The Epipalaeolithic-Neolithic-Transition in the Mediterranean region of Northwest Africa

Der Übergang vom Epipaläolithikum zum Neolithikum im mediterranen Nordwest-Afrika

Jörg LINSTÄDTER*

Universität Köln, Institut für Ur- und Frühgeschichte, Weyertal 125, D-50923 Köln

ABSTRACT - The transition from hunter-gatherer to food producing societies in Africa is a multi-faceted long-term process showing many particularities depending on time and location. This important social-economic shift in the Mediterranean zone of Northwest Africa has strong connections to similar developments over the entire Mediterranean area. The last hunter-gatherer phase, the Epipalaeolithic, starts contemporary with the onset of the Holocene and is characterized by a number of major climatic and environmental changes. The increase of temperature and humidity leads to widespread afforestation, associated with comprehensive changes in the living conditions of human populations. Some components of the populations migrate into the former hyper arid Northern Sahara (Capsian), others remain in the ancestral territories and adapt to new environmental conditions (Mediterranean Epipalaeolithic). The corresponding shifts in subsistence and mobility decrease the archaeological visibility of these groups, a phenomenon that previous studies associated with a hiatus in human occupation. Although rare, the few excavated inventories show a clear continuity with the subjacent Iberomaurusian. In the first half of the 6th millennium calBC, these populations come into contact with Neolithic groups of the Western Mediterranean and subsequently adopt some of the Neolithic innovations. Similarities in pottery decoration on the African and European side of the Western Mediterranean demonstrate active intercontinental exchange with reciprocal impact.

***ZUSAMMENFASSUNG** - Der Übergang von Jäger-Sammler Gemeinschaften zu Nahrungsmittel produzierenden Gesellschaften ist auf dem afrikanischen Kontinent ein langwieriger Prozess, der in Abhängigkeit von Zeit und Ort viele Besonderheiten zeigt. Im mediterranen Nordwest-Afrika offenbart dieser bedeutende sozio-ökonomische Wandel zahlreiche Bezüge zu parallelen Entwicklungen im gesamten Mittelmeerraum. Um auf der Basis aktueller Forschungen in Nordwest-Afrika ein klares Modell der Kulturentwicklung vom Ende des Pleistozäns bis hinein ins Neolithikum entwerfen zu können, mussten zunächst einige Fragen zur Terminologie geklärt werden. Die letzte Kultur des ausgehenden Pleistozäns das Iberomaurusien wurde parallel auch als Epipaläolithikum bezeichnet und damit nicht klar von den Jäger-Sammler Gruppen des frühen Holozäns getrennt. In diesem Artikel wird vorgeschlagen das Iberomaurusien im zehnten Jahrtausend calBC enden zu lassen und nur noch die Wildbeutergemeinschaften des frühen Holozäns unter dem Begriff des Epipaläolithikums zusammen zu fassen. Für die Gruppen im Kernsiedlungsbereich des Iberomaurusien wird der Begriff des Mediterranen Epipaläolithikums eingeführt um so eine Abgrenzung zum Capsien und zu den frühholozänen Gruppen der Atlantikküste zu schaffen. Ein zweiter neu definierter Begriff ist der des Epipaläolithikums mit Keramik. Ab der Mitte des sechsten Jahrtausends calBC tritt abdruckverzierte Keramik in Jäger-Sammler Kontexten des nordwest-afrikanischen Hinterlandes auf. Der Begriff epipaläolithische Keramik wurde in der Vergangenheit für Inventare verwendet, in denen Keramik deutlich vor der Mitte des sechsten Jahrtausends auftritt, die somit zur Grundlage für die Diskussion um eine autochthone Keramikentstehung in diesem Gebiet wurden. Da keines dieser Inventare jedoch zweifelsfrei datiert und publiziert ist, wird hier dieser Hypothese widersprochen und ein Erscheinen der Keramik erst ab ihrem allgemeinen Auftreten im westlichen Mittelmeerraum in der Mitte des sechsten Jahrtausends angenommen. Obwohl ab dem fünften Jahrtausend auch die anderen Aspekte der neolithischen Wirtschaftsweise übernommen wurden, sind nach unserer Meinung Begriffe wie Para- oder Epineolithikum irreführend. Wir schlagen vor, die Keramik führenden Jäger-Sammler Kulturen der zweiten Hälfte des sechsten Jahrtausend als „Epipaläolithikum mit Keramik" zu klassifizieren. Demnach beginnt die letzte Jäger-Sammler Kultur, das Mediterrane Epipaläolithikum, parallel zum Holozän, das auch für Nordwest-Afrika mit einem deutlichen Klimaumbruch und wahrnehmbaren Umweltveränderungen einhergeht. Der Anstieg von Temperatur und Feuchtigkeit führte zu einer großflächigen Wiederbewaldung, die mit umfassenden Veränderungen der menschlichen Lebensbedingungen verbunden war. Während ein Teil der ehemaligen Iberomaurusien Bevölkerung des ausgehenden Pleistozäns in ihren angestammten Siedlungsgebieten verbleib (Mediterranes Epipaläolithikum), zogen andere Teile der Bevölkerung in jetzt wieder nutzbare Bereiche der bis dahin hyperariden Nordsahara (Capsien). Die damit verbundenen Veränderungen der Subsistenz und der Mobilität erschweren die archäologische Wahrnehmbarkeit dieser Gruppen. Das hat manche Autoren dazu bewogen, für diesen Zeitraum einen Besiedlungshiatus im mediterranen Bereich anzunehmen. Doch einige wenige gegrabene Inventare aus diesem Zeitraum belegen die Anwesenheit des Menschen und zeigen eine klare Kontinuität zum vorangegangenen Iberomaurusien. In der ersten Hälfte des sechsten Jahrtausends calBC kommen die Gruppen des Mediterranen Epipaläolithikums mit neolithischen Gemeinschaften des westlichen Mittelmeer-*

*joerg.linstaedter@uni-koeln.de

raumes in Kontakt und übernehmen sukzessive neolithischen Innovationen. Ähnliche Keramikverzierungen auf beiden Seiten des Mittelmeeres zeigen den aktiven interkontinentalen Austausch mit gegenseitiger Beeinflussung.

Keywords - Epipalaeolithic, Capsian, Neolithic, Cardial, Northwest-Africa, Holocene climate
Epipaläolithikum, Capsien, Neolithikum, Cardial, Nordwest-Afrika, holozänes Klima

Introduction

The transition from hunter-gatherer subsistence to food-producing economy is associated with some of the most important cultural and socio-economic changes in the history of mankind (Childe 1960; Zvelebil & Rowley-Conwy 1984; Müller 1993; Whittle 1996; Guilaine 1996; van Willigen 2006). In contrast to the importance of this major cultural change, our knowledge of the underlying processes is still quite limited, especially on the African continent. The prehistory of the Northwest African Mediterranean zone, as discussed in this paper, developed independently from the cultural process both in the arid Sahara as well as its semiarid periphery. Considering the environmental and archaeological record the study region is part of the Western Mediterranean. In the 6th millennium calBC (all age estimates in the present paper are based on tree-ring calibrated 14C-ages [IntCal04: Reimer et al. 2004] with CALPAL [Bernhard Weninger, University of Cologne] expressed as calendric ages related to the "calBC" scale), when the transition from hunter-gathering to food-production took place, the entire study area is characterized by a "horizon of impressed pottery" From an archaeological point of view the existence of this horizon allows us, to some extent, to consider its diverse landscapes as one single homogenous entity (Guilaine 1996, 53). The impressed pottery is, sometimes abruptly sometimes step by step, accompanied by all components corresponding to the emergence, development, and spread of these earliest non-hunter gatherer communities of the region (Zilhão 2001; Manen et al. 2007).

Until the second half of the twentieth century, the Central European Linearbandkeramik (LBK), with its numerous specific cultural features such as e.g. longhouses, pottery and polished stone tools, as well as domesticated plants and animals (Lüning 1988, 29) was considered to represent a highly homogeneous cultural unit. This impression was supported by the wide distribution of LBK features from the Balkans to the Paris Basin, as well as by its speed of diffusion. However, during recent decades, researchers have identified more regional distinctions within the LBK community, as well as an increasing number of clearly Mesolithic influences (Zimmermann 1995).

In the western Mediterranean, the existence of regional distinctions between contemporary Neolithic communities, represented by artefact inventories and subsistence strategies, was quite obvious from the beginning of research. Beside geographically widespread cultural features such as shell-impressed pottery of the "Cardial classique", found from Provence to the Portuguese Atlantic coast, other regional pottery styles are recorded from the Tyrrhenian islands, Southern Spain or the Mediterranean coast of Northwest Africa (Manen 2000; Linstädter 2004; van Willigen 2006). Most researchers believe that influence of local hunter-gatherer societies is responsible for this diversity.

State of research in Mediterranean Northwest Africa

On the European side of the Western Mediterranean (Italy, France and Spain) some hundred Epipalaeolithic or Mesolithic as well as early Neolithic sites have been studied, although excavations are often limited and only on a small scale (Schuhmacher 1994; Manen 2000; Zilhão 2001; van Willigen 2006). On the African side of the Mediterranean our knowledge is even more limited. Early Neolithic sites in Mediterranean Northwest Africa are known from some specific regions. Three of them were already investigated at the end of the 19th century (Balout 1955; Vaufrey 1955; Souville 1972; Camps 1974). These are the peninsula of Tangier at the north-western edge of Morocco (Koehler 1931; Tarradell 1954; 1955; Jodin 1958/59; Gilman 1975; Otte et al. 2004), the environs of the town of Oran in north-western Algeria (Pallary 1893, 1896, 1900; Doumergue 1921; Goetz 1964; Aumassip 1971) and the Moroccan Atlantic coast. All areas have urban centres where, prior to the independency of both countries, archaeological research was undertaken by French or Spanish researchers. It was only one hundred years later that archaeological investigations also began in neighbouring areas e.g. Eastern Morocco.

In contrast to the European side of the Western Mediterranean, the number of archaeological projects has decreased during the last decades. In addition most of the recent work has been restricted to the territory of Morocco (Wengler 1983/84, 1985; Grébénart 1974, 1995; Daugas et al. 1989, 1998; Searight 1998). The amount of archaeological data as well as the level of modelling is therefore quite different, on both sides of the Mediterranean.

In 1995 a Moroccan-German joint research project was initiated, focussing on Eastern Morocco, where archaeological data at the time were extremely limited (Wengler & Vernet 1992). The partners of this joint project are the Institut National de Sciences de l'Archéologie et du Patrimoine (INSAP, Rabat, Morocco) and the Kommission für die Archäologie aussereuropäischer Kulturen des Deutschen Archäologischen Instituts (KAAK, Bonn, Germany). Since the beginning of this project, a number of sites ranging from the Lower Palaeolithic up to the Neolithic have been investigated and first results have been published (Mikdad et al. 2000; Moser 2003; Linstädter 2004; Nami 2008).

In the eastern Mediterranean a wide variety of models for the diffusion of Neolithic subsistence has been developed, due to the vast amount of available data including many radiometric dates on the Early Neolithic (Lewthwaite 1987, 738; Roudil 1990).

In contrast to the western Asian perspective, during the second third of the 20th century Spanish researchers developed models that proposed an African influence on the process of neolithisation in Southwest Europe (Bosch-Gimpera 1932, 1967; Martinez Santa Olalla 1941). These models represented at the time an alternative to the dominant conception of an eastern origin of early farming. Later in the 20th century results of excavations at Arene Candide (Bernabó Brea 1950) stressed again the eastern roots of the west Mediterranean Neolithic (van Willigen 2006, 28).

It is well beyond the scope of this paper to evaluate all the neolithisation models that have been developed in the last decades. Detailed and comprehensive reviews are available elsewhere (van Willigen 2006, 38ff.). During the second half of the 20th century data were published that placed the earliest Spanish evidence for Neolithic innovations such as domesticated plants or animals (Cueva de la Dehesilla, Acosta & Pellicer 1990; Cova Fosca, Olaria 1988) and ceramics before the middle of the 6th millennium calBC. These very early findings stimulated the hypothesis of a local development of pottery production and animal domestication (Estévez 1988).

A major step forward, in methodological terms, is a paper by Zilhão (2001) which rejects the entire suite of early ^{14}C-dates, showing that these data are either unreliable due the old-wood or marine-reservoir effect, or are lacking a clear reference for their stratigraphical position. Zilhão (2001, 14181) concludes that not a single Neolithic innovation can be related to an undisturbed and well-dated Mesolithic context. His model of "maritime pioneers" describes a fully Neolithic society that spread by boat along the European coasts of the Western Mediterranean. Its distribution is not continuous, because the mariners founded a number of so-called pioneer settlements – mostly situated in major river deltas e.g. the Rhone delta (van Willigen 2006) or the regions of Valencia (Schuhmacher 1994, 65) and Cadiz (Ramos Muñoz et al. 2000, 147). From these areas they moved out to the next Neolithic outpost ("leapfrog colonisation"). According to the critically filtered ^{14}C dates, the Neolithic groups started in Liguria at about 5,8 ka calBC, passed the Spanish Levant at about 5,6 ka calBC, and arrived in Portugal at 5,4 ka calBC.

