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Beyond the Desert and the Sown: Settlement Intensification in Late Prehistoric Southeastern Arabia

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Arabia lies outside the focus of most archaeologists working in western Asia and is considered to have been a periphery in the past and therefore peripheral to contemporary research interests. The reasons for this include generalized assumptions about human–environmental dynamics and a belief in the necessity of foreign intervention as a spur for innovation and change in arid environments. In this paper, these two assumptions are examined, and a case study from southeastern Arabia is presented which details evidence for indigenous adaptation and a concomitant emergence of political and economic complexity in the early first millennium B.C.

INTRODUCTION: THE BEDU, THE HADHAR, AND ARABIA IN NEAR EASTERN ARCHAEOLOGY

In her landmark conspectus on the archaeology of the Holy Land, Dame Kathleen Kenyon wrote: "The Fertile Crescent encloses the plateau of the Arabian desert, which from the dawn of history has served as a vast reservoir of nomadic raiders upon the riches of the surrounding Crescent" (Kenyon 1979: 11). Kenyon's view embodies many perceptions of ancient Arabia. These include the belief that Arabia is essentially a homogenous, desert environment and as such provokes a defined set of behavioral responses, normally aggressive nomadism. This view embodies a master narrative based upon the Western reading of the Arabic paradigm of the Bedu and the Hadhar, or the Desert and the Sown. As formulated by Ibn Khaldun in the 14th century, this was a complex notion that sought to characterize the symbiotic relationship between urban and non-urban life. It operated on many levels: environmental, economic, and spiritual. In the hands of Western explorers like Bell (1907) or Stark (1940), it lost most of its heuristic complexity and was quickly reduced to a form of environmental determinism that contrasted a desert, with few obvious resources, to an agricultural landscape in which there is the potential for economic growth because of cereal production. In this interpretation, conflict results because one landscape is less materially advantaged than the other. As the desert is perceived as environmentally static, these patterns of behavior are considered immutable. Recent archaeological research in the Near East has done much to overturn some of these perceptions (e.g., Banning 1986), but the belief that inhabitants of desert environments remain relatively unchanging in their adaptational behavior still permeates much research.

Related to these assumptions is a belief that any change in human behavior in desert environments must be allochthonous in origin, more often than not coming from an imperial or economic center. This view is crystallized by one side of the debate on the origin of oasis polities in the Hijaz of northwestern Arabia. Archaeological research at Tayma, al-Ula, and Qurayya led Parr (1993) and others (Parr, Harding, and Dayton 1968–1969) to argue that during the Late Bronze and Iron Ages there were two discrete periods of flourishing oasis urbanism. Parr (1993) argued that the Late Bronze Age phenomenon was a direct result of Egyptian imperialism during the 19th and 20th Dynasties. Specifically, he argued that the

Egyptians created Hijazi towns and settled nomadic people in order to control the caravan trade from southern Arabia. Parr argued that when the power of the Egyptian 20th Dynasty declined, urban settlements were abandoned and the local population returned to their "natural" nomadic lifestyle. With the renewed interest in the Hijaz under the Neo-Babylonian and Achaemenid kings, particularly Nabonidus, Hijazi towns once again emerged, according to Parr. Underlying this argument is an absolute belief in the veracity of canonical, in this case Assyrian, representations of so-called peripheries. To quote Parr, "although the inhabitants of the north Arabian desert during the 8th and 7th centuries were undoubtedly powerful and well-organized peoples, engaged in the aromatic trade and acquiring considerable wealth from it, it is entirely as nomadic pastoralists that they are characterized in the Assyrian records and reliefs" (Parr 1993: 54). Despite Bawden's (1992; Bawden and Edens 1988) presentation of new data that largely overturns this model, Parr's interpretation has persisted as a seeming *opinio communis*. It is simply accepted as fact in a recent volume on pre-Islamic Arabia (Hoyland 2001: 90–92). The possibility, raised by Bawden, that the inhabitants of this part of Arabia may have undergone transformation in their lifeways as a result of indigenous adaptation or environmental exploitation (e.g., mining) is neglected in favor of a model emphasizing the primacy of foreign intervention for which there is typically abundant textual and historical evidence.

