Proceedings of the Seminar for Arabian Studies

Volume 38 2008

MBI Foundation

Archaeopress

Proceedings
of the
Seminar for Arabian Studies

Volume 38
2008

Papers from the forty-first meeting of the
Seminar for Arabian Studies
held in London, 19-21 July 2007

Seminar for Arabian Studies

Archaeopress
Oxford

Orders for copies of this volume of the *Proceedings* and of all back numbers should be sent to
Archaeopress, Gordon House, 276 Banbury Road, Oxford OX2 7ED, UK.
Tel/Fax +44-(0)1865-311914.
e-mail bar@archaeopress.com
http://www.archaeopress.com
For the availability of back issues see the Seminar's web site: www.arabianseminar.org.uk

Seminar for Arabian Studies
c/o the Department of the Middle East, The British Museum
London, WC1B 3DG, United Kingdom
e-mail seminar.arab@durham.ac.uk

Opinions expressed in papers published in the *Proceedings* are those of the authors and are not necessarily shared by the Editorial Committee.

Typesetting, Layout and Production: David Milson

The *Proceedings* is produced in the Times Semitic font, which was designed by Paul Bibire for the Seminar for Arabian Studies.

ISSN 0308-8421
ISBN 0-9539923-4-9

Proceedings of the Seminar for Arabian Studies 38 (2008): 153–172

Wādī aṭ-Ṭayyilah 3, a Neolithic and Pre-Neolithic occupation on the eastern Yemen Plateau, and its archaeofaunal information

Francesco G. Fedele

Summary

The stratified site WTH3, located at an altitude of 2025 m in the upper drainage of the Wādī aṭ-Ṭayyilah on the eastern highlands of Yemen, was found during surveys in 1984 and partially studied through detailed excavation in 1984–1986, within the activities of the Italian Archaeological Mission. This work confirmed its tentative attribution to the Neolithic and revealed a virtually unknown manifestation of the mid-Holocene occupation of highland Yemen. This Neolithic culture is aceramic (pottery makes its appearance on the Yemen Plateau during the Bronze Age) and is characterized by the occurrence of small-tool lithic components in association with certain recurrent stone features, including "enclosure" alignments and oval or elliptical "huts". The occupation at WTH3 is associated with mid-Holocene sediments that can be dated to the sixth–fifth millennia BC on the basis of pedology as well as a ^{14}C measurement on the soil's organic acids. A pilot study of the abundant lithic collection and the zooarchaeological analysis of the fauna has been completed, while the collation of the field records towards final publication is in progress. In this paper an up-to-date appraisal of the site and excavations is given, including a particular account of Neolithic economy as derived from the archaeofaunal information. WTH3 and similar sites on the eastern Plateau appear to be connected with cattle pastoralists, a picture that accords well with a milder, moister, greener mid-Holocene landscape.

Keywords: Yemen Plateau, Wādī aṭ-Ṭayyilah, Neolithic, mid-Holocene, pastoralism

Introduction

The purpose of this paper is to summarize and update information on the research programme carried out at Wādī aṭ-Ṭayyilah 3 (WTH3), (1) a Neolithic and Pre-Neolithic site in the eastern sector of the Yemen Plateau, between 1984 and 1986. Full publication of work conducted at the site has long been delayed, unfortunately, and only short interim reports and cursive evaluations have appeared in print (Fedele & Zaccara 2005, with references). However, WTH3 remains to this date one of the very few Neolithic settlements investigated on the Yemen Plateau in general, and continues to be mentioned in the occasional publications on the Neolithic of highland Yemen (e.g. Kallweit 1996). In addition, the site was excavated and recorded with exacting procedures, and as a consequence generated a very large controlled collection of lithic finds and a valuable sample of archaeofaunal material, the latter never reported in any detail. These facts and characteristics suggest that WTH3 still deserves to be brought to the consideration of a wider community of interested scholars. (2)

The Wādī aṭ-Ṭayyilah basin is located in the region of Khawlān at-Tiyāl, which together with Al-Hadā formed the core study area of the Italian Archaeological Mission between 1980 and 1990 (Fig. 1). The region includes a mosaic of mountains and small intermontane plains, with average annual precipitation of around 200 mm, as well as more dissected and barren fringes nearer the edge of the Plateau, above 2000 m in altitude. These uplands are scarred by wadis that eventually cut through the margin of the Plateau and disappear from escarpments into the vast stretches of semi-desert and desert to the east. The largest wadi system draining this part of the eastern Plateau is the Wādī Ḏanah, the very river course that flows down to Mārib and facilitated the florescence of the ancient Sabaean capital on the desert border. Both Wādī aṭ-Ṭayyilah and a fossil furrow nearby, An-Najd al-Abyad or "white valley", belong to the Wādī Ḏanah drainage.

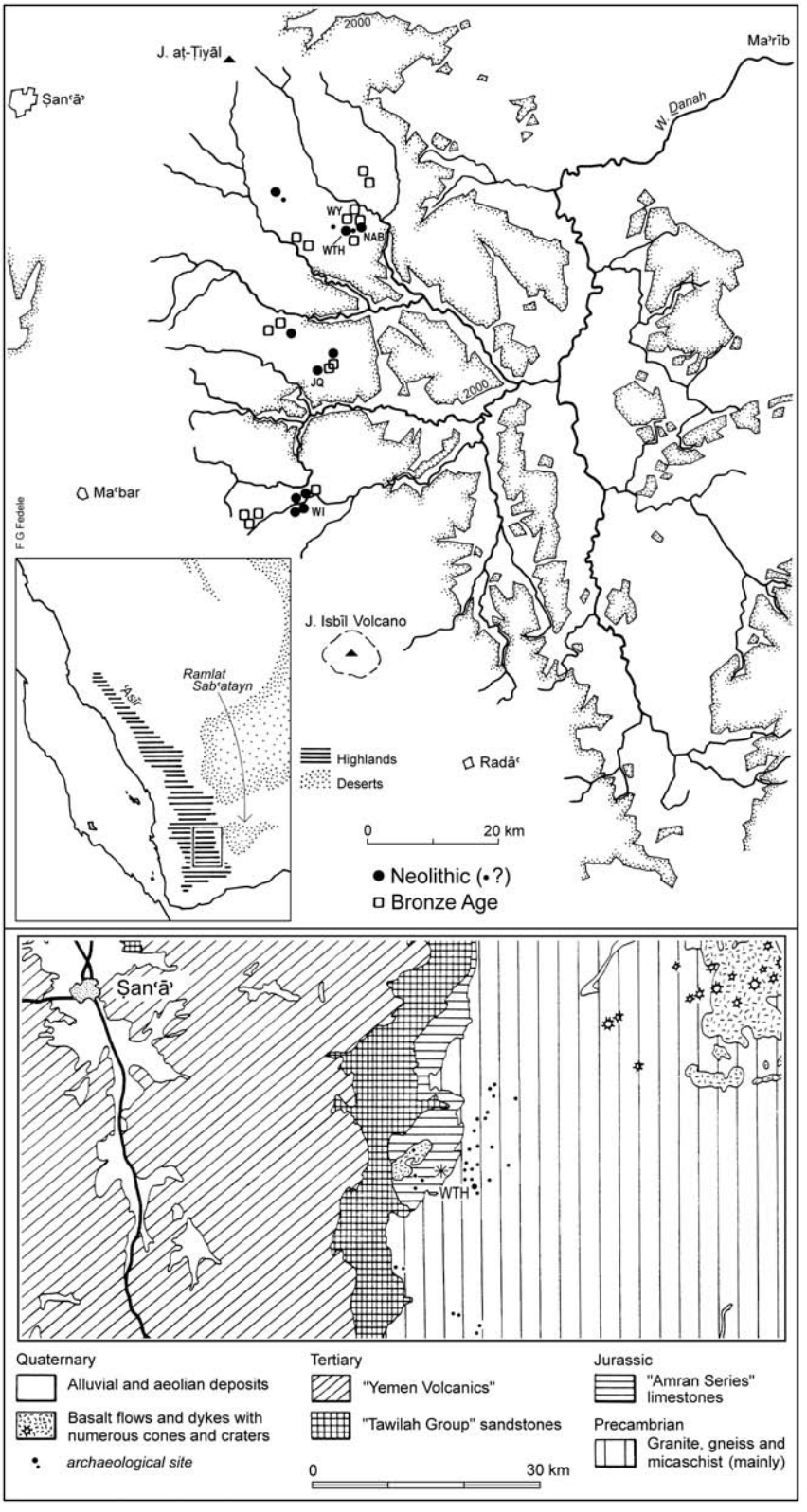

FIGURE 1. *Above: a map of the central part of the eastern Plateau, emphasizing the Wādī Ḏanah basin and the 2000 m contour line. The main Neolithic sites include JQ = Jebel Qutrān, NAB = Wādī an-Najd al-Abyad, WI = Wādī al-ᶜIšš, WTH = Wādī aṭ-Ṭayyilah.*
Below: a simplified geological map of the Khawlān at-Tiyāl. (Redrawn after B. Marcolongo, geological data derived from Grolier & Overstreet 1978). WTH as above; the asterisk is Jebel al-ᶜArqūb.

Historiography of research

WTH3 was found by Alessandro de Maigret and co-workers during a late stage of their general archaeological survey of the Italian study area in September 1984 (de Maigret 2002). This was one of a number of sites represented by particular block-and-boulder structures combined with substantial scatters of chipped stone artefacts on the ground, with pottery strangely lacking. The eastern Plateau was *terra incognita* as far as prehistoric archaeology was concerned. On the basis of structures above ground, rock patination, and perceived affinities of lithic types, a "Neolithic" label was assigned to such occurrences, although no archaeological association was available, strictly speaking, and the food economy was obviously unknown.

