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INHALT

Elena A. A. Garcea

Modern Behaviour and Cultural Complexity in the Upper Pleistocene and Early Holocene in Western Libya

Foreword

Two main aspects characterise the prehistory of North Africa: modern behaviour and cultural complexity. Both show peculiar and unique features that typify the African continent. In the Upper Pleistocene, North African populations had a fully modern behaviour, although they still produced Levallois stone technology. In the Early Holocene, their environmental adaptation and cultural complexity led to food production with no agriculture.

This paper will first consider broad considerations concerning North Africa in general and, then, will analyse specific examples from north-western Libya, in the mountain range of the Jebel Gharbi, and from south-western Libya, in the mountain range of the Tadrart Acacus and the Messak Settafet plateau (Fig. 1).

Modern behaviour in the Late Pleistocene

Not simply a terminological question

The term "Middle Stone Age" was suggested in 1927 by M. Wilman and N. Jones in order to create a specific frame of reference for African prehistory: *Early Stone Age (ESA)*, *Middle Stone Age (MSA)*, and *Later Stone Age (LSA)* (Deacon 1990). This terminology has been well-accepted in sub-Saharan Africa, but is still unfamiliar north of the Sahara, due to the history of research started by French scholars who applied European terms to North African contexts. At present, few Africanist archaeologists refer to North African prehistory with the terms expressly made for Africa (e. g. Kleindienst 1999, 2000; McBrearty/Brooks 2000: 487).

European terms like *Middle Palaeolithic* and *Mousterian* are still used to define North African cultural contexts. F. Bordes (1961) defined the Aterian as the "Epimousterian" industry of North Africa, which ů he thought ů had directly evolved from the Mousterian. According to him, the basic content of Aterian assemblages was Mousterian in both technology, which largely employed the Levallois method, and tool types. The Aterian was distinguished from the Mousterian for a decrease of sidescrapers and a development of "Upper Palaeolithic" types, mainly endscrapers and burins, with or without a concomitant production of tanged pieces (Bordes 1976ů77, 1984).

J. Tixier (1967) confirmed that the Aterian was a "Mousterian facies" with a Levallois debitage, often on a blade, a large production of faceted platforms, and a proportion of endscrapers higher than in the Mousterian. According to him, tanged pieces could be extremely numerous and could make up as much as one-fourth of the assemblage. As a matter of fact, tanged tools became "the" distinctive element, or "guide fossil", of the Aterian (Tixier 1958ů59; Bordes 1961). J. D. Clark (1982) questioned the presence/absence of tanged tools in basically "Mousterian" assemblages as "the"

Fig.2

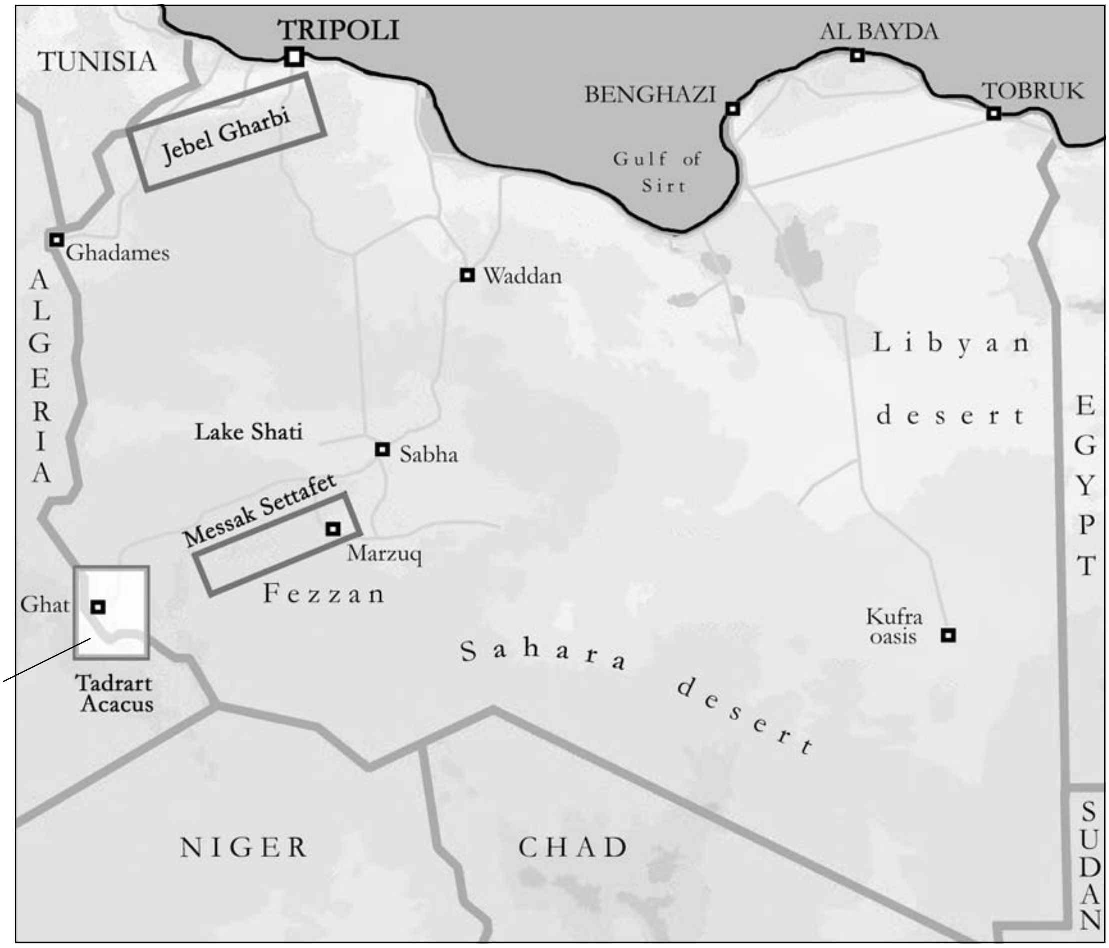

Fig. 1. Map of Libya with the study areas.

evidence of the Aterian. M. Kleindienst (1998) re-discussed the same topic, and considered bulbar basal thinning and bifacial retouching as much more distinctive features of the Aterian. In reality, tanged tools are not as frequent as expected and could not always be found, especially in surface collections or limited test trenches, which have been the most common method of investigation in Africa.

European-based terms inferred meanings and assumptions that often biased and confused the substantial understanding of African ancient cultures. As a matter of fact, J. D. Clark had earlier pointed out that the term "Middle Palaeolithic" referred to a specific cultural entity and a particular stratigraphic position that did not apply to Africa (Bishop/Clark 1967: 867).

For the above reasons, I prefer to use the African term Middle Stone Age (MSA) to describe the techno-complexes that developed in North Africa during the Upper Pleistocene. Two main broad groups can be identified within the MSA: an early MSA complex and the Aterian (cf. Garcea 2001d, in press).

