such as population stress, dwindling resources, economic transitions, and environmental fluctuations. Archaeology, as a discipline, is in a unique position for elucidating adaptive patterns through tracing and evaluating cultural responses to critical situations over an exceedingly long time span (Harris, 1968: 360).

Some manifestations of adaptive strategies which are most apparent archaeologically are settlement patterns, economic modes, and settlement size. A traditional view of the evolution of prehistoric adaptive strategies, based upon these archaeological manifestations, stresses the replacement of highly mobile settlement systems, specialized economies, and small in-group populations by more sedentary settlement systems, broad-spectrum economies, and larger in-group populations. In the Near East, this evolutionary trend is normally viewed as culminating at the end of the Pleistocene with large, semi-sedentary populations which employed diversified hunting and collecting economies. The terminal Pleistocene adaptive strategies of this 'settling in' period, although interpreted in different ways, are fundamental to the various explanatory models proposed for the origin of agriculture (Braidwood, 1960; Binford, 1968; Redman, 1978).

While the changes in adaptive strategies recognized for the terminal Pleistocene are well documented in the Near East (Braidwood and Howe, 1960; Hole and Flannery, 1967; Binford, 1968; Mortensen, 1972; Henry and Leroi-Gourhan, 1976; Marks and Freidel, 1977), a question arises as to whether similar transitions occurred at other times during the Pleistocene. The proposed diachronic directional trend of greater sedentism, more diversified economy, and larger in-group size appears to be theoretically unsound given the lack of directionality in such important influential factors as environment and over-all population density of the region. Furthermore, recently acquired empirical data indicate the presence of a settlement pattern associated with sedentary residential encampments during the Middle Paleolithic in the central Negev Highland (Hietala and Stevens, 1977; Marks and Freidel, 1977). If Middle Paleolithic sedentism was a regional as opposed to local phenomenon, the well documented change in adaptive patterns which occurred at the end of the Pleistocene would appear to represent only one of a number of such intermittent occurrences rather than the culmination of an evolutionary trend. If the changes recognized in adaptive patterns at the end of the Pleistocene do not represent a unique occurrence limited to that time period, then many of the existing notions on post-Pleistocene adaptions need to be recognized. The differences between Pleistocene and terminal Pleistocene episodes of sedentism may be considerable importance in explaining the origin of agriculture within the region.

Unfortunately, relatively few areal research projects concentrating on the definition of prehistoric adaptive strategies have been conducted in the Near East. The paucity of such studies is due to a traditional regional orientation of intensively excavating individual prehistoric sites. Although a few notable studies have addressed the problem (Braidwood and Howe, 1960; Hole and Flannery, 1967; Hole, Flannery, and Neely, 1969; Higgs, 1972; Marks, 1976, 1977; Bar-Yosef and Phillips, 1977), their differences in temporal foci, particular topical orientations, and recovered evidence have limited the most complete and detailed sequence of changes in adaptive patterns to the Central Negev Highlands (Marks, 1976, 1977).

Southern Jordan: an ideal study area

Although there are no doubt a number of regions in the Near East which would contain excellent study areas for examining Paleolithic adaptive strategies, the southern edge of the Jordanian Plateau is in many ways unique in respect to environmental diversity and high density of Paleolithic sites. The region exhibits striking differences in elevation which range from 800 metres to over 1,700 metres above sea level. Although in general, the region is desertic, receiving less than 200 mm. of precipitation annually, the marked vertical relief generates significant local variation in precipitation patterns as evidenced by the elevational zonation of plant communities (Zohary, 1962:51–53).

As an expression of the vertical relief of the region, three distinct phytogeographic zones (Mediterranean, Irano-Turanian, and Saharo-Sindian) appear within short transects running from the floor of the Wadi Hisma to the hills on the edge of the plateau. The transects which incorporate these three zones are normally of the order of 10 km. in length and traverse elevations from 900 metres to 1,400 metres above sea level.

