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A. NORTH AFRICA

Paleoenvironments and Epi-Paleolithic Economies in the Maghreb (ca. 20,000 to 5000 B.P.)

DAVID LUBELL

Situated midway between Europe and both sub-Saharan Africa and the Near East, the Maghreb has long been prime territory for colonizing movements, and this has affected the way in which prehistorians have viewed the region. While strictly diffusion-migration explanations for Maghreb prehistory can no longer be accepted, it is a fact that there are strong, if generalized, similarities

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throughout the circum-Mediterranean during the late Pleistocene and early to mid-Holocene. These similarities cover the full range of archaeological data and interpretations, yet in the Maghreb the situation appears distinctive. The Neolithic mode of production, apparently so well-documented elsewhere in the circum-Mediterranean (or are we still, unconsciously, overwhelmed by the developments in southwestern Asia?), cannot be shown to have arrived in the Maghreb until a late date and probably from an external source. Why not? Some interpret this as evidence for cultural stagnation or, at least, a lower level of cultural development. This writer, on the contrary, sees it as evidence that the Epi-Paleolithic populations of the Maghreb had, from an early date, achieved an effective, successful, and, above all, flexible subsistence adaptation to their environment(s) that obviated the "necessity" of introducing a new mode of production, despite declining environmental productivity, until later than elsewhere in North Africa specifically or the circum-Mediterranean in general. It should, however, be borne in mind that the data available are neither complete nor conclusive, and that the writer will, therefore, rely heavily on his own research, which covers a limited timespan (the Capsian, 10,000 to 6000 B.P.) and a restricted area (the Chéria and Télidjène basins in eastern Algeria).

Paleoenvironments

The climatic history of the Maghreb during the last 18,000 to 20,000 years is not well documented. The available data are of uneven quality, are from widely dispersed localities, and are poorly calibrated. No detailed palynological studies cover this period. Most interpretations rest on the study of alluvial and colluvial deposits which have all too often been dated by the archaeological remains they contain (Coque, 1962; Vita-Finzi, 1967; Ballais, 1976), archaeological faunal assemblages (Higgs, 1967b; E. C. Saxon, 1976; Lubell et al., 1975), or charcoal from archaeological deposits (Hassan in Lubell et al., 1975); we seem to know a great deal more about other parts of the Mediterranean and the Sahara than we do about the Maghreb (e.g., Rognon, 1976; Thunell, 1979); and the Maghreb data are not always consistent. Thus, the outline presented here is very tentative.

The CLIMAP model (CLIMAP, 1976) suggests that at 18,000 B.P. the Maghreb was cooler than it is today. July surface air temperatures are estimated to have been between 13° C. (northwest) and 3° C. (northeast) lower than at present (Gates, 1976: 1142). The average temperature depression seems to have been about 6° C., which is in agreement with the estimate of Peterson et al. (1979) based on terrestrial data. Higher elevations in the Moroccan Atlas are reconstructed as snow-covered (Gates, 1976: 1139), while the coastal plain and high inland plateaux are said to have been covered by forest or other dense vegetation (CLIMAP, 1976: 1132). Sea-surface temperatures off the northwest coast of Africa were apparently about 2° C. colder than today, while in the western Mediterranean they were more than 4° colder. The western Mediterranean was apparently 10° cooler than the eastern Mediterranean, whereas the difference today is only 1° to 2° (CLIMAP, 1976: 1135). A low-pressure cell over the western central Sahara (Gates, 1976: 1141) probably brought increased precipitation to this region, and the depression of the westerlies (in combination with other factors) may have brought more precipitation to the Maghreb as well (Peterson et al., 1979). The latter is, however, far from certain; Rognon (1976) argues for an inverse relationship between the Sahara and the Maghreb, that is, one being wet while the other was dry and vice versa.

The available data are not entirely in agreement with this general model. Charcoal from archaeological sites (Couvert, 1972, 1976) suggests that the period from about 20,000 to 12,000 B.P. was cool and relatively dry. Sheet-flood erosion resulting in widespread erosional surfaces (pediment formation) was common (cf. Coque, 1962), with concurrent sedimentation occurring downslope, i.e., toward the centers of basins. In some areas these surfaces may have formed over a long period, and the downslope portion of a pediment-sediment surface may be younger than its upslope portion. Despite the uncertainty surrounding the term, these surfaces are often called Soltanian (Lubell et al., 1976: n. 16). In eastern Algeria they frequently appear to have been truncated by erosion and to have been overlain unconformably by Holocene deposits. In several instances we have observed Capsian sites resting directly on such surfaces. At the site of Ain Misteheyia this emplacement can be dated no earlier than 10,000 B.P., while 5 km down-

TABLE 1. **Radiocarbon Dates from the Chéria/Télidjène Region**

Locale	Lab. No.	Provenience	Material	B.P. (T½ 5568)
Wadi Mezeraa	I–9833	± 10 m upstream from Ballais's section and 2.1 m, below Roman age deposits	snail shell	2270 ± 80
	I–9834	marsh deposits ± 50 m downstream from Ballais's section	snail shell	4685 ± 95
	I–7693	marsh deposits at Ballais's section	snail shell	5830 ± 95
	SMU 655 (temp.)	*in situ* hearth ± 200 m upstream from Ballais's section in higher (older) terrace	charcoal	11,619 ± 109
Wadi Oussif	SMU 688 (temp.)	Marsh deposits exposed in tributary to Wadi Télidjène	snail shell	6957 ± 69
Oued Télidjène A	I–9832	Escargotière—middle of deposits: 120–125 cm	snail shell	7280 ± 120
Kef Zoura D	I–9835	Capsien supérieur levels (within shelter): 90–95 cm	charcoal	5965 ± 115
	I–9836	125–130 cm	charcoal	6485 ± 125
	I–9837	145–150 cm	charcoal	6505 ± 125
	I–9838	165–170 cm	charcoal	6575 ± 170
	SMU 704 (temp.)	Capsien typique levels (in front of shelter): 260 (hearth)	charcoal	8607 ± 161
	SMU 712 (temp.)	280–290 cm	charcoal	9213 ± 158
Ain Misteheyia	I–7690	Upper assemblage: J9 40–45 cm	snail shell	7280 ± 115
	I–9782	L9N 48–55 cm	snail shell	7640 ± 115
	I–9781	K10W 50–60 cm	snail shell	7725 ± 120
	I–8378	Lower assemblages: J9 80–90 cm (disturbed)	snail shell	8835 ± 140
	I–9783	M8E/N 90–100 cm	snail shell	7990 ± 125
	I–9784	L11N 95–105 cm	snail shell	8125 ± 125
	I–7691	J9 125–135 cm	snail shell	9280 ± 135
	I–9785	M10S 130–140 cm	snail shell	9430 ± 150
	I–9786	K9 140–145 cm	snail shell	9615 ± 155
	I–9826	K8 140–150 cm (burial)	snail shell	9130 ± 150
	I–9824	K12 145–150 cm	snail shell	9805 ± 160
	I–9825	K10N 150–155 cm	snail shell	9590 ± 155

All depths for archaeological deposits are below datum.

slope, at the site of Oued Télidjène A, the emplacement appears to be no earlier than about 8000 B.P. (see Table 1).