Modern anatomy

With regards to the Upper Pleistocene, the most exemplary difference between Eurasia and Africa is that none of the African Middle Stone

Age industries was produced by Neanderthal peoples as they never lived in the African continent. The earliest modern human remains in North Africa come from Jebel Irhoud, in Morocco. They had been previously attributed to Neanderthal morphologies, on the simple basis of their association with a "Mousterian" industry (Ferembach 1976). Accurate anthropological analyses showed that they belong to an archaic type of Proto-Cro Magnon (Grün/Stringer 1991).

In Africa, different cultural groups employed the Levallois technique over a longer period of time than in Europe and the Middle East. They first made earlier, generalised MSA technocomplexes and later, Aterian, still MSA, assemblages. Both groups produced Levallois debitage; both of them were associated with anatomically modern humans. Moreover, Aterian populations adopted a wide range of modern behaviours that were unknown to Middle Palaeolithic populations in Eurasia.

The chronic chronological question

Absolute chronologies of Middle Stone Age sites in Africa and the Sahara are still quite rare. Furthermore, almost all of them were made with the radiocarbon method, which is known to be inadequate for ages >50,000 years. Some of the radiometric measurements could only provide reasonable infinite dating, "greater than" a certain absolute age, whereas finite dates resulted to be inaccurate. For instance, finite dates of the Aterian levels at Taforalt, a well-known cave in Morocco, were 19,080±250/19,400±250 years BP (Gifů2278) and 21,860±330 (Gifů2280), whereas the infinite one was ≥40,000 BP (Gifů2279) (Delibrias *et al.* 1982).

Dating techniques underwent considerable improvements since the times when the Aterian sites were first dated, between the 1960s and the 1980s. For example, the Aterian layer at Ifri n'Ammar, in the Eastern Rif of Morocco, was dated to 41,020ů38,570 (KIAů8822) and 41,030ů36,960 (KIAů8823) calBP, and the "Mousterian" was dated to 52,950ů50,240 calBP (KIAů8824) (www.dainst.de). Moreover, other dating methods have been used and can complement more recent techniques of radiocarbon dating.

Jebel Irhoud, which was mentioned before for the archaic modern humans, was first radiocarbon dated to ≥32,000 years BP (Camps *et al.* 1968), whereas different dating methods provided a much earlier chronology. Electron spin resonance (ESR) determinations on tooth enamel samples found near the human remains provided Early Uptake (EU) estimates ranging between 90,000 and 125,000 BP and Linear Uptake (LU) estimates between 105,000 and 190,000 years BP (Grün/Stringer 1991; Hublin 1993).

In addition to technical limitations of dating methods, there have been conceptual biases in dating the Aterian. This horizon was originally thought to be associated with a humid episode which was presumably dated to 40ů20,000 years ago. However, none of the Pleistocene lacustrine events in the Sahara could be actually dated to that period. In fact, no humid episode could be confirmed after 65,000 BP (Wendorf/Schild 1992; Wendorf *et al.* 1993).

With specific regards to Libya, a series of uranium dates were run on Upper Pleistocene lacustrine sediments from the lake Shati, in central Libya (Fig. 1). They ranged from 200,000 to 77,000 years BP (Gaven *et al.* 1981; Petit-Maire 1982) and confirmed the existence of lakes also in the Libyan Sahara during the first part, but not in the final phase, of the Upper Pleistocene.

As a matter of fact, the Saharan sites, where archaeological deposits with Aterian lithics could be found, indicated that they were associated with sandy sediments formed under dry conditions. Their adaptation to the desert appeared to be very successful and allowed them to spread to different types of bio-geographic niches (Clark 1980).

It first seemed that Aterian groups only occasionally visited the Saharan mountain ranges for hunting or raw material procurement purposes (among others, Tillet 1987, 1989, 1995; Debénath 1994). On the contrary, numerous MSA, and particularly Aterian, sites were located during surveys in the Central Sahara.

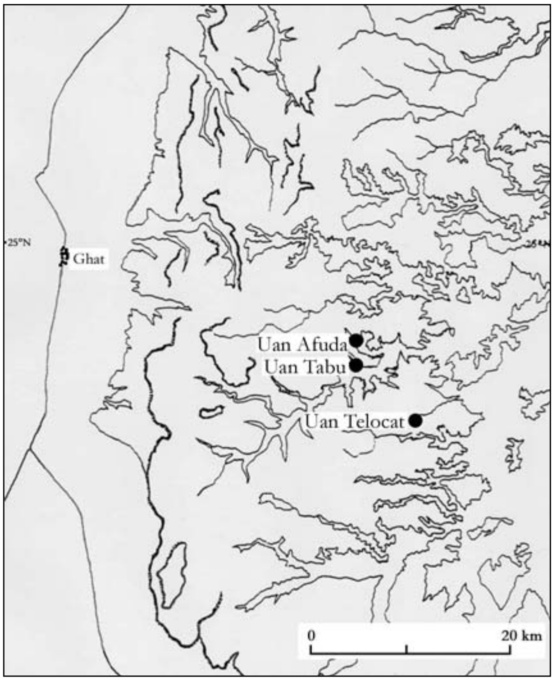

Fig. 2. Map of the sites in the Tadrart Acacus cited in the text.

Among them, research in south-western Libya (Fig. 1) revealed Aterian artefacts all around the Tadrart Acacus mountain range, the Messak Settafet plateau and the surrounding lowlands (Garcea 1996a; Cremaschi/di Lernia 1998).

Within the field activities of the Joint Italo-Libyan Mission for Prehistoric Research in the Sahara and the Interuniversity Centre for Research on the Ancient Sahara and Arid Zones, formerly directed by F. Mori and presently directed by M. Liverani, both from the University of Rome "La Sapienza", Italy, extended excavations were carried out at various rockshelters in the Tadrart Acacus (Fig. 2). They provided a long sequence spanning from the Late Pleistocene to the Late Holocene. Among them, the rock shelter of Uan Tabu yielded a 55 cm thick Pleistocene deposit with Aterian artefacts suggesting that the site was occupied for considerable periods of time. As no organic remains were preserved in the sediment, radiocarbon dating was not possible, regardless of the chronology of the deposit. Therefore, OSL dating was run on the sandy sediment of the upper layer (Layer 22) with Aterian artefacts. This provided the first indications of the absolute chronology of the Aterian in the Central Sahara: the layer was dated to 61,000±10,000 years BP (Martini *et al.* 1998).

A near-by rockshelter, Uan Afuda, was excavated later and was dated by TL method to 70,500±9500 and 73,000±10,000 years BP, and by OSL to 69,000±7000 years BP. Another OSL date of 90,000±10,000 years BP was obtained from the sands below the archaeological material (di Lernia 1998; Martini *et al.* 1998).