By that time, in the same district of the Khawlān, de Maigret had been able to identify a later prehistoric manifestation, which included pottery and was based on a different kind of settlement features and locational choices, which he called the Yemeni Bronze Age (de Maigret 1990). In 1984, a stratigraphic confirmation that the so-called "Neolithic" preceded this ceramic tradition came from a test excavation at An-Najd al-Abyad site 7 (NAB7), where a level with scanty Neolithic material appeared below a surface layer with Bronze Age structures (de Maigret *et al.* 1984). WTH3 nearby seemed to offer comparable conditions. Later that year, when I was asked to join the Italian Mission with the task of developing the Neolithic and its palaeo-economic aspects (de Maigret 2002: 120–126), I examined the "Neolithic" sites and eventually selected WTH3 for a specific excavation programme.

The choice of WTH3 for detailed excavation was dictated by a need for context. Only buried occupations that afforded reliable contextual evidence could advance the definition and understanding of the presumed, aceramic Neolithic of the Khawlān. WTH3 appeared to be notable for surface area, indications of sizeable buried portions, and richness in lithics. Furthermore, by 1984 a certain difference had been perceived between the stone-tool composition of most Khawlān "Neolithic" sites, as gleaned from surface sampling, and a supposed Neolithic site at Jebel Qutrān (GQ1; "JQ" in Fig. 1), to the south of the study area, which had been tested for two days late in 1983 (de Maigret 1983). An assessment of the variation and peculiarities of the Plateau "Neolithic" had thus become an additional reason for undertaking a specific Neolithic programme.

WTH3: setting, stratigraphy, and organization

Site setting and general stratigraphy

WTH3 (44°39'58" E, 15°10'00" N) is a stratified site located in a semi-desert environment at an altitude of 2025 m in the upper Wādī aṯ-Ṯayyilah drainage, 60 km south-east of Ṣanʿāʾ (Fig. 2). The drainage is almost completely set within the Precambrian granites at the foothills of the limestone tableland of Jebel al-ʿArqūb (cf. Fedele 1990*a*). Half buried on the rock-strewn hillside, the site occupies a shallow depression between rocky hillocks and covers an estimated area of 0.53 ha (1.3 acres), within a rectangle of about 70×90 m (Fig. 3). The settlement coincides with a mildly sloping terrace in proximity of a watercourse, a standard location among the Neolithic sites of the Khawlān. The present-day wadi runs eastwards about 100 m north of the site and is flanked by a series of alluvial terraces; the third and topmost possibly indicates the margin of the mid-Holocene riverbed. Some amount of rainwater flows across the site during the monsoonal season, but actual erosion tends to be low due to the diffuse pattern of runoff.

A generalized litho- and pedo-stratigraphy of what we may call the Najd al-Abyad-Ṯayyilah area — in view of its uniform environmental record — is summarized in Figure 4. Detailed profiles and cultural horizons from site WTH3 can be correlated rather easily to the local depositional sequences of the area. Above the decayed granite bedrock there are 40 to 80 cm of colluvial and aeolian sediments, predominantly silty-sandy in texture, due to prolonged but discontinuous slope deposition. This trend was punctuated by one major phase of soil formation, simultaneously identified at WTH3 (horizon "G", for grey); (3) (de Maigret *et al.* 1984: 431–437; Fedele 1985) and by the Italian geologists in the Najd al-Abyad-Ṯayyilah area (Marcolongo & Palmieri 1986). On qualitative data this fossil soil was designated the "Thayyilah Palaeosol" (Fedele 1986; 1987; 1988; 1990*b*); quantitative data have subsequently improved the identification (Marcolongo & Palmieri 1988; de Maigret *et al.* 1989). This palaeosol was traced to the north during a brief survey in the Suhmān (Fedele 1990*c*; and unpublished data).

The Thayyilah Palaeosol is a local expression of a mid-Holocene soil which appears to represent a useful pedo-stratigraphic marker over a wide area of Yemen and south-western Arabia, having been reported from an

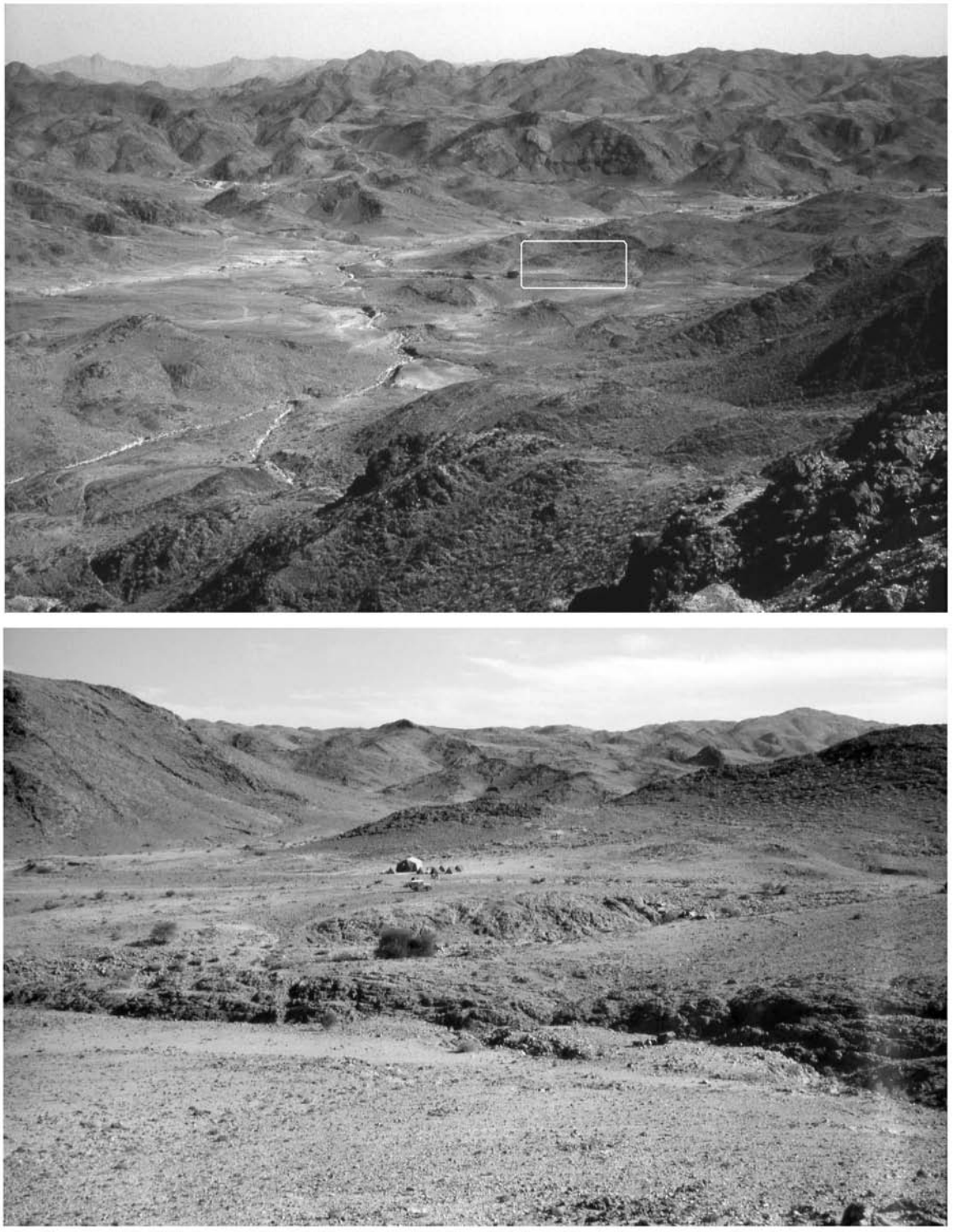

Figure 2. *Above: the confluence of Wādī aṭ-Ṭayyilah and Wādī an-Najd al-Abyad, a panoramic view from the Jebel al-ʿArqūb escarpment; site WTH3 is within inset frame. Below: site WTH3 from across Wādī aṭ-Ṭayyilah.*