These sets of biases have done much to marginalize the study of ancient Arabia, since it is assumed that change in ancient lifeways is either absent or can be inferred from the machinations of ancient political and economic centers. New data from the Arabian southeast indicates that this is not the case and that processes of adaptation and social and economic change were indigenously developed as a unique response to the distinctive challenges presented by an arid environment. In this paper, this new evidence is presented, with the aim of overturning some of the assumptions that still contour archaeological research on the ancient Near East.

SOUTHEASTERN ARABIA

In ancient Egypt and Mesopotamia, the dynamic between a riverine environment and a restricted-rainfall regime provided the basis for the emergence of state-level complexity. Algaze (2001) has highlighted the many factors that may have contributed to this process, but in essence the ability to exploit a river using irrigation and utilize the resultant surpluses lies at the economic core of Mesopotamia and the Egyptian civilization. Two factors differentiate southeastern Arabia, defined here as the United Arab Emirates (UAE) and Sultanate of Oman, from these regions (fig. 1). The lack of a permanent or even semi-permanent river is the most obvious difference. Although wadis in the al-Hajjar Mountains may experience short periods of rapid flow during precipitation, there are few above-ground sources of water suitable for intensive cereal cultivation. Lenses of freshwater can appear on the coast because of a Ghyben-Herzberg interface, but these are episodic and cannot sustain intensive cereal cultivation. Average annual rainfall is around 90 mm (J. H. Stevens 1975: 161), thus clearly falling outside the optimal climatic conditions of the Fertile Crescent, and a very high degree of interannum variation means that for several years there may be little or no rainfall and then downpours of over 100 mm in several weeks in winter. For example, rainfall records from the city of Sharjah on the western coast of the UAE indicate an average per annum rainfall of 164 mm for the four-year period from 1954 to 1958, which dropped to 51 mm per annum for the following four years (thus creating an average of 107 mm, close to the long-term annual precipitation average).[1]

Despite the restrictive-rainfall pattern, the physical environment of southeastern Arabia contains abundant, albeit dispersed, resources that can support varied subsistence strategies. Running through the spine of the entire peninsula is the al-Hajjar mountain range. These mountains contain a wealth of mineral resources—in particular copper, for which this area was famous in antiquity. Although one might think that agricultural potential would be restricted in the mountains, the many intermontane wadis are an important resource niche. Their banks can be terraced to produce flat agricultural fieldworks and trap rainfall and soils. Furthermore, the base of the wadis provides easy access to the water table, which is rapidly recharged through gravel deposits during periods of rainfall and from the occasional spring. The Batinah coast lies on the east side of these mountains and extends to the Arabian Sea. This is a thin agricultural plain in which there is relatively easy access

[1] Based on data provided by the Sharjah Directorate of Antiquities (Sharjah, UAE).