The Pleistocene sequences at both Uan Tabu and Uan Afuda were formed by a desert dune deposit which indicated a dry environment that was only slightly more humid than the present one (Cremaschi/Trombino 1999, 2001). This evidence confirmed that the Aterian occupation in the Central Sahara occurred under quite severe climatic conditions in a dry environment.

In coastal North Africa, climatic conditions were different and milder than in the Central Sahara. They could support Aterian occupations for a longer period of time. The Maghreb could be still occupied around 30/20,000 BP, as the ^{14}C dates on reliable charcoal samples indicated (Wendorf/Schild 1992). Therefore, it is reasonable to suggest that Aterian occupations eventually moved from the Sahara towards the North African coasts, when the climate became unbearable in the desert.

My research in north-western Libya is located on the Jebel Gharbi, a mountain range in Tripolitania (Libya), south-west of Tripoli, towards the Tunisian border (Fig. 1). It is part of the large Italian-Libyan archaeological Project by the University of Rome "La Sapienza", directed by B. E. Barich (Barich 1995; Barich *et al.* 1995, 1996). This mountain range was known since the 1950s, when McBurney (McBurney/Hey 1955; Neuville 1956) explored the area of the Wadi Ghan.

Geological sequences in the Jebel Gharbi indicated that the Aterian was separated from the preceding generalised MSA by a considerable lapse of time. This further confirmed that

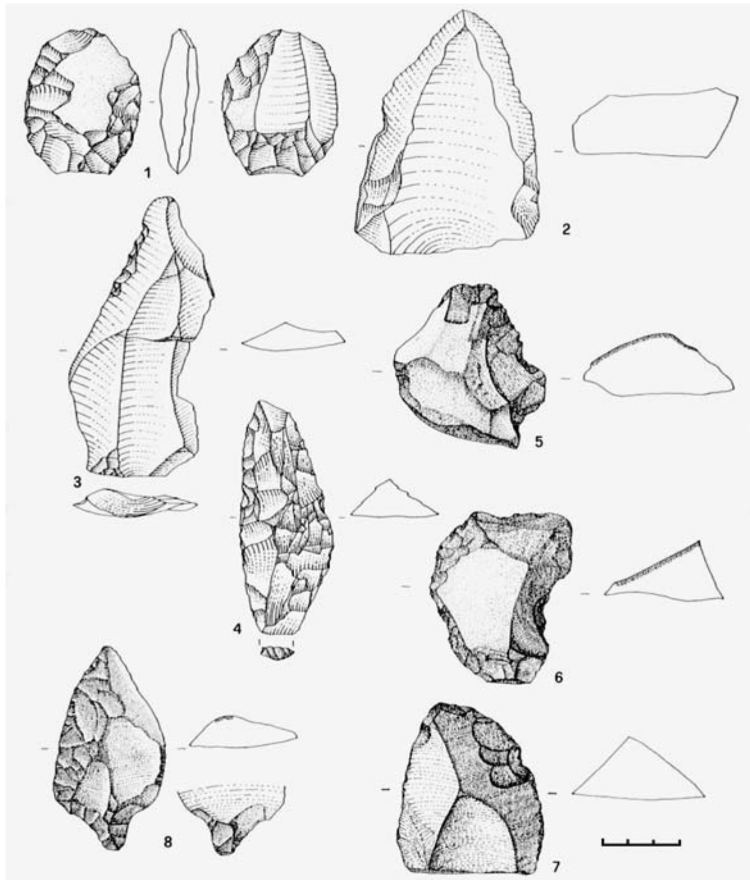

Fig. 3. Aterian tools from Uan Tabu: 1 Levallois flake core, 2 Nubian core, 3 retouched Nubian point, 4 elongated "Mousterian" point, 5 simple concave sidescraper, 6 double concave-convex sidescraper, 7 convergent convex sidescraper, 8 tanged ogival point.

the Aterian was not a "pedunculated" evolution or acculturation of the early MSA, as suggested in the past.

The geological evidence showed that the Aterian in the Jebel Gharbi was earlier than 30,000 years BP and later than OIS 4 and was associated with OIS 3, dated from 59,000 BP (Barich *et al.* in press a, in press b). U/Th dating on calcareous crusts on top and below the silts with Aterian industries dated the Aterian between 85,000 and 43,000 years ago. AMS radiocarbon dates of the geological deposits indicated that the formations with Aterian artefacts were 44ů43,000 years old.

In sum, the absolute date of the upper part of the Aterian sequence at Uan Tabu is earlier than the chronology of the Aterian sequence in the Jebel Gharbi. Furthermore, the Aterian groups in the Sahara were adapted to live in arid climatic conditions, whereas those settled in the north benefited from a more humid climate, which lasted for a longer period of time.

The Aterians

Research in the Libyan Sahara and northern Libya recognized various Aterian assemblages with chronological, technological and typological differences (Garcea 1998b, 2001d, in press).

At Uan Tabu, the technology of the entire Aterian sequence (Fig. 3) is more conservative than in the Jebel Gharbi, in north-western Libya (Fig. 4). It includes the so-called Nubian (Type 1) technique (Fig. 3.2), which is a bipolar technique of core preparation that was first recognized in Nubia (Guichard/Guichard 1965, 1968; Van Peer 1991). The lithic assemblage from Uan Tabu shows that this technique was

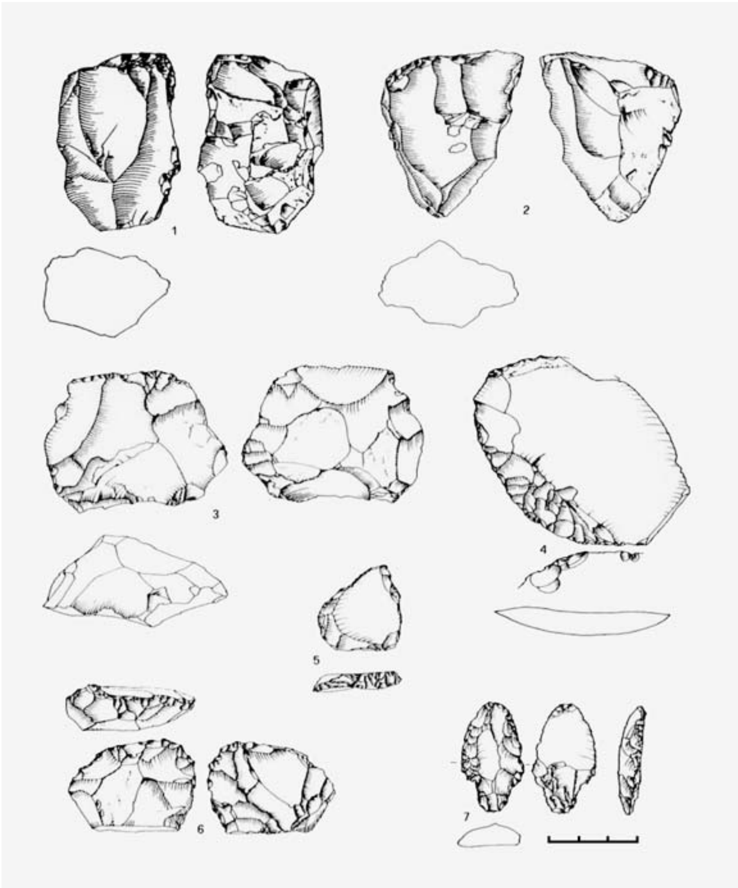

Fig. 4. Aterian tools from Jebel Gharbi: 1ů2 Nubian cores, 3 Levallois core, 4 simple convex sidescraper, 5 perforator, 6 simple endscraper on a retouched flake, 7 tanged point.