Starting from these pioneer settlements, Neolithic innovations spread to the surrounding areas. The process of cultural diffusion is described by the so-called "dual model" (Cabanilles 1990; Bernabeu 1996; van Willigen 2006). Arriving Neolithic groups continued with their life style, but came into contact with local hunter-gatherer societies. These autochthonous populations also maintained most components of their own traditional way of life and both populations coexisted for some time. However, hunter-gatherer populations began slowly to adopt certain elements of the Neolithic package. Pottery was quite easily integrated, whereas the adaptation of domesticated animal species required a much longer time due to the greater impact on social and economic structures. Nevertheless, such model interpretations, in our present state of knowledge, may be an artefact of the more limited preservation of botanical remains.

This model has been developed to describe the relations between the Epipalaeolithic and the Neolithic cultural complexes in the region of Valencia, but following Zilhão (2001, 14184) its general features can also be applied to other regions e.g. the Portuguese coast.

Other authors suppose that the model has to be modified for the southern Iberian Peninsula and the Mediterranean Maghreb (Manen et al. 2007). A simple east-west transfer of the Neolithic package and a step by step adoption of its elements by local hunter-gatherers do not explain the particular composition of early Neolithic inventories in Portugal, Andalusia and Morocco, and their differences from inventories in Eastern Spain. Probably the Neolithic package underwent reorganization from eastern Spain to Portugal. Typical features of the Western Early Neolithic pottery, such as pointed bases or particular impressed decorations, as well as certain techniques of stone tool production are very rare in the eastern Spanish inventories. For some researchers this supports the ancient hypothesis of African influences on the West-Mediterranean Neolithic, to be understood as a partial transfer of ideas (Manen et al. 2007, 148). Results of current research on Moroccan coastal sites are therefore crucial for the testing of such hypotheses.

Aims and objectives

Within this geographical and theoretical framework, this paper provides some new data from eastern Morocco, with particular emphasis on the environmental background of neolithisation. At present our knowledge of the Epipalaeolithic-Neolithic-transition deals mainly with local hunter-gatherer populations and their role in the process of distribution of Neolithic innovations. The Upper Palaeolithic culture of Northwest Africa is the Iberomaurusian ranging from 20 - 9,5 ka calBC. This period is relatively well-known at a number of rich cave sites, such as Taforalt, Columnata, Tamar Hat, Ifri el Baroud or Ifri N'Ammar (Roche 1970; Lubell 2001, 137ff.; Mikdad et al. 2000; Moser 2003; Nami 2008), but the cultural process between the end of the Iberomaurusian and the first appearance of Neolithic innovations is not understood at all. Due to the limited number of excavated sites and a lack of radiometric dates, different researchers propose different, sometimes contradicting hypotheses. A "worst case scenario" even postulates a hiatus of human occupation (Nehren 1992, 184ff.).

Neither the exact geographic limits of the Mediterranean Neolithic of Northwest Africa nor its precise temporal onset are known. Some data are available from the region of Oran, Algeria (Aumassip 1971), the Tangier Peninsula (Daugas et al. 1998), the regions of Rabat and Casablanca (Lacombe et al. 1991; Daugas et al. 1998, 350) and - most recently - from eastern Morocco (Bellver Garrido & Bravo Nieto 2003; Linstädter 2004). Beyond this, most regions are still unexplored. The fragmentary archaeological record provides only poor data for elaborate interpretations. Many concepts are therefore speculative.

Study area

The Maghreb is limited by the Mediterranean to the north, the Atlantic coast to the west and the northern rim of the Sahara to the south. The Moroccan landscape is largely defined by its major mountain ranges, above all the High Atlas with a distance end to end of 3 000 km and summits higher than 4 000 m. The Mediterranean coast is dominated by the Rif Mountains with summits rising up to 2 500 m (Mikesell 1961, 12). The Algerian and Northern Tunisian coastline has a rocky appearance caused by the Tell Atlas, which is the eastern extension of the Moroccan High Atlas. The Tell Atlas has tree growth up to a height of 1 600 m, with fertile plains and valleys in between. Further to the south is a series of extensive plains, which are deflated party below sea level, the so-called "chotts".

The contemporary climate is typically Mediterranean, with most precipitation between autumn and spring. This winter rainfall is a result of the southwards migrating westerlies (Allen 1996, 308). Rain is mostly restricted to the coastal regimes and declines rapidly to the south. With increasing altitude, the mountains show a strong increase in precipitation and decrease in temperature, with average winter temperatures often below 15 degrees centigrade. The summer climate is dominated by a northwards migrating subtropical high pressure cell, with accompanying high temperatures and infrequent rains causing sporadic droughts (Allen 1996, 307). The position of the Maghreb between the temperate and subtropical Hadley-cells, as well as the Atlantic and continental influences, induce an altogether highly complex and variable climate regime, with many shifts through time.

Terminology

At present no generally accepted archaeological terminology exists due to the fragmentary record. We propose the following concept:

In contrast to other classifications (e.g. Nehren 1992), the Iberomaurusian (18–9,5 ka calBC) should not be included in the Epipalaeolithic (9–5 ka calBC), but should be classified as Upper Palaeolithic. The Iberomaurusian groups lived as did their European counterparts in an open landscape and hunted large herbivores (e.g. horse, Barbary sheep and gazelle at Ifri el Baroud, cf. Mikdad et al. 2000, 150) from long-term residential camps. Parallel to the Younger Dryas the amount of data decreases rapidly. Therefore the end of the Iberomaurusian is difficult to determine.

With the onset of the Holocene, appear some enigmatic inventories which follow the tradition of the Iberomaurusian but differ slightly in their percentage of tool types such as backed bladelets, notched and denticulate pieces as well as microliths. Some authors use generic terms for these like "Épipaléolithique de transition" (Camps 1974, 204) or "Épipaléolithique indifférencié" (Nami 2008). The irregular appearance of these inventories resulted in the creation of various site-specific cultural classifications (e.g. *Columnatien*). In this paper we lump all of them together under the label "Mediterranean Epipalaeolithic". This classification corresponds to the use of the term "Mediterranean Neolithic". The geographical extension of both complexes is almost identical. The Mediterranean Epipalaeolithic precedes the neolithisation of the region and might instead be named Mesolithic, with reference to the comparable situation in Central or even Western Europe (Zilhão 2001, 14184). However, this term seems to be inappropriate for an African culture in view of the misunderstandings raised by Arkell's (1947) use of the label "Khartoum Mesolithic" for pre-Neolithic hunter-gatherer societies in Central Sudan.

In earlier research even the labelling of Neolithic sites and inventories along the Northwest African coast was hotly debated. Vaufrey (1955, 291) groups all Northwest African sites under a "Néolithique de tradition capsienne" (NTC) and disputes continuity between the Iberomaurusian and the Neolithic. In contrast, Balout (1955) assumes continuity between them and creates the term "Néolithique de tradition ibéromaurusien" (NTI). He defines the NTI by recording its differences to the NTC (Balout 1955:479).

The term "Néolithique marocain" is first used by Camps-Fabrer (1970, Abb.1). Two years later a map was published joining the "Néolithique marocain" and the "Néolithique tellien ou des grottes" to the "Néolithique méditerranéen" (Camps & Camps-Fabrer 1972, Abb. 16). This "Néolithique méditerranéen" even includes the Tunisian coast, where to date no Neolithic site has been identified.

In his book „Les civilisations préhistoriques de l'Afrique du Nord et du Sahara" Camps (1974) uses the term 'Néolithique méditerranéen' parallel to the term 'Néolithique de Tradition Capsien' and 'Néolithique saharo-soudanais'. Here, the close connections between Europe and North Africa are emphasised.

A new term was introduced by J.-L. Daugas et al. (1989, 681). For the Neolithic in their working area, which includes the Atlantic coast and the Tangier peninsula (definitely part of the Mediterranean Neolithic), the authors use the term 'Néolithique nord-atlantique du Maroc'. Despite the many differences, all approaches lump fully developed Neolithic complexes (Gilman 1975) as well as pottery using hunter-gatherers (Linstädter 2004) together under the term 'Neolithic'. This concept should be abandoned

The term Mediterranean Neolithic will be used in this paper exclusively for fully Neolithic for Northwest African groups represented at sites such as the caves of the Tangier Peninsula as well as those on the East Moroccan Coast. Pottery-bearing inventories with a proven or presumed hunter-gatherer economy such as Hassi Ouenzga (Eastern Rif) and the sites of the Oujda and Oran region should instead be labelled 'Epipalaeolithic with pottery'. The use of this term (e.g. Keramisches Epipaläolithikum, cf. Nehren 1992, 173ff.) could be misleading, since it was already applied to Epipalaeolithic inventories containing pottery older than the first half of the 6th millennium calBC (e.g. Bou Aichem, Goetz 1967, 19), leading to the concept of an autochthonous development of pottery in Mediterranean Northwest Africa. Since at the moment none of these early sites with pottery are reliable we will not encourage following this concept and propose to use the term 'Epipalaeolithic with pottery' with a new meaning for sites younger then 5,8 ka calBC. Other labels such as Proto-, Peri- or incomplete Neolithic should be rejected.

The temporal extension of the North African Mediterranean Neolithic is described in the "Essai Chronologique" of Daugas et al. (1989, 681), in which data from the Tangier Peninsula are used. The best dated site of Epipalaeolithic with pottery is Hassi Ouenzga. The phase discussed here is dated by seven ^{14}C-ages, all of which lie between 5,6 and 4,9 ka calBC (Fig. 2, see next page).

The Epipalaeolithic and Early Neolithic of Mediterranean Northwest Africa – an inventory

The Late Pleistocene prehistory of the Northern Maghreb is dominated by the Iberomaurusian (18 – 9,5 ka calBC), which may be divided into two subphases, an Early and a Late Iberomaurusian. As shown in Fig.11 the number of published ^{14}C ages increases rapidly for the later phase of the Iberomaurusian and displays a remarkable correspondence to the Bølling and Allerød stages of the Last Interstadial (Greenland ice-core GRIP and using the terminology of the Late Glacial in northern Europe). The end of the Iberomaurusian is again well defined by a substantial decrease of ^{14}C data, and correlates broadly with the northern European Younger Dryas.

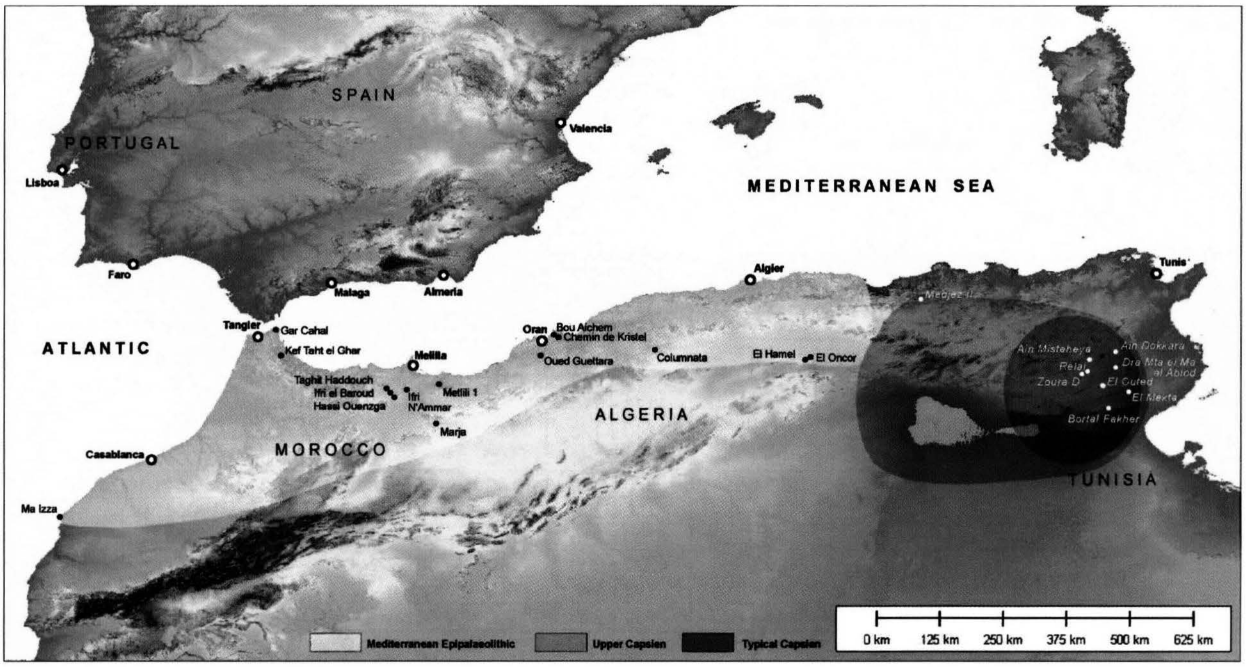

Fig. 1. Distribution of Epipalaeolithic sites in Northwest Africa (9,5 – 5,6 ka calBC).