It has been suggested that somewhat to the west, in Algeria, the Soltanian *glacis* can be dated to about 19,000 B.P. (Guiraud, n.d.). However, given the probability that such surfaces are time-transgressive, such a date does not necessarily refer to the end of their formation. It is, of course, possible that a hiatus is present, especially considering the truncated nature of many of these surfaces.

It is also far from clear that such surfaces formed continuously throughout the late Pleistocene and early Holocene. There are several alluvial sections (located both in basin centers and on basin margins) in which deposits suggestive of marshy conditions have been observed. We have obtained a provisional radiocarbon date of 6957 ± 69 B.P. (SMU 688) for one such deposit in the Télidjène basin. These observations may, of course, be indicative of local rather than regional conditions, and additional research in several areas must be done before a more accurate picture can be drawn.

Some additional data are available now which permit a partial (and tentative) reconstruction of paleoenvironments during the early Holocene in a restricted part of eastern Algeria. The region is near the modern town of Chéria, some 40 km southwest of Tébessa (Fig. 1). Working in this area since 1972, we have collected data that bear on paleoenvironments.

The Wadi Mezeraa drains the Chéria basin, passing through a narrow gorge just west of the Télidjène basin. A 6-meter section in this gorge was studied by Ballais (1976; and in Lubell et al., 1975), who defined the "Chéria formation" on the basis of his observations. Subsequent work by the present writer and Achilles Gautier (1979) and by W. R. Farrand suggests that Ballais's conclusions were premature. The section he studied (cf. Lubell et al., 1975: fig. 3) does not span the entire Holocene but, rather, at most the last 5000 years (see Table 1). Furthermore, just upstream from his type section there is a 10 m exposure of generally fine-grained sediments that underlie a terrace that is at least 5 m higher than at Ballais's section and that do not contain the sort of dark-colored organic facies present in the section he studied. In addition, toward the base of the higher section, we observed two *in situ* hearths. Charcoal from one of these has been provisionally dated to 11,619 ± 109 B.P. (SMU 655). Thus, the "Chéria formation" must be abandoned as a formal unit (Lubell and Gautier, 1979). The deposits used to define it appear to represent a mid to late Holocene series of short periods of marshy sedimentation interrupted by deposition of stream gravels in shallow channels cut into the marsh sediments, perhaps during flood spates (W. R. Farrand, *in litt.*, 1978).

These data appear to suggest an earlier period (first half of the Holocene?) of slower alluvial deposition and more complete weathering with little colluviation (i.e., greater vegetation cover on the slopes), followed by a period of more irregular deposition in which colluvial, alluvial, and marshy depositional environments were all present—though not necessarily at the same time. This period seems to have begun by at least 5000 B.P. and has probably continued through the Roman period and into the present, both here and elsewhere in the Maghreb (e.g., Vita-Finzi, 1967: 211–213).

How much of the difference is due to climatic change and how much to human interference cannot be accurately determined. Certainly the Roman colonization of the Maghreb had some effect. Urban population densities during the Roman and Byzantine eras were as great as or greater than today. When the Third Augustan Legion was stationed at Tébessa during the reign of Vespasian (A.D. 69–79), the population of the town is estimated to have been at least 40,000, 25 percent larger than now (Pierre, 1977).

Rural densities were, in some areas at least, also apparently higher than at present, though little is known about these settlements. It seems that some were farms of indigenous people, while others belonged to discharged Legionnaires. Olive cultivation on valley sides was certainly an important part of the economic pattern in eastern Algeria—a practice almost obsolete today, since the slopes now are likely to be bedrock (cf. Leveau, 1978).

Many Roman wells of up to 20 m deep are dry today. It is clear that in North Africa (Le Houerou, 1970), as elsewhere in the Mediterranean (e.g.,

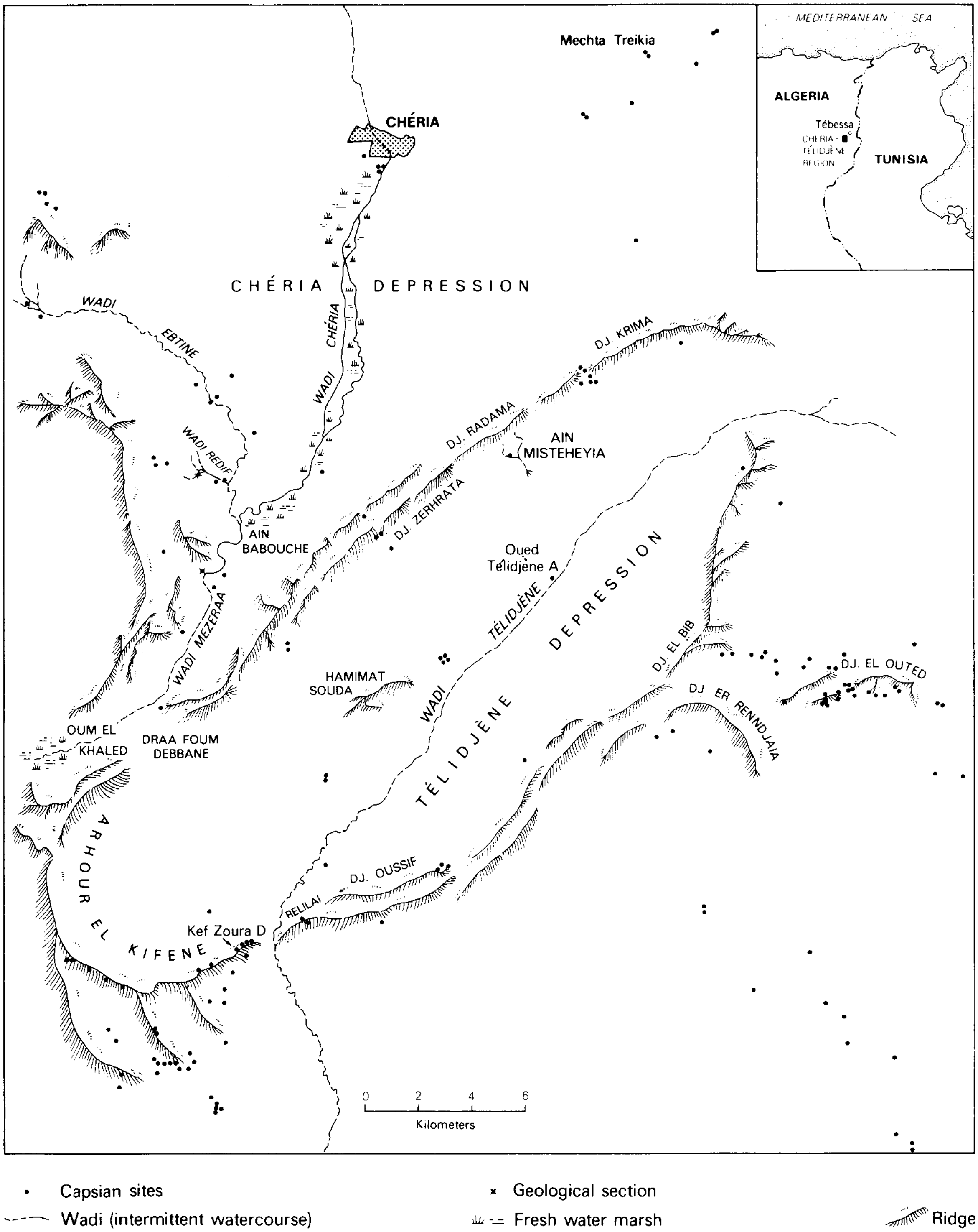

Figure 1. Chéria/Télidjène region.