particularly in use in the earlier Aterian occupation; and the Levallois technique was employed during the entire sequence (Fig. 3.1). On the contrary, in the Jebel Gharbi, the Nubian technique (Fig. 4.1ů2) was not attested to at any Aterian site and the Levallois technique (Fig. 4.3) disappeared from more recent Aterian assemblages (Garcea in press).

Typologically, the production and use of sidescrapers were associated with the Levallois debitage, both in the Sahara (Fig. 3.5ů7) and in the north (Fig. 4.4). On the contrary, endscrapers and perforators appeared at sites where the Levallois technique and sidescrapers lost their importance (Garcea in press).

Furthermore, industries made on smaller blanks with steep retouch were identified both in northern (Jebel Gharbi) and southern (Messak Settafet) Libya. These assemblages were attributed to younger Late Pleistocene aggregates, that post-dated the Aterian (Garcea 2001d; Van Peer 2001).

Such a variety of complexes suggests that the different Aterian horizons in Libya must represent various cultural groups with diversified chronological, technological and typological identities.

Modern behaviour

The skills to adapt to different environments and climatic conditions, including arid ones, have been considered a major evidence for modern behaviour of Aterian groups. Even though some general techniques and tool-kits appeared over the wide Saharan territory, they were separated by tens of millennia. It is therefore likely that Aterian peoples adopted isolated forms of social organisation, as suggested for sub-Saharan Africa (Yellen 1998; McBrearty/Brooks 2000). Such a system could explain the conservative duration of some technical traditions from the early MSA to the late North African Aterian and could justify their spread, at a very slow pace, over such a vast territory.

Another evidence for modern behaviour comes from the variety of exploited natural resources. Various lithic raw materials became in use in the Aterian and fine grained rocks were used for more accurate tool-kit manufacturing. At Uan Tabu, sandstone was the only exploited rock until the later Aterian occupation, attested to the upper layers (21 and 22), indicated a higher degree of regional mobility. Raw materials included quartzite that was available in the Messak Settafet, a plateau located some 80 km east/north-east from the Tadrart Acacus (Fig. 1). In order to have access to that rock, human groups must have moved from the Tadrart Acacus mountain range and crossed the lowland of the Erg Uan Kasa, before reaching the Messak Settafet.

Fishing and fowling considerably increased, as indicated by the position of several sites near water resources and by the composition of faunal remains at archaeological sites. However, several Aterian sites in the Sahara were located on terraces near ephemeral water supplies, suggesting that Aterian groups had a flexible and opportunistic adaptation which favoured their expansion over a wide area under varying environmental conditions (Marks 1975).

The growing number of Aterian sites found in the Sahara and North Africa gives priority, for the time being, to the need to focus on the different aspects of the Aterian, which are not clearly similar everywhere. The various Aterian facies, with different chronological extents, were usually based on the typological differences of the tool-kits (cf. e. g. Tillet 1983). However, other local and inter-regional variables should be considered in order to determine whether there were chronological, geographical, or functional specificities among the various "Aterians" (Garcea 1998b, in press).

Cultural complexity in the Early Holocene

Terminological bases again

Terminological misunderstandings also affected the North African cultures that developed during the Holocene. Various cultural groups were defined according to the Mediterranean and Near Eastern terminology as "Epipalaeolithic", "Mesolithic" and "Neolithic". As a consequence, pottery and polished stone tools were taken as cultural markers of "Neolithic" cultures. As pottery in the Mediterranean and in the Near East was approximately contemporaneous to, or rather later than, food production, it was assumed that the occurrences of pottery and grinding stones were "guide fossils" for a productive subsistence economy also in North Africa.

The assumption was that any site with pottery or grindstones must have been "Neolithic" (Balout 1955; Hugot 1963; Camps 1969; Maitre 1972). On the contrary, later research showed that pottery was produced in the Sahara much earlier than food-producing economy was adopted. Therefore, ceramics do not represent an economic indicator in Africa. Equally, grinding stones were commonly associated with agriculture in Eurasia. By contrast, they were frequent in the Sahara, even though agriculture was never adopted. Polished stone tools appeared before the only known food-producing economy, pastoralism, was acquired in the Sahara. Therefore, "pre-pastoral" and "pastoral" cultures seemed to be the first distinction to make (cf. Garcea 1993). These broad contexts were further differentiated into more specific cultural entities. Within the pre-pastoral horizon, two distinct groups were separated. In order to avoid Mediterranean-biased correlations, they were named with new terms: *Early Acacus* and *Late Acacus* (di Lernia/Garcea 1997). The subsequent horizon was divided into three phases, *Early*, *Middle* and *Late Pastoral* (Garcea/Sebastiani 1995, 1998; Cremaschi/di Lernia 1996, 1998, 1999; Garcea 2003a).

The following description takes into consideration the Early Acacus, the Late Acacus and the Early/Middle Pastoral horizons. It is mainly based on the data from the latest excavations at Uan Tabu (Garcea 1996b, 1998a, 2001c) and Uan Telocat, another site in a near-by wadi (Wadi Imha) in the central Tadrart Acacus (Garcea/Sebastiani 1995, 1998; Garcea 2003a).

Chronology and climate

The radiocarbon dates for the Early Acacus at Uan Tabu go from 9810±75 years BP (BOů509) to 8880±100 BP (Romeů293). They cover the entire chronological span of the Early Acacus, whereas the Late Acacus occupational deposit is probably partly eroded as it spans from 8870±100 (Romeů295) to 8580±80 BP (BOů 344).

Pastoral pottery was found on the surface at Uan Tabu (Garcea 2001c). The archaeological deposit corresponding to the Pastoral occupations was eroded by the strong erosional activities during the Middle Holocene (Cremaschi 1998a, 1998b).

The environmental conditions were substantially similar during the shift from the Early to the Late Acacus (Cremaschi 1998b; Castelletti *et al.* 1999; Cremaschi/di Lernia 1999). A more significant change towards aridity occurred during the Late Acacus. Pollen spectra indicated a reduction of the savannah-like vegetation and an increase of shrubs, favouring a diversification of the habitats (Mercuri/Trevisan Grandi 2001).