Abb. 1. *Verteilung der epipaläolithischen Fundstellen in Nordwest-Afrika (9,5 – 5,6 calBC).*

region	site	lab No.	^{14}C age	calBC	method	material	references
Tangier	Kef Taht el Ghar	Ly 7695	9865 ± 75	9375 ± 90	14C	Charcoal	Daugas et al. 1989
		Ly 7287	9910 ± 50	9400 ± 90	14C	Charcoal	Daugas et al. 1989
Rif oriental	Taghit Haddouch	Hd 19880	7166 ± 38	6040 ± 30	14C	Charcoal	Linstädter 2004
		Hd 19543	7248 ± 39	6130 ± 60	14C	Charcoal	Linstädter 2004
		Hd 19868	6139 ± 30	5110 ± 80	14C	Charcoal	Linstädter 2004
	Hassi Ouenzga	KIA 433	7930 ± 50	6850 ± 130	14C	charcoal	Linstädter 2004
	Hassi Ouenzga o. air	Bln 4756	10570 ± 177	10470 ± 250	14C	Charcoal	Mikdad et al. 2000
		Erl 9993	9350 ± 65	8614 ± 91	14C	Charcoal	this article
	Ifri el-Baroud	Bln 4755	9677 ± 60	9080 ± 150	14C	Charcoal	Nami 2008
		Bln 4872	8556 ± 52	7580 ± 30	14C	Charcoal	Nami 2008
	Mtlili 1	KIA 31007	8880 ± 35	8080 ± 100	14C	Charcoal	this article
Oujda	Marja (Oued el-Hay)	Gif 6188	9930 ± 90	9500 ± 160	14C	ostrich egg	Wengler & Vernet 1992
	Site de la piste	Gif 6826	9340 ± 100	8590 ± 150	14C	?	Wengler & Vernet 1992
		Gif 6827	9350 ± 100	8610 ± 150	14C	?	Wengler & Vernet 1992
		Gif 6495	8960 ± 130	8070 ± 190	14C	?	Wengler & Vernet 1992
	Chaâba Bayda	Gif 6828	9560 ± 100	8960 ± 170	14C	ostrich egg	Wengler & Vernet 1992
Oran	Columnata	?	10800 ± 425	10590 ± 550	14C	?	Brahimi 1966
	Columnata	MC 154	7300 ± 200	6178 ± 186	14C	?	Camps 1966
	Columnata	MC 155	8280 ± 150	7291 ± 176	14C	?	Camps 1966
	El Hamel	?	9540 ± 120	8930 ± 190	14C	?	Delibrias & Roche 1976
	El Oncor	?	10040 ± 190	9720 ± 330	14C	?	Amara & Heddouche 1978-79
	Bou Aichem	?	?	7750 ± 400	14C		Goetz 1967
		?	?	8256 ± 400	14C		Goetz 1967
	Chemin de Kristel	Alg 40	7760 ± 190	6703 ± 235	14C	shell	Goetz 1967
Capsien	Ain Dokkara	?	7090 ± 100	5060 ± 100	14C	Charcoal	Rahmani 2004
		?	7990 ± 90	6890 ± 140	14C	Humid Acid	Rahmani 2004
		?	7090 ± 100	5960 ± 100	14C	Charcoal	Rahmani 2004
	Ain Misteheyia	?	7280 ± 115	6170 ± 120	14C	Humid Acid	Rahmani 2004
		?	7640 ± 115	6500 ± 110	14C	Humid Acid	Rahmani 2004
		?	7990 ± 125	6900 ± 170	14C	Humid Acid	Rahmani 2004
		?	9805 ± 160	9290 ± 310	14C	Humid Acid	Rahmani 2004
	Ain Naga	?	9170 ± 200	8390 ± 290	14C	Charcoal	Rahmani 2004
		?	8900 ± 280	8060 ± 350	14C	Humid Acid	Rahmani 2004
		?	9300 ± 300	8620 ± 430	14C	Humid Acid	Rahmani 2004
	Bortal Fakher	?	7600 ± 200	6480 ± 220	14C	Charcoal	Rahmani 2004
		?	6930 ± 200	5840 ± 170	14C	Charcoal	Rahmani 2004
	El Outed C	?	7400 ± 170	6260 ± 160	14C	Charcoal	Rahmani 2004
		?	7850 ± 170	6780 ± 220	14C	Charcoal	Rahmani 2004
		?	6700 ± 150	5630 ± 120	14C	Charcoal	Rahmani 2004
	El-Mekta	?	8400 ± 400	7440 ± 530	14C	Charcoal	Rahmani 2004
	Kef Zoura D	?	9100 ± 130	8300 ± 200	14C	Humid Acid	Rahmani 2004
		?	8580 ± 150	7700 ± 190	14C	Charcoal	Rahmani 2004
		?	9390 ± 130	8740 ± 240	14C	Charcoal	Rahmani 2004
		?	5965 ± 115	4870 ± 140	14C	Charcoal	Rahmani 2004
		?	7590 ± 60	6450 ± 50	14C	Charcoal	Rahmani 2004
		?	7750 ± 50	6570 ± 60	14C	Humid Acid	Rahmani 2004
		?	8390 ± 170	7380 ± 190	14C	Charcoal	Rahmani 2004
	Medjez II	?	8860 ± 150	7980 ± 220	14C	Charcoal	Rahmani 2004
		?	8550 ± 150	7640 ± 190	14C	Charcoal	Rahmani 2004
		?	8480 ± 300	7550 ± 400	14C	Charcoal	Rahmani 2004
		Gif 886	7900 ± 180	6827 ± 219	14C	?	Camps 1966
		Gif 885	7680 ± 500	6666 ± 551	14C	?	Camps 1966
		Gif 462	6620 ± 300	5530 ± 292	14C	?	Camps 1966
		MC 151	6500 ± 100	5450 ± 89	14C	?	Camps 1966
	Relilai	?	8180 ± 180	7150 ± 260	14C	Charcoal	Rahmani 2004
		?	8380 ± 150	7380 ± 170	14C	Charcoal	Rahmani 2004
		?	8350 ± 150	7350 ± 170	14C	Charcoal	Rahmani 2004
		?	8180 ± 150	7170 ± 220	14C	Charcoal	Rahmani 2004
		?	7700 ± 150	6610 ± 170	14C	Charcoal	Rahmani 2004
		?	8100 ± 150	7060 ± 240	14C	Charcoal	Rahmani 2004
		?	7950 ± 150	6870 ± 190	14C	Charcoal	Rahmani 2004
		?	7850 ± 150	6780 ± 200	14C	Charcoal	Rahmani 2004
		?	7760 ± 180	6700 ± 230	14C	Charcoal	Rahmani 2004
		?	7800 ± 140	6730 ± 200	14C	Charcoal	Rahmani 2004
		?	7300 ± 140	6190 ± 140	14C	Charcoal	Rahmani 2004
		?	8840 ± 160	7960 ± 220	14C	Charcoal	Rahmani 2004

Fig. 2. ^{14}C data of Epipalaeolithic sites. The ^{14}C-ages are calibrated using the CalPal program (B. Weninger, Univ. Cologne, www.calpal.de).
Abb. 2. *^{14}C-Daten des Epipaläolithikums. Die ^{14}C-Daten wurden mit dem Programm CalPal kalibriert (B. Weninger, Univ. Köln, www.calpal.de).*

In contrast to many other regions of the world, the climatic development during the period of deglaciation, as well as the early Holocene in Northwest Africa is little understood and controversial. The same is true for the cultural process. The first four millennia of the Holocene until the onset of the Neolithic are defined by two cultural complexes: The Mediterranean Epipalaeolithic and the Capsian (Fig.1).

Capsian (9,5-5 ka calBC)

While the chronology, geographical distribution, subsistence strategies and internal development of the period we call Mediterranean Epipalaeolithic still remain vague, the character of the synchronous Capsian is better known due to recent publications (Nehren 1992; Lubell & Sheppard 1997; Rahmani 2004). According to these studies, the Capsian dates to between *9.5–5 ka calBC* and its geographical distribution is limited to certain areas of Algeria and Tunisia (Fig. 1). In contrast to former ideas of an independent evolution of the Capsian, Nehren (1992, 153ff.) as well as Lubell & Sheppard (1997, 326) support a formation of the Capsian out of the Iberomaurusian. Nehren further demonstrates the affiliation of local facies such as the "Horizon Collignon" to the Iberomaurusian, as well as the connection of the Keremian to the Upper Capsian.

The Capsian may be subdivided into two complexes, the Typical Capsian (Capsien typique) and the Upper Capsian (Capsien supérieur). Early models (Balout 1955; Vaufrey 1955) explained these two complexes as consecutive phases, but due to radiometric dates, they are now considered as contemporary (Lubell et al. 1976; Camps 1974). While the Typical Capsian is restricted to an area at the Algerian–Tunisian Border, the territory of the Upper Capsian is much more extensive. It covers large parts of the Northern Sahara and the Tell Atlas in the west. Some of the most important sites of the Capsian e.g. Relilai, Ain Misteheyia and Kef Zoura D contain deposits of both Capsian traditions. Following the work of Lubell and others, we know that the two complexes differ clearly in their lithic assemblages with reference to their raw material, blank production and tool kits. The Upper Capsian is considered to represent communities with high mobility. While in the Capsian core area of Gafsa-Tébessa (Fig.1) good raw material is abundant, in more remote areas the raw material displays lower quantity and quality. Technical innovations of the Upper Capsian such as an increased variability of raw material, use of pre-prepared cores with higher productivity and a consequent lightening of the tool kit (by backed bladelets, microliths) facilitate the adaptation to these remote areas (Rahmani 2004, 97).

Both Capsian traditions appear to have been well adapted to their environment. Thus, groups could maintain their way of life until 5,0 ka calBC, although in other parts of the Maghreb Neolithic economies had been established several centuries earlier (Lubell 1984, 54).

Mediterranean Epipalaeolithic (9,5 – 4,9 ka calBC)

As stated above we classify the Iberomaurusian as Upper Palaeolithic. It is the last techno-complex at the end of the Pleistocene. The Epipalaeolithic sensu stricto follows the Iberomaurusian at ca. 9,5 ka calBC and ends with the onset of the Neolithic. The lower limit at 9,5 ka calBC is well defined by the youngest radiocarbon date for the Iberomaurusian, the sample Erl-4394: 10 022 ± 80 BP - 9 610±190 calBC for layer 4, K16 (charcoal) from Ifri N'Ammar (Moser 2003, Tab. 21). *The earliest dates for Epipalaeolithic inventories* (Fig. 2) are known from sites like Kef Taht el Ghar near Tetouan (Daugas et al. 1998): 9 520 ± 235 calBC (Ly-7287: 9 910 ± 50 ^{14}C-BP, charcoal) and 9 375 ± 90 calBC (Ly-7695: ^{14}C-age 9 965 ± 75, charcoal) as well as Marja (Oued el-Hay) with 9 491 ± 157 calBC (Gif-6188: ^{14}C-age 9 930 ± 90, charcoal) und Chaâba Bayda with 8 962 ± 167 calBC (Gif-6828: ^{14}C-age 9 560 ± 100, charcoal) in the Oujda region.

The amount of both archaeological and radiocarbon data for the Mediterranean Epipalaeolithic is so low that, for a long time, researchers presumed an extended temporal gap between the Iberomaurusian and the Early Neolithic, at least in some areas. Nearly all facies mentioned by Gabriel Camps in his studies "Les civilisations préhistoriques de l'Afrique du Nord et du Sahara" (1974) are limited to the Eastern Maghreb, among them the so-called "Elassolithic" or the "Kérémien", or to the Middle Maghreb in the case of the "Columnatien". The stratigraphy of the eponymous site of Columnata is crucial for the understanding of the Mediterranean Epipalaeolithic and its relations to the Capsian. The site yielded inventories of the Iberomaurusian and the Neolithic, which are separated by two very different levels with Epipalaeolithic lithic material, called the Columnatian and Upper Capsian. The Columnatian is characterised by high percentages of backed bladelets, notched and denticulate pieces, as well as microliths. All of these are typical features of the Mediterranean Epipalaeolithic, and the role of the Columnatian as an independent local facies should be reconsidered. The same is true of the lithic material classified as Upper Capsian. As already pointed out by Nehren (1992, 159), the material is insufficiently published and should no longer be included in the Capsian.

Nevertheless, further west there exist several sites and inventories which can be assigned to the Epi-

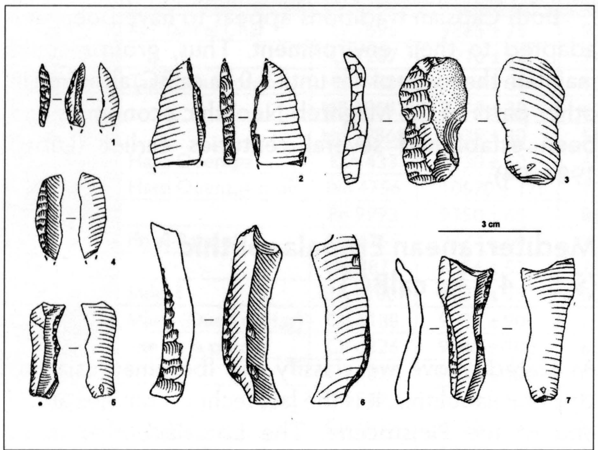

Fig. 3. Lithic tools from Epipalaeolithic layers of Ifri el Baroud, Eastern Rif, Morocco (after Nami 2008). 1 backed bladelet, 2 backed piece, 3-7 edge retouched pieces.

