Quaternary International xxx (2016) 1–11

Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

Defining the Early Neolithic of the Eastern Rif, Morocco – Spatial distribution, chronological framework and impact of environmental changes

J. Linstädter [a, *], M. Broich [b], B. Weninger [b]

[a] German Archaeological Institute, Commission for Archaeology of Non-European Cultures, Dürenstraße 35-37, 53173 Bonn, Germany
[b] Institute of Prehistoric Archaeology, University of Cologne, Weyertal 125, 50923 Cologne, Germany

ARTICLE INFO

Article history:
Available online xxx

Keywords:
Morocco
Epipalaeolithic
Early Neolithic
Land use pattern
Radiocarbon chronology
Holocene environment

ABSTRACT

We provide a detailed chronological framework for the Early Neolithic of the Eastern Rif of Morocco. Neolithic innovations such as pottery and domestic plants begin ca. 7.6 ka calBP, at which time plant cultivation is clearly documented for cereals (*Triticum monococcum/dicoccum*, *Triticum aestivum/durum*, *Hordeum vulgare*) and pulses (*Lens culinaris*, *Pisum sativum*, *Vicia faba*). This represents the earliest evidence for Africa as a whole. The Early Neolithic ends ca. 6.3 ka calBP and is marked by the definitive disappearance of *Cardium*-decorated pottery. The disintegration of the Early Neolithic dates to the interval 6.6–6.0 ka calBP, during which time a gradual desiccation of the Sahara has been observed. In the Eastern Rif of Morocco, Saharan influences become visible after 6.0 ka calBP. These are characterised by the presence of ivory objects and the appearance of comb-impressed pottery with so-called herringbone motives.

1. Introduction: the Neolithic transition in the Mediterranean regions of NW-Africa

The Neolithic transition in Mediterranean NW-Africa is very closely connected to the Neolithisation of the Western Mediterranean as a whole. Characteristic for the Western Mediterranean (wMed) mode of the Early Neolithic, as is well-known in southern France and the Iberian Peninsula, is the appearance of shell-decorated pottery and a high variability of subsistence strategies. In all regions of the wMed, the large river deltas serve as bridgehead for further Neolithisation of the hinterland (Perrin, 2008; Bernabeu Aubán and Martí Oliver, 2014).

Beyond sharing many of the European features of the wMed such as Cardium impressions, relief cordons, decorated handles and pointed bases, the Early Neolithic in NW-Africa has its own characteristic properties, represented by distinct pottery shapes and certain decorations (e.g. Hassi Ouenzga: Linstädter, 2004; El Zafrín: Rojo Guerra et al., 2010). According to ^{14}C-ages, the first appearance of Neolithic features in southern Spain and northeast Morocco seems to be contemporaneous (Linstädter et al., 2012a, 228). During the Neolithic transition in the eastern Rif at around 7.6 ka calBP, the area is inhabited by well adopted local hunter-gatherers, represented e.g. at Ifri Oudadane (Linstädter and Kehl, 2012), Hassi Ouenzga (Linstädter, 2004), Taoungat and Mtlili (Linstädter et al., 2012b) or Ifri n'Etsedda (Linstädter et al., 2016) whose lithic industries – based on bladelet productions – have deep roots in the late Pleistocene culture of the Iberomaurusian. The coexistence of food producing groups and late hunter-gatherers is evident at sites such as Ifri Oudadane and Hassi Ouenzga. The first can be classified as a pioneer site (BETA-295779: 6740 ± 50 BP, lentils), whereas the latter is characterized by a local group in clear Epipalaeolithic tradition nonetheless providing pottery. As already described and discussed extensively in Linstädter (2004, 2014) and Linstädter et al. (2012a) it can be assumed that Neolithic innovations reached the eastern Rif via West Mediterranean networks. Archaeological research throughout the Mediterranean, a DNA studies, and the fact that all domesticated species originate in the Near East indicate that Early Neolithic settlers coming from Tyrrhenian and French coasts feed Neolithic innovations into the above mentioned West Mediterranean networks. Local hunter-gatherers integrated these innovations step by step into their subsistence strategies. Furthermore, the appearance of such properties within western

* Corresponding author.
E-mail address: joerg.linstaedter@dainst.de (J. Linstädter).

http://dx.doi.org/10.1016/j.quaint.2016.07.042
1040-6182/

parts of the Iberian Peninsula suggests a cultural backflow from NW-Africa into the wMed via marine networks (Manen et al., 2007).