Naveh and Dan, 1973), environmental degradation resulting in lowered water tables has been extensive during the last 2,000 years. As a result, there has been both destruction and masking of evidence for earlier environments and settlements. This makes it all the more difficult to comprehend fully the nature of late Pleistocene and early Holocene paleoenvironments and paleoeconomies.

Using charcoal from archaeological deposits, Couvert (1972) has proposed a tentative reconstruction of variations in temperature and precipitation for the past 14,000 years in Algeria. He suggests a warming trend with more or less modern precipitation values from about 13,000 to 8000 B.P., interrupted by two periods of lower temperatures and higher precipitation about 10,500–10,000 and again about 8,500 years ago. Following this and until about 4000 B.P., temperature declined while precipitation increased.

While his conclusions can be criticized (he does not control for elevation; the charcoal was brought into the sites by people and does not, therefore, necessarily represent an accurate picture of the regional climate), his reconstruction does agree, in general terms, with what one might expect (cf. CLIMAP, 1976; Rognon, 1976). Couvert is aware of these problems and has attempted to resolve them (Couvert, 1976), trying to reconstruct the phytogeography of the Télidjène basin during the mid-Holocene occupation at Relilai. If he is correct, the area was much more heavily covered by forests than it is at present. However, Couvert's methods are not quantitative in the same way as are palynological studies, and these latter will be required before his reconstruction can be confirmed.[1]

Further suggestions for higher plant (and animal) biomass during the early and mid-Holocene come from the study of prehistoric site distributions and the faunal remains from those sites. Even given that many sites have been destroyed (cf. Grébénart, 1976; Lubell et al., 1976), their present numbers argue for (at least seasonally) higher population densities than one might expect for hunting-gathering populations in a semiarid environment. Furthermore, the apparent abundance of large herbivores (*Bos*, *Equus*, *Alcelaphus*) in many Capsian sites (ca. 10,000 to at least 6000 B.P.) argues for more productive grassland than is presently the case.

Geoarchaeological analyses (Hassan in Lubell et al., 1975) suggest that a decline in the abundance of these larger herbivores, and their replacement by *Gazella* and other small mammals such as lagomorphs, may have been due in part to change in environmental conditions just before 8000 B.P. (Lubell et al., 1976; Lubell and Gautier, 1979; in press). This is the period during which Couvert (1972) indicates rapid oscillation between cold-wet and warm-dry climatic conditions. While our reconstruction here is based on data from only two sites (Ain Misteheyia and Kef Zoura D) in a restricted area (the Télidjène basin), there do appear to be parallels at one other site (Medjez II) located several hundred kilometers to the northwest near Setif (see Bouchud in Camps-Fabrer, 1975).

The suggestion that forest cover may have been more common at higher elevations and along the coast (cf. CLIMAP, 1976) also receives some confirmation from the archaeozoological data. At Medjez II, *Ammotragus lervia* (the Barbary sheep) is far more common than it is further south, suggesting the presence of more forested biotopes to the north. At Tamar Hat on the coast near Bejaia, *A. lervia* is the most common animal in the deposits throughout the period of occupation, which spans ca. 20,000 to 16,000 B.P. (Saxon et al., 1974).

In sum, the available data suggest that during the late Pleistocene and early to mid-Holocene the Maghreb was a rather more lush environment than it is today. It seems to have been cooler, less arid, more heavily vegetated, and more densely populated by large herbivores—all conditions that would have made it attractive to hunter/gatherer populations. Local differences certainly existed, as they do today, but we do not yet have sufficient information to determine their importance.

There are a number of questions that cannot

1. In 1978, J. C. Ritchie obtained a preliminary 2.5 auger sample from the Oum el Khaled marsh, just northwest of Draa Foum Debbane (see Fig. 1). Pollen are well preserved in the sediments and stratigraphic changes are present. Since the basin contains at least 5 m of sediment and is within the Wadi Mezeraa drainage, additional coring (November 1979) should recover a record for, at least, the Holocene (cf. Table 1).

be answered adequately until we have more information. Why, for example, does it seem that coastal and inland regions were occupied during different periods by groups producing distinctive stone tools (earlier Iberomaurusian on the coast and later Capsian inland)? Why do there appear to be no immediate successors to the former and no immediate predecessors to the latter in their respective areas? Finally, what was the character of the economies that sustained these groups and why does it appear that a Neolithic mode of production was never established autochthonously in the Maghreb but instead was introduced at a late date, apparently from outside the region? An attempt will be made below to deal with these questions.

Epi-Paleolithic Economies

Until recently, most investigations into the prehistory of the Maghreb were not primarily concerned with the collection and study of data on prehistoric economies. While Pond and his colleagues (Pond et al., 1938) attempted this, their example was not followed by subsequent investigators. Vaufrey (1955) concluded that all Epi-Paleolithic groups (i.e., Capsian and Iberomaurusian) were hunter/gatherers. Balout (1955) concurred, although he did mention the possibility that some Capsian groups might have practiced a rudimentary form of agriculture (p. 431) and even discussed the idea of their having raised snails (p. 392). Gobert (1938) insisted that snails were never a major source of food among Capsian groups, and Morel (1974) argued that snails could only have been a seasonal resource. The latter point is particularly important in that (a) we have come to the same conclusion on independent grounds (Lubell et al., 1975, 1976) and (b) some investigators continue to argue that Capsian groups were sedentary (e.g., Grébénart, 1978).

A number of recent studies have added more in the way of speculation than useful data. While Camps (1974) sees no evidence of either domestic animals or cultivated plants among Capsian and Iberomaurusian groups, E. C. Saxon (1976; Saxon et al., 1974) has argued that the latter domesticated the Barbary sheep (*Ammotragus lervia*) and the former the hartebeest (*Alcelaphus buselaphus*) and possibly snails. The presence of domestic sheep and goat in the Neolithic levels at Haua Fteah appears well attested (Higgs, 1967b), while domestic pigs and sheep seem to have been present during the Neolithic in Morocco (Gilman, 1976). Roubet (1978) claims the presence of domestic sheep and goat during the Neolithic of Capsian Tradition in eastern Algeria by about 6,500 years ago, in association with a transhumant pastoral economy without domestic plants or cultivation. Further to the south in the Sahara, a widespread pastoral economy with domestic cattle seems to have been in evidence by about 8000 B.P. (e.g., Wendorf et al., 1977), but the pattern is apparently far from uniform. At Amekni, Camps (1969, 1979) suggests that millet was cultivated but that no domestic animals were present. The existence of a Neolithic economy (with ceramics) might be earlier in the Sahara proper than further to the north in the Maghreb. However, along the Atlantic coast of the Sahara, hunting/gathering and shellfish collection seem to have been the main subsistence adaptations throughout the past 10,000 years. No evidence is yet available for cultivated plants and domestic animals, although some of the archaeological evidence (heavy and fragile artifacts) has suggested to investigators that sedentary occupation was not unknown (cf. Petit-Maire, 1979a).