Abb. 3. *Steinwerkzeuge aus epipaläolithischen Schichten der Fundstelle Ifri el Baroud, Östliches Rif, Marokko nach Nami (2008). 1 Rückenmesser, 2 Bruchstück mit Rückenretusche, 3-7 Stücke mit Kantenretusche.*

palaeolithic by their ^{14}C dates and artefact assemblages. Most important are the sites of Bou Aichem (Goetz 1967) and Oued Guettara (Camps 1967) near Oran, as well as two inventories from the Oujda region, Chaâba Bayda and Marja (Oued el-Hay) (Wengler & Vernet 1992) and the two major sites of Gar Cahal (near Ceuta) and Kef That el Ghar (near Tetouan) on the Tangier peninsula. Based on the appearance of cereals in the same layer the inventory of the latter is termed Néolithique acéramique (Daugas et al. 1998, 350). No absolute dates are available from the site of Ma Izza, but, following the excavator, assignment to the Epipalaeolithic seems most probable (Berthélémy 1987).

As mentioned above, the most recent excavations of Epipalaeolithic sites were undertaken within the framework of the German-Moroccan joint project. Three of the excavated sites yielded Epipalaeolithic inventories. Whereas the material from Ifri el Baroud (Fig. 3) is published (Nami 2008), the analysis of the inventories from Taghit Haddouch (Mikdad in prep.) and Hassi Ouenzga open air (Holzkämper in prep.) is still in progress.

A highly controversial topic is the appearance of pottery within Epipalaeolithic context (Nehren 1992, 184). The main problem is insufficient documentation of earlier excavations, in particular in the Oran region and at Gar Cahal cave near Ceuta. Furthermore, the majority of sites is not dated by the radiocarbon method and lithic industries from the Epipalaeolithic and the Neolithic are very similar. Due to this situation some researchers argue that the appearance of pottery, as demonstrated at Ma Izza or Gar Cahal, is a distinctive cultural marker. But following this reasoning runs the risk of applying a circular argument.

We argue that the Mediterranean Epipalaeolithic lasts some 4 000 years and covers the central and western territory of the ancient Iberomaurusian. The data base is small and data quality is low. Bearing this in mind, a coarse grained image of the Mediterranean Epipalaeolithic can be based on the bladelet technology of small dimension, which is in the tradition of the Iberomaurusian. Tool kits seem to have change moderately. Backed bladelets remain the dominant lithic tool type, although their percentages decrease, while other types like notched and denticulate pieces as well as microliths increase (Nami 2008). On the base of present knowledge we cannot decide whether pottery was part of the equipment, or not.

Early Neolithic (5,8–4,9 ka calBC)

In the study region the Early Neolithic is better known than the Epipalaeolithic due to a much better data base in the European part of the Western Mediterranean. The Early Neolithic sites of Mediterranean Northwest Africa seem to be concentrated in the same territory as the Mediterranean Epipalaeolithic. Three provinces are important: the peninsula of Tangier, the Atlantic and the Eastern Moroccan coast (Fig. 4). In the Capsian area Neolithic innovations do not appear before the 5th millennium calBC (Lubell 1984, 54).

Although archaeological research on the Tangier peninsula started just as early as in the Oran region (caves of el Khril, Buchet 1907; Grotte des Idoles, Buchet 1907; Koehler 1931), we possess a good data base. The stratigraphies and archaeological assemblages of the Mugharet es-Safiya, Mugharet el Aliya and Mugharet el Khail were excavated by professional American archaeologists in the 1930's and 1940's (Hencken 1948; Howe 1949), with results adequately published by Gilman (1975). Furthermore, sites excavated earlier such as the Grotte el Khril C and the Kef That el Ghar near Tetouan (Tarradell 1954, 1955) have been re-investigated by the French Moroccan team of the „Mission préhistorique et paléontologique française au Maroc" since 1984 (Daugas et al. 1989, 1998). Several new sites such as Wadi Tahadart (Zych 2004), Boussaria (El Idrissi 2001) and Benzu (Ramos Muñoz & Bernal Casasola 2006) were also investigated.

Pottery and evidence for food production are the essential elements. Food production is proven by domesticated animals. From the Tangier area several faunal inventories have been studied. The bones of Mugharet el Aliya were was first identified by Glover M. Allen (Howe 1967, 181ff.) and the faunal remains of the other Ashakar caves by Camille Arambourg (Gilman 1975, 84ff.). Complemented by his own analyses of Gar Cahal, Boussaria and Kef Taht el Ghar, these results are summarised by Ouchaou (2004), who also synchronises the nomenclature of several species and smooths the progress of further research. Unfortunately radiometric dating is rare. Early

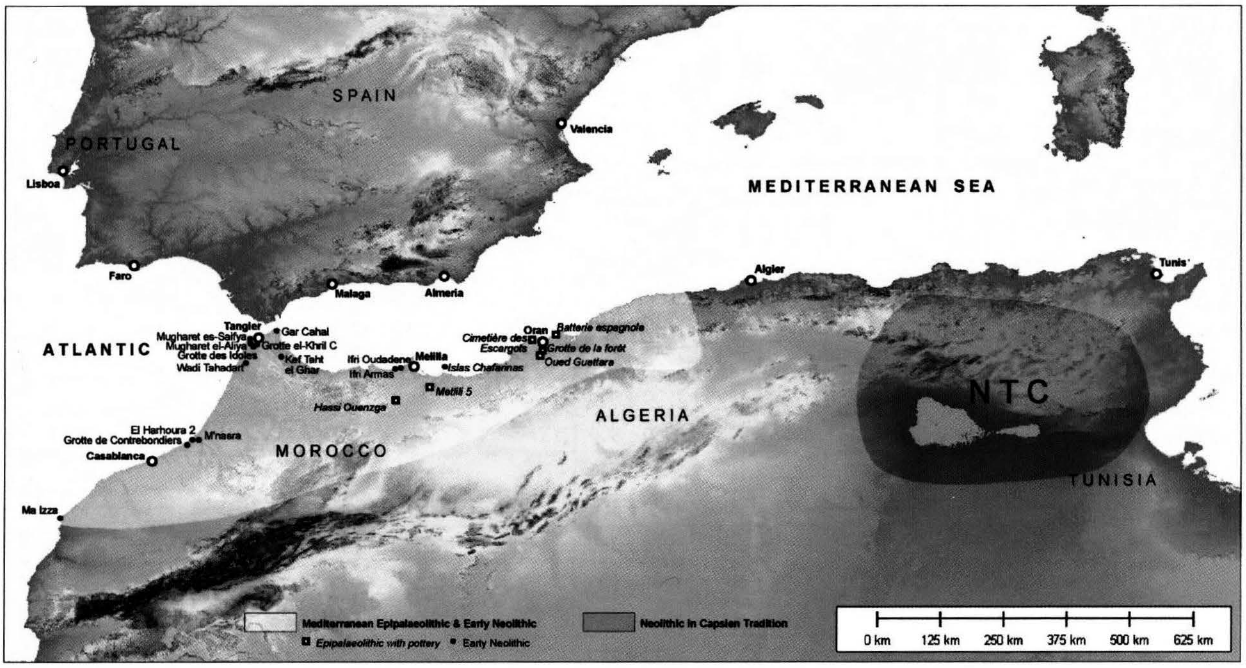

Fig. 4. Distribution of Early Neolithic and Epipalaeolithic with pottery sites in Northwest Africa (5,6 – 4,9 ka calBC).
Abb. 4. *Verteilung von Fundstellen des frühen Neolithikums und des Epipaläolithikums mit Keramik in Nordwest-Afrika (5,6 – 4,9 ka calBC).*

Neolithic data exist exclusively from Kef Taht el Ghar. Here sheep *(Ovis aries)* and goat *(Capra hircus)* appear first as domesticated species in layer F1 The underlying layer G is classified as Epipalaeolithic. Other domesticated species like pig *(Sus scrofa* f. *domestica)* and cattle *(Bos primigenius* f. *taurus)* follow in the above layer E.

Other inventories are classified generally as "Neolithic". At Mugharet el Khail and Mugharet el' Aliya sheep, cattle and pig appear together in the lowermost Neolithic layers H and 4 respectively. At Mugharet es Saifiya only sheep occurs in the lowermost layer E, while pig goat and cattle also appear in layer C. At Gar Cahal domesticated species appear in a sequence beginning with sheep and goat in layer V, via cattle in layer IV, to pig in layer IIIb. A similar record is known from the recently excavated site of Boussaria (El Idrissi 2001). Sheep and goat appear in the lowermost Neolithic layer 4a, while cattle and pig occur in the following layer 3c (Ouchaou 2004, Tab. 4). Domesticated species are present in most of the Neolithic inventories in the region (Gilman 1975, 86). At some sites the spectrum of domesticated species appears successively. Sheep and goat mark the beginning of the domestication process and are followed by cattle and pig.

Finds of cultivated plants are very rare and the oldest published finds of domesticated species have to be examined very critically (Daugas et al 1998, 350,). The authors assert the presence of domesticated *Triticum dicoccum*, *Triticum monococcum* and *Triticum aestivum/ Triticum durum* in a layer at Kef Taht el Ghar dated to 9 520 ± 235 calBC (Ly-7287: 9 910 ± 50 ^{14}C-BP, charcoal) and 9 375 ± 90 calBC (Ly-7695: ^{14}C-age 9 965 ± 75, charcoal). Because of these cereals the authors assign this layer a "Neolithic" character and name it "Néolithique ancien régional". Due to the early dating and the absence of pottery, the layer is mentioned above as Mediterranean Epipalaeolithic.

Ballouche & Marnival, having analysed the material, name it "initial Cardial" (2004, 78) and allocate it to between 7 000 and 5 450 BC (Ballouche & Marnival 2003, 50). This age, although still old, is more plausible considering the most recently published evidence for Mesolithic agriculture in Central Europe (Tinner et al. 2007) and Southern France (van Willigen 2006, 93ff.). Beside cereals Leguminosae such as vetch *(Lathyrus ochrus)* and fava beans *(Vicia fava)* are recorded.

In the following Cardial layer, dated between 5 450 BC and 4 350 BC, the amount of determined specimen decrease but *Triticum dicoccum*, *Triticum aestivum/ Triticum durum* as well as *Lathyrus ochrus* prove a Neolithic context. Although preservation of pollen is poor, the available data (nearly 3% cereal pollen in the Early Neolithic layer) seem to support the carpological analyses (Ballouche & Marnival 2004, 78)

The situation at the Atlantic coast is comparable to the Tangier peninsula but early Neolithic sites are less frequent. Archaeological research started early, with the excavation of the Grotte des Contrebandiers near Rabat (Roche 1969). Recently research was carried out by the Mission préhistorique et paléontologique française au Maroc (Daugas et al. 1989; Raynal et al 2004). Impressed pottery, classified by the respective author as early Neolithic is known from the sites of Harhoura 2 (Débénath & Sbihi-Alaoui 1979), Grotte

region	site	lab No.	^{14}C age	calBC	method	material	references
Atlantic	El Harhoura 1	Gif-5519	5400 ± 290	4234 ± 316	14C	bone	Débénath & Sbihi-Alaoui, 1979
		UBA-8084	5552 ± 36	4402 ± 37	14C	bone	this article
	El Harhoura 2	UQ 1601	5800 ± 150	4680 ± 170	14C	shell	Débénath & Sbihi-Alaoui, 1979
		Ly 2149	5980 ± 210	4900 ± 260	14C	bone	Débénath & Sbihi-Alaoui, 1979
Tangier	Wadi Tahadart	UQ 1556	5600 ± 200	4460 ± 220	14C	shell	Daugas et al. 1998
		Cle 122	6490 ± 560	4510 ± 560	TL	ceramics	Daugas et al. 1998
		Cle 123	5047 ± 580	3067 ± 580	TL	ceramics	Daugas et al. 1998
		Cle 124	6710 ± 510	4730 ± 510	TL	ceramics	Daugas et al. 1998
		Cle 125	6850 ± 520	4870 ± 520	TL	ceramics	Daugas et al. 1998
		Ox 726bII	5900 ± 800	3920 ± 800	OSL	sand	Daugas et al. 1998
		Ox 726aII	6200 ± 800	4220 ± 800	OSL	sand	Daugas et al. 1998
	Grotte de El Khril C	Rabat 119	5720 ± 114	4580 ± 120	14C	charcoal	Daugas et al. 1998
		Cle 118	6400 ± 500	4420 ± 500	TL	ceramics	Daugas et al. 1998
		Cle 119	5950 ± 350	3970 ± 350	TL	ceramics	Daugas et al. 1998
	Grotte des Idoles	Gif-A 92332	5630 ± 80	4480 ± 90	14C	charcoal	Daugas et al. 1998
		Cle 120	6900 ± 600	4920 ± 600	TL	ceramics	Daugas et al. 1998
	Kef Taht el Ghar	Ly 7288	6520 ± 120	5470 ± 110	14C	charcoal	Daugas et al. 1989
		Ly-971OxA	6350 ± 85	5336 ± 94	14C	grain	Ballouch & Marnival 2003
		Ly 3821	6050 ± 120	4990 ± 160	14C	charcoal	Daugas et al. 1989
		Cle 126	6780 ± 550	4800 ± 550	TL	ceramics	Daugas et al. 1998
		Cle 127	6350 ± 600	4370 ± 600	TL	ceramics	Daugas et al. 1998
		Cle 128	5800 ± 750	3820 ± 750	TL	ceramics	Daugas et al. 1998
		Cle 129	7200 ± 750	5220 ± 750	TL	ceramics	Daugas et al. 1998
Eastern Rif	Ifri Armas	Erl 9995	7106 ± 53	5979 ± 49	14C	charcoal	this article
		Erl 9996	6739 ± 52	5659 ± 39	14C	charcoal	this article
		UBA-8082	5989 ±33	4884 ± 44	14C	bone	this article
	Ifri Oudadane	Erl 9987	5756 ± 48	4614 ± 61	14C	charcoal	this article
		Erl 9988	6175 ± 50	5131 ± 70	14C	charcoal	this article
		Erl 9989	6053 ± 50	4957 ± 70	14C	charcoal	this article
	Islas Chafarinas	KIA 17373	5600 ± 30	4420 ± 40	14C	charcoal	Bellver Garrido & Bravo Nieto 2004