Clearly, Southern Jordan provides an ideal setting for collecting information on past climates and prehistoric settlement patterns and economics. The elevational differences of the region which result in the current environmental diversity, no doubt, played a similar role in prehistoric times. One would suspect that the region was environmentally quite sensitive to climatic fluctuations of the past with the elevational zonations of plant communities shifting in concert with changes in precipitation and temperature patterns (Butzer, 1971: 78). The region's environmental diversity and its potential for dramatic environmental shifts, associated with climatic change, provide an ideal situation for examining prehistoric settlement patterns and economics on the basis of seasonal adjustments and long-term changes in adaptive strategies.

In respect of our knowledge of the Paleolithic archaeology of the region, the paucity of detailed investigations is surprising given the large numbers of sites that have been reported from Southern Jordan (Stockton, 1969). Although intensive systematic surveys of Paleolithic sites have not as yet been undertaken in southern Jordan, a number of reconnaissances have provided some information on the varieties and densities of Paleolithic occupations (Kirkbride and Harding, 1947; Zeuner, et. al., 1957; Kirkbride, 1960; Field, 1960; Huckreide and Weisemann, 1968; Copeland and Hours, 1971; Price and Garrad, 1975). Over forty sites representing Lower Paleolithic, Middle Paleolithic, Upper Paleolithic, Epi-Paleolithic, and Neolithic industries have been recorded in Southern Jordan (Stockton, 1969). Detailed studies and excavations, however, have only been initiated on late Pleistocene and Holocene occupations attributed to Epi-Paleolithic and Neolithic industries at the sites of Beidha (Kirkbride, 1966; Mortensen, 1970), Wadi Madamagh (Kirbride, 1958), and Wadi Dhobai (Waechter and Seton-Williams, 1938). While a limited number of prehistoric investigations have been undertaken in southern Jordan, it is evident that the region exhibits a high density of Paleolithic occupations which represent a considerable time depth. When the region's environmental features are considered in conjunction with the density and time-depth of Paleolithic occupations, southern Jordan clearly provides a unique laboratory for examining the changes in prehistoric adaptive patterns over a very long time span.

Fundamental information: chronology and environment

The development of sound cultural-historical and environmental sequences are requisite for examining changes in man-land relationships during the Paleolithic. An understanding of the chronological order of cultural and environmental successions is fundamental to studying man's responses to changes in his environmental background.

Our general knowledge of the relative chronologic order of Paleolithic complexes of the Near East has not been greatly altered over the last fifty years. Our understanding of the generic relationships and the absolute antiquity of these complexes, however, has undergone considerable refinement as a result of technical and theoretical advances (Henry and Servello, 1974). The increased precision of chronologically ordering the Paleolithic record has produced a far more complex picture than we previously imagined. While in the past major differences in artifactual patterns were normally given temporal significance, it is now apparent that such variability may represent different functional or regional expressions of a single cultural entity. The recognition of numerous variables other than 'change through time' which may have contributed to variability in the archaeological record has prompted many scholars to develop a more holistic approach in their investigations. Although holistic studies seek to identify the various expressions which the archaeological manifestations of a discrete Paleolithic cultural entity may have taken as a result of seasonal, functional, or settlement differences, temporal control of the archaeological record nevertheless remains a fundamental issue. The necessary precision or resolution of our chronologic scale, however, varies with the problem with which we are dealing. In studying the changes in adaptive strategies for the Paleolithic, the temporal focus defines broadly contemporary occupations belonging to socio-cultural systems which fall within rather wide chronologic partitions. The early Levantine Mousterian and the Natufian would represent examples of such socio-cultural systems which prevailed for tens of thousands and thousands of years, respectively. Fortunately, typologic indicators within the artifactual inventories of these systems facilitate their identification. When the typologic information is then coupled with radiometric and stratigraphic evidence cultural-historical sequences are developed which allow for the examination of changes in adaptive patterns.

While in general the chronology of Paleolithic complexes in the Levant is known, our understanding of paleoenvironmental settings equivalent with these complexes is at present poorly understood. Paleo-environmental reconstructions are restricted to the late Pleistocene with the greatest amount of evidence coming from terminal Pleistocene and Holocene deposits.