A complete Pastoral sequence was unearthed at Uan Telocat (Garcea 2003a). The very beginning of the Early Pastoral corresponded to a dry phase. Later, between 6900 and 6400 BP, the climate improved again with humid conditions both in the mountains and in the lowlands (Trevisan Grandi *et al.* 1995; Mercuri *et al.* 1998; Cremaschi/di Lernia 1998, 1999).

Delayed return economy

Barbary sheep hunting predominated in the Early Acacus and decreased (to about 45ů60%) in the Late Acacus due to intensive predation. Such a subsistence change was countered by the exploitation of a broader faunal spectrum and Barbary sheep corralling. Wild animal exploitation and management suggested increasing cultural complexity. A longer-term system of wild animal management based on delayed and planned consumption was developed to compensate shortages (Gautier 1987; di Lernia 1999, 2001; Garcea 2003b). Barbary sheep taming and penning became a common practise in the Late Acacus rockshelters. The archaeological deposits showed colluviation phases rich in organic matter and coprolites of caprine ruminants and thick accumulations of dung layers and plant remains (di Lernia 2001; Cremaschi/Trombino 1999, 2001; Garcea 2001b).

Plant exploitation provided another evidence for a delayed return economy in the Late Acacus. It constantly increased in this period: wild grasses were intensively collected and used for different purposes; a large spectrum of plant resources were exploited and the accumulation of plants doubled. Furthermore, the final phase of the Late Acacus (Unit I at Uan Tabu) showed a higher specialisation over a slightly reduced spectrum of plant resources, with an intensive exploitation of cattails (*Typha*) (Mercuri/Trevisan Grandi 2001). Cattails were used for food, bedding, weaving, and/or building. Gramineae, particularly Paniceae (*Panicum*, *Setaria*, *Echinochloa*), were abundant. Burned caryopses of Gramineae suggested they were stored and roasted for later consumption (Mercuri 1999, 2001).

Some kind of empirical "cultivation" must have been attempted. According to Harris (1989), cultivation is a combination of land clearance and tillage with planting and sowing and harvesting of undomesticated crops, that does not necessarily lead to domestication. Such cultivating activities allowed the preservation and survival of the wild cereals and plants under human care, even when their habitat was reduced (Mercuri 2001). It appeared that wild cereals could survive in the Wadi Teshuinat even during dry climatic episodes that could have caused their total disappearance from the area. These grasses survived in the region thanks to both natural and artificial protection. On one hand, it is likely that the mountains naturally acted as refugium areas. On the other, some specific wild plants may have been artificially tended by humans (Mercuri 2001).

Wood remains used for fuel confirmed the exploitation of a larger spectrum of resources. Charcoal of Tamarix was complemented by other species (Chenopodiaceae, namely *Calotropis procera*), including the first tropical elements (*Salvadora persica* and *Leptadenia pyrotechnica*) (Neumann/Uebel 2001).

Some plants, including wild cereals (*Cenchrus* and *Digitaria*), occurred both in the Late Acacus at Uan Tabu and at Early Pastoral sites. They suggested a continuity in the transmission of cultural knowledge on plant exploitation (Mercuri 2001).

The accumulation of surpluses and storage was an important asset of delayed return economies (Woodburn 1982). Storing food allowed to maximize the resources that were only periodically, or seasonally, available and to extend their period of preservation and consumption. This practise required developing a specific technology for preserving and processing food. The result produced a surplus that had never been available before. As a consequence, the social factors of storing did not only concern the need to develop alliance networks to cover the extra labour required by foraging, preservation and protection of the plant resources. They also involved unequal accumulation of resources, providing varying prestige and status of different groups (Rowley-Conwy/Zvelebil 1989).

Designed spatial organisation

A designed spatial organisation is another evidence for cultural complexity. A marked intra-site organisation appeared as a peculiar feature of the Late Acacus sites. At Uan Tabu, a wooden hut was found in the Late Acacus layers. A spatial analysis of the artefactual material within the site indicated that some activities were intentionally carried out in the hut area, and others outside of it (Garcea 2001b).

Complex and large combustion structures became another distinctive feature of the Late Acacus (Garcea 2001a). Some of them indicated the repetition of the same activity or a series of activities over the time; others suggested a sequence of several cycles of use.

On the contrary, only small hearths could be found in the Early and Middle Pastoral periods, suggesting a much higher mobility connected to animal herding.

Increased sedentism

It has been suggested that changes towards sedentism could be related to an increased cultural complexity, large availability of resources and demographic growth (Price/Brown 1985; di Lernia 1996, 1999). In the final phase of the Late Acacus, intensive exploitation and population growth probably brought to a reduction in available resources with a concomitant increase in human pressure (Mercuri 2001).

The Early Acacus featured high mobility connected to high seasonality. During the Late Acacus, mobility decreased, although inter-regional relations and long-distance trade and/or exchange developed. Increased sedentism never brought to permanent sedentism in this area.

With the adoption of food production, very high mobility characterized Pastoral settlements. Sites were only shortly and seasonally occupied. Nomadism became the necessary organisational system to practise animal herding.

Functional equipment

As mentioned before, hunting/gathering populations began to produce ceramics in the Sahara. Pottery became common in the Late Acacus. It was decorated with impression rocker-stamped techniques, employing combs with evenly serrated teeth (Fig. 5.1ů4). Petrographic analyses indicated that Late Acacus pastes included granite, which is not present in the Tadrart Acacus mountain range. Its closest source is located near the Algerian border, about 70 km south-west from the site (Livingstone Smith 2001). This suggested that Late Acacus pottery was imported and may have not been an ordinary product for domestic use. The earliest pottery could be related to concepts of prestige,