There is, thus, a diversity of opinions based, in the writer's view, on largely inadequate data. A critical review of these data seems appropriate.

THE REFUGIUM HYPOTHESIS AND PLANT DOMESTICATION

H. E. Wright (1976) has hypothesized that parts of the Maghreb were a refugium for wild wheats and barley during the late Pleistocene. While the distribution of barley may have been wider, and its domestication earlier, than was once believed (Wendorf et al., this volume), there is simply no evidence that these grains existed in the

Maghreb before a very late date.[2] Moreover, since wild wheats and barley are absent from the modern Algerian flora (Quézel and Santa, 1962) and do not seem to be present elsewhere in the Maghreb (Quézel, 1978), it seems most logical to conclude that the domestic forms were imported. It seems unlikely that their modern absence can be explained by habitat destruction: elsewhere in the circum-Mediterranean these grasses grow well in secondary (disturbed) habitats. Furthermore, if cereals (including millet, sorghum, and oats) were an important part of prehistoric subsistence in the Maghreb, we should have some evidence for them even though recovery of botanical remains has not normally been a focus of archaeological research in the region (cf. P. E. L. Smith, 1976). In addition, one would expect evidence for the sort of artifacts and settlement patterns we know were a part of those subsistence adaptations that utilized both wild and domestic grains in the Nile Valley (Wendorf, and Schild, 1976b; Wendorf and Schild, this volume) and the Near East (Flannery, 1972; P. E. L. Smith, 1976; Kraybill, 1977; Reed, 1977).

True, there is some evidence for grinding stones, "sickles," and artifacts with silica gloss in both Iberomaurusian and Capsian sites (cf. Camps-Fabrer, 1966; Clarke, 1976). However, there is no reason to assume *a priori* that these were used to harvest or process either wild or domestic grains. The only good evidence available for prehistoric use of plant foods in the Maghreb (Roubet, 1978) comes from the Neolithic of Capsian Tradition. The range of plants includes fruits, seeds, bulbs, nuts, and grasses, but not cereal grains.

Thus, Wright's hypothesis cannot be substantiated with the data at present available. Palynological work is required. A start has been made on this in both Tunisia (Van Zeist, *in litt.*, 1978) and Algeria (research begun by J. C. Ritchie in 1978 and continuing).

2. Included is only that part of the Maghreb north of the Saharan boundary, i.e., north of 34° N and with average elevations of 1000 m above msl.

ANIMAL DOMESTICATION

There do not appear to be any convincing data that argue *on strictly morphological grounds* for prehistoric animal domestication in the Maghreb. The evidence rests primarily on the interpretation of age and mortality curves and sex ratios; osteometric data are inconclusive. Evidence for morphological changes associated with domestication is not yet to hand, and the basis for Roubet's (1978) identification of domestic sheep and goat during the Neolithic of Capsian Tradition is not explained.

The best evidence comes from the Neolithic levels at Haua Fteah in Cyrenaica (not strictly within the Maghreb), where Higgs (1967b) argues that domestic caprines were present by about 6800 years ago. Gilman's (1976) evidence for domestic pigs and caprines during the Mediterranean Neolithic at Ashakar in northern Morocco by about the seventh millennium B.P. seems plausible. It is interesting that he interprets the mortality curve of the (imported) caprines as suggesting that they were treated as "feral" while the pigs were not. It is difficult to assess Roubet's data prior to full publication, but given the dates for the Neolithic of Capsian Tradition (ca. 6500 to at least 4500 B.P.: cf. Roubet, 1971, 1978) and the evidence from Haua Fteah and Morocco, her interpretation seems plausible.

E. C. Saxon's argument (1976; Saxon et al., 1974) for domestication of Barbary sheep (*Ammotragus lervia*) by Iberomaurusian groups as early as 20,000 B.P. is not very convincing, and even less so is his suggestion that Capsian groups had domesticated the hartebeest (*Alcelaphus buselaphus*). Saxon's data suggest that Barbary sheep are the most frequent mammals in the Iberomaurusian deposits at Tamar Hat, as seems to be the case at other Iberomaurusian sites. He argues that since the sample from Tamar Hat differs in certain osteometric, mortality-curve, and sex-ratio characteristics from modern wild populations, and that modern populations are difficult to hunt even with firearms, a special man-animal relationship existed during the Iberomaurusian which was not one of intensive and selective hunting of an abundant resource. His data are open to different interpretations, notably one of seasonal hunting.[3]

Shackleton (in Saxon et al., 1974) analyzed the o^{16}/o^{18} ratio of twenty-five *Monodonta turbinata* shells from layers 7–14 (ca. 16,000 to 17,000 B.P.) at Tamar Hat. He concludes (p. 70) that "the oxygen isotope analysis provides positive evidence for a winter occupation and no indication of a summer occupation." Saxon (Saxon et al., 1974: 71) appears to accept a hypothesis of only winter occupation throughout the entire Iberomaursian period at Tamar Hat. Thus, there seems to be no necessity to explain the characteristics of the *Ammotragus* remains as due to anything other than season of kill, and there seems every reason to assume that the site was not occupied throughout the year. Even though the oxygen isotope results from lower levels are not yet available, the invertebrate assemblage is relatively uniform over the entire depth of the deposits and there does not seem to be any reason to question the premise of strictly seasonal occupation.[4]

Saxon also implies (Saxon et al., 1974: 81) that Capsian groups may have domesticated both the hartebeest and the land snail. He develops his speculation about the former at some length in a later paper (1976) in which he defines three types of domestication, all dependent on varying degrees of control by people over an animal species. He suggests that two of these types are "evident in the Capsian economy" and that "a marked degree of control (possibly including artificial pens) was established by Man over the hartebeest" (p. 211).

This suggestion seems to have no foundation. First, no such structures (implying a system of *parcage*) have been found in association with a Capsian site. Second, the sample of juvenile hartebeest teeth from Dra-Mta-El-Ma-El-Abiod (Morel, 1974) on which Saxon bases his suggestion have been reexamined by Gautier, who disagrees with Morel's interpretation (A. Gautier, *in litt.*, 1978). Morel has accepted this revision and, furthermore, does not agree with Saxon's interpretation of the data (J. Morel, 1978b: 77 and *in litt.*, 1977).