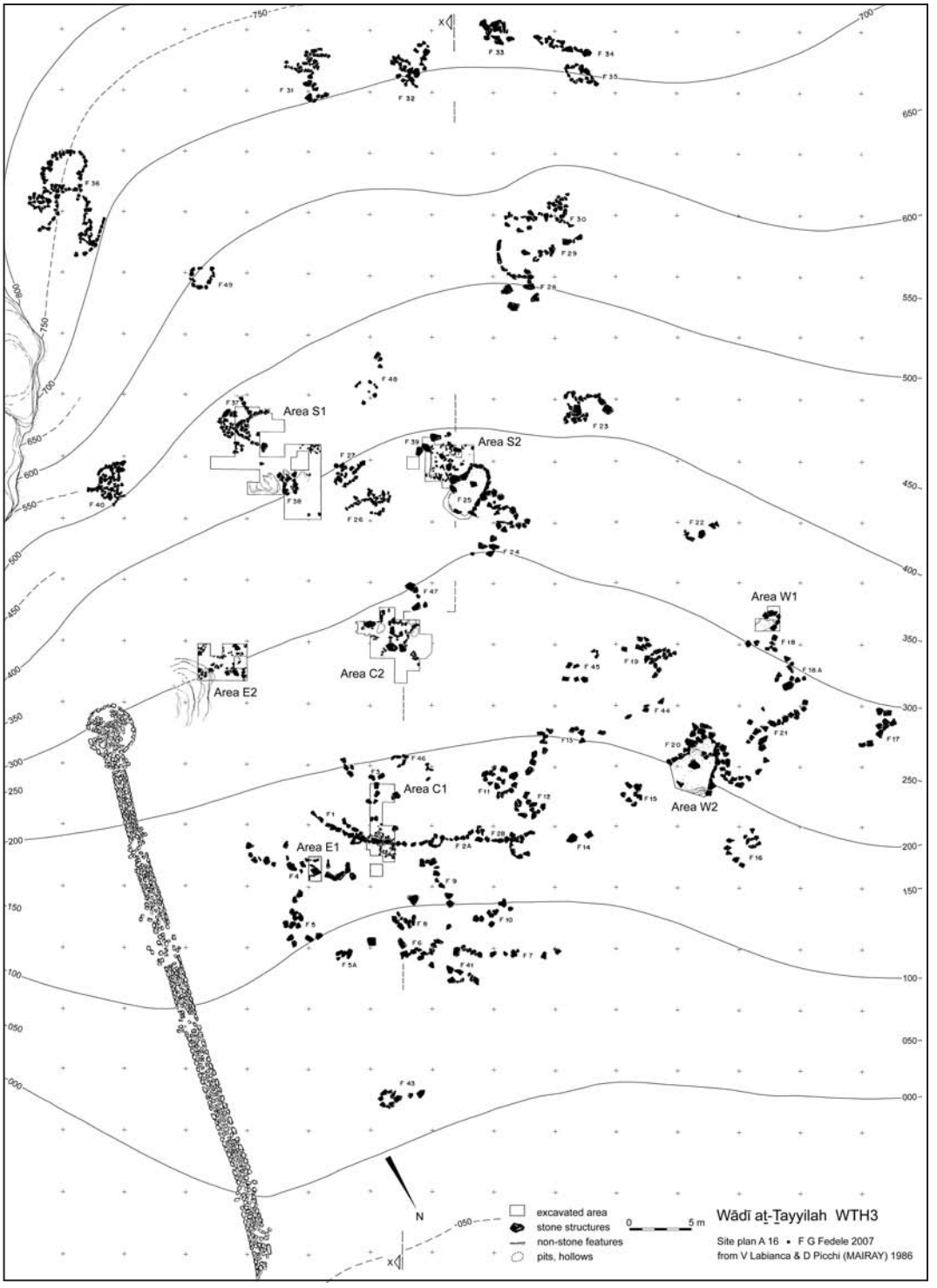

FIGURE 3. *Wādī aṭ-Ṭayyilah: a general plan of site WTH3. Excavations and above-ground features of the prehistoric site are shown; the large structure to the east is a later tomb, unrelated to the Neolithic and Pre-Neolithic occupations.*

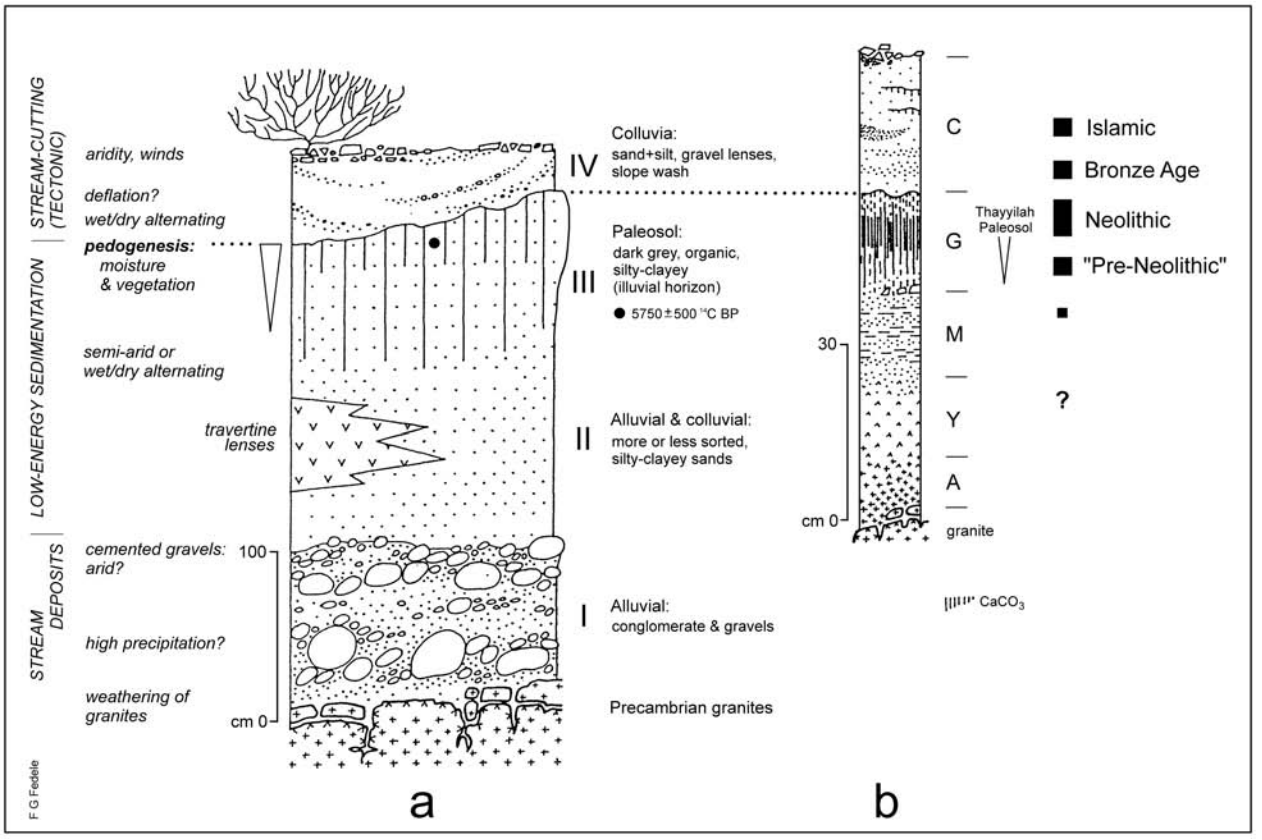

Figure 4. *Late Quaternary depositional sequences in the eastern Yemen Plateau, NAB-WTH area (cf. Figs 1–2). a. a generalized lithostratigraphy and palaeoenvironmental sequence. (After Marcolongo & Palmieri 1986; 1988). The radiocarbon date is from the Rome laboratory and is unpublished. (Reported in Marcolongo & Palmieri 1986); b. the stratigraphy of site WTH3 according to the 1984–1986 excavations: litho- and pedostratigraphic units on the left, cultural horizons or "ethnostratigraphy" on the right.*

increasing number of locations at different altitudes (e.g. Bintliff & van Zeist 1982; Overstreet, Grolier & Toplyn 1988; Overstreet & Grolier 1996; Garcia *et al.* 1991; Wilkinson 1997; Lézine *et al.* 1998; McCorriston 2000; French 2003; Parker, Davies & Wilkinson 2006). On the basis of correlation to similar pedogenetic bodies, and a radiocarbon determination on the soil's organic acids that calibrates to *c.* 5300–4000 BC (Fig. 4.a), the Thayyilah Palaeosol can be dated to the sixth–fifth millennia cal. BC. This soil is bounded by a well-defined upper limit and was truncated in places by deflation or erosion. Subsequently in the series only aeolian silts and exfoliation debris can be seen, linked to recent aridity.

The Thayyilah Palaeosol has environmental significance for the Neolithic of the eastern Plateau (cf. Fedele 1988). Site topography, soil and sediment evidence, and a palynological test (Lentini 1988; Fedele 1990*b*: fig. 4), strongly suggest the presence of some vegetation cover, high water table conditions, and scattered ponds in many upland basins. An ecosystem with woodland vegetation and well-watered districts can also be inferred from the incidence of bovine husbandry in the Neolithic, as suggested below. The connection of widespread soil formation with a period of milder and moister oscillations, plausibly resulting from higher rainfall (e.g. Wilkinson 2005), is generally accepted, hence the frequent designation of Mid-Holocene Pluvial. Widespread geomorphic stability contributed to this kind of landscape on the eastern Plateau. By the beginning of the third millennium BC such conditions gave way to a new cycle of severe desiccation, exacerbated by riverbed erosion induced by tectonic uplift, which changed the landscape and brought to an end the Neolithic lifeways (Fedele 1990*b*).

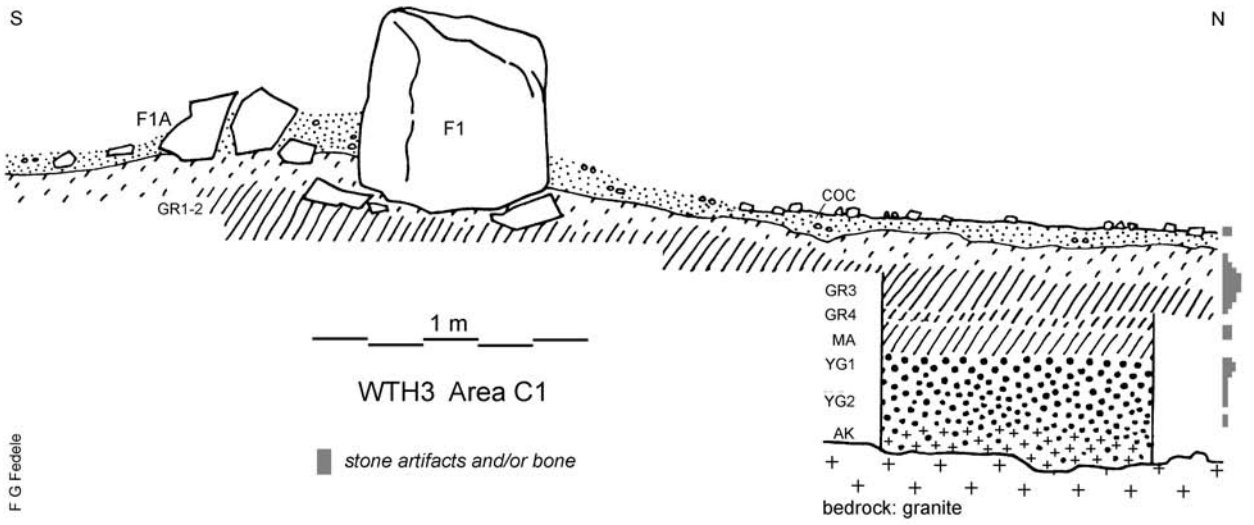

Figure 5. *Site WTH3: south–north stratigraphic profile in Area C1, across alignment F1, showing one of the soundings down to the bedrock (1984 excavations) and the vertical distribution of cultural material.*

Site components

Site WTH3 was studied through detailed excavation during three intensive seasons. A total of approximately 120 m² were excavated, amounting — in spite of the effort — to perhaps 5% of the site. In order to sample the internal variation eight excavation areas were opened (Fig. 3); area code letters stand for central, eastern, western, and southern, these being conventional partitions only. We managed to employ tight spatial control and very detailed recording criteria, unprecedented on the Plateau, encompassing both cultural evidence and geoarchaeological context. All sediments were dry screened with a 4 mm mesh and expertly hand picked for artefacts and ecofacts. Deposits from particular contexts were bagged for water sieving in Ṣanʿāʾ.