Following the last interglacial and equivalent with early Levantine Mousterian times (+60000 BC) palynological, geological, and paleontological data indicate greater humidity and lower temperatures than at present (Jelinek, et al, 1973; Marks, 1977). By late Levantine Mousterian times (c. 45000 BC), after an erosional hiatus, the climate appears to have been similar to todays with slightly cooler temperatures.

Although dry climatic conditions continued in association with Upper Paleolithic manifestations, until around 30000 BC, a slow climatic amelioration apparently began as early as 35000 BC (Marks, 1976). A brief period of climatic amelioration from about 30000 to 25000 BC is indicated by palynological, geological, and settlement pattern evidence (Marks, 1976; Bar-Yosef and Phillips, 1977). An episode of dry conditions associated with lower temperatures than at present appears to have persisted from c. 25000 BC until around 12000 BC with maximum aridity occurring between 14000 and 13000 BC (Marks, 1976; Henry and Leroi-Gourhan, 1976). The end of the Pleistocene in the Levant appears to have been associated with climatic-environmental oscillations which were equivalent in number if not magnitude to the rest of the world. In association with geometric Epi-Paleolithic industries, a mild humid climate prevailed from about 12000 to 10500 BC to be replaced by colder, drier conditions from 10500 to 10000 BC (Henry and Leroi-Gourhan, 1976). Synchronous with the early Natufian, there was an onset of a warm, humid climate which persisted from about 10000 to 9000 BC. The warm humid setting, however, gave way during late Natufian times, about 9000 BC, to drier conditions, with lower temperatures appearing between 8500 and 8000 BC (Leroi-Gourhan, 1974). Beginning with the Aceramic Neolithic (PPN 'A'), around 8000 to 7800 BC, the arid phase gave way to increased temperature and moisture (Leroi-Gourhan, 1974). While I would like to emphasize that the paleo-environmental summary presented here is a tentative one, based upon a limited number of localities in the Levant, it nevertheless provides a useful framework for organizing, developing, and evaluating newly acquired evidence.

Adaptive strategies revealed in settlement patterns

In that a population's settlement system reflects the interplay of the environmental, economic, demographic, and social forces which influence a population's adaptive strategy, prehistoric settlement pattern perhaps provides the most tangible evidence for elucidating prehistoric adaptive strategies. Various classificatory schemes have been used in studies of settlement systems (Beardsley, et. al., 1955; Hole and Flannery, 1967; MacNeish, 1972; Mortensen, 1972). Although the terminologies of the studies differ, settlement systems have principally been viewed as adaptive mechanisms which adjust group size, movement, and scheduling to most efficiently mesh procurement technologies with the locations and seasonal availability of resources.

Two polar types of settlement patterns have been defined, i.e. circulating and radiating. Mortensen (1972), in differentiating between the two settlement patterns, noted that in the circulating pattern the movements of prehistoric groups would have accounted for numerous ephemeral camp sites while a radiating pattern would have contained permanent or semi-permanent base camps which were in part supported by various non-residential satellite exploitation encampments. The site catchments of the two patterns would be expected to differ significantly as well (Henry, 1975: 381) the site catchments associated with a circulating pattern would include areas in close proximities to the sites; perhaps in the order of 10 km. in radius (Vita-Finzi and Higgs, 1970; Jarman, 1972). The site catchments of a radiating pattern, on the other hand, would include considerably larger territories through the channelling of resources from the various radial exploitation camps back to the base camps.

As previously discussed, the changes in settlement patterns within the Central Negev Highlands during the last glaciation appear to have been partially correlated with climatic-environmental oscillations (Marks and Freidal, 1977:153). During moist climatic intervals, coeval with early Levantine Mousterian and Natufian industries, radiating settlement patterns appear to have been operative. Radiating patterns, however, gave way to circulating patterns during drier climatic-environmental intervals associated with Upper Paleolithic, Kebaran and Geometric Kebaran industries. If the settlement pattern changes identified in the Central Negev can be applied regionally, as suggested, a similar sequence should be defined within southern Jordan. In order to evaluate the proposed settlement pattern sequence and to more fully integrate the observed settlement pattern changes into the broader context of adaptive strategies, two specific settlement pattern models are proposed for testing in southern Jordan.