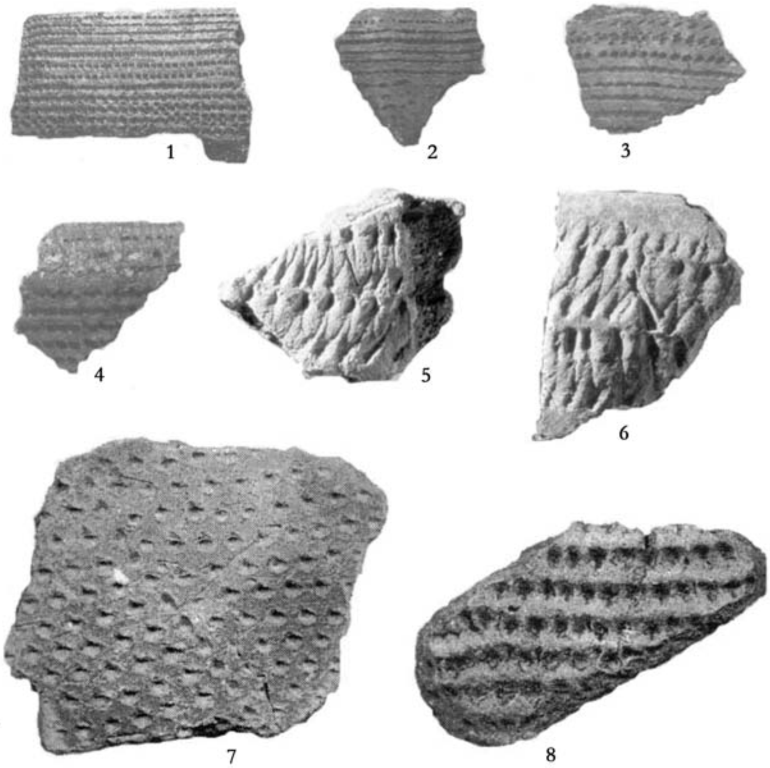

Fig. 5. 1ů4 Late Acacus pottery from Uan Tabu, 5ů6 Early Pastoral pottery from Uan Telocat, 7ů8 Middle Pastoral pottery from Uan Tabu.

ownership of stored goods, and social interactions, rather than practical purposes (Close 1995; Hayden 1995; Hoopes/Barnett 1995). Exchanges of goods and ceramics could have played a role in a reciprocity network with neighbouring groups. Reciprocity was recognized as a means of risk reduction to reduce environmental variation (Cashdan 1985).

The Early Pastoral pottery from Uan Telocat exhibited different manufacturing techniques and decorations than those observed in the Late Acacus. It was also imported from the Tassili, as the paste included granite-derived minerals. However, it differed from the Late Acacus one as tempers in the former indicated straw addition, while tempers in the latter comprised not only straw, but also sand and dung. The presence of dung in ceramic pastes is not necessarily associated with the existence of animal domestication. In fact, accumulations of wild Barbary sheep dung was common at Late Acacus sites, and could therefore have been used for pottery manufacturing. On the other hand, animal dung did not accumulate in the short-term Early Pastoral sites and was more hardly available as pottery temper (Livingstone Smith 2001; Garcea 2003a).

The Middle Pastoral pottery from Uan Tabu represented the first evidence of local production. The clay contained local sandstone-derived sediments. Tempers were made of dung, instead of straw and sand (Livingstone Smith 2001).

The Early Pastoral ceramics from Uan Telocat also differed in the decorations. Motifs showed continuous bands of plain zigzags made with a curved implement with a plain edge (Fig. 5.5ů6). Middle Pastoral pottery was decorated with the alternately pivoting stamp (Fig. 5.7) and return techniques (Fig. 5.8) (cf. Caneva 1987 and Caneva/Marks 1990, for

Fig. 6. Late Acacus wooden perforator from Uan Tabu.

Fig. 7. Late Acacus cord from Uan Tabu.

Fig. 8. Late Acacus polished bone tools from Uan Tabu.

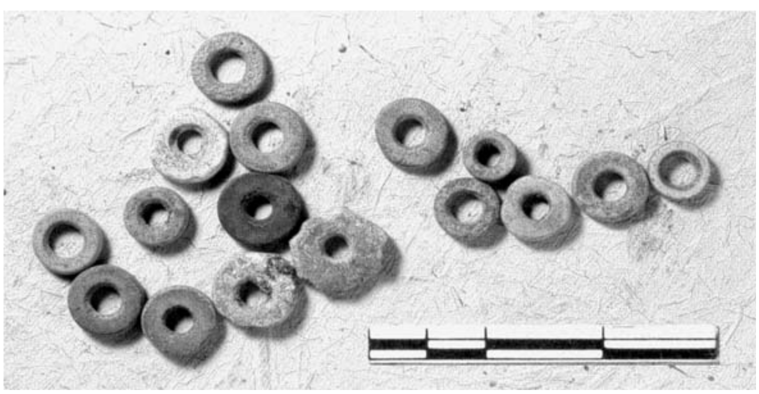

Fig. 9. Late Acacus ostrich eggshell beads from Uan Tabu.

the classification of pottery decorations). Pottery was more common in the Middle Pastoral than in the Late Acacus and in the Early Pastoral, suggesting that it was used for daily functions related to food processing and consumption.

Wooden tools, like perforators (Fig. 6), and plant artefacts, like baskets and cords (Fig. 7), were common in the Late Acacus. Baskets have been related to either grain winnowing or storage. Polished bone tools (Fig. 8) and ostrich eggshell beads (Fig. 9) and fragments, some of

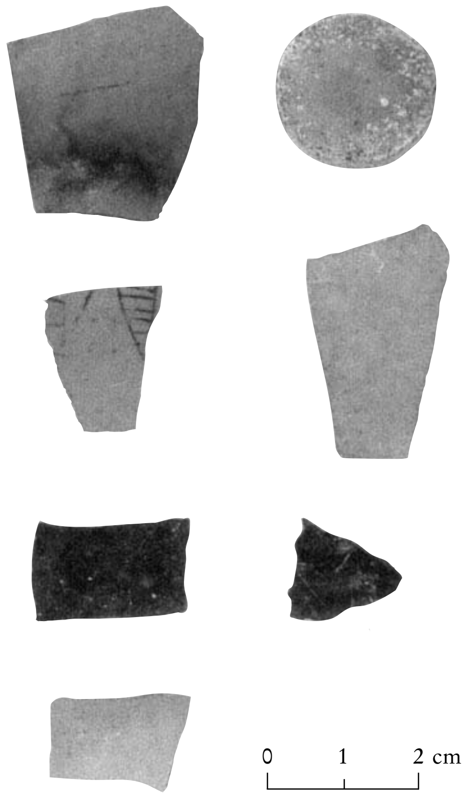

Fig. 10. Late Acacus decorated fragments of ostrich eggshell from Uan Tabu.

them circular-shaped (Fig. 10.2) or decorated (Fig. 10.3), were of different types in the Late Acacus (Garcea 1996b, 2001c).

Different lithic raw materials were common in the Early Acacus. Microliths were a considerable component in the technological assemblage (Fig. 11). Retouched tools were made on numerous local and non-local raw materials. On the other hand, the Late Acacus lithic technocomplex mainly consisted of generic formal tools on a macroflake made from local sandstone (Fig. 13). This suggested activities that probably required longer time of processing, preparing and manufacturing food and secondary products (Garcea 2001b, 2001c). The lithic technology did not basically change from the Late Acacus to the Pastoral periods. The only innovation was the production of arrowheads (Garcea 2003b). Polished stone tools were largely produced during the Late Acacus. Wild cereal grinding must have been usually practised. Grindstones were also used for pounding ochre (Fig. 12) and other colouring materials probably used for rock painting (Garcea 2001c). On the contrary, polished stone tools were not very important in Pastoral times.