Fig. 5. ^{14}C-data of the Neolithic sites. The ^{14}C-ages are calibrated using the CalPal program (Bernhard Weninger, University of Cologne, www.calpal.de).

Abb. 5. *^{14}C-Daten neolithischer Fundstellen. Die ^{14}C-Daten wurden mit dem Programm CalPal kalibriert (Bernhard Weninger, Universität Köln, www.calpal.de).*

des Contrebandiers (Daugas et al. 1998) and Grotte d'El M'nasra (Lacombe et al. 1991).

The first investigations of coastal sites in eastern Morocco were undertaken by Spanish archaeologists at the Chafarinas Islands near the Moulouya delta (Bellver Garrido & Bravo Nieto 2003). The open air sites excavated here record a Neolithic population using a broad variety of resources, such as the hunting of marine and terrestrial mammals, fishing, collection of molluscs and keeping livestock. The only proven domestic species is sheep (Bellver Garrido & Bravo Nieto 2003, 82). The ceramic finds are decorated in various styles, including cardial impressions. For all these sites only one reliable ^{14}C date of 4 422 ± 37 calBC (KIA-17373: ^{14}C-age 5 600 ± 30 BP, charcoal) is available (Fig. 5), but the appearance of Cardial pottery suggests a previous occupation in early Neolithic times.

The earliest ^{14}C dates come from excavations in progress (Fig. 5). At the moment the German-Moroccan "Rif oriental" project is excavating three cave sites west of Mellila, in the immediate vicinity of the Oued Kert delta. The three sites, Ifri Ouzabor, Ifri Odadane and Ifri Armas, have yielded Early Neolithic inventories (Linstädter in press). At Ifri Armas, layers with impressed and incised decorated pottery are dated by two ^{14}C ages of 5 659 ± 39 calBC (Erl-9996: ^{14}C age 6 739 ± 52, charcoal) and 5 979 ± 49 calBC (Erl-9995: ^{14}C age 7 106 ± 53, charcoal). These very early ages need careful evaluation and are a serious challenge for existing models about the dispersion of Neolithic innovations. The archaeozoological analyses

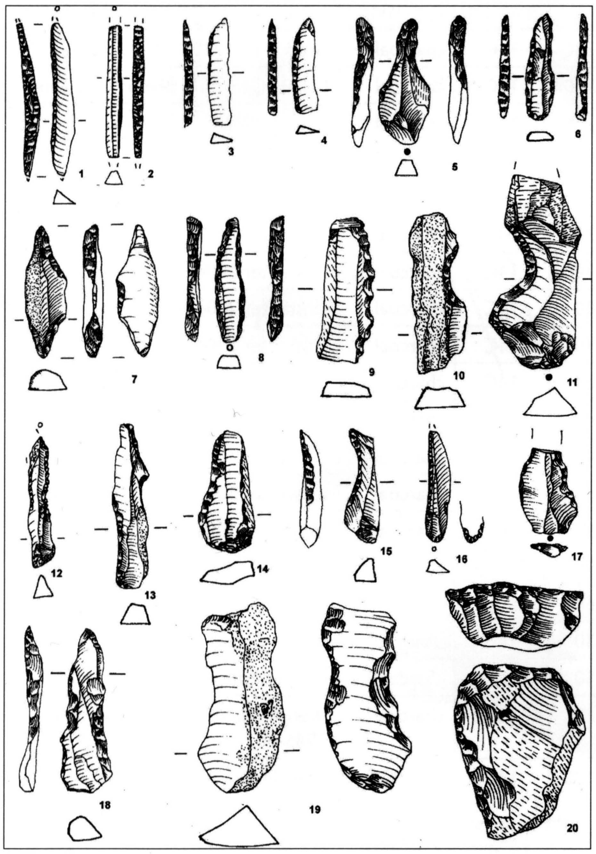

Fig. 6. Lithic tools from Epipalaeolithic with pottery site of Hassi Ouenzga, Eastern Rif, Morocco (after Linstädter 2004). 1-4 backed bladelets, 5-8 perforators, 9 denticulated blade, 10-11 notched pieces, 12-19 edge retouched pieces, 20 scraper.

Abb. 6. *Steingeräte des Epipaläolithikums mit Keramik in Hassi Ouenzga, Östliches Rif, Marokko (nach Linstädter 2004). 1-4 Rückenmesser, 5-8 Bohrer, 9 gezähnte Klinge, 10-11 gekerbtes Stück, 12-19 Stücke mit Kantenretusche, 20 Kratzer.*

of cave sites excavated in 2006 and 2007 are still in progress, but it seems that domestic animals like cattle, sheep, goat and pig, as well as dog, occur together in the early Neolithic layers (pers. comm. Hubert Berke, Cologne).

Epipalaeolithic with Pottery (5,6–4,9 ka calBC)

Ceramic bearing sites in the region of Oran, such as Columnata, the Oujda Mountain and the Eastern Rif, including the lower Moulouya valley, have long been labelled as Neolithic because of their pottery. However, recent research in the Eastern Rif and the evaluation of the older material show that these sites, dated to the second half of the 6th millennium calBC, were probably occupied by hunter-gather groups. Analysis of their lithic material demonstrates the Epipalaeolithic tradition of these groups (Fig. 6). To distinguish these sites from sites of the fully Neolithic groups as described above, we here refer to them as Epipalaeolithic with pottery. Unfortunately, as mentioned above, this term has been used earlier for sites and inventories with pottery considered to be older than the second half of the 6th millennium calBC. These inventories shall be discussed now.

One of the most famous sites of this group is the cave of Oued Guettara (Camps 1967). Layer V, superposed by three Neolithic layers (Camps 1974, 263), is dated to 8 240 ± 230 BC (Lab. code unknown). On the basis of the stone tool inventory, Camps labels this layer as „Post-Ibéromaurusien". A coarse undecorated vessel with pointed base belongs to this layer. Another example is the open air shell midden of Chemin de Kristel. Besides some backed bladelets, scrapers, perforators and notched bladelets (Goetz 1964, 523ff., Abb. 12), some undecorated potsherds were found. The site is dated to 6 703 ± 235 BC (Alg-40: ^{14}C age 7 760 ± 190, shell).

Another site is Bou Aichem (Goetz 1967; Nehren 1992, 225), with a rich Epipalaeolithic tool kit, including backed bladelets, scrapers, notched pieces and geometric microliths. Altogether, 25 sherds were found, only two of them during the excavation. These sherds are undecorated, friable and without recognisable temper. The other sherds (surface finds) are better fired and decorated with plastic applications and finger impressions (Goetz 1967, 19). The chronology of the site is highly controversial. Two radiocarbon dates exist, but they are not reliable due to their high standard deviations: 8 265 ± 400 calBC and 7 750 ± 400 calBC. The excavator classifies the site as "Neolithic".

We complete this discussion by a brief mention of the site of Ma Izza (Berthélémy & Accart 1987) which, until now, marks the south-western limit of the Mediterranean Epipalaeolithic (see Fig.1). Unfortunately no ^{14}C data exist for the site. The lower part of the stratigraphy (layer B) is interpreted as Iberomaurusian, superimposed by two layers (A1 & A2) with pottery. Some of the sherds are decorated with Cardium impressions (Berthélémy & Accart 1987, 77, Abb. 3). The lithic material from all layers barely differs (Berthélémy & Accart 1987, Tab. 1). The situation could mean that the site may have been occupied by local Epipalaeolithic groups that received pottery at a latter stage of occupation.

Archaeological investigations in the Oran region already started in the late 19th (Pallary 1893, 1896, 1900) and early 20th century (Doumergue 1921), while sporadic excavations were also carried out in the middle of the last century (Goetz 1964, 1967; Roubet 1955; Camps 1966, 1967, 1974). With the exception of ceramic analyses by Aumassip (1971) recent research is lacking and ^{14}C dates are scarce. The current state of research is discussed in Linstädter (2004, 43ff.). Most famous are the two open air sites of Batterie Espagnole and Cimetière des Escargots, as well as the caves of Grotte de la Forêt, Grotte de la Guethna, Grotte de Troglodytes, Grotte du Cuartel, Grotte du

region	site	lab No.	^{14}C age	calBC	method	material	references
Oran	Cimetière des Escargots	Gif 463	6680 ± 300	5600 ± 280	14C	charcoal	Grébénart 1970
	Oued Guettara		6810 ± 330	5720 ± 300	14C	charcoal	Bellver Garrido & Bravo Nieto 2004
	Columnata		6850 ± 300	5771 ± 265	14C	charcoal	Camps 1966
			6800 ± 150	5724 ± 135	14C	charcoal	Camps 1966
			6340 ± 300	5227 ± 309	14C	charcoal	Camps 1966
Eastern Rif	Hassi Ouenzga	Bln 4956	6035 ± 47	4930 ± 70	14C	charcoal	Linstädter 2004
		UtC 6185	6230 ± 70	5180 ± 100	14C	charcoal	Linstädter 2004
		KIA 437	6240 ± 40	5200 ± 80	14C	charcoal	Linstädter 2004
		KIA 436	6270 ± 40	5260 ± 40	14C	charcoal	Linstädter 2004
		UtC 6186	6378 ± 44	5380 ± 60	14C	charcoal	Linstädter 2004
		UtC 6187	6540 ± 50	5510 ± 40	14C	charcoal	Linstädter 2004
		Bln 4957	6611 ± 40	5560 ± 40	14C	charcoal	Linstädter 2004
		Bln 4913	6683 ± 48	5600 ± 40	14C	charcoal	Linstädter 2004
		KIA 434	6710 ± 50	5630 ± 50	14C	charcoal	Linstädter 2004
	Mtlili 5	KIA 31002	6110 ± 35	5080 ± 90	14C	charcoal	not published
		KIA 31001	6020 ± 40	4920 ± 60	14C	charcoal	not published
		KIA 31008	5880 ± 30	4760 ± 30	14C	charcoal	not published
	Mtlili 6	KIA 31003	5840 ± 35	4710 ± 50	14C	charcoal	not published
Oujda	Jorf Akhdar (Oued Isly)	Gif 6493	5080 ± 70	3870 ± 80	14C	charcoal	Wengler & Vernet 1992; Wengler 1985-86
		Gif 6923	5870 ± 100	4740 ± 130	14C	charcoal	Wengler & Vernet 1992; Wengler 1985-86
		Gif 6879	5700 ± 70	4560 ± 90	14C	charcoal	Wengler & Vernet 1992; Wengler 1985-86
		Gif 6494	5930 ± 80	4820 ± 100	14C	charcoal	Wengler & Vernet 1992; Wengler 1985-86
		Gif 7684	5760 ± 80	4610 ± 90	14C	charcoal	Wengler & Vernet 1992; Wengler 1985-86
	Grotte du Rhafas	Gif 6185	5190 ± 100	4013 ± 159	14C	charcoal	Wengler & Vernet 1992; Wengler 1983-84b,1985-86

Fig. 7. ^{14}C-data of the Epipalaeolithic with pottery sites. The ^{14}C-ages are calibrated using the CalPal program (Bernhard Weninger, University of Cologne, www.calpal.de).