Models for the study area

The models are based upon the premises that: 1) a strong positive correlation exists between population density and rainfall patterns among hunting-gathering populations (Birdsell, 1953); 2) a Mediterranean climate characterized by a marked seasonal distribution in rainfall has prevailed during the upper Pleistocene for the area (Farrand, 1977); and 3) that the orographic features which control rainfall patterns in the area today were operative in the past. Within southern Jordan, rainfall distributions, viewed as having been the most influential factors governing settlement patterns, are principally controlled by the variables of climate, seasonality, and elevation. Two major varieties of climate, moist and arid, are considered in the models. The region is presently experiencing an arid climate, but as discussed mounting paleo-environmental data indicate marked climatic oscillations during the last glaciation. The region exhibits marked seasonality in rainfall with almost all of the precipitation occuring during the months of December, January, and Feburary. Striking differences in rainfall patterns are also caused by elevational differences with two major zones being distinguished. The high elevations (1,000–1,600 metres) of the Edom Plateau receive over 500 mm. of rainfall annually, while the lower elevations (c. 900 metres) of the steppe country of the Eastern Desert receive under 200 mm. precipitation annually.

Moist climatic intervals

It is proposed that during major climatic intervals of greater available moisture than today, radiating settlement patterns would have existed in the Jordanian highlands with either radiating patterns, circulating patterns, or combinations of the two being operative in the Eastern Desert depending on the magnitude of pluvial conditions. It is also suggested that the sedentary base camps of the groups living in the highlands during these times would have been located in ecotones in order that resources from diverse environmental zones could be procurred from a single locus. In that the environments of the region are elevationally zoned, it is predicted that sedentary base camps of a specific period (e.g. Natufian, early Levantine Mousterian) will be found at similar elevations given their ecotonal positions.

Arid climatic intervals

During arid climatic intervals with moisture budgets similar to or less than that of the region today, it is proposed that circulating patterns prevailed for the highlands and the Eastern Desert. The circulating settlement system would have encompassed both the highlands and Eastern Desert, with the highlands having been occupied during the long dry season (April through November) and the Eastern Desert having been occupied during the wet season (December through March). It is suggested that the residential encampments of the circulating settlements pattern in the highlands would not have been tied to a single environmental locus, but would have been situated in various environmental settings. The site distributions of arid climatic intervals would, therefore, not be expected to exhibit similar elevations.

Although the population density of the region (including both the highlands and the Eastern Desert) was probably higher during major pluvials, the population density of the highlands must have risen considerably during the dry season of arid climatic intervals when populations abandoned the Eastern Desert. These demographic differences should be expressed archaeologically in a significantly greater number of residential encampments being recorded for arid as opposed to moist climatic intervals, even when the inherent differences in settlement patterns are considered.

A methodology for evaluating the models

In order to evaluate these models archaeologically, the examination of the site distributions for each of the time periods should involve: 1) Discerning to what degree the site distributions have been biased by differential geologic exposures; 2) Identifying the different varieties of prehistoric encampments (i.e. permanent or semi-permanent base camps, transitory residential camps, non-residential exploitation camps); 3) Comparing the site distributions by variety to topography, paleo-environmental zones, and fixed resources (lithic sources and water); 4) Studying the locations of abandoned and extant Bedouin encampments.

Geologic exposures

In order to ascertain the degree to which the distributions of sites have been biased by differences in geologic settings, surface maps of the study area should be prepared for each of the archaeological periods. The maps, based upon geologic and archaeologic evidence, will identify those portions of the study area where sediments of a particular period are exposed, removed, or buried. In this manner, the distribution of prehistoric sites can be accurately evaluated for settlement patterns.