Ideology: rock art

At Uan Tabu, Round Head anthropomorphic figures were covered by Pastoral paintings representing a herd of cattle (Figs. 14 and 15). This superimposition of paintings from two different periods could provide an important relative chronology for Saharan rock art. Rock paintings belonging to the so-called Round Head phase could be related to the Late Acacus (Garcea 1998a; di Lernia 1999). Round Head figures are the earliest paintings in the Saharan rock art and the earliest known anthropomorphic representations (Mori 1965, 1998).

The need of marking the territory by means of permanent signs, such as rock paintings, is certainly an important cultural acquisition of the Late Acacus (di Lernia 1999; Garcea 2003b).

Final remarks: the shift to food production

The Late Acacus phase showed that several economic and cultural events took place before animal domestication and pastoralism were fully adopted in the Libyan Sahara. Pottery production in North Africa started well before food production. In the Sahara, it predated animal herding by about 1500 years. The production of pottery was associated with a reduced mobility attested to the last North African foragers.

The already acquired skills of controlling and taming wild species under dry climatic conditions (Klein/Scott 1986) developed towards controlled reproduction with a modification of the gene pool. Attempts of domestication must have been practised on several species other than Barbary sheep, such as gazelle, hartebeest, oryx, etc. However, cattle, sheep and goat must have provided the most successful results for

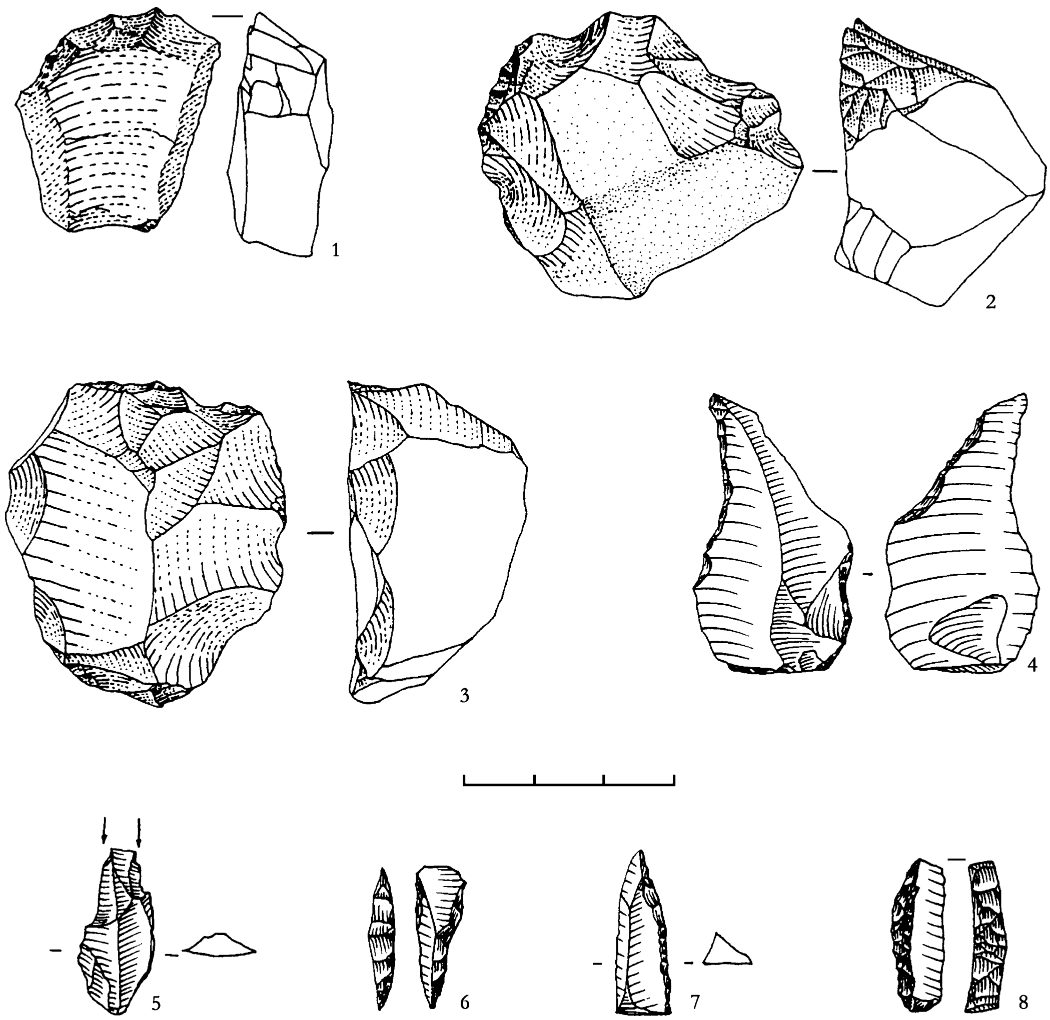

Fig. 11. Early Acacus retouched tools from Uan Tabu: 1 simple endscraper on a flake, 2 denticulated endscraper, 3 double endscraper, 4 simple perforator, 5 burin on a snap, 6 straight backed bladelet, 7 arch-backed bladelet, 8 arch-backed bladelet with rounded base.

domestication as they are herd animals, and therefore are easier to manage. They could also provide fair amounts of fat, which is a much appreciated resource (Smith 1992).

Barbary sheep was the only local wild caprine present in Africa, but could never be fully domesticated. Although its domestication was never successful, various attempts led to an

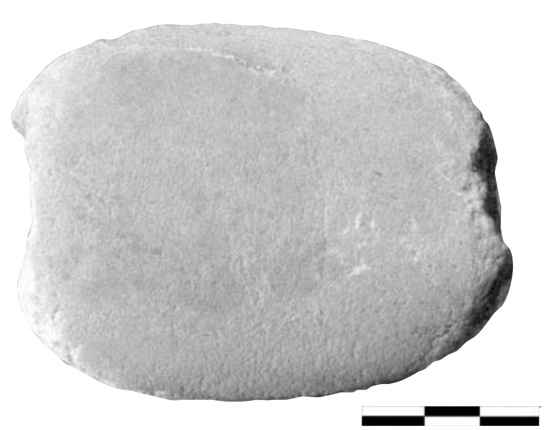

Fig. 12. Late Acacus polished grinding stone with traces of ochre from Uan Tabu.