While it is possible to accept that Capsian groups depended heavily on hartebeest and that land snails were less important as sources of food, to suggest that domestication in any sense of the term (cf. Brothwell, 1975) was involved does not accord with our data. On the contrary, our information suggests that variability in Capsian faunal assemblages is best explained by season of occupation, an idea first suggested by Romer (1938: 166) and which Saxon (1976: 210) also entertains. In fact, our reconstruction of the Capsian economy in eastern Algeria (Lubell et al., 1975, 1976) seems to fit neatly with Roubet's (1978) interpretation of the succeeding Neolithic of Capsian Tradition. We think Capsian groups were very mobile and that occupation of any one site was of short duration. We suspect this may have involved movement between the Sahara (winter), the high plateaus (summer), and intervening areas (such as the Télidjène valley) in either spring or fall, or both. Roubet suggests a short-distance (altitudinal) transhumant pattern for Neolithic pastoralist-gatherers in the Aurès, and this can be interpreted as supporting evidence for a hypothesis of long-term continuity in the subsistence adaptations of prehistoric people in the Maghreb.

3. Much of this writer's dissatisfaction with Saxon's argument stems from a critique written by Gary Nurkin when he was a graduate student in anthropology at the University of Toronto. Nurkin points out that Saxon's osteometric data are not always accurate and that his interpretation of them can be questioned. See also Morel (n.d.).
4. If the CLIMAP estimates for Mediterranean sea-surface temperatures are correct, Shckleton's interpretation may require revision. Thus, the case for strictly seasonal occupation at Tamar Hat might be open to question. Nonetheless, Saxon's reconstruction (cf. n. 3 above) is unconvincing.

Continuity Versus Change

Can this hypothesis be confirmed or refuted with the data now available? Although this is doubtful, the evidence will be discussed here.

If continuity existed it should be manifested in many aspects of the archaeological record. Yet, at the present time, the two main archaeological "cultures" in the Maghreb, the Iberomaurusian and the Capsian, are said to be completely distinctive in time, distribution, the typology and, to some extent, the technology of stone tools, and the biology of the human populations who produced those artifacts. It is sometimes argued that Capsian peoples were "invaders" (Balout, 1955: 398) from the Near East (Chamla, 1978: 397).

Iberomaurusian sites are, in general, older than Capsian ones. Furthermore, with probably only two exceptions, they are found in different geographical regions: Iberomaurusian along the modern Maghreb coast, and Capsian south of the Tell and extending into the northern fringe of the Sahara. The exceptions are the site of El Hamel near Bou Saâda (Tixier, 1954), which is technically within Capsian territory, and El Haouita-versant near Laghouat in the Saharan Atlas (Estorges, Aumassip, and Dagorne, 1969). In both instances Iberomaurusian assemblages are said to be present.

The question of chronology is clear. The earliest dates for the Iberomaurusian are from Tamar Hat, where Saxon (Saxon et al., 1974) has an internally consistent series beginning at ca. 20,000 B.P. The latest dates for the Iberomaurusian cluster around 10,000 B.P., although there are one or two in the 8000 B.P. range (Camps, 1975). The oldest Capsian date is ca. 9800 B.P. from the base of Ain Misteheyia (see Table 1), and numerous dates suggest that the industry lasted until at least 6000 B.P. It no longer seems necessary to envisage a hiatus between the Iberomaurusian and the Capsian (cf. Tixier, 1963). There does, however, seem to be clear spatial separation, which is curious, in that the Capsian follows the Iberomaurusian.

On typological grounds (and less so, perhaps, on technological ones) the two industries are distinct. This has been satisfactorily demonstrated by applying a cluster analysis using both average linkage and Ward's method (CLUSTAN 1C in Wishart, 1978) to 122 Iberomaurusian and Capsian assemblages. The sample includes most of the assemblages published by Camps (1974), as well as those from Tamar Hat (Close in Saxon et al., 1974), Ain Dokkara (Tixier, 1976), Dra-Mta-El-Ma-El-Abiod (Morel, 1978a) and the writer's own unpublished figures for Ain Misteheyia and Kef Zoura D. Both clustering procedures clearly distinguish between the two industries, on the basis of the percentages of the eight major tool classes present (see Appendix). Other characteristics (metrical data, stylistic attributes, etc.) might well give different results. Unfortunately, the data necessary for such procedures are not available.[5]

What about the people? Chamla (1978) continues to argue that Iberomaurusian populations belonged to the Mechta-Afalou and Mechtoid types and that these were distinct from the proto-Mediterranean type of the Capsian. She uses Penrose's C^2H distance coefficient to construct matrices which purport to show the degree of similarity among all Maghreb populations from the Epi-Paleolithic to the present; her data are selected measurements of the skull and mandible. It is important to note here that Penrose's coefficient is calculated from the means of previously determined groups and thus tends to reinforce the idea of separation. In fact, and Chamla does not discuss this, the distance between Iberomaurusian populations is frequently greater than the distance between Iberomaurusian and Capsian populations.[6] Table 2 has been constructed from her data (Chamla, 1978: 42, table 15).

Furthermore, Chamla points out that there are now several instances in which Mechtoid individuals are known from Capsian sites and proto-Mediterranean individuals from Iberomaurusian sites. At Medjez II (Camps-Fabrer, 1975), a site with a Capsien supérieur assemblage, both types are present. Chamla (1978: 393) states that "le type de Mechta-Afalou est loin d'être rare dans les gisements capsiens."

Meiklejohn and Molgat (n.d.) have used Chamla's data together with data of their own to perform a cluster analysis with CLUSTAN. Their results do not substantiate the typological division advocated by Chamla. The various human types are distributed throughout the array, and there is great variability within each type, as well as overlap between them. Thus, there is reason to question any division between the two human populations

5. Peter Sheppard is writing his Ph.D. dissertation at the University of Toronto on stylistic criteria for distinguishing variability in Capsian stone tool assemblages. He is largely responsible for the attempt to use cluster analysis in this paper. We are preparing a more detailed analysis, which we hope to publish shortly.
6. The writer is indebted to Mary Jackes for pointing out this inconsistency in Chamla's data and for explaining Penrose's coefficient.

TABLE 2. **Penrose's distance coefficient for selected Maghreb populations. Data from Chamla (1978).**

	Western Iberomaurusian		Eastern Capsian	
	Males	**Females**	**Males**	**Females**
Eastern Iberomaurusian				
Males	0.497		0.438	
Females		0.475		0.386
Western Iberomaurusian				
Males	0.0		0.821	
Females		0.0		0.564

and, by inference, between the cultural remains they produced.

The following points should be noted.

1. The apparent geographical separation of the two industries could be a result of pre-Holocene erosion producing the erosion surfaces discussed earlier. In other words, is it possible that almost all the pre-Capsian Epi-Paleolithic sites south of the Tell were destroyed? This seems improbable, but the idea warrants close examination.[7]

2. There seems to be a hiatus at many Iberomaurusian sites. Epi-Paleolithic levels are usually followed by Neolithic levels that are several thousand years younger.

3. Capsian sites frequently seem to have been established on bare ground. There is almost no evidence for immediately pre-Capsian occupation at any site, so far as is known, with the possible exception of Haua Fteah (which seems to be exceptional in many ways).