Site varieties

The investigation should seek to classify sites discovered within the study area in to permanent/semi-permanent base camps, transitory residential encampments, and non-residential exploitation camps. The classification should be based upon differences observed between the sites and their respective assemblages in regard to: 1) site areas, 2) variability in tool-kits, 3) stages of lithic reduction, 4) curation modes, 5) load applications, 6) tool-to-debitage ratios, and 7) artifact densities. No single attribute to those listed should be considered to be diagnostic of site variety, for a combination of attributes is viewed as necessary for cross-checking and verifying the classification of a site as to variety.

Fixed resources

The sites from each of the prehistoric periods will be compared by variety to the topography, contemporary environmental zones, elevation, and fixed resources (flint, water) of the study area. These distributions will be examined in respect to a minimax strategy where sites were located so as to minimize human energy expenditures and maximize the procurement of resources.

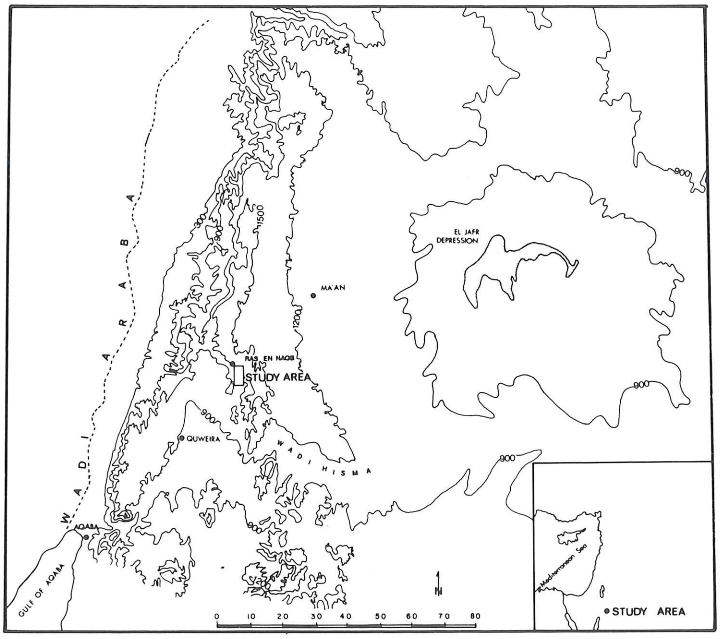
Bedouin settlement pattern

Although the focus of the investigation is on prehistoric adaptive strategies, knowledge of the movements and exploitive practices of Bedouin groups within the region should assist in the interpretation of the prehistoric evidence. In that the seasonal movements of Bedouin groups in the area are primarily controlled by rainfall distribution (Patai, 1958:164–165), their settlement pattern should be similar to the pattern predicted for prehistoric hunters and gatherers who occupied the area during arid climatic intervals. Ethnographic data for the Howetat Ibn Jazi, in fact, confirm a circulating settlement pattern. The tribe occupies the highlands of the Ras en Naqb during the dry season and disperses into the Eastern Desert in smaller social units during the winter rains (Patai, 1958, 164–165).

Preliminary results of the investigation

During an eight week field season in the summer of 1979, a multi-disciplinary archaeological investigation was conducted in the area of the village of Ras en Naqb in southern Jordan (FIG. 1). Although the long term goals of the study focus on tracing and evaluating adaptive changes for the Paleolithic occupation of the area, the first season's fieldwork concentrated on surveying the area for Paleolithic sites, ordering the

1. Study area



discovered sites chronologically, and collecting environmental evidence of the past and present.

The study area captures the marked environmental and elevational diversity exhibited by the region in containing the three major vegetational communities of the Levant in conjunction with elevations ranging from 800 metres to 1600 metres above the sea level. The topography of the study area can primarily be divided into the uplands on the edge of the Edom or Ma'an Plateau and the lowlands which front the plateau and form the edge of the Wadi Hisma.