Abb. 7. *^{14}C-Daten der Fundstellen des Epipaläolithikums mit Keramik. Die ^{14}C-Daten wurden mit dem Programm CalPal kalibriert (Bernhard Weninger, Universität Köln, www.calpal.de).*

Polygone and Grotte du Ciel Ouvert in the Gebel Murdjadjo region.

Most of the sites known today from the region of Oujda, between the Moulouya and the Algerian Border, were discovered and examined by B. und L. Wengler in the 1970's and 1980's. The most important sites are the Grotte d'El Heriga (Wengler 1983/84, 86), Abri Rhirane (Wengler & Wengler 1979/80, Wengler 1985), Jorf Akhdar, Oued Ben Séguir, Grotte de Rhafas, Oued Béni Méliarene and Jorf el Annaga (Wengler & Vernet 1992). According to available ^{14}C dates (Fig. 7), occupation of the sites is demonstrated since about 4 ka cal BC (Grotte de Rhafas, 4 013 ± 159 calBC, Gif-6185: ^{14}C age 5 190 ± 100 BP, charcoal, Wengler et al. 1989, 513). Rare finds of pottery from sites like Grotte d'El Heriga, Jorf el Annaga, Grotte de Rhafas (Wengler et al. 1989, Fig.9) show strong similarities to the Early Neolithic incised pottery of the Oran region and to Hassi Ouenzga (Linstädter 2004, Fig.58), which dates to the 6th millennium calBC.

In the Eastern Rif (Morocco) research on sites of this period only started very recently (Mikdad et al. 2000). With respect to the focus of research in this paper the single most important site is the shelter and open air site of Hassi Ouenzga, which has yielded archaeological material from the Late Iberomaurusian up to the Final Neolithic. The Late Iberomaurusian was excavated in 2003 at an open air site, with ^{14}C dates between 12,0 - 9,5 ka calBC. The Epipalaeolithic occupation of the site is defined by two dates. The older one of 8 614 ± 91 calBC (Erl-9993: ^{14}C age 9 350 ± 65 BP, charcoal) belongs to a layer of the open air site, and the younger one 6 857 ± 133 calBC (KIA-433: ^{14}C age 7 930 ± 30 BP, charcoal) dates a layer within the shelter, which was excavated in 1996 and 1997. Whereas the material from the open air site is still under study (Holzkämper in prep.), the inventory of the rock shelter is already published (Mikdad 1997;

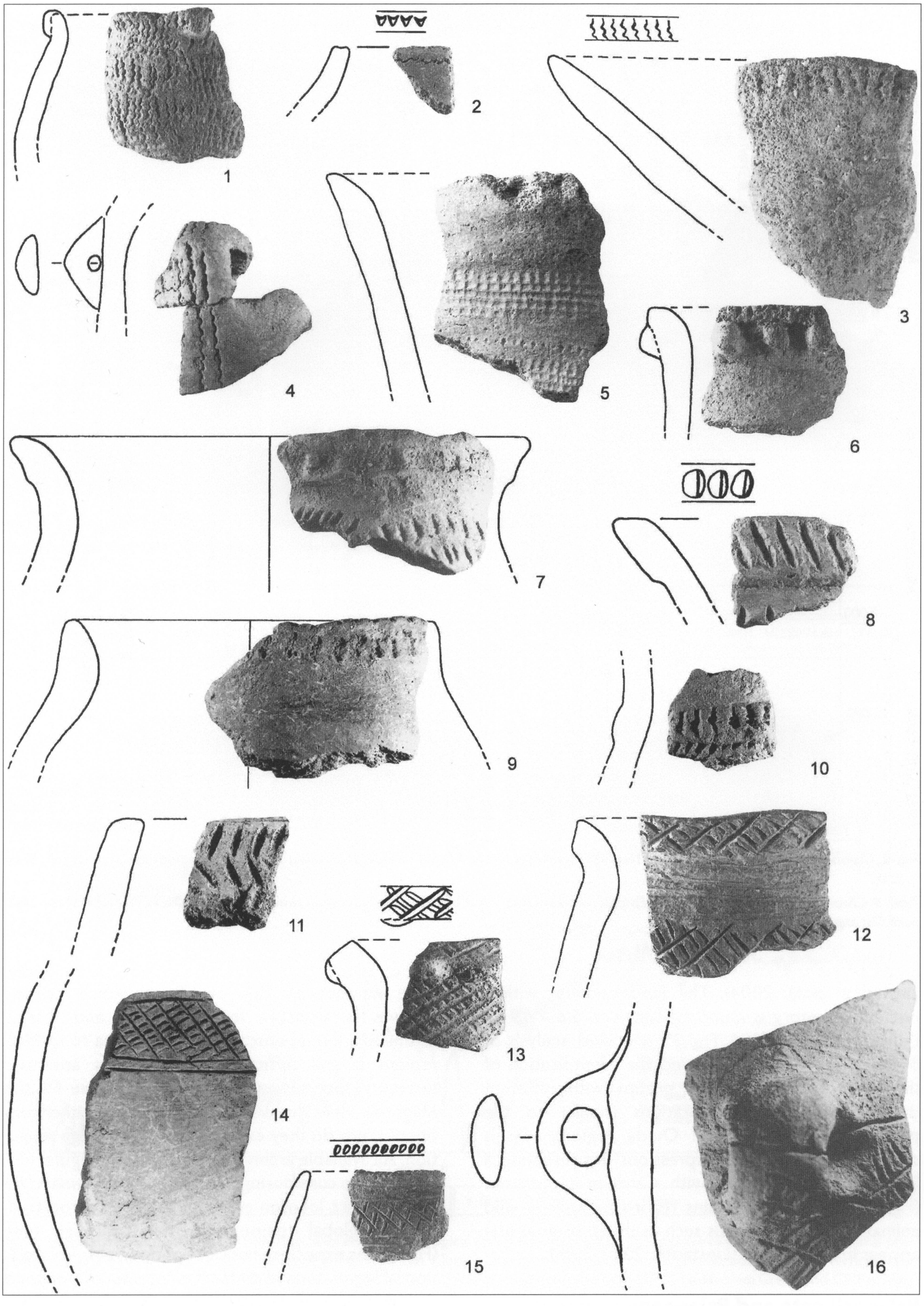

Fig. 8. Pottery from Epipalaeolithic with pottery site of Hassi Ouenzga Abri (Northeast Morocco). 1-4 *Cardium* impressions, 5-11 impressions of various tools, 12-19 incised decorations.

Abb. 8. *Keramik aus der Epipaläolithikum mit Keramik Fundstelle von Hassi Ouenzga Abri (Nordost-Marokko). 1-4* Cardium*-Verzierung, 5-11 Abdrücke verschiedener Werkzeuge, 12-19 Ritzverzierungen.*

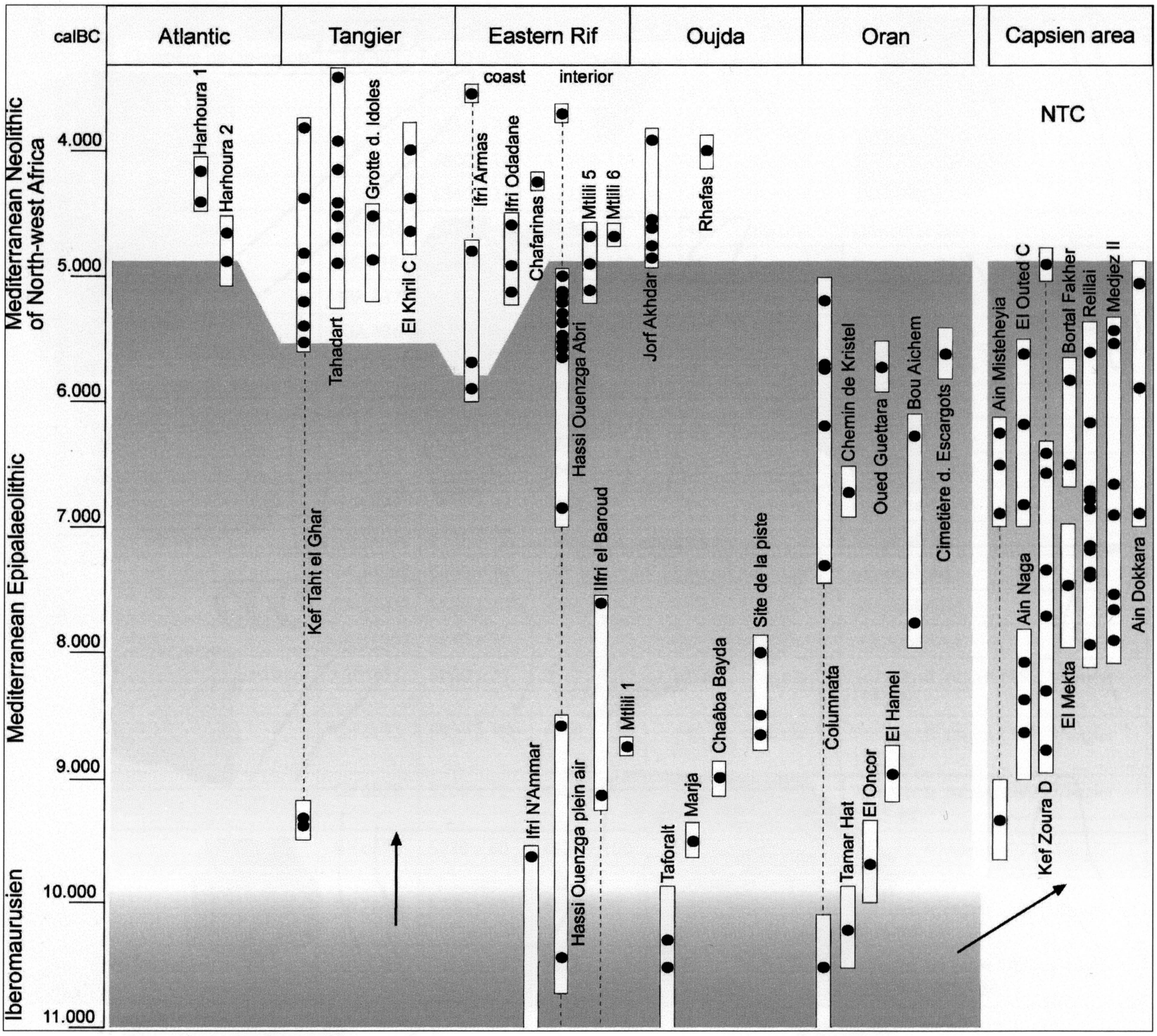

Fig. 9. Chronology of the Epipalaeolithic-Neolithic transition in the Mediterranean Northwest Africa. The regions are sorted from West to East.

Abb. 9. *Chronologie des Übergangs vom Epipaläolithikum zum Neolithikum im Mediterranen Nordwest-Afrika. Die Regionen sind von West nach Ost angeordnet.*

Linstädter 2003, 2004). The Epipalaeolithic with a pottery inventory is dated by between 5,6 - 4,9 ka calBC (Linstädter 2004, Fig. 31). Detailed analysis of 314 pottery fragments allowed the identification of three synchronous ceramic groups with different decorations: incised decorations (similar to the pottery in the Oran and Oujda region), vessels decorated with various impressions (representing a local style) and pottery with *Cardium* impressions (Fig. 8). The faunal remains record exclusively wild animals. Domestic animals such as sheep or goat first appear in later phases (Linstädter 2004, 73ff.).

Palaeoclimate and Palaeoenvironment

Interpretations of patterns of distribution of sites in time and space (Fig. 9) need to consider environmental conditions in Northwest Africa. Although a large number of high resolution global climatic archives is available from ice-cores and marine sediments, the downscaling of these data to specific regions is still difficult. In most cases adequate terrestrial archives are missing. This is true for the Maghreb. Here the available archives are neither continuous, nor do they exhibit the requisite high resolution. All available archives are displayed in figure 10.

Polar ice core borings such as GRIP *(Greenland Ice Core Project,* Johnson et al. 2001) allow a reconstruction of global temperature shifts through time (Fig. 11). As expected, the curve shows a good correlation of higher temperatures (Bølling and Allerød) and the increase of archaeological data in the late Iberomaurusian. During the Younger Dryas a decrease of data is recorded. The following increase of temperature in the 10th millennium calBC coincides with the earliest dates of the Mediterranean Epipalaeolithic.