Site WTH3 is stratified and up to 1 m thick in places. Already during the initial testing in 1984 it turned out to possess some evidence of earlier material in addition to the principal and more conspicuous component. Two main cultural strata were eventually recognized in some parts of the settlement (Fig. 4.b): a rich "Neolithic" assemblage associated with fully domesticated animals; and a lower and earlier component, only detected in small portions of the site, particularly in Area C2 and through soundings in Areas S1 and C1 (Fig. 5). This latter component is here labelled "Pre-Neolithic", an explicitly noncommittal designation, and provisionally equated with the Pre-Pottery Neolithic B of the Levant on the basis of pedostratigraphy — as it appears to antedate the formation of the Thayyilah Palaeosol — and owing to some peculiar finds.

A partial figurine made of hardened, unfired clay (Fig. 8.n), which may represent a female torso — or two closely facing figures — is currently understood to be the oldest piece of portable "art" in Yemen (Fedele 1986: fig. 28; Fedele & Zaccara 2005: fig. 5). The nearest parallels are probably to be found in the PPNB of Jordan (e.g. Kuijt & Chesson 2005: figs 8.2, 8.4), and according to this hypothesis a date in the seventh millennium BC is tentatively proposed. The figurine was found within a deep feature in Area S1, an erosional furrow containing a pocket of dark ashy silts and piled stones, probably from a nearby hearth. The same locus gave a small group of bone remains from rather large bovids, possibly wild (see below). Other features from this lower horizon include stone clusters set inside pits in Area C2. We may be dealing with ephemeral human occupation by essentially mobile groups, such as those found near Saʿdah to the north (Garcia *et al.* 1991; Garcia & Rachad 1997); its classification as "Mesolithic" might in future turn out to be appropriate.

Spatial organization

The main Neolithic cultural stratum will be briefly described. As elsewhere on the eastern Plateau, the defining features of the settlement typically comprise "enclosure" alignments and oval or elliptical "huts" (Fig. 6). These are simply shorthand terms for partly

Figure 6. *Site WTH3: a. the large-stone alignment F1–F2 from the west; b. elliptical "hut" F25 and its inside hollow during excavation in 1986.*

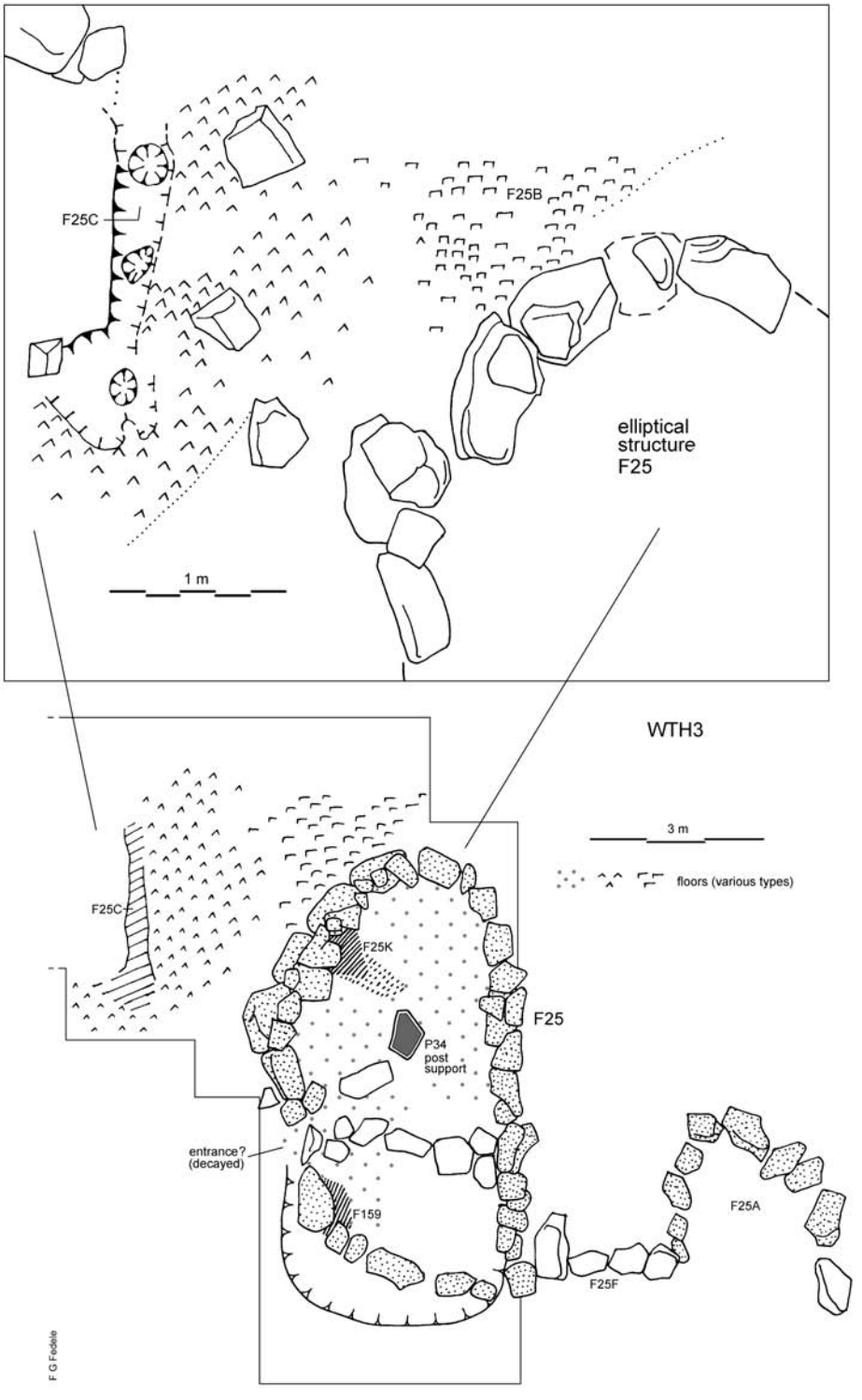

Figure 7. *Site WTH3: a simplified plan of elliptical "hut" F25 and its accessory structures. The annexe shown in the enlarged plan, above, is bounded by F25C, which can be recognized as the base of a light wall probably made of stakes and branches.*

buried, dry-stone constructions of varying shape, size, and preservation. The most conspicuous structures are made of large stone blocks and lie apparently scattered. In addition, as already mentioned, most Neolithic sites are consistently located on gently sloping ground near watercourses or silted-up alluvial flats. At WTH3 there is a curved boulder alignment in the lower half of the site, F1–F2, and about six elliptical "huts". Although obviously scattered, these elliptical structures are all located in the western half of the site and appear to share the main axis orientation (south-west–north-east, curiously diagonal to the slope).

Two large elliptical structures were excavated and studied within their surrounding context (F20 and F25) (Fig. 7). They measure about 4×7 m and 3×5 m respectively, and are typically built of large unfashioned blocks. Cultural refuse suggests that they should be considered houses, or rather, part of house compounds. Two heavily eroded hearths were found inside F25. The ellipses have a slightly sunken floor, often paved with cobbles and angular broken stones; near the centre stood a flat stone that may have supported a post (Fig. 6.b). It appears that the stone-built part of the house was the base, while the upper walls and the roofing were made of perishable or other material (hides? mud?); the smaller stones that litter the site today may have been walling material as well. Some ideas about the original plan of certain elliptical "houses" were gleaned from better-preserved above-ground examples occasionally to be seen elsewhere among the Neolithic sites of the Khawlān. Useful suggestions towards the reconstruction and interpretation of some structures were also derived from elements of contemporary rural villages in the Khawlān at-Tiyāl and Al-Hadā.

In addition, alignment F1 was studied. The fact that its juxtaposed boulder faces show a kind of façade in a downslope direction may support the hypothesis that it was an enclosure. An alternative possibility is to interpret F1 as a "divider", an activity-area divider in particular; or else it may have been for the control of surface runoff. Work at WTH3 was insufficient to resolve the functional interpretation of such an alignment.

The above-ground features, as excavation has shown, only bear a vague resemblance to their buried counterparts. WTH3 is a dilapidated site, whose structures were robbed of their stones during later prehistoric and historical times (witness to this is the construction of the large cairn-and-ray tomb, possibly Bronze Age in date; Fig. 3). Furthermore, an emphasis on large-stone elements alone would give a biased picture of the site. Substantial stone buildings were only a small part of the settlement. There are several small-stone features that are difficult to interpret. There are floored sectors in the open and, often, higher densities in lithic artefacts appear to be mutually exclusive with them. The main occupation at WTH3 represents an open-air village in which substantial stone "houses" and flimsy structures appear to have existed side by side. Light structures built from wood and other organic materials were recognized, particularly in Area S1 (Fig. 7). Parts of the site, which on the surface appeared to be empty, were shown to be occupied by inconspicuous features made without stones.