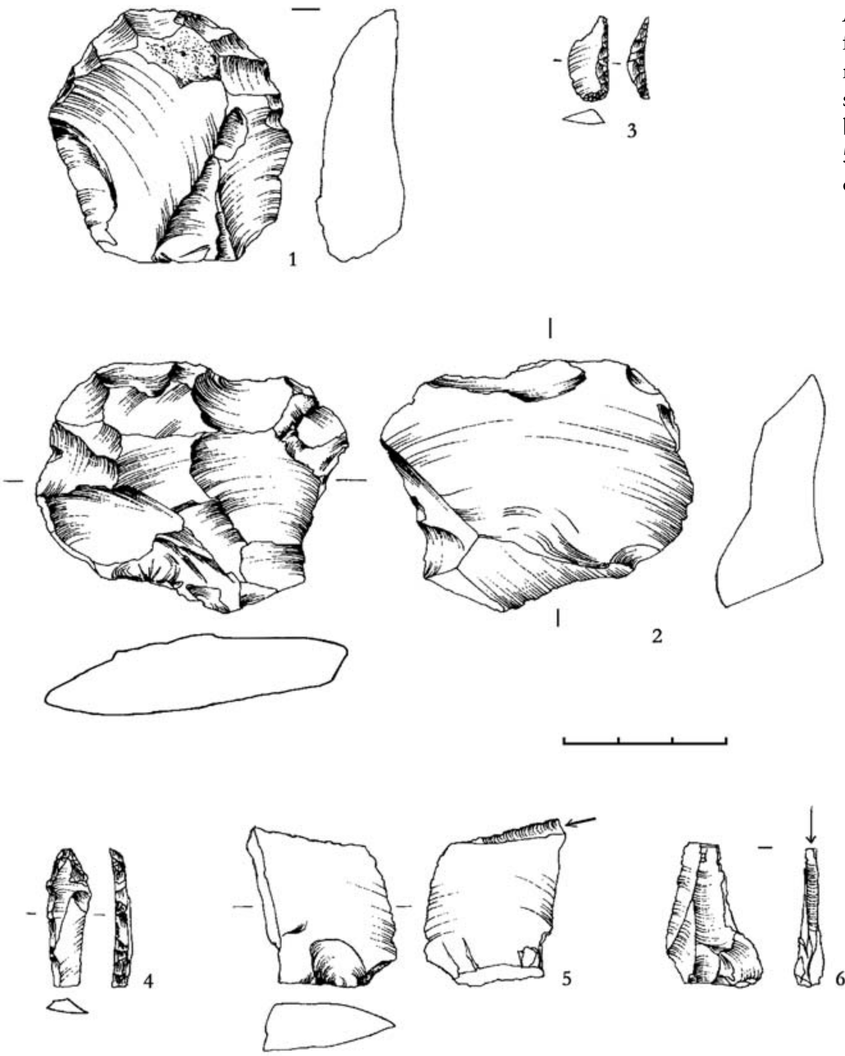

Fig. 13. Late Acacus retouched tools from Uan Tabu: 1 endscraper on a retouched flake, 2 denticulated endscraper, 3 perforator on a backed bladelet, 4 double backed perforator, 5 dihedral angle burin, 6 angle burin on a fracture.

incipient stage of animal control. In the Libyan Sahara, Barbary sheep management and taming started during the 10th millennium BP (Early Acacus: 9800ů8800 BP). It is also possible that this species produced hybrid forms with goats. However, they remained rather insignificant and later could not compete with fully domesticated small livestock imported from the Near East (Smith 1992).

Unlike caprines, cattle did have an endemic wild progenitor in Africa. It was the North African aurochs (*Bos primigenius*), which lived in the Nile Valley and the Maghreb. It is now well-assessed that the earliest cattle domestication in the Sahara was independent from Near Eastern influences (Loftus *et al.* 1994; Bradley *et al.* 1996). The shift to food producing economy was nearly contemporaneous in various parts of the Sahara, suggesting independent adoptions of pastoralism in different places, instead of a gradual expansion over North Africa (Smith 1992). The Sahara may have been a central area from which cattle spread to the west, to the south into the Sahel, and to the upper Sudanese Nile Valley (Gautier 1987; Gifford-Gonzalez 2000). In the Libyan Sahara, it was attested to from the second half of the 8th millennium BP. A climatic deterioration occurred in the Sahara at the end of the 9th millennium BP and probably caused a depopulation of the area. However, the wadi valleys could provide good seasonal grazing, establishing favourable prerequisites for animal domestication or the adoption of domesticated herds (Holl 1998). Later, around 7000 BP, the environmental conditions improved and human occupation increased in the most favourable areas where water resources were available. It was suggested that animal repopulation followed a similar trend bringing animal resources closer to human settlements (Clark 1980).

At Uan Telocat, domesticated species were well-preserved in the Middle Pastoral deposit, with over 50% domestic caprines (*Ovis ammon* f. aries/*Capra aegagrus* f. hircus). Cattle (*Bos primigenius* f. taurus) were present, but rare (Corridi 1998).

Agriculture was not practised in most of North Africa during the Early and Middle Holocene. On the other hand, plant exploitation was extended to a larger number of species that were cultivated without being domesticated. Many attempts must have been first made and later abandoned, such as the case of Boraginaceae and Urochloa. These plants could grow or increase their reproduction in certain ecological niches thanks to human control (Mercuri 2001). Ultimately, vegetable food stocking was an important cultural and economic change that was intensively practised in the Late Acacus, and reduced or even abandoned by nomadic pastoralists.

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Fig. 14. Pastoral paintings covering Round Head anthropomorphic figures at Uan Tabu.

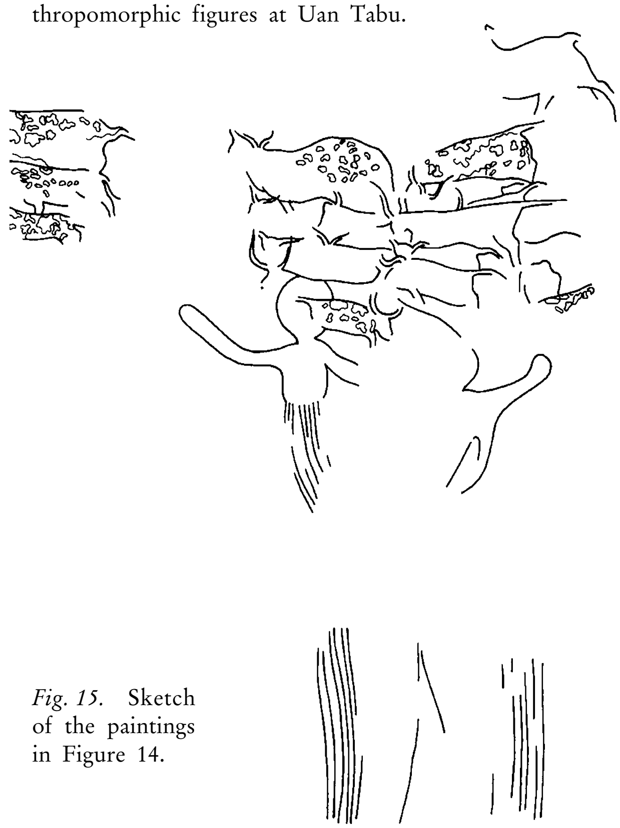

Fig. 15. Sketch of the paintings in Figure 14.

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