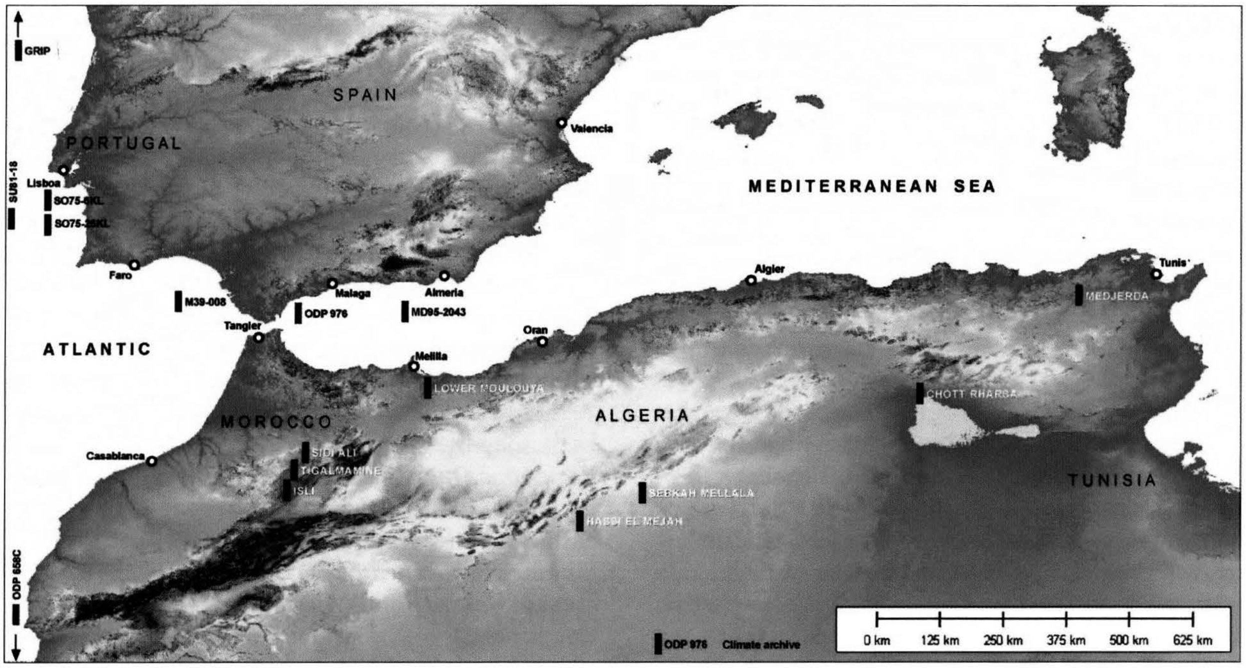

Fig. 10. Distribution of climate- and environmental archives mentioned in the text.

Abb. 10. *Verteilung der im Text erwähnten Umwelt- und Klimaarchive.*

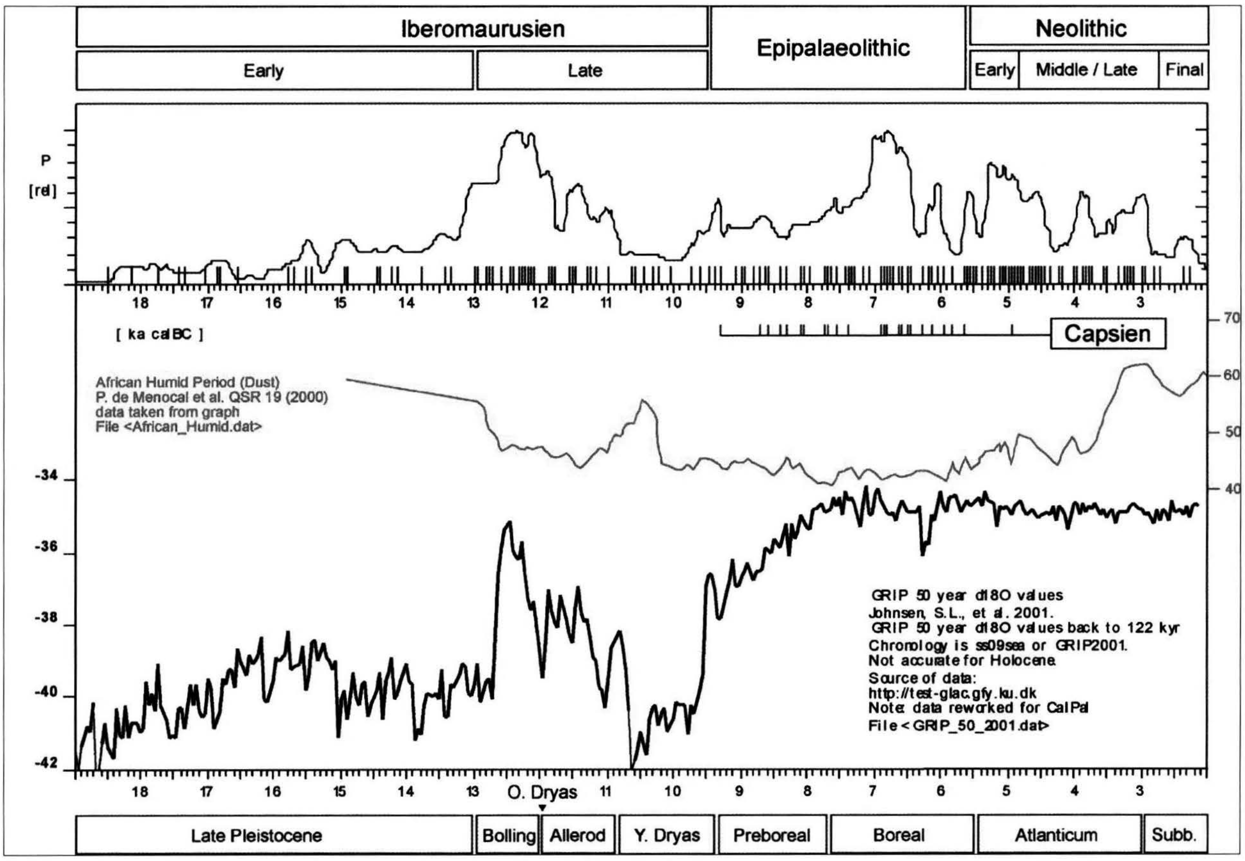

Fig. 11. Cumulative frequency plot of tree-ring calibrated archaeological radiocarbon ages. The ^{14}C-ages are calibrated using the CalPal program (Bernhard Weninger, University of Cologne, www.calpal.de). Climate data shown in context (lower graphic box) are flux of terrigenuous dust measured in ocean core ODP 658C (de Menocal et al. 2000), and stable oxygen isotope ratio ($\delta^{18}O$) values from Greenland GRIP drilling using GRIPss09sea age model (Johnson et al. 2001).

Abb. 11. *Kumulative Häufigkeitsverteilung kalibrierter ^{14}C-Daten. Die ^{14}C-Daten wurden mit dem Programm CalPal kalibriert (Bernhard Weninger, University of Cologne, www.calpal.de). Zusätzlich sind im unteren Bereich der Grafik folgende Klimaproxys abgebildet: der Saharastaubeintrag im Atlantik vor der Mauritanischen Küste, Bohrkern ODP 658C (deMenocal et al. 2000) als Anzeiger für Feuchtigkeitsschwankungen und das Sauerstoffisotopenverhältnis ($\delta^{18}O$) in GRIP, mit Hilfe des GRIPss09sea age model datiert (Johnson et al. 2001) als Index für Temperaturänderungen.*

Similar observations can be made on the base of marine cores from the Atlantic and Mediterranean (Cacho et al. 2001). Mediterranean surface temperature (SST) over the last 25 kyr has been reconstructed and records a high sensitivity of the Mediterranean to short-term climatic changes in the North Atlantic. In all cores the transition from the Younger Dryas to the Holocene is marked by increasing SST. The core (MD-2043) from the Alboran Sea between Southern Spain and Morocco displays a temperature maximum between 9,5 - 8 ka calBC, which corresponds to the beginning of the Epipalaeolithic. From 8 ka calBC onwards a general cooling to present day can be observed (Cacho et al. 2001, 50). In the nearby core ODP 976, for which pollen analysis is available, the same transition is apparently marked by a decrease of steppic grass species like *Artemisia* and Chenopodiacea as well as an increase of the taxa of deciduous forest such as *Quercus* (Combourieu-Nebout et al. 1999, 465).

One approach to reconstructing the variability of precipitation in prehistoric times is by measuring terregeneous dust influx in marine deposits. Saharan dust is accumulated in deep sea sediments of the Mediterranean, in particular the Alboran Sea (Moreno et al. 2002), as well as in the Atlantic Sea, close to the West African coast (deMenocal et al. 2000). The dust is blown out of areas with low vegetation cover, lifted to mid-troposphere levels by surface turbulence associated with monsoonal frontal systems and then transported in a westerly direction by the African Easterly Jet (deMenocal et al. 2000, 349). While a high dust influx indicates scarce vegetation cover, a low influx should indicate a more or less closed vegetation cover and therefore more humid conditions. The record of the ODP site 658C off Cap Blanc, Mauritania shows a well defined period of low dust influx between 16 – 4,3 ka calBC. This period correlates with a phase for which other proxies, notably pollen analysis (Combourieu-Nebout et al. 1999), also record a more humid environment. This phase is so far best known as the African Humid Phase but in earlier studies has also been titled the early to mid-Holocene humid episode (Ritchie et al. 1985, 352). How this period of much better environmental conditions progresses is not entirely understood, due to the complexity of the interacting earth-ocean-atmospheric subsystems. Our current knowledge is that during the early Holocene the higher solar insolation associated with the earth's orbital position and, notably, the angle towards the sun, induced increased summer monsoon precipitation that penetrated deep into the North African interior. Increased surface water on the continent, in combination with a denser vegetation cover, can produce land-surface feedbacks that further increase the precipitation already enhanced by orbital radiation forcing (deMenocal et al. 2000, 357).

Limnic archives for the Eastern Maghreb are known from three lakes in the Middle Atlas: Sidi Ali (Barker et al. 1994), Isly and Tigalmamine (Lamb et al. 1989). One of the most cited sites is Tigalmamine. The lake is situated about 100 km south of Meknes and approx. 1 626 m asl. From core M86 continuous data are available for mineralogy, stable isotopes, pollen, diatom and mollusc dating between 10,5 ka calBC and 300 calAD (Lamb et al 1995, 402). The data record a set of shorter climatic shifts, which had no obvious impact on the vegetation (Lamb et al 1995, 406). Comparable to the pollen data of the ODP 976 (Combourieu-Nebout et al. 1999), the Pleistocene-Holocene transition is marked by a decrease of *Artemisia* and Chenopodiacea and an increase of oak, both the evergreen *Quercus rotundifolia* and the deciduous *Quercus canariensis*.

In later periods differences between the eastern and western Maghreb are probable. Pollen data from Tunisia show increasing aridity and for the coastal areas of Morocco and Algeria a decrease of precipitation is noted, with a tendency towards cooling. Such circumstances would be favourable for vegetation and may support a gradual succession of environmental conditions also favourable to humans. At about 5,0 ka calBC the deciduous *Quercus canariensis* begins to dominate over the evergreen *Quercus rotundifolia*. Around 3,0 ka calBC a remarkable increase of cedar is recorded. The disappearance of trees accompanied by an increase of *Artemisia* around 800 calAD is interpreted as a result of increasing human impact on the landscape (Lamb et al 1995, 406). Different environmental developments in the Middle Atlas region probably depend on its altitude of more than 1 600 m asl. Today, this region receives an annual precipitation of around 930 mm/a, which is significantly higher than in the semi-arid areas of the Eastern Rif.

Two further terrestrial archives are available from the Algerian northern Sahara rim (Gasse 2000). This area was occupied by hunter-gatherers of the Upper Capsian. The site of Sebkha Mellala displays lacustrine phases between 10,0 - 4,5 ka calBC and a desiccation phase between 7,5 – 7,0 ka calBC (Gasse et al. 1990). The Hassi el Mejah lakebasin is occupied by shallow bodies of water between 11,0 - 1,6 ka calBC (Gasse et al. 1987). In sum, these data indicate a water supply for Capsian groups even in remote areas, at least on a seasonal basis.

The Tunisian record of Chott Rharsa shows the already described Holocene tendency to more arid conditions accompanied by cycles of higher water levels (similar to the beginning of the Holocene around 9,5 ka calBC) even at such a late period as 5,8 and 3,8 ka calBC (Swezey et al. 1999, 144). In general, there is good correlation with other archives from Northern Africa. Chott Rharsa itself is situated at the centre of the Capsian area and its proxies are a good reference for the environmental conditions during the Capsian.

Other important terrestrial archives are fluvial deposits. In our study region investigations have been undertaken in northern Tunisia (Faust et al. 2004) as well as eastern Morocco (Barathon et al. 2000). Even though the studied fluvial deposits are not very old and often discontinuous and difficult to interpret, the results of these North African case studies allow correlations with data from marine cores and regional limnic deposits. In the lacustrine and fluvial systems, the onset of the Holocene is poorly documented, but the deposits confirm favourable conditions during the early Holocene by their low sedimentation rates and by soil formation processes. Both features indicate an intact vegetation cover. From the mid-Holocene onwards a trend to more arid conditions is visible in the fluvial deposits. A good example is the Tunisian Medjerda River which records an increase of sedimentation between 4,5 - 4 ka calBC. We interpret this as evidence for a brief dry phase (Zielhofer & Linstädter 2006). The particular advantage of alluvial deposits is expressed by their occasional stratigraphical connection with archaeological sites, which allows direct study of correlations between geomorphologic parameters and changes in the archaeological material.