What happened? Is it possible that post-Glacial sea levels rose sufficiently to make the coastal plain unattractive and thus initiated movement to the south? Are there post-Iberomaurusian sites now beneath the sea? Did the inland regions suddenly become more attractive for other reasons? These questions cannot be answered at present, but they clearly deserve investigation.

It at least seems clear that there is more variability in Capsian lithic assemblages than in Iberomaurusian ones. Could it be that a move to the interior plateaux required more and different tool kits? Certainly, Capsian assemblages occur in what one can only interpret as having been a wide range of habitats—savanna, parkland, lakeside, perhaps even desert. Movement, probably seasonal, between such habitats seems a likely possibility.

There are two main kinds of Capsian: the Capsien typique, in which burins and larger tools are frequent, and the Capsien supérieur, in which geometric microliths, backed bladelets, and notched or denticulated tools are more common. Radiocarbon dates suggest that the two were contemporaneous (Camps, 1975). However, the known geographical extent of the typique is more restricted (Camps, 1974: 110).

In only a few instances have both kinds of Capsian been identified in a single site. With the possible exception of Relilai (Grébénart, 1976), the typique appears to lie beneath the supérieur. The question is complex, for we now know that horizontal variation within a single site can be great and that neighboring sites which appear to be more or less contemporaneous may contain very different assemblages (Grébénart, 1976; Morel, 1978a; and personal observations). An analogous situation

7. This idea may not be all that farfetched. Numerous surface finds in the Télidjène basin have a Middle Paleolithic character. Some are clearly Levallois cores and flakes which could be derived from Aterian assemblages. There is one Aterian site in the area (Grébénart, 1976). All the examples seen were heavily patinated. Moreover, we have some evidence at Kef Zoura D (see Fig. 1) for an erosional break between the Capsien typique and Capsien supérieur levels. This needs to be confirmed by additional excavation. Furthermore, we have observed several destroyed Capsian sites in wadi sections. Taken together, these data suggest that many sites have been destroyed; whether by one or several periods of erosion, and at what date, is not yet known.

may occur in the Nile Valley (Lubell, 1974; Wendorf and Schild, 1976b).

Camps and Camps-Fabrer (1972; Camps, 1974) have proposed a division of the Capsien typique into two facies (one with a high frequency of burins, the other with a low frequency) and a subdivision of the Capsien supérieur into three phases spread over five regional facies. These are distinguished by the differential frequencies of certain classes of tools (e.g., endscrapers, burins), as well as by the frequency of certain, supposedly diagnostic, types in Tixier's (1963) typology. Can these subdivisions be considered valid? As a check, the CLUSTAN program has been used to analyze 81 Capsian and other Epi-Paleolithic assemblages, using both average linkage and Ward's method (see Appendix). The data were the percentage frequencies of eight major tool classes; in each case the percentages were recalculated on the total of the eight classes used.

Both clustering methods distinguish typique from supérieur assemblages and confirm a subdivision within the typique. Six southern Tunisian assemblages always cluster as a group and one Keremian assemblage (Bois des Pins) is always isolated. There are no clear divisions among the Capsien supérieur assemblages: the different facies and phases are spread, more or less indiscriminately, across the entire array. Only the cluster diagram for the average linkage procedure is reproduced here (Fig. 2). Figure 3 shows the percentage occurrence of each previously defined assemblage group in the various clusters distinguished by both the average linkage and Ward's method analyses.

If this method of analysis is valid, one is led to the conclusion that the proposed subdivisions of the Capsien supérieur cannot be substantiated. Furthermore, while different levels of a single site often cluster, sites of the same facies do not. The analysis thus produced almost no clear geographical groupings. Therefore, if the assemblages represent distinctive Capsian populations, they must have been quite mobile—a clear refutation of the idea that Capsians had a sedentary lifestyle (cf. Grébénart, 1978).

Many Capsian assemblages seem to have rather individual styles—in other words, both inter- and intra-assemblage variability is high. Yet, it is suggested that one group would have habitually returned to the same area, even to the same site. While direct archaeological evidence for this is slight, we know that modern hunter/gatherer populations do have habitual rounds and that man, in general, does not wander at random but moves along familiar routes.

How, then, can we explain the diversity of Capsian assemblages? One part of the answer must lie with the diversity of habitats in which the sites occurred. This may answer the question of regional diversity, but can it bear at all on the problem of change over time? Probably, so long as we realize that the environmental changes which occurred were likely to have been localized but, nonetheless, marked enough to require short-term adaptive changes. Thus, if we interpret the variations in stone-tool assemblages as methods of dealing with varying environmental conditions, we may have an explanation for both inter- and intra-assemblage variability.

A full explanation along these lines will require many more data than we now have. Specifically, questions of function and style will become paramount. The former will necessitate coordinated analyses of lithic, faunal, and paleobotanical assemblages from a number of sites. The latter can build upon these using additional techniques of analysis.

We already have two sets of data from the Télidjène basin that suggest that an explanation along these lines may be possible. At Ain Misteheyia there are two major assemblages. The lower one (9805 ± 160 to 7990 ± 125 B.P.) contains large artifacts, among which are many burins and a number of geometric microliths. The mammals in these levels are predominantly large herbivores (*Bos*, *Equus*, *Alcelaphus*). The upper assemblage (with a terminal date of 7280 ± 115 B.P.) contains smaller artifacts, few burins or geometrics, and large numbers of notched or denticulated pieces, as well as backed bladelets. The associated fauna still contains numerous *Alcelaphus*, but there are also many lagomorphs and *Gazella*. The upper assemblage is certainly Capsien supérieur; the lower assemblage may belong within the Capsien typique—the data are equivocal.

At Kef Zoura D the situation is clear. A Capsien typique assemblage is found in the deposits in