Chronology

A systematic 100 per cent survey of slightly over ten square km. was undertaken on foot. The survey resulted in the discovery of 56 Paleolithic sites attributed to Middle Paleolithic, Epi-Paleolithic, Neolithic, and Chalcolithic occupations of the study area. While the majority of the sites were deflated, a surprising number were *in situ*, in primary archaeological context, with thick cultural deposits. Many of the sites were also multi-component in containing occupations attributed to more than one Paleolithic Period.

The Middle Paleolithic occurrences include early and late Levantine Mousterian occupations. Although the uplands are dominated by Mousterian artifacts, the sites appear as large sporadic surface scatters of flint artifacts which have moderate to heavy patination. All indications are that the Middle Paleolithic age sediments in the uplands have been removed leaving the sites in deflated contexts. A single Levantine Mousterian site was discovered in association with a small cave located along the western edge of the basin. Based upon typologic considerations, the site appears to have been occupied during late Levantine Mousterian times.

Surprisingly, no Upper Paleolithic occurrences were discovered within the study area. Epi-Paleolithic occurrences, on the other hand, appeared in high density and represent several complexes. The Epi-Paleolithic occurrences included both geometric and non-geometric microlithic assemblages similar in appearance to Kebaran and Geometric Kebaran manifestations. Early and late Natufian occupations were also recorded in the survey. A single aceramic Neolithic occupation was discovered which is tentatively viewed as equivalent in age with Tel Mureybet Phase II on the basis of point typology (Cauvin, 1974). Numerous Chalcolithic sites were encountered in the survey, often overlying deposits containing late Natufian artifacts. The Chalcolithic sites normally exhibited curvilinear structures fashioned from unmodified limestone or sandstone rocks.