Discussion

As noted above, the Iberomaurusian ends in the 10th millennium calBC. At the same time, the formation of major cave deposits comes to an end. The archaeological record becomes less common in the area of the former Iberomaurusian, but traces of its continuation are recorded by some sites classified as Mediterranean Epipalaeolithic. In addition, the northern rim of the Sahara (i.e. south of the traditional Iberomaurusian territory) is now occupied by the Capsian.

As shown in the previous chapter, the transformation of the Iberomaurusian into the Epipalaeolithic and the development of the Capsian correlate broadly with the onset of the Holocene, which is marked - not only in our study region - by an abrupt increase of temperature (Johnson et al. 2001; Cacho et al. 2001) and precipitation (deMenocal et al. 2000). The pollen data (Lamb et al. 1995; Combourieu-Nebout et al. 1999) illustrate afforestation in the Mediterranean zone and limnic archives demonstrate the existence of lakes in the semi-arid and arid zones to the south (Swezey et al. 1999; Gasse 2000).

Most current models of the transition from the Iberomaurusian to the Epipalaeolithic support the idea of continuity (Nehren 1992, 155ff.; Lubell & Sheppard 1997, 326; Rahmani 2004, 63ff.). A part of the former Iberomaurusian population remains in their territory, where they adapt to the changing environmental conditions (e.g. afforestation) and undergo a cultural transformation to the Mediterranean Epipalaeolithic. The environmental amelioration opens up new settlement areas in the south, where water is available at newly formed lakes. A part of the population adapts to the slightly dryer environment in the south, colonizes this area and forms the Capsian.

The chronology of this transition coincides with a major environmental shift at the beginning of the Holocene. The rapidly changing climatic system and corresponding environmental changes are the major driving forces for the Palaeolithic-Epipalaeolithic-transition. But is this interpretation also practicable for the Epipalaeolithic-Neolithic transition? As far as we know from the climate archives, environmental conditions are still highly favourable prior to the moderate cooling and distinct decrease of precipitation of the mid-Holocene. But the beginning of the Neolithic is much less pronounced in the environmental record in comparison to the onset of the Epipalaeolithic. The widely observable 8,2 ka calBP event - which probably had a strong impact on the neolithisation process in the Eastern Mediterranean (Weninger et al. 2006) - occurs about half a millennium prior to the time when the first Neolithic innovations arrive in the Maghreb. Therefore the major driving forces for the spread of farming into the Western Mediterranean are still unknown.

Conclusions

The period of the Northwest African Epipalaeolithic and Early Neolithic (9,5 – 4,9 ka calBC) correlates with favourable environmental conditions. The beginning of the period coincides with the onset of the Holocene. All climate archives show a considerable increase of temperature and precipitation with major impact on the landscape. This favourable phase ends in the fourth millennium with the end of the African Humid Period and the drying-up of the Sahara (Kuper & Kröpelin 2006). Cultural development can be described in four phases (Fig. 12):

1. End of the Iberomaurusian (~ 9,5 ka calBC, Fig. 12.1)

Several ^{14}C dates and the formation of massive cultural deposits (such as Ifri N'Ammar, Rif oriental; Moser 2003) allow the characterization of the Late Iberomaurusian. It corresponds to the Northern European Bølling and Allerød Interstadials. The following Younger Dryas is associated in Northwest Africa with a distinct decrease of archaeological data.

2. Mediterranean Epipalaeolithic and Capsian (~9,5–5 ka calBC, Fig. 12.2)

With the onset of the Holocene, major environmental as well as cultural changes take place. The increased precipitation of the African Humid Period allows occupation of the former hyper arid Sahara. The Iberomaurusian population split into two major units: One unit, which we call the Mediterranean Epipalaeolithic, remains in the traditional territory and adapts to

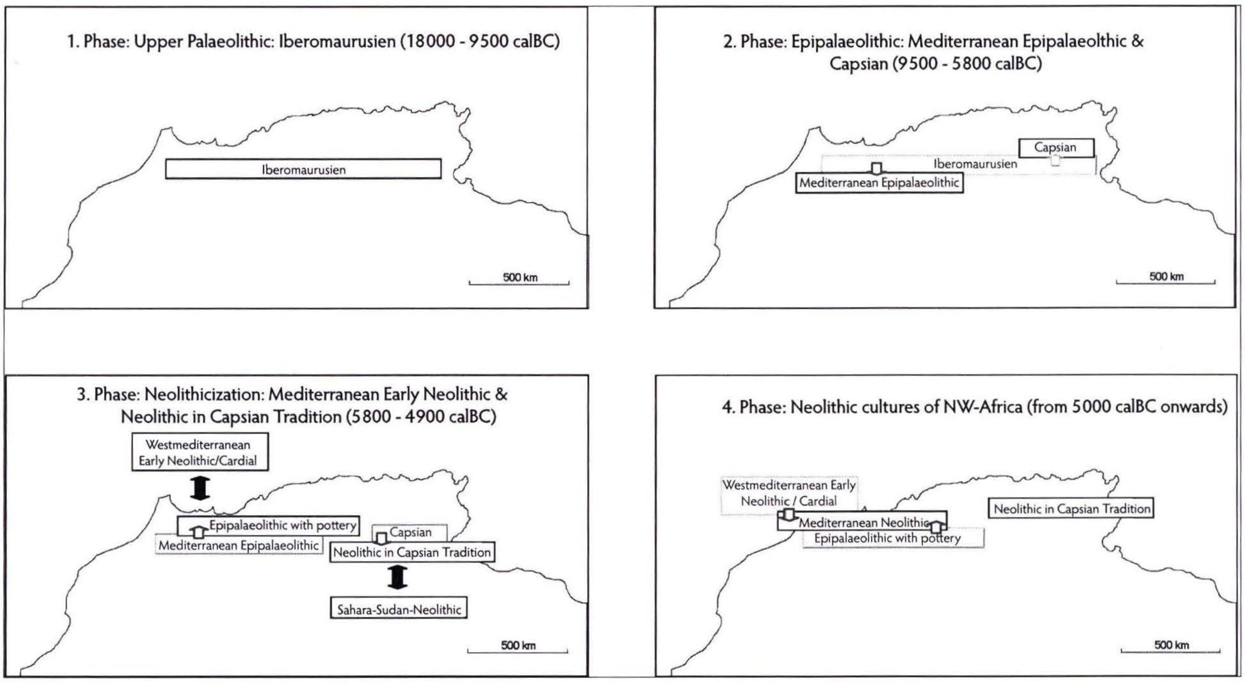

Fig. 12. Schematic model of cultural development in Northwest Africa between 10 ka – 4 ka calBC.
Abb. 12. *Schematisches Model der Kulturentwicklung im Mediterranen Nordwest-Afrika zwischen 10 ka – 4 ka calBC.*

changing environment (afforestation). The second unit, the Capsian, colonizes the previously semi-arid areas of the Northern Sahara. The Capsian can be subdivided into two contemporary complexes, well defined by differences in material culture: the Typical and the Upper Capsian. While the first complex is restricted to an area along the Algerian-Tunisian border, the latter spread over a much wider territory including the Tell-Atlas and parts of the Northern Sahara. The Upper Capsian population is characterised by a higher mobility recognisable in a more versatile use of raw material and a more efficient technology of stone tool production (Lubell & Sheppard 1997; Rahmani 2004). Around 5 ka calBC, the Capsian transforms into the so-called Neolithic with Capsian Tradition (NTI). This transition takes place under the influence of the neighbouring Neolithic cultures, the Mediterranean Neolithic in the northwest and the Saharan Neolithic in the south. How this process developed in detail needs further investigation.

The transition from the Iberomaurusian to the Mediterranean Epipalaeolithic remains elusive. Large cave sites are no longer recorded and in some regions traces of human occupation are so poor and difficult to distinguish, that previous researchers have sometimes supposed the existence of a gap in human occupation. A supra-regional cultural imprint is no longer recognizable and only isolated inventories with local features as the Columnatian are found. Major environmental changes such as afforestation can affect prehistoric land use, as has been repeatedly observed during the Central European transition from the Upper Palaeolithic (Magdalenian) to the Late Palaeolithic (Floss 1994, 332ff.). The corresponding gradual disappearance of the herds of large herbivores demands new subsistence and hunting strategies adapted to forest game. This means changes in mobility too. Corresponding modes of subsistence are described as collectors and foragers by Binford (1983). Collectors install long term residential camps (archaeologically well detectable) and move away for special activities like hunting and collecting (residential mobility). Foragers, in contrast, have to displace their residential camps when the resources of the local exploitation are exhausted (logistical mobility). Such displacements and corresponding temporary camps are much more difficult to detect. With some restrictions this model can be transferred to the situation in the Mediterranean Northwest Africa (Linstädter 2004, 153ff.) and might explain the scarcity of sites and inventories of the Mediterranean Epipalaeolithic.

3. Early Neolithic and Epipalaeolithic with pottery (5,8–4,9 ka calBC, Fig. 12.3)

The early Neolithic of the Mediterranean zone shares the favourable environmental conditions with the underlying Epipalaeolithic. But in contrast, its onset is not marked by noticeable environmental shifts.

On the basis of the economic data, the Mediterranean zone of the period can be divided into two areas: The Tangier Peninsula and the Mediterranean coast up to the Chafarinas Islands, and the interior of Eastern Morocco, including the Eastern Rif, the Moulouya and the Oujda region, as well as the Oranais.

The earliest Neolithic sites of Mediterranean Northwest Africa are scattered along the coastline. The societies of that area seem to display a full Neolithic subsistence, including heavy exploitation of marine resources. Domesticated animals are demonstrated for the Tangier region (Ouchaou 2004), the Chafarinas Islands (Bellver Garrido & Bravo Nieto 2003) and the cave sites of Ifri Oudadane and Ifri Armas west of Oued Kert (pers. comm. Hubert Berke, Cologne). The palaeobotanical record is still very poor but the analyses of Ballouche & Marnival (2004) confirm domesticated plants for the region. Decoration of the pottery is dominated by *Cardium* impressions, but belongs to very different traditions. The Tangier material has many parallels to the pottery of Catalonia, as Gilman (1975, 124) already points out, but the *Cardium* impressed pottery from coastal sites like Islas Chafarinas or Ifri Oudadane shows no parallels to Tangier, but rather to Andalusian sites. Comparable material comes, for example, from sites like Cueva de Nerja at Malaga (Pellicer & Acosta 1997) and Cabecicos negros, near Almeria (Camalich et al. 2004). A spread of Neolithic inventions according to the maritime pioneer model seems most likely. The origin of the Neolithic population is the Iberian coast, as can be recognised by the *Cardium* decorated pottery that clearly derives from this region. The Neolithic innovations find their way to Northern Africa by trans-continental contacts. However, the hypothesis that Tangier represents a bridgehead, and that all further distribution of the Neolithic package proceeds from here towards the east, as proposed e.g. by Roudil (1990), can no longer be supported due to the early date of the eastern Moroccan cave sites (e.g. Ifri Armas, Linstädter in press.).

For the second area of eastern Morocco and western Algeria, neither domestic animals nor plants are proved. Local hunter-gatherer populations, recognisable by their lithic industry, follow an Epipalaeolithic tradition. According to the dual model (e.g. van Willigen 2006) they adopt Neolithic innovations if required. This process starts with the production of pottery and continues later with the introduction of domesticated animals. Own styles of pottery decoration have been developed in the Epipalaeolithic context. For the typical incised decorations of the Oran region no comparable material is known (cf. Manen et al. 2007; Linstädter 2004). The most complex region seems to be eastern Morocco. At the site of Hassi Ouenzga several overlapping influences are recognisable: a) the presence of the Oran incised pottery, b) a pottery with impressed decorations showing a clearly local style (cf. the "Hassi Ouenzga Group" in Linstädter 2004, 129) and c) the pottery decoration continues to be influenced due to still existing contacts to Iberia, perhaps by a process that Manen et al. (2007) describe as transfer of know-how. This know-how transfer defers to pre-Neolithic networks between the Northwest African coast and Andalusia and probably results in a re-composition of the Neolithic package on the Iberian side, before it spreads further west to the Atlantic coasts of Africa and Europe (Manen et al. 2007).

4. Middle and Late Neolithic (Fig.12.4)

The internal development of the Neolithic still represents a major challenge. Huge cemeteries like Rouazi of El Kiffen are known from the Atlantic coast, but living sites are rare. In eastern Morocco some sites of the so-called "Néolithic moyen-recent" are known, but the material belonging to this phase is poorly defined. Further to the east, indicators for a cultural phenomenon we could describe as Middle Neolithic are unknown.

Acknowledgments: The author is very grateful to the Institut National des Sciences de l'Archéologie et du Patrimoine du Maroc and Mr. Abdesalam Mikdad for permissions to perform archaeological field-work, as well as for comprehensive support and co-operation in the field, and finally also for the permission to publish the results. I am also very thankful to the German Archaeological Institute and their representative, Dr. Josef Eiwanger, project leader and second director of the Kommission für die Archäologie Außereuropäischer Kulturen, Bonn, for all imaginable support. Furthermore the author thanks the two reviewers for the very meticulous reading of the manuscript and the various valuable comments.

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