Following some twenty years of archaeological and palaeoenvironmental research, in the following we provide, (1) a detailed overview of the period during which active food production was established in NE-Morocco, (2) an up-to-date presentation of its chronological framework, (3) a description of its material culture, and finally, (4) a broader discussion of human–environment interaction during the Epipalaeolithic–Neolithic-transition. In our study region (Fig. 1), the earliest food production is indicated by the appearance of cereals and pulses at the coastal site of Ifri Oudadane, where it is securely dated to 7.6 ka calBP (Linstädter and Kehl, 2012; Morales et al., 2013). At the same site, and indeed in the same cultural layers, there is evidence for domesticated ovicaprides, to be published in the near future (Hutterer, pers. comm.). Evidence for plant cultivation is also available from the pollen record of Ifri n'Etsedda (Linstädter et al., 2016). Although the studies of the material culture are still partly ongoing, the pottery from the sites of Hassi Ouenzga (Linstädter, 2003, 2004), Ifri Armas (Lorenz, 2010), Ifri Oudadane (Linstädter and Wagner, 2013) and from the open air sites of the Lower Moulouya valley (Linstädter et al., 2012b), as well as the lithic industry from Ifri Oudadane (Linstädter et al., 2015) is already published. We can expect further insights into Epipalaeolithic and Early Neolithic lifestyles from ongoing studies of the rich bone industry, as well as into adornment production based on marine shells and ostrich egg shells. Already completed publications are devoted to dietary studies (Hutterer et al., 2014) and human–environment interactions (Zapata et al., 2013; Lehndorff et al., 2014). In the current paper, we present the radiocarbon-based chronology for the Neolithic transition in the Eastern Rif of Morocco, describe in detail the socio-cultural role of the different landforms within the study region, and for the first time discuss some geographic wider correlations of climate and environmental changes in NW-Africa during the Early Holocene.

2. Material & methods

2.1. Surveys & excavations in the Eastern Rif of Morocco

Systematic surveys in the Eastern Rif of Morocco (50 × 50 km) have allowed the discovery of ten previously unknown sites, with deposits from the period of Neolithic transition (Fig. 1). Altogether, over the last twenty years we have excavated 15 sites with Epipalaeolithic and Neolithic assemblages (Linstädter, 2014). This includes open air sites, mainly well preserved within alluvial deposits, as well as shelters. Some of these shelters such as Ifri Oudadane, Hassi Ouenzga, Taghit Haddouch and Ifri n'Etsedda provide both Epipalaeolithic as well as Neolithic deposits. All radiocarbon ages used in this study, including dated material and references, are listed in Table 1. In parallel to the archaeological excavations, particular focus was placed on the recovery of materials suitable for palaeoenvironment reconstruction. Beginning with the 2010 campaign, all excavated sediments underwent water flotation, which resulted in an enormous corpus of faunal and botanical materials, by which it was possible to establish the main food resources: plants (Morales et al., 2013, in press), animals, marine and terrestrial molluscs (Hutterer et al., 2011). The environmental program included taking samples for pollen (Zapata et al., 2013), sedimentological and geochemical analysis, as well as for molecular black carbon research (Lehndorff et al., 2014). Micromorphological studies provide detailed information on site formation processes (Linstädter and Kehl, 2012; Linstädter et al., 2016).

Table 1
List of ^{14}C-dates for Epipalaeolithic and Neolithic sites of the eastern Rif.