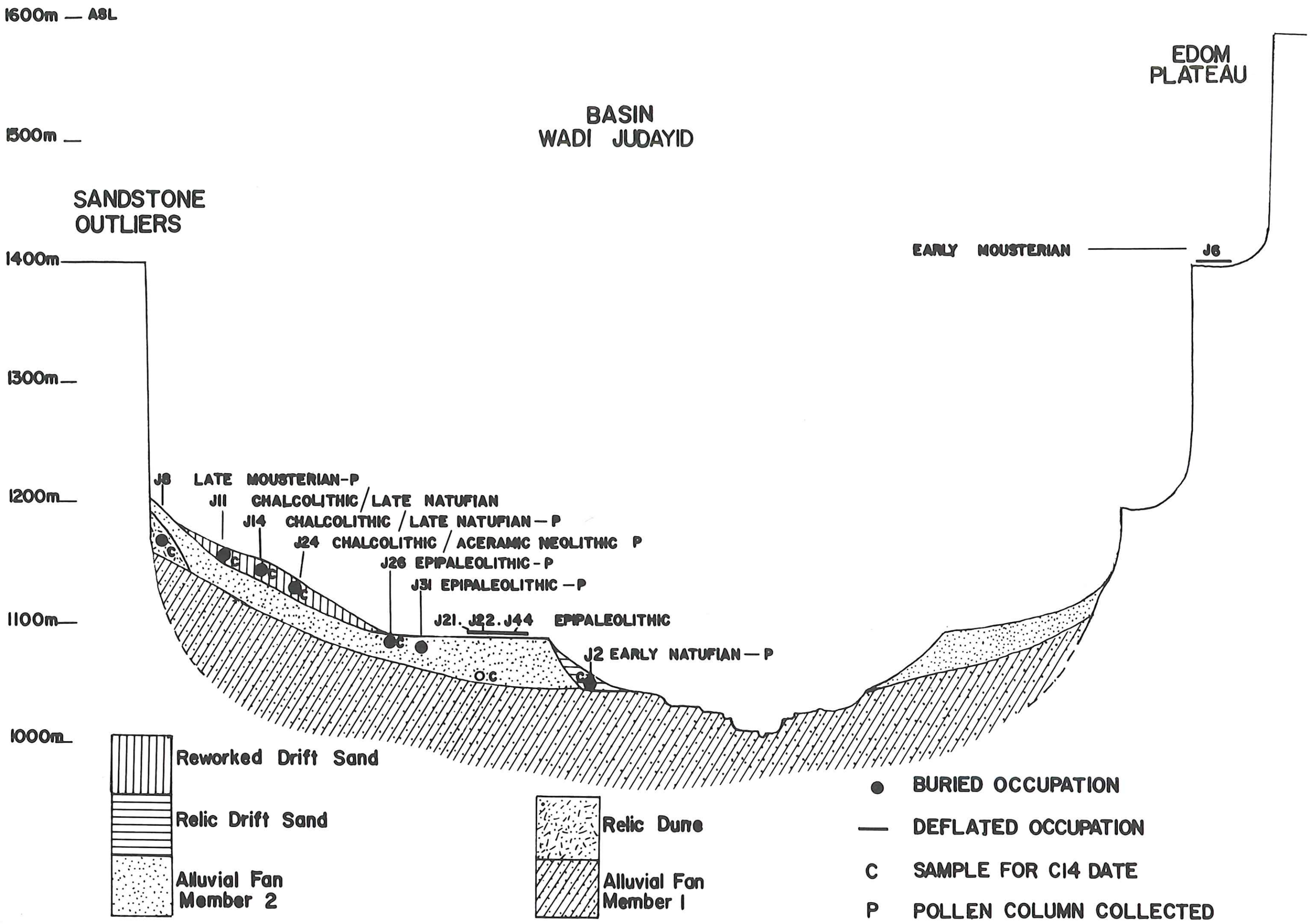
Paleo-environment

In general the chronology and geologic settings of the Paleolithic sites discovered near Ras en Naqb mesh well with the paleo-environmental sequence developed on evidence from other localities in the Levant (FIG. 2). The high density of Levantine Mousterian artifacts distributed throughout the uplands away from permanent water sources probably correlates with the moist phase equivalent with the early part of the last glaciation. Within the basin lowlands, this episode is represented by alluvial fan deposits containing reddish yellow sands cemented by carbonates and including zones rich in carbonate modules. These characteristics are indicative of a sub-arid environment with seasonal dryness. A period of major downcutting ensued which may have been associated with the erosion of the uplands. Following this erosional episode, dunes formed from freshly weathered sandstone accumulated in the basin under dry, cool conditions. A late Levantine Mousterian site is contained within a relict of dune sands of this period.

A period of alluviation followed under conditions which were warmer and somewhat more moist than the preceding episode of dune accumulation. The alluviation apparently continued until c. 11000 BC as indicated by geometric Epi-Paleolithic occupations appearing in situ in the top of this unit.

The subsequent geologic events within the area appear to have been predominantly erosional, with the exceptional episode of wadi alluviation. The erosional cycles resulted in a series of cut terraces with the lowest visable terrace at 0.5 metres above the modern wadi floor. Following the formation of the highest terrace, an early Natufian settlement was established thus providing a temporal bracket for the erosional episode between 11000 and 10000 BC. During late Natufian times cooler, drier conditions followed leading to intensive mechanical weathering and aeolian activity. With the onset of warmer, more moist conditions iron oxides within the sands were liberated and the reddish sands were reworked into drift sand on top of the earlier deposits. This phase is in

2. Chronological/Geological diagram of site.



concert with recent palynological evidence which indicates moist conditions for the chalcolithic (Horowitz, 1974:411).

Summary

Although the cultural-chronologic and environmental sequences presented for the area will no doubt be modified and refined as additional evidence is accumulated in forthcoming field seasons, the results of the first season provide a framework on which to organize the evidence. Radiocarbon determinations on a series of samples collected during the summer of 1979 should provide absolute dates for late Levantine Mousterian, Epi-Paleolithic, Neolithic, and Chalcolithic occurrences. In conjunction with these dated occurrences several sediment columns were collected for palynological analysis. The results of this analysis, which is currently underway, will offer a means of amplifying and evaluating the paleo-environmental reconstruction as based primarily on geologic interpretation.

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