This summary suggests the coexistence of several types of habitation and non-habitation elements, a complex settlement organization and a rather varied village life. The agricultural capacity of these groups is not known, but their integration into a tropical high-plateau ecosystem appears to have been efficient, largely on the basis of cattle breeding (see below). WTH3 and the florescence of these Neolithic groups in general can be attributed to the sixth–fourth millennia BC on the basis of their correlation to the Thayyilah Palaeosol. (4) The archaeological map for the Neolithic, although very incomplete, would point to high population densities in several areas of the eastern highlands (cf. also Fedele 1990*c*), whereas the region is characterized today by very low population densities, both of humans and animals. The recent depopulation thus contrasts sharply with the situation during an earlier part of the Holocene.

WTH3: small finds, particularly lithic artefacts

WTH3 is an aceramic lithic site. Stone artefacts comprise, by far, the single most abundant class of archaeological evidence, as is common throughout the Neolithic of the Plateau. The WTH3 lithic collections derive from both excavation and surface sampling and amount to over 15,000 items, including manuports. (5) About 98% is represented by chipped stone artefacts; polished stone is virtually nonexistent. Small finds and lithic typology will be mentioned only very briefly in this article. More information can be found in a pilot study recently published in advance of final reports (Fedele & Zaccara 2005), with lithic analysis particularly aiming at a dynamic, behavioural understanding of stone-working technology. The initial surface collections from 1984 were examined in typological fashion by Di Mario (1992).

On the basis of the excavated assemblages a "Thayyilah

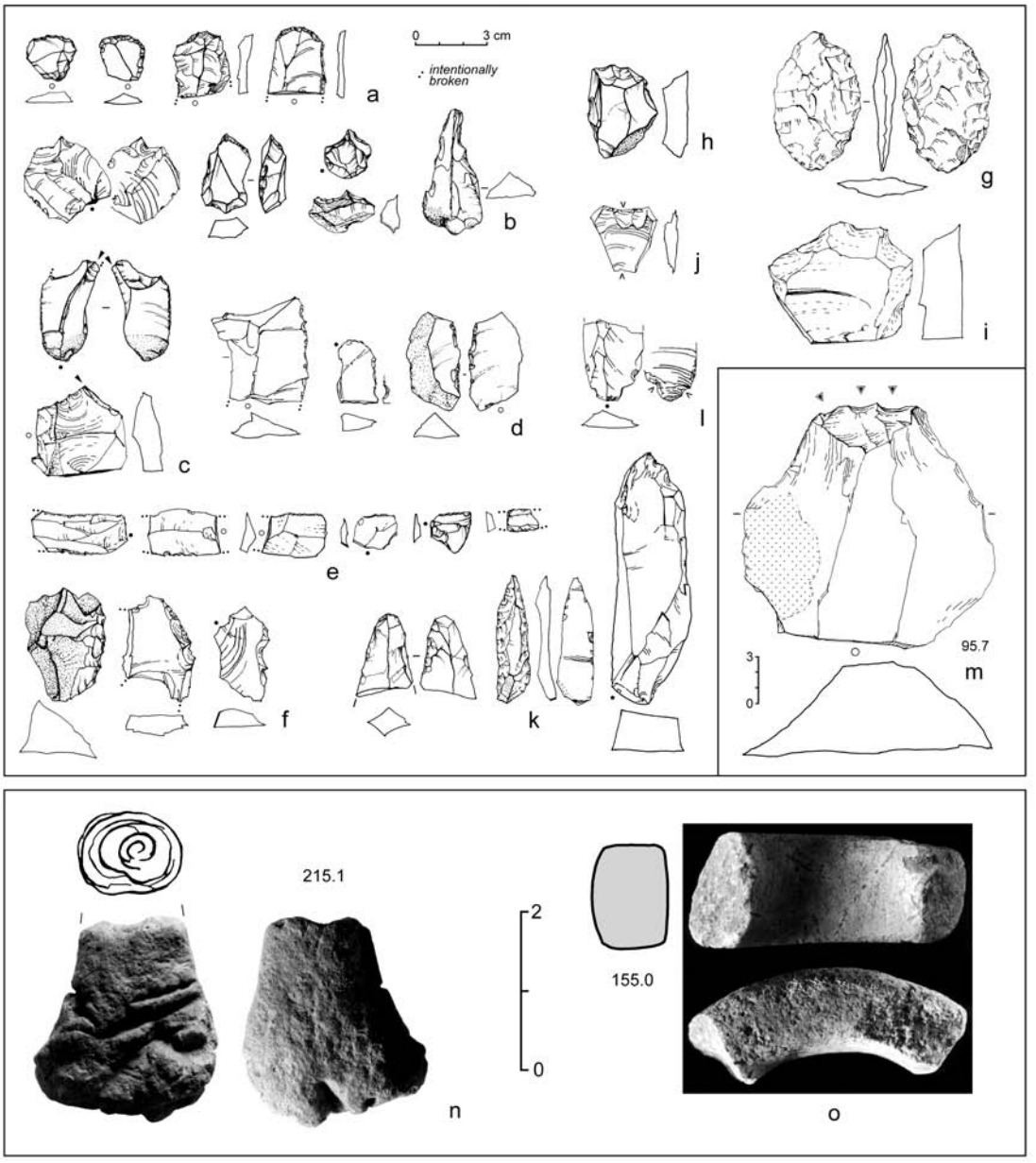

Figure 8. *A sample of chipped lithic tools representing artefact types in the Thayyilah industry, from WTH3: a. endscrapers; b. borers; c. burins; d. naturally backed knives; e. a series of "segments" as mounted on a reaping knife or sickle; f. scrapers; g. a foliate; h. rabots; i. denticulate core-tool; j. a pièce esquillée; k. stout unifacial points; l. contracting-stemmed pieces; m. a macrolith, a large granite chopper. Special finds: n. a Pre-Neolithic partial figurine made of unfired clay; o. a Neolithic stone bracelet fragment.*

industry" can be defined. The prehistoric users were interested in the geometry of the lithic piece and utterly indifferent to reduction categories and blank orientation in the archaeological sense (cf. Andrefsky 1998: 197). Fundamental aspects of morphology were thus controlled by blank choice in terms of size, proportions, and edge articulation. Concurrent characteristics are scant interest in formal blades, expedient utilization of blanks, and an

authentic passion for intentional breakage by snapping ("segmentation"; Fedele 1987). At least 50% of actual tools are not retouched at all, but simply obtained by deliberate segmentation. Hafting and the composite-tool component were highly developed. Obsidian (cf. Francaviglia 1990) accounts for about 25% on average, but the main raw material is chert from the limestone belt (cf. Fig. 1).

Toolkits are dominated by various kinds of scraping, boring, and cutting implements reflecting a way of life in which grass cutting and skin- and plant-material processing had gained importance. Ordinary-sized tools include — in decreasing frequency — naturally backed cutting tools, endscrapers, perforators and borers, rabots, burins, discoid core-tools, stout unifacial points, truncated tablets, *pièces esquillées*, stemmed pieces, and scrapers (Fig. 8). Hafting by insertion or binding is amply indicated on a number of different types, and utilized blades and "segments" were often mounted as a series on reaping knives or sickles. In addition to ordinary-sized tools there are frequent and well-made macroliths, including granite choppers and large denticulates, which point to the relevance of heavy-duty equipment.

Foliates and foliate fragments are extraordinarily rare, an estimated 0.2%. Often crudely made, they include broad ovate bifaces (Fig. 8.g), bifacial drills and tanged bifacial arrowheads. This paucity stands in contrast to the frequency of foliates not only in the southern Khawlān and al-Hadā regions, including Jebel Qutrān and perhaps Wādī al-ᶜIšš, but in most Neolithic inventories of Yemen and southern and central Arabia in general (e.g. Edens 1982; 1988; Di Mario *et al.* 1989; Edens & Wilkinson 1998; Kallweit 1996). Richness in foliates and arrowhead types is fundamental to the definition of an Arabian Bifacial Tradition or "Rubᶜ al-Khali Neolithic" centred on the lowlands and desert. Although Qutrān remains essentially unique to this day, its inventory is clearly reminiscent of this latter tradition. WTH3 seems to represent a different kind of Neolithic, also lacking e.g. polished adzes and gouges. In light of such compositional attributes, I have argued for a distinction between two Neolithic industries on the eastern Plateau, provisionally named "Thayyilah" and "Qutran" (Fedele 1988; de Maigret, Fedele & Di Mario 1988; Fedele & Zaccara 2005; cf. Wilkinson, Edens & Gibson 1997; Edens & Wilkinson 1998), but on present evidence their actual identity and space-time articulation are impossible to assess.

Worth noting among WTH3's small finds are some unique objects specifically coming from house floor contexts. A cache of entirely natural calcarenite manuports with evocative shapes was preserved within structure F20. Similarly, elliptical structure F25 gave a fragment of a white marble bracelet (Fig. 8.o). It closely matches finds from the Neolithic occupation of Shaabat Sulaiman 1 in the Wādī Ḏahr (Kallweit 1996: 123, pl. 20), and can be compared in a more general way with finds from the Ramlat Sabᶜatayn (Di Mario *et al.* 1989) and other parts of Arabia, the Levant and predynastic Lower Egypt.