Lab code	Site	Culture	^{14}C-age [BP]	±1 σ [BP]	δ^{13}C [‰PDB]	Cal-age [calBP]	±68% [calBP]	Material	Reference	#
UtC-6184	Hassi Ouenzga Abri	LN	5029	47	−20,5	5780	160	Charcoal	Linstädter (2004)	1
COL-2120	Hassi Ouenzga Abri	EN	6022	52	−31,1	6870	140	Charcoal	This paper	2
Bln-4956	Hassi Ouenzga Abri	EN	6035	47	−21,7	6880	140	Charcoal	Linstädter (2004)	3
UtC-6185	Hassi Ouenzga Abri	EN	6230	70	−22	7130	200	Charcoal	Linstädter (2004)	4
KIA-437	Hassi Ouenzga Abri	EN	6240	40	−23	7150	160	Charcoal	Linstädter (2004)	5
KIA-436	Hassi Ouenzga Abri	EN	6270	40	−22,4	7200	80	Charcoal	Linstädter (2004)	6
UtC-6186	Hassi Ouenzga Abri	EN	6378	44	−23,4	7330	120	Charcoal	Linstädter (2004)	7
COL-2121	Hassi Ouenzga Abri	EN	6509	42	−22,4	7410	100	Charcoal	This paper	8
UtC-6187	Hassi Ouenzga Abri	EN	6540	50	−21,5	7460	80	Charcoal	Linstädter (2004)	9
Bln-4957	Hassi Ouenzga Abri	EN	6611	40	nd	7510	80	Charcoal	Linstädter (2004)	10
Bln-4913	Hassi Ouenzga Abri	EN	6683	48	−19,3	7550	80	Charcoal	Linstädter (2004)	11
KIA-434	Hassi Ouenzga Abri	EN	6710	50	−21,1	7570	100	Charcoal	Linstädter (2004)	12
KIA-433	Hassi Ouenzga Abri	EPI	7930	50	−17,5	8800	260	Charcoal	Linstädter (2004)	13
Erl-9993	Hassi Ouenzga Open Air	EPI	9350	65	−22,2	10,560	200	Charcoal	Linstädter et al. (2012a)	14
Erl-9991	Hassi Ouenzga Open Air	EPI	10,130	68	−22,1	11,740	380	Charcoal	Mikdad et al. (2000)	15
Bln-4756	Hassi Ouenzga Open Air	EPI	10,570	177	nd	12,400	480	Charcoal	Linstädter et al. (2012a)	16
Erl-9992	Hassi Ouenzga Open Air	IBM	10,643	73	−21,7	12,600	140	Charcoal	Linstädter et al. (2012a)	17
Erl-12422	Ifri Armas	LN	4798	108	−24,4	5500	260	Capra hircus	Lorenz (2010)	18
Erl-9994	Ifri Armas	LN	4916	47	−23,3	5660	100	Charcoal	Lorenz (2010)	19
UBA-8082	Ifri Armas	LN	5989	33	−19,3	6830	100	Bos taurus	Lorenz (2010)	20
Erl-9996	Ifri Armas	EN	6739	52	−23,3	7600	100	Charcoal	Lorenz (2010)	21
Erl-9995	Ifri Armas	EN	7106	53	−23,1	7920	120	Charcoal	Lorenz (2010)	22
KN-5969	Ifri Armas	IBM	10,670	80	0,84	12,620	120	Ostrea cf. Edulis	Lorenz (2010)	23
KIA-510-I	Ifri el Baroud	EPI	8290	40	−23	8300	180	Charcoal	This paper	24
Bln-4872	Ifri el Baroud	EPI	8556	52	−22,3	9530	60	Charcoal	Görsdorf and Eiwanger (2000)	25
Bln-4755	Ifri el Baroud	EPI	9677	60	−22,4	11,020	300	Charcoal	Görsdorf and Eiwanger (2000)	26
Erl-4394	Ifri n'Ammar	IBM	10,022	80		11,540	340	Charcoal	Moser (2003, 101)	27
COL-2373.1.1	Ifri n'Etsedda	EN	5326	38	−23,6	6100	140	Pistacia lentiscus	Linstädter et al. (2016)	28

Please cite this article in press as: Linstädter, J., et al., Defining the Early Neolithic of the Eastern Rif, Morocco – Spatial distribution, chronological framework and impact of environmental changes, Quaternary International (2016), http://dx.doi.org/10.1016/j.quaint.2016.07.042