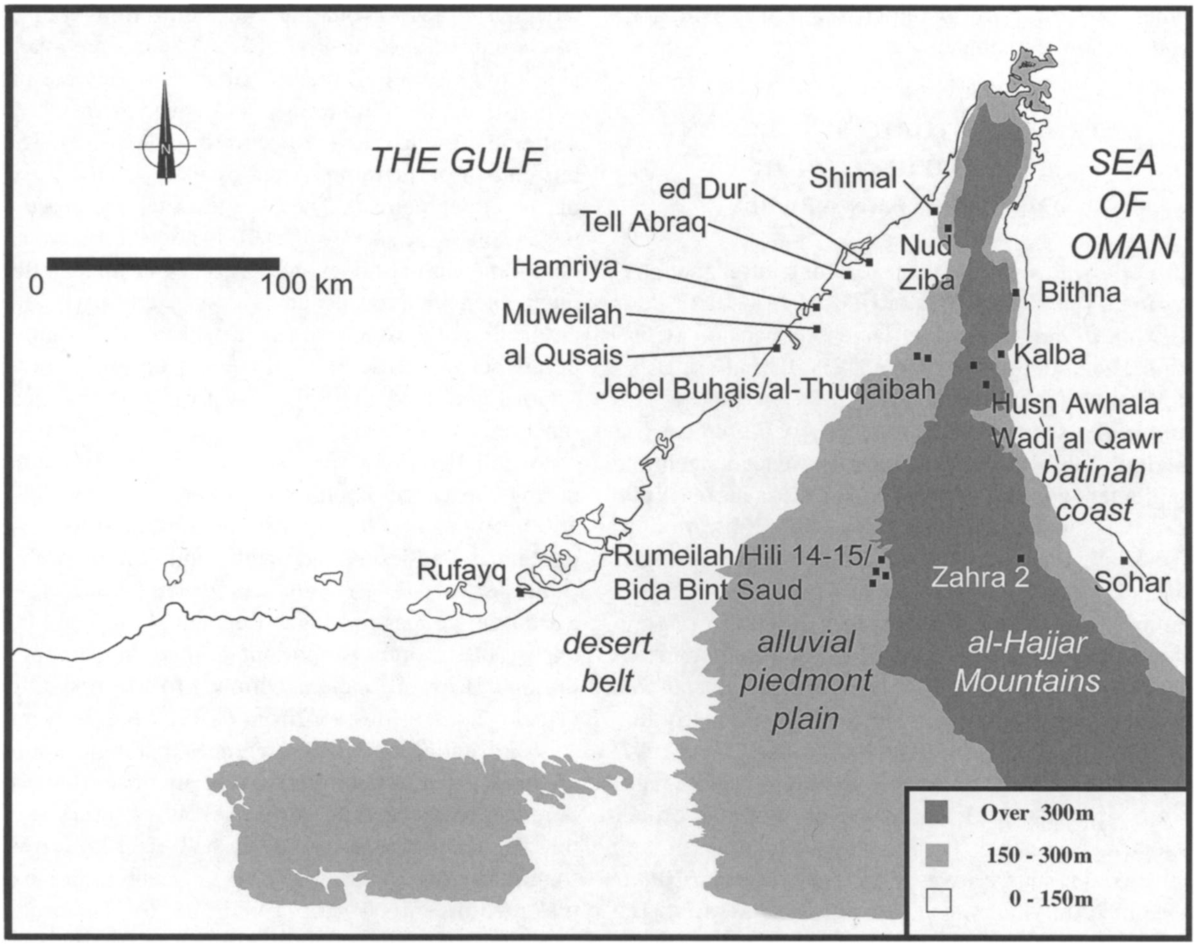

Fig. 1. The physical environment of southeastern Arabia and major Iron Age II settlements.

to the water table and to a varied coastal environment that is not only useful for obtaining marine food, but also supports pockets of mangrove in which useful woods, edible shellfish (particularly *Terebralia palustris*), and edible birds such as the Socotra cormorant (*Phalacrocorax nigrogularis)* are found.

On the west side of the mountains, there are three contiguous environments. Several alluvial plains locally called the al-Madam, Jiri, or Gharif are found at the base of the mountains. These contain soils to a depth of about 60 cm (Satchell 1978: 206). This area may be considered the "bread-basket" of the entire region, but access to the water table is difficult the farther one moves away from the mountain base (Boucharlat 1984; Tengberg 1998). These plains lead to an aeolian sand-dune belt that is the northern extension of the Rub al-Khali or Empty Quarter. Agricultural soils are limited in this area, but interdunal troughs may provide access to the water table to grow plants, such as the date palm, that are relatively resistant to sandy and saline conditions. Furthermore, the desert belt contains many plants on which camels can graze. This desert zone merges into a coast that in antiquity supported and today contains a number of *sabkha*, or dried lagoon beds and mangroves (Prieur 1990). These sabkha contain resources similar to the east coast but give access to the Gulf, an important waterway linking Mesopotamia, Iran, Arabia, and the Indo-Iranian borderlands.