On lithic evidence, the Neolithic and Pre-Neolithic manifestations appear to be phases of a single continuum, in spite of the very small size of the Pre-Neolithic sample. There is also the impression of similarities with the East African sequence rather than the Fertile Crescent, which would incline towards adopting an eastern African terminology. If so, the lithic phases above could be grouped under a designation such as "Late Stone Age" of the Yemen Plateau (cf. Uerpmann M 1992 for a similar terminology in the context of south-eastern Arabia). Further exploration of this issue is clearly necessary.

Archaeofaunal information

Neolithic and Pre-Neolithic WTH3

Recovery of bone material in the field is problematic in the drier parts of Yemen, as a result of the loss of organic substance, mechanical abrasion, and splitting. Most faunal finds from WTH3 were very badly preserved and had to be block-lifted within their matrix for laboratory processing after consolidation in the field: samples had to be generated, not just collected (Fig. 9). This painstaking procedure resulted in a larger collection — about 400 pieces — and ensured that more finds became amenable to faunal identification. What follows is an account of Neolithic and Pre-Neolithic economy as derived from the archaeofaunal information (cf. Fedele 1991; 1992: 69–76). Anatomical measurements are given in millimetres.

Totalling about 265 individual pieces, the archaeofauna from Neolithic WTH3 (Table 1) is represented by 73% domestic cattle and 16% domestic caprines, in terms of number of identified specimens; no caprine could be identified to species. A calculation of the minimum number of individuals might indicate rather more cattle, although small sample size suggests caution. Adults predominate, with adult-to-juvenile ratios of about 15:1 in cattle and 4:1 in caprines. The remaining 11% is represented by wild or possibly wild species, notably a small equid (Fig. 9.b), accounting for a theoretical 5%. A diaphysis of *Bos* points to a larger animal than normal, domestic or wild. Two fragments can apparently be attributed to gazelle and

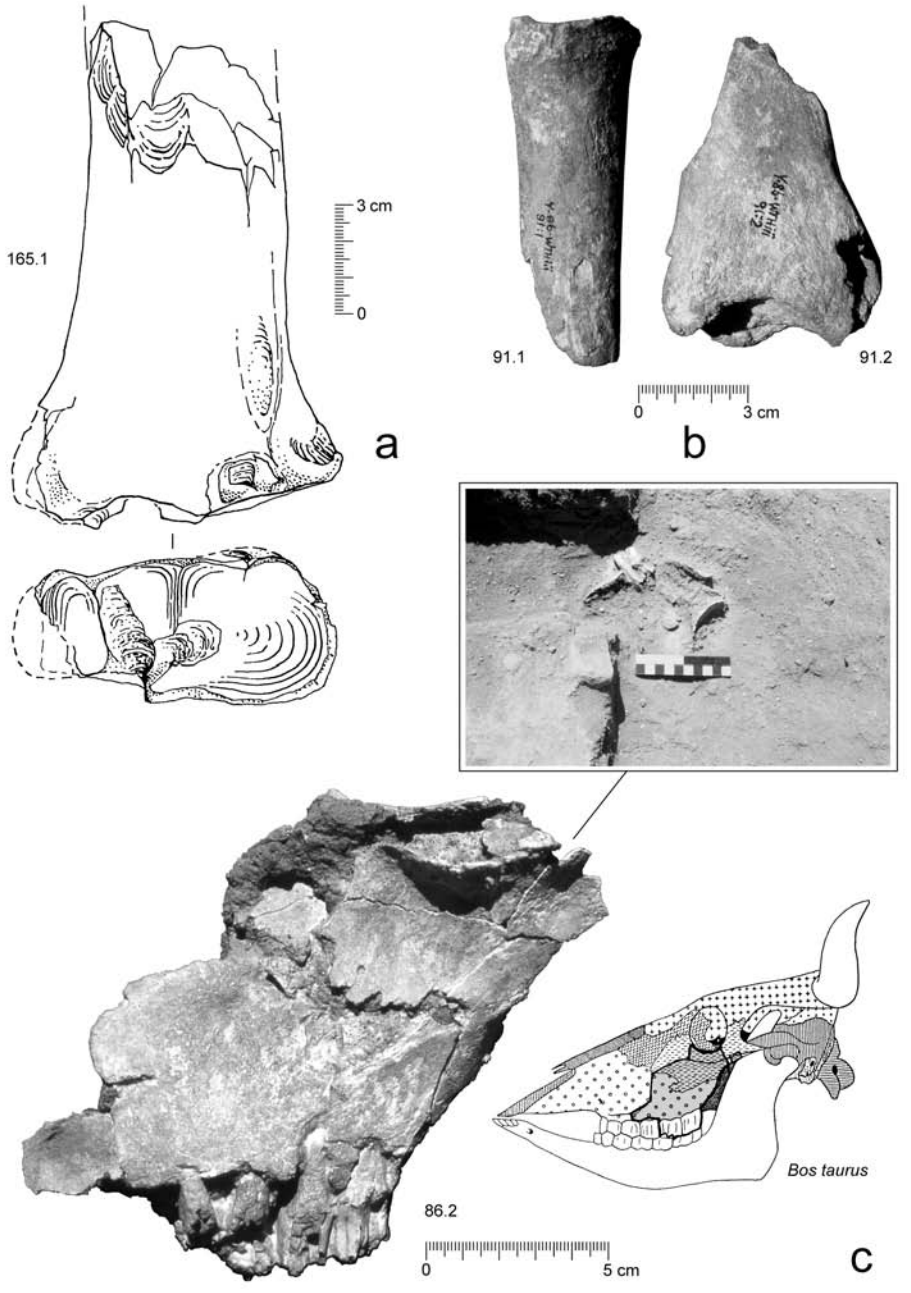

Figure 9. *Faunal remains from WTH3: a. Pre-Neolithic,* Bos sp.*, proximal radius intermediate between wild and domestic cattle; b. Neolithic,* Equus sp.*, metatarsal and tibia; c. Neolithic,* Bos taurus*, jugal-maxillary portion of a skull (and the find* in situ *in Area C2).*

a cervid, and there is in addition a freshwater clam.

As to cattle, most material is compatible with diminutive, domesticated *Bos*, very plausibly the common western Eurasian cattle; the water buffalo should be excluded. An outstanding find is a lateral skull piece from Area C2 (Fig. 9.c), which includes the maxilla and jugal with a part of the orbital rim, its hollow sinus exposed, and the two distal molars. It belongs to an aged adult

Total number of specimens	WTH3: Neolithic c. 265 (identified 44)	WTH3: Pre-Neolithic c. 140 (identified 6)	An-Najd al-Abyad NAB7 18+ (identified 4)	Jebel Qutrān GQ1 280 (identified 49)
Domestic species				
Bos taurus, cattle	32		1	12
Capra hircus, goat				3
Ovis aries, sheep				4
Ovis/Capra, domestic caprines	7		2	19
Wild species				
cf. Gazella, possibly gazelle	1	2		
?*Cervid*	1			
Bos cf. primigenius, ?aurochs				7
Capra ibex, ibex				1
Equus sp., ass or hemione	2			
Equus sp., small equid				2
freshwater clam	1			
Meriones sp., jird			1	
Only identified to size				
caprine-gazelle size group	c. 50	c. 20		
cattle-equid size group	c. 70	c. 45		
Indeterminate status				
Bos sp., possibly wild	1	4		
Carnivore: *Canis cf. familiaris,* ?dog				1

Table 1. *Archaeofauna from excavated Neolithic sites: species composition and number of identified specimens. The sites include WTH3 (Neolithic and Pre-Neolithic), NAB7, and GQ1 (Analysis of Jebel Qutrān after Bökönyi 1990). + indicates an indeterminate quantity of comminuted debris from bones and teeth.*

individual (crown height of M^3 ~ 17; length of M^3 = 28 and of M^2–M^3 ~ 55). This piece raises the question of the zebu, *Bos indicus*, being represented among our finds. (7) However, the diagnostic criteria do not substantiate this possibility (Grigson 1976; 1980; cf. Marshall 1989): our find presents sharp, converging borders to the lower angle of orbital rim and an apparently prominent orbit, and the cheek is proportionally high as in *Bos taurus* (distance from molar tip to orbit rim = 119).

Identification of the equid fragments — a proximal metatarsal and a distal tibia — is difficult. The bones are slightly worn, particularly the medial malleolus of the tibia which is important for determination (Uerpmann H-P 1991: 24); morphology is thus inconclusive. Metrically the tibia (Bd = 55, Dd = 38) exactly falls at the boundary between wild or early domestic ass, *Equus (Asinus) africanus*, and hemione, *E. (hemionus) hemionus* (e.g. Fedele 1990*d*: fig. 165; a Bronze Age donkey from Wādī Yanāʿim has Bd = 54 and Dd = 37). H-P. Uerpmann has long attracted attention to the distribution of wild ass in the Arabian Peninsula, and has aptly predicted that its mountainous margins may have provided suitable habitats for *E. africanus*, which is adapted to the same sort of stony and arid environment on the other side of the Red Sea (Uerpmann H-P. 1987; 1991: 29–30). My preferred interpretation is to consider the species from WTH3 to be African ass, although slightly smaller than the equivalent examples from eastern Arabia reported by Uerpmann.

The Pre-Neolithic samples come from deep contexts in Areas S1 and E2 and total about 140 pieces (Table 1). Preservation was mildly favoured by rapid burial and slight charring, as in the locus of the clay figurine in Area S1, which yielded bone remains from rather large bovids. An adult radius (Fig. 9.a) is metrically intermediate

between wild and domestic cattle. The estimated width of proximal radius is Bp = 94 ± 1, so its logarithmic difference from the animal assumed as standard by Grigson — a European *Bos primigenius* female — is ~ -0.030: it means that although large the WTH3 radius could be either wild or domestic (Grigson 1989: fig. 5; and *in litteris* 26.07.1988). Other relevant measurements are BFp ~ 85, Fp depth = 38, maximum proximal depth = 43; a proximal radius from the Neolithic occupation has Bp = 73.5, and an associated distal humerus has BT = 73.