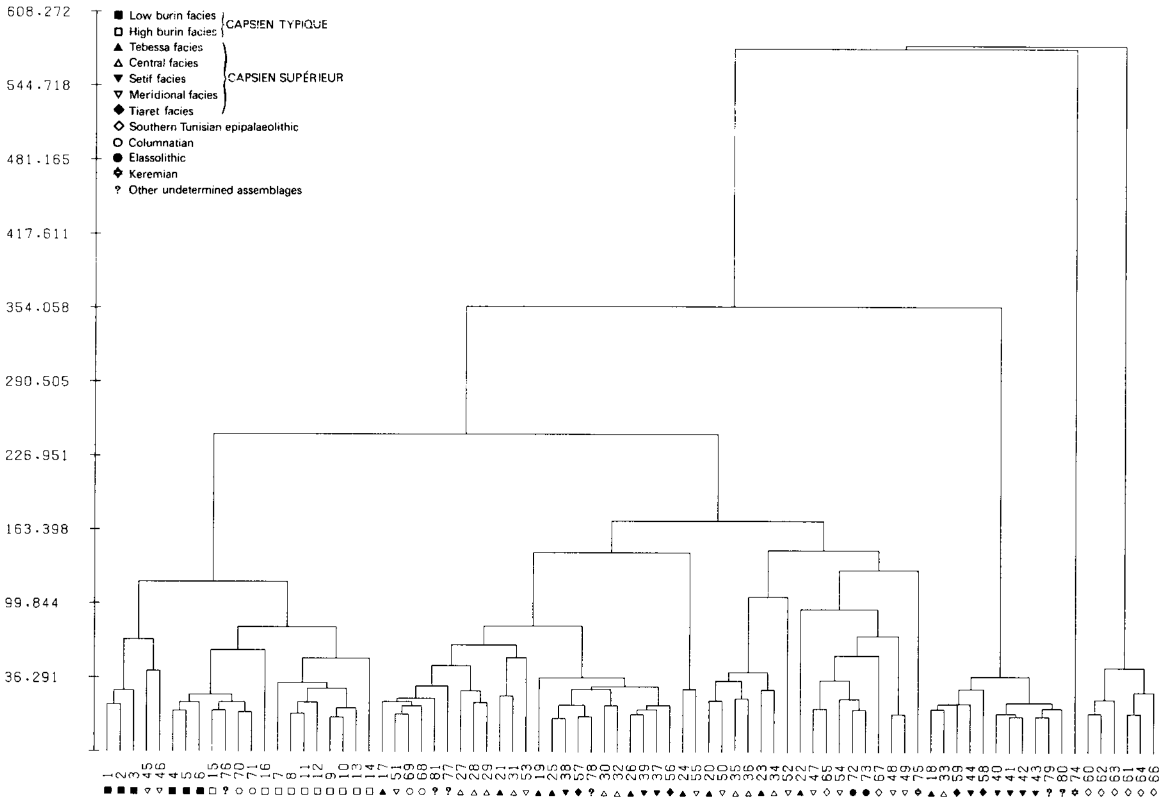

Figure 2. Average linkage cluster analysis.

front of the shelter (No. 76 in Fig. 2) in association with a faunal assemblage composed of large herbivores. The stone tools bear certain resemblances to the lower assemblage at Ain Misteheyia. Two provisional radiocarbon dates for these deposits of 8607 ± 161 B.P. (higher) and 9213 ± 158 B.P. (lower) (Table 1) place them in the time range of the lower Ain Misteheyia deposits.

Within the shelter (No. 79 in Fig. 2), in levels which appear to overlie those in front of the shelter and for which four radiocarbon dates are available (6575 ± 170 to 5965 ± 115 B.P.), we have recovered a Capsien supérieur assemblage with a mammalian fauna consisting almost exclusively of *Gazella* and lagomorphs.

Thus, within the Télidjène basin, we have two sites at which the Capsien typique is associated with a fauna composed predominantly of large mammals, and the Capsien supérieur is associated with a fauna composed predominantly of small mammals. A similar situation may be present at Medjez II both in regard to change in the fauna (Bouchud in Camps-Fabrer, 1975) and the stone-tool assemblages (Camps-Fabrer, 1975).

The archaeozoological and geoarchaeological evidence from Ain Misteheyia indicates a short period of increased aridity and reduced grassland between about 8000 and 7500 B.P. (Lubell et al., 1976; Lubell and Gautier, in press). Yet, so far as we can determine, the subsistence practices of Capsian groups living at the site did not change in any fundamental way. The larger vertebrates and invertebrates they had hunted and gathered previously were replaced by more but smaller animals. The ratio between mammal and snail meat does not change very much over time (Lubell and Gautier, in press). It is too early to say whether a similarly flexible and adaptable set of subsistence practices is evidenced at Kef Zoura.

Several lines of evidence convince us that nei-

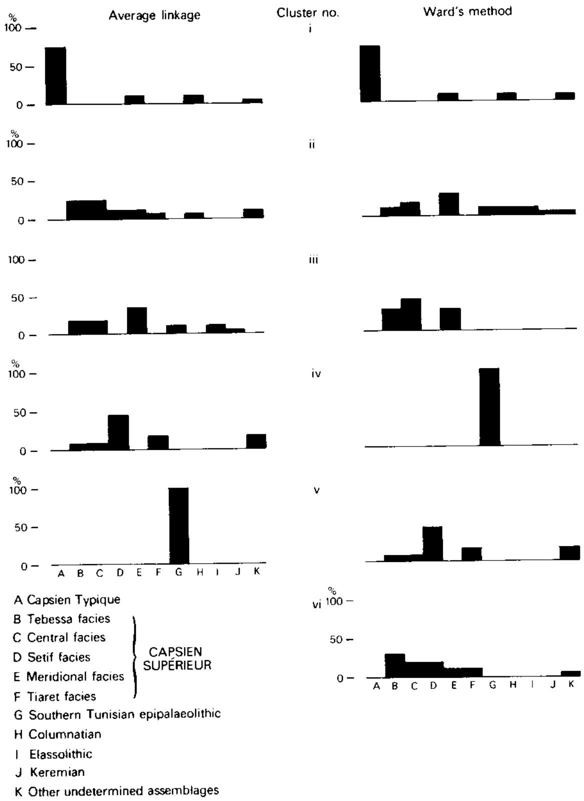

Figure 3. Frequency of assemblages by clusters.

ther Ain Misteheyia nor Kef Zoura was ever occupied for more than a few months at a time (Lubell and Gautier, in press) and that this pattern of occupation reflects a seasonal round involving movement over substantial distances. Short-distance seasonal movements seem to have been an adjustment made to this pattern by certain groups, belonging to the Neolithic of Capsian Tradition, who acquired domestic animals about 6500 years ago. Colette Roubet (1978) interprets the subsistence adaptation of one such group in the Aurès as a pastoralist/gathering economy in which short-distance transhumance was practiced. A sense of continuity is furthered by the lack of difference between Capsien supérieur and Neolithic of Capsian Tradition artifact assemblages. There seems no reason to argue that the two were culturally distinct.

All the evidence suggests that certain elements of a Neolithic economy were introduced into the Maghreb and not developed there independently. Part of the explanation for this possibly lies in the absence of native plants and animals suitable for domestication (although the exception of *Bos primigenius* is curious), but it seems certain that a greater part of the answer has to do with the very successful nature of the Capsian subsistence adaptation. Capsian groups were able to adjust their way of life to a number of habitats, as well as to changing environmental conditions. Some of this flexibility no doubt involved collection of numerous kinds of plants, as Clarke (1976) suggested should be and as Roubet (1978) has demonstrated was indeed the case. Among populations with such a flexible pattern of adaptation there was simply no need (or desire?) to change to a different mode of production before a date which is rather late by comparison with the rest of the circum-Mediterranean.[8]

8. Many of the points made in this paper, written in 1978, are treated at greater length and with new information in a paper by Lubell, Sheppard, and Jackes which will be published in Volume 3 of *Advances in World Archaeology*.