When southeastern Arabia is examined in some detail, therefore, it is clear that the description of it as a homogenous desert environment, while grossly accurate, masks a wide variety of resources, which can be differentially exploited and provoke different responses and adaptive strategies. Importantly, these environments exist within close proximity to each other, providing the potential for tightly knit trade and economic exchange.

LATE PREHISTORIC SETTLEMENT INTENSIFICATION IN SOUTHEASTERN ARABIA

Following a period of far-reaching intra- and interregional trade (Cleuziou and Tosi 1994; 2000; Potts 1993c; 1993d; 1994), settlement expansion (Cleuziou 1982; 1996; Potts 1993b; 2000), and craft specialization (David 1996; Méry 2000) in the late third and early second millennia B.C., or Umm an-Nar period, southeastern Arabia experienced declining settlement and economic intensification around 1600 B.C. (Cleuziou 1981; Potts 1990a: 192–260). A multifactorial explanation for this change must be sought: the collapse of the copper trade (Weeks 1999; 2003), environmental change, and over-exploitation of fragile agricultural landscapes are all possible contributors (Cleuziou 1981). Whatever the cause, the number of permanent settlements declined significantly into the Iron Age I period (1300–1000 B.C.) (Carter 1997; Magee 1996a; Magee and Carter 1999). Evidence from sites like Tell Abraq indicates that a broad-spectrum economy, comprising marine, avian, and terrestrial resources, was practiced at this time (Potts 1990b; 2000). Intersite analysis of ceramics from Tell Abraq and Shimal (Velde 1990) suggests that pottery was probably being produced at each site in what may be labeled as a part-time or household-based economy (Magee 1995). Together with subsistence data, this indicates an extensive economy that may have contained a regularized seasonal component.

In the period known as the Iron Age II period (ca. 1000–600 B.C.), there was rapid settlement growth throughout southeastern Arabia (Magee 1999a; 2003). For the first time in the region's prehistory, all major environmental zones were occupied (fig. 1), including coastal settlements like Tell Abraq (Potts 1990b; 1991), desert settlements such as Muweilah (Magee 2004b), and numerous inland piedmont settlements (e.g., al-Tikriti 2002; al-Tikriti and Haddou 2001; al-Tikriti, Haj, and Niyadi 2001; Boucharlat and Lombard 1985; Córdoba 1998; 2002; Córdoba and Mañé Rodriguez 2000). A uniform material culture comprising distinctive ceramics, softstone artifacts (Lombard 1982), and bronze artifacts (Lombard 1984; 1985) has been recovered at all these sites. This was noted shortly after research began in this region (e.g., Boucharlat 1984), but the exact chronology of it has remained unclear. Presently, ^{14}C dates are available from sites in all these regions, and they are instructive on the chronology and speed with which settlement intensification occurred (tables 1–3). The terminus post quem presented by many of these ^{14}C dates is in agreement. They suggest that this process began sometime shortly after 1000 B.C. Presently, the chronometric data does not suggest that this settlement intensification occurred first in any particular environmental zone even if, as discussed in more detail below, settlement in certain environmental regions benefited more directly from technological innovations.

As alluded to above, settlement intensification during the earlier Umm an-Nar period (ca. 2500–1900 B.C.) can, at least partly, be attributed to Mesopotamian and Indus trade with southeastern Arabia (Potts 1993a; 1993d). This is indicated by numerous textual references to Magan (ancient Oman) and the export of its most important commodity, copper, through Bahrain (ancient Dilmun) to Mesopotamia (Weeks 2003). However, from ca.1700 B.C. onward, Assyrian and Babylonian references that unquestionably refer to southeastern Arabia are absent, and it is not until the middle of the seventh century B.C. that the land, which previously had been known as Magan but is now known as Qade, reenters the textual record (Potts 1985a; 1985b; 1986). Therefore, Mesopotamia's demand for copper, perhaps flagging with increased reliance on iron or satiated by trade with copper-producing centers like Urartu or Cyprus, was not an impetus for the emergence of settlement intensification in southeastern Arabia. This is reflected in the indigenous character of Iron Age II material culture (Lombard 1985; Magee 1995). Evidence for Mesopotamian goods is limited to small numbers of vessels from only two sites and one unpublished Neo-Assyrian cylinder seal (Magee 2001). This can be contrasted with the Umm an-Nar period when Mesopotamian, Iranian, and Indus ceramic and stone vessels, pendants, and beads are common from many sites (Méry 2000; Potts 2000).