Since all the materials from the Pre-Neolithic horizon appear to derive from large bovids and gazelle-sized animals, with domesticates not clearly present, I would suggest that we are dealing with a wild fauna in which the aurochs may be dominant. However, one should take into account the report of mid-Holocene wild buffalo from an occupation at Saʿdah ("*Pelorovis antiquus* = *Bubalus arnee*"; Garcia *et al.* 1991; Garcia & Rachad 1997); depictions of the same species do indeed appear on a rock surface nearby. The Pre-Neolithic occupations of WTH3 can be equally interpreted as campsites where hunting groups would bring butchered game.

Faunal data from other Neolithic sites

Neolithic faunal samples only come from two other sites in the Italian study area: Jebel Qutrān GQ1 and NAB7 lower layer (Table 1). Neolithic NAB7 only gave scanty remains of domestic cattle (a proximal femur) and caprines (permanent upper molars, one diaphysis from a juvenile), all identical to WTH3 in size. A femur from a jird is considered ancient rather than intrusive, due to its physical appearance and adhering matrix identical with the rest of the fauna: anatomically *Meriones* (Fedele 1990*d*: 161–162), it may be the king jird, the most characteristic "sand rat" of the south-western Arabian highlands.

The chance sample from Qutrān, examined by Bökönyi (1990), would vaguely confirm the picture from WTH3; domestic caprines are slightly dominant over cattle, however. As Bökönyi states, "both cattle and caprovine remains point to comparatively large domestic individuals"; in addition, "four tooth fragments and [a] humerus fragment are really large even by European standards, thus they are solid proofs of wild cattle". These contentions cannot be checked, (8) but the identification of wild cattle should be approached with caution. Apart from the presumed aurochs the wild fauna is very scanty. "A left proximal tibia fragment and a distal metatarsus fragment come from a small equid species"; ibex is indicated by a third phalanx with GL = 36.5, and the dog is "only probable".

Obviously we know very little, and the above is a rough approximation to the economies on the eastern Plateau. However, what we get is probably a picture of cattle pastoralists (Fedele 1992: 74–77; Grigson 1996: 48), which would accord well with a milder, greener mid-Holocene landscape, very different from the arid conditions of today. Grigson (1996: 65) postulated long ago a correlation between summer rainfall regime and dominance of cattle, not caprines. It is encouraging to observe that the faunal composition of WTH3 is replicated at mid-Holocene sites in the Wādī Ḏahr, north-west of Ṣanʿāʾ, admirably studied by Kallweit (1996: 133; analysis by A. von den Driesch). The Neolithic groups at Ḏahr were most likely pastoral nomads breeding cattle, sheep, and goat, and occupying small seasonal camps situated on the flanks of the wadi.

Conclusions

Elsewhere I speculated (Fedele 1988; 1991) that most of the eastern Plateau Neolithic might represent a regional tradition, somewhat specific to the high plains and distinct from desert and coastal cultures (cf. Tosi 1986; Durrani 2005). Such an "upland Neolithic tradition" would be associated with highland settlement by early cattle herders who co-adapted to this severe landscape — albeit under climatic optimum conditions — using pastoralism and particular toolkit inventories. This tradition remains a hypothetical construct. However, if the idea is correct, it may have more in common with the parallel and broadly coeval developments in the Ethiopian Highlands, or elsewhere around the Horn of Africa, than with the Neolithic of the Near East. Yemen ought perhaps to be viewed as the southern periphery of a cultural continuum specific to the West Arabian uplands. During the subsequent Bronze Age, in the third millennium BC, the Neolithic life ways were superseded by a caprine-and-sorghum farming economy. The pastoralists of the highlands can be contrasted with the hunting groups that were active alongside the desert, where hunting presumably remained a persistent way of life and disappeared from the arid lowlands only recently.

Acknowledgements

Special thanks are due to Alessandro de Maigret for his substantial support within the Italian Archaeological Mission to Yemen. Permission for fieldwork was granted by the General Organisation of Antiquities, Manuscripts and Museums (Ṣanᶜāᵓ), then headed by Dr Yūsuf ᶜAbdallāh. The excavations were carried out with the assistance of Francesco Di Mario and the participation of Yemeni archaeologists from GOAMM and Italian students and technical staff. I am grateful to Jill Morris and particularly Daniela Zàccara for laboratory assistance, and to Mark Beech, Jeffrey A. Blakely, Ueli Brunner, Robert Carter, Joy McCorriston, Christopher Edens, Michel-Alain Garcia, Caroline Grigson, Marie-Louise Inizan, Heiko Kallweit, and Tony J. Wilkinson (among others) for literature or comments, although the use here made of this information is my sole responsibility.

Notes

1 The spelling of the place name was obtained from residents and checked with the assistance of Yemeni officers. WTH3 was initially coded WTHiii.

2 Work towards the full publication of WTH3 was resumed in 2002 after a long interruption. The archaeological collections from the site are housed at the National Museum in Ṣanᶜāᵓ, except for two small lithic assemblages temporarily exported to the University of Naples through an official agreement.

3 Stratum G in the WTH3 standard profile (Fig. 4.b; cf. units GR1 to GR3 in Fig. 5) normally represents the lower part of a distinctive "A" soil horizon, typically enriched in humus due to ecosystemic conditions and prolonged geomorphic stability.

4 Although sedimentary indications of former hearths were found (e.g. within "house" F25) well-preserved charcoal was very rare at WTH3; and, alas, several charcoal samples for radiocarbon were misplaced in Rome after preparation for shipping to the dating laboratory. Only a return to the site would allow a dating programme to be performed.

5 Unfashioned natural elements brought to the site by people (after Leakey 1971).

7 Grigson (1996: 46) remarks that, in western Arabia, "although most cattle today are zebu, there are small unhumped cattle in the mountainous part of the Yemen and it is possible that these were once more widely distributed". Unhumped taurine cattle are certainly common in the Khawlān.

8 The present whereabouts of the Qutrān collection are unknown.

References

Andrefsky W. Jr.
1998. *Lithics. Macroscopic Approaches to Analysis*. Cambridge: Cambridge University Press.

Bintliff J.L. & van Zeist W. (eds)
1982. *Palaeoclimates, Palaeoenvironments and Human Communities in the Eastern Mediterranean Region in Later Prehistory*. (British Archaeological Reports, International series, 133). Oxford: British Archaeological Reports.

Bökönyi S.
1990. Preliminary report on the animal remains of Gabal Qutrān (GQi) and Al-Masannah (MASi). Pages 145–148 in A. de Maigret (ed.), *The Bronze Age Culture of Hawlān at-Tiyāl and Al-Hadā (Republic of Yemen): A First General Report*. (IsMEO Reports and Memoirs, 24). Rome: Istituto Italiano per il Medio ed Estremo Oriente.

de Maigret A.
1983. Activities of the Italian Archaeological Mission in the Yemen Arab Republic (1983 campaign). *East and West* [N.S.] 33: 340–344.
2002. *Arabia Felix: An Exploration of the Archaeological History of Yemen*. London: Stacey International.

de Maigret A., Azzi C., Marcolongo B. & Palmieri A.M.
1989. Recent pedogenesis and neotectonics affecting archaeological sites in North Yemen. *Paléorient* 15: 239–243.

de Maigret A., Bulgarelli G.M., Fedele F.G., Marcolongo B., Scerrato U. & Ventrone G.
1984. Archaeological activities in the Yemen Arab Republic, 1984. *East and West* [N.S.] 34/4: 423–454.

de Maigret A., Fedele F. & Di Mario F.
1988. Lo Yemen prima del regno di Saba. *Le Scienze* 40/234: 12–23.

Di Mario F.
1992. L'industria "neolitica" di Wadi Ath-Tayylah, sito 3 (Repubblica dello Yemen): studio della collezione litica di superficie. *Yemen. Studi archeologici, storici e filologici sull'Arabia meridionale* 1: 55–77.

Di Mario F., Costantini L., Fedele F.G., Gravina F. & Smriglio C.
1989. The western ar-Rubᶜ al-Khālī "Neolithic": new data from the Ramlat Sabᶜatayn (Yemen Arab Republic). *Annali, Istituto Universitario Orientale* 49: 109–148.

Durrani N.
2005. *The Tihamah Coastal Plain of South-West Arabia in its Regional Context c. 6000 BC–AD 600*. (Society for Arabian Studies Monographs, 4). Oxford: Archaeopress.

Edens C.
1982. Towards a definition of the western ar-Rubᶜ al-Khālī "Neolithic". *Atlal* 6/3: 109–123.
1988. The Rubᶜ al-Khālī "neolithic" revisited: the view from Nadqan. Pages 15–43 in D.T. Potts (ed.), *Araby the Blest: Studies in Arabian Archaeology*. (Carsten Niebuhr Institute Publication, 7). Copenhagen: Museum Tusculanum.

Edens C. & Wilkinson T.J.
1998. Southwest Arabia during the Holocene: recent archaeological developments. *Journal of World Prehistory* 12/1: 55–119.