Appendix: Key to the Sites in Figure 2
(Data used for cluster analysis of Capsian and other assemblages)

A. Tool classes

1. endscrapers	**4.** backed flakes and blades	**6.** notches and denticulates
2. perforators	**5.** backed bladelets, including Ouchtata bladelets	**7.** truncations
3. burins		**8.** geometric microliths

B. Assemblages

No.	*Name*	*Affiliation*	*Source*
1.	Redeyef table sud inférieur	Capsien typique, low burin facies	Camps, 1974
2.	El Mekta grande tranchée	Capsien typique, low burin facies	Camps, 1974
3.	Abri 402	Capsien typique, low burin facies	Camps, 1974
4.	Relilai Phase I	Capsien typique, low burin facies	Grébénart, 1976
5.	Relilai Phase III	Capsien typique, low burin facies	Grébénart, 1976
6.	El Outed Niveau I	Capsien typique, low burin facies	Grébénart, 1976
7.	Ain Zannouch	Capsien typique, high burin facies	Camps, 1974
8.	Ain Sendes	Capsien typique, high burin facies	Camps, 1974
9.	Bortal Fakher talus	Capsien typique, high burin facies	Camps, 1974
10.	Bortal Fakher abri	Capsien typique, high burin facies	Camps, 1974
11.	Relilai (Vaufrey excav.)	Capsien typique, high burin facies	Camps, 1974
12.	Relilai Phase II	Capsien typique, high burin facies	Grébénart, 1976
13.	Relilai Phase IV	Capsien typique, high burin facies	Grébénart, 1976
14.	El Outed Niveau II	Capsien typique, high burin facies	Grébénart, 1976
15.	El Outed Niveau III	Capsien typique, high burin facies	Grébénart, 1976
16.	Bir Hammairia II	Capsien typique, high burin facies	Grébénart, 1976
17.	El Mekta	Capsien supérieur, Tébessa facies	Camps, 1974
18.	Nechiou	Capsien supérieur, Tébessa facies	Camps, 1974
19.	Lalla	Capsien supérieur, Tébessa facies	Camps, 1974
20.	Hamda	Capsien supérieur, Tébessa facies	Camps, 1974
21.	Bir Hammairia	Capsien supérieur, Tébessa facies	Camps, 1974
22.	Relilai	Capsien supérieur, Tébessa facies	Camps, 1974
23.	Khanguet el Mouhâad	Capsien supérieur, Tébessa facies	Camps, 1974
24.	Bekkaria	Capsien supérieur, Tébessa facies	Camps, 1974
25.	R'Fana inférieur	Capsien supérieur, Tébessa facies	Camps, 1974
26.	R'Fana supérieur	Capsien supérieur, Tébessa facies	Camps, 1974
27.	Bou Nouara	Capsien supérieur, Central facies	Camps, 1974
28.	Koudiat Kifène Lahda supérieur B	Capsien supérieur, Central facies	Camps, 1974
29.	Koudiat Kifène Lahda supérieur A	Capsien supérieur, Central facies	Camps, 1974
30.	Site 51 inférieur	Capsien supérieur, Central facies	Camps, 1974
31.	Site 51 supérieur	Capsien supérieur, Central facies	Camps, 1974
32.	Kef Fenteria inférieur	Capsien supérieur, Central facies	Camps, 1974
33.	Kef Fenteria supérieur	Capsien supérieur, Central facies	Camps, 1974
34.	Faid Souar inférieur	Capsien supérieur, Central facies	Camps, 1974
35.	Faid Souar moyen	Capsien supérieur, Central facies	Camps, 1974
36.	Faid Souar supérieur	Capsien supérieur, Central facies	Camps, 1974
37.	Medjez II phase 1	Capsien supérieur, Sétif facies	Camps, 1974
38.	Medjez II phase 2	Capsien supérieur, Sétif facies	Camps, 1974
39.	Medjez II phase 3	Capsien supérieur, Sétif facies	Camps, 1974
40.	Medjez II phase 4	Capsien supérieur, Sétif facies	Camps, 1974

41.	Ain Boucherit inférieur	Capsien supérieur, Sétif facies	Camps, 1974
42.	Ain Boucherit moyen	Capsien supérieur, Sétif facies	Camps, 1974
43.	Ain Boucherit supérieur	Capsien supérieur, Sétif facies	Camps, 1974
44.	MacDonald II	Capsien supérieur, Sétif facies	Camps, 1974
45.	Rabah I	Capsien supérieur, Meridional facies	Camps, 1974
46.	Rabah II	Capsien supérieur, Meridional facies	Camps, 1974
47.	Rabah III	Capsien supérieur, Meridional facies	Camps, 1974
48.	Rabah IV	Capsien supérieur, Meridional facies	Camps, 1974
49.	Rabah V	Capsien supérieur, Meridional facies	Camps, 1974
50.	El Mermouta	Capsien supérieur, Meridional facies	Camps, 1974
51.	Dakhlat es Sâadane inférieur	Capsien supérieur, Meridional facies	Camps, 1974
52.	Dakhlat es Sâadane supérieur	Capsien supérieur, Meridional facies	Camps, 1974
53.	Rocher des Pigeons	Capsien supérieur, Meridional facies	Camps, 1974
54.	Ain Naga	Capsien supérieur, Meridional facies	Camps, 1974
55.	El Haouita versant	Capsien supérieur, Meridional facies	Camps, 1974
56.	Ain Keda	Capsien supérieur, Tiaret facies	Camps, 1974
57.	Ain Cherita	Capsien supérieur, Tiaret facies	Camps, 1974
58.	Côte de la Fontaine Noire	Capsien supérieur, Tiaret facies	Camps, 1974
59.	Kef Torad	Capsien supérieur, Tiaret facies	Camps, 1974
60.	Sidi Mansour	S. Tunisian bladelet industries	Camps, 1974
61.	Lalla	S. Tunisian bladelet industries	Camps, 1974
62.	Menchia	S. Tunisian bladelet industries	Camps, 1974
63.	Ain el Atrouss	S. Tunisian bladelet industries	Camps, 1974
64.	Mareth	S. Tunisian bladelet industries	Camps, 1974
65.	Oued Akarit Station C	S. Tunisian bladelet industries	Camps, 1974
66.	Oued Akarit Station A	S. Tunisian bladelet industries	Camps, 1974
67.	Oued Akarit Station B	S. Tunisian bladelet industries	Camps, 1974
68.	Columnata "sous abri"	Columnatian	Camps, 1974
69.	Cubitus niveau inférieur	Columnatian	Camps, 1974
70.	Cubitus niveau moyen	Columnatian	Camps, 1974
71.	Cubitus niveau supérieur	Columnatian	Camps, 1974
72.	El Hamel couche A	Elassolithic	Camps, 1974
73.	Koudiat Kifène Lahda supérieur	Elassolithic	Camps, 1974
74.	Bois des Pins	Keremian	Camps, 1974
75.	Bou Aichem	Keremian	Camps, 1974
76.	Kef Zoura D—T/20–5	Capsien typique	Lubell, unpub.
77.	Ain Misteheyia lower	?	Lubell, unpub.
78.	Ain Misteheyia upper	Capsien supérieur	Lubell, unpub.
79.	Kef Zoura D—main excavations	Capsien supérieur	Lubell, unpub.
80.	Ain Dokkara	Capsien supérieur, Ain Aachena type	Tixier, 1976
81.	Dra-Mta-El-Ma-El-Abiod	Capsien supérieur	Morel, 1978a