Falaj Irrigation and the Emergence of the Oasis Polity

Since the onset of scientific fieldwork in this region, it was suspected, but unproven (Boucharlat 1984; Potts 1990a: 392), that *falaj* irrigation, which was such an important agricultural technology in the pre-

TABLE 1. Calibrated Ranges for Radiocarbon Dates from Iron Age Coastal Settlements in Southeastern Arabia

Site	*Code*	*Material*	*Remarks*	^{14}C *Age*	*Calibrated 2 Sigma Calib 4.1*
Muweilah	OZB-802	Date seed	Destruction layer	2406 ± 134	810–197 B.C.
Muweilah	OZB-803	Wood charcoal	Destruction layer	2427 ± 78	780–394 B.C.
Muweilah	OZB-804	Date seed	Destruction layer	2488 ± 67	786–411 B.C.
Muweilah	OZB-805	Wood charcoal	Destruction layer	2943 ± 182	1603–1555 B.C. (.013) 1539–792 B.C. (0.987)
Muweilah	OZB-806	Wood charcoal	Destruction layer	2334 ± 116	788–163 B.C. (.996) 129–121 B.C. (.004)
Muweilah	OZB-807	Wood charcoal	Destruction layer	2885 ± 144	1412–802 B.C.
Muweilah	Beta-116112	Wood charcoal	Destruction layer	2560 ± 60	828–505 B.C. (.965) 488–484 B.C.(.002) 464–413 B.C. (.033)
Muweilah	Beta-116117	Wood charcoal	Area C fire pit date	2680 ± 50	922–791 B.C.
Muweilah	Wk-9243	Beam	Gateway beam	2650 ± 40	897–788 B.C.
Muweilah	Wk-9244	Beam	Gateway beam	2530 ± 50	803–511 B.C. (.959) 463–419 B.C. (.040)
Muweilah	Wk-9506	Wood charcoal	Sand deposit in deep wall area	2863 ± 68	1258–1234 B.C. (.028) 1216–894 B.C. (.940) 878–841 B.C. (.032)
Muweilah	Wk-9572	Date seed	Pit in Building II	2568 ± 58	831–515 B.C. (.976) 486–485 B.C. (.001) 463–414 B.C. (.024)
Rufayq	GU-9156	Charcoal	Hellyer and Beech 2001	2790 ± 70	1185–1184 B.C. (.001) 1127–810 B.C. (.999)
Rufayq	GU-9157	Charcoal	Hellyer and Beech 2001	2890 ± 110	1374–1337 B.C. (.034) 1319–832 B.C. (.966)
Rufayq	GU-9158	Charcoal	Hellyer and Beech 2001	2800 ± 50	1110–1100 B.C. (.011) 1080–1061 B.C. (.018) 1053–829 B.C. (.971)
Rufayq	GU-9159	Charcoal	Hellyer and Beech 2001	2480 ± 60	781–478 B.C. (.857) 471–411 B.C. (.143)

modern era (Wilkinson 1977; 1983), may be the key to understanding Iron Age II settlement intensification. This irrigation system, also known as the *qanat*, *karez*, or *foggara*, involves tapping aquifers and transporting the water via human-constructed subterranean channels to lower-lying piedmont areas (fig. 2). Radiocarbon data of the type presented here were unavailable at the time falaj irrigation was highlighted as a possible cause of settlement intensification.

Perhaps more importantly, scholars were