Fedele F.G.
1985. Research on Neolithic and Holocene paleoecology in the Yemeni highlands. Pages 369–373 in A. de Maigret *et al*., Archaeological activities in the Yemen Arab Republic, 1985. *East and West* [N.S.] 35: 337–395.
1986. Neolithic and Protohistoric cultures. Excavations and researches in the eastern Highlands. Pages 396–400 in A. de Maigret et al., Archaeological activities in the Yemen Arab Republic, 1986. *East and West* [N.S.] 36: 376–470.
1987. *Research on the Neolithic and the Holocene of the Yemen Highlands, 1987*. Naples: Institute of Anthropology, University of Naples. [Unpublished circulated report for MAIRAY].
1988. North Yemen: the Neolithic. Pages 34–37 in W. Daum (ed.), *Yemen. 3000 Years of Art and Civilisation in Arabia Felix*. Innsbruck/Frankfurt am Main: Pinguin.
1990*a*. Fossil volcanism and archaeology: the North Yemen Highlands. Pages 11–23 in C. Albore Livadie & F. Widemann (eds), *Volcanology and Archaeology. Proceedings of the European Workshops of Ravello, November 1987 and March 1989*. (PACT, 25). Strasbourg: Conseil de l'Europe, European Study Group on Physical, Chemical, Biological and Mathematical Techniques Applied to Archaeology.
1990*b*. Man, land and climate: emerging interactions from the Holocene of the Yemen Highlands. Pages 31–42 in S. Bottema, G. Entjes-Nieborg & W. van Zeist (eds), *Man's Role in the Shaping of the Eastern Mediterranean Landscape*. Rotterdam/Brookfield: A.A. Balkema.
1990*c*. *Prehistoric Archaeology and Ecology in the Eastern Highlands of North Yemen. Report of Activities Conducted in February 1990*. Naples: Laboratory and Museum of Anthropology, University of Naples. [Unpublished circulated report for MAIRAY].
1990*d*. Bronze Age faunal collections from North Yemen. Pages 149–185 in A. de Maigret (ed.), *The Bronze Age Culture of Hawlān at-Tiyāl and Al-Hadā (Republic of Yemen): A First General Report*. (IsMEO Reports and Memoirs, 24). Rome: Istituto Italiano per il Medio ed Estremo Oriente.
1991. Holocene Man-animal Relations in the Yemen Highlands. Paper presented at the "Arabia Antiqua" International Conference, May 1991, Rome, *IsMEO*. [Unpublished circulated paper].
1992. Zooarchaeology in Mesopotamia and Yemen: a comparative history. *Origini. Preistoria e protostoria delle civiltà antiche* 16: 49–93.

Fedele F.G. & Zaccara D.
2005. Wādī at-Ṯayyila 3: a mid-Holocene site on the Yemen Plateau and its lithic collection. Pages 213–245 in A.M. Sholan, S. Antonini & M. Arbach (eds), *Sabaean Studies. Archaeological, Epigraphical and*

Historical Studies in Honour of Yūsuf M. ᶜAbdallāh, Alessandro de Maigret, Christian J. Robin on the Occasion of Their Sixtieth Birthdays. Naples: Yemeni-Italian Centre for Archaeological Researches/ Ṣanᶜāᵓ: University of Ṣanᶜāᵓ and Centre français d'archéologie et de sciences sociales de Ṣanᶜāᵓ.

Francaviglia V.
1990. Obsidian sources in ancient Yemen. Pages 129–136 in A. de Maigret (ed.), *The Bronze Age Culture of Hawlān at-Tiyāl and Al-Hadā (Republic of Yemen): A First General Report*. (IsMEO Reports and Memoirs, 24). Rome: Istituto Italiano per il Medio ed Estremo Oriente.

French C.A.I.
2003. The Dhamar region, central highlands, Yemen. Pages 224–234 in C. French (ed.), *Geoarchaeology in Action. Studies in Soil Micromorphology and Landscape Evolution*. London: Routledge.

Garcia M-A. & Rachad M.
1997. *L'Art des Origines au Yémen*. Paris: Éditions du Seuil.

Garcia M., Rachad M., Hadjouis D., Inizan M-L. & Fontugne M.
1991. Découvertes préhistoriques au Yémen, le contexte archéologique de l'art rupestre de la région de Saada. *Comptes rendus de l'Académie des Sciences de Paris* 313/2: 1201–1206.

Grigson C.
1976. The craniology and relationships of four species of Bos. 3: Basic craniology: Bos taurus L. sagittal profiles and other non-measurable characters. *Journal of Archaeological Science* 3: 115–136.

1980. The craniology and relationships of four species of Bos. 5: Bos indicus L. *Journal of Archaeological Science* 7: 3–32.
1989. Size and sex: evidence for the domestication of cattle in the Near East. Pages 77–109 in A. Milles, D. Williams & N. Gardner (eds), *The Beginnings of Agriculture*. (British Archaeological Reports, International series, 496/Symposia of the Association for Environmental Archaeology, 8). Oxford: British Archaeological Reports.
1996. Early cattle around the Indian Ocean. Pages 41–74 in J. Reade (ed.), *The Indian Ocean in Antiquity*. London: Kegan Paul International/The British Museum/New York: Kegan Paul International.

Grolier M.J. & Overstreet W.C.
1978. *Geologic Map of the Yemen Arab Republic (Ṣanᶜāᵓ)*. (US Geological Survey Miscellaneous Investigations Series, Map I-1143-B). Reston, VA: US Geological Survey.

Kallweit H.
1996 [2001]. *Neolithische und Bronzezeitliche Besiedlung im Wadi Dhahr, Republik Jemen. Eine Untersuchung auf der basis von Geländebegehungen und Sondagen*. Inaugural-Dissertation der Philosophischen Fakultäten der Albert-Ludwigs-Universität zu Freiburg i. Br. [Unpublished].

Kuijt I. & Chesson M.S.
2005. Lumps of clay and pieces of stone: ambiguity, bodies, and identity as portrayed in Neolithic figurines. Pages 152–183 in S. Pollock & R. Bernbeck (eds), *Archaeologies of the Middle East. Critical Perspectives*. Oxford: Blackwell.

Leakey M.D.
1971. *Olduvai Gorge, 3: Excavations in Beds I and II, 1960–63*. Cambridge/London: Cambridge University Press.

Lentini A.
1988. Preliminary pollen analysis of paleosoil [sic] horizon in the Yalā area. Pages 52–53 in A. de Maigret (ed.), *The New Sabaean Archaeological Complex in the Wādī Yalā (Eastern Hawlān at-Tiyāl, Yemen Arab Republic). A Preliminary Report*. Rome: Istituto Italiano per il Medio ed Estremo Oriente.

Lézine A-M., Saliège J-F., Robert C., Wertz F. & Inizan M-L.
1998. Holocene lakes from Ramlat as-Sabᶜatayn (Yemen) illustrate the impact of monsoon activity in southern Arabia. *Quaternary Research* 50: 290–299.

McCorriston J.
2000. Early settlement in Hadramawt: preliminary report on prehistoric occupation at Shiᵓb Munayder. *Arabian Archaeology and Epigraphy* 11/2: 129–153.

Marcolongo B. & Palmieri A.M.
1986. Palaeoenvironmental conditions in the areas of Wādī at-Tayyilah and Baraqiš: preliminary report. Pages 461–464 in de Maigret et al., Archaeological activities in the Yemen Arab Republic, 1986. *East and West* [N.S.] 36: 376–470.
1988. Environmental modification and settlement conditions in the Yalā area. Pages 45–51 in A. de Maigret (ed.), *The New Sabaean Archaeological Complex in the Wādī Yalā (Eastern Hawlān at-Tiyāl, Yemen Arab Republic). A Preliminary Report*. Rome: Istituto Italiano per il Medio ed Estremo Oriente.

Marshall F.
1989. Rethinking the role of Bos indicus in Sub-saharan Africa. *Current Anthropology* 30/2: 235–240.

Overstreet W.C. & Grolier M.J.
1996. Summary of environmental background for the human occupation of the al-Jadidah basin in Wadi al-Jubah, Yemen Arab Republic. Pages 337–429 in M.J. Grolier, R. Brinkmann & J.A. Blakely (eds), *Environmental Research in Support of Archaeological Investigations in the Yemen Arab Republic, 1982–1987*. Washington, DC: American Foundation for the Study of Man.

Overstreet W.C., Grolier M.J. & Toplyn M.R.
1988. *The Wadi al-Jubah Archaeological Project, 4: Geological and Archaeological Reconnaissance in the Yemen Arab Republic, 1985*. Washington, DC: American Foundation for the Study of Man.

Parker A., Davies C. & Wilkinson T.
2006. The early to mid-Holocene moist period in Arabia: some recent evidence from lacustrine sequences in eastern and south-western Arabia. *Proceedings of the Seminar for Arabian Studies* 36: 243–255.

Tosi M.
1986. The emerging picture of prehistoric Arabia. *Annual Review of Anthropology* 15: 461–490.

Uerpmann H-P.
1987. *The Ancient Distribution of Ungulate Mammals in the Middle East*. (Beihefte zum Tübinger Atlas des Vorderen Orients, Reihe A 27). Wiesbaden: Dr. Ludwig Reichert Verlag.
1991. *Equus africanus* in Arabia. Pages 12–33 in R.H. Meadow & H-P. Uerpmann (eds), *Equids in the Ancient World*. ii. (Beihefte zum Tübinger Atlas des Vorderen Orients, Reihe A 19/2). Wiesbaden: Dr. Ludwig Reichert Verlag.

Uerpmann M.
1992. Structuring the Late Stone Age of southeastern Arabia. *Arabian Archaeology and Epigraphy* 3: 65–109.

Wilkinson T.J.
1997. Holocene environments of the high plateau, Yemen, recent geoarchaeological investigations. *Geoarchaeology, an International Journal* 12/8: 833–864.
2005. Soil erosion and valley fills in the Yemen highlands and southern Turkey: integrating settlement, geoarchaeology, and climate change. *Geoarchaeology, an International Journal* 20/2: 169–192.

Wilkinson T.J., Edens C. & Gibson McG.
1997. The archaeology of the Yemen High Plains: a preliminary chronology. *Arabian Archaeology and Epigraphy* 8: 99–142.

Author's address
Francesco G. Fedele, Chair and Laboratory of Anthropology, University of Naples "Federico II", via Mezzocannone 8, 80134 Naples, Italy.
e-mail ffedele01@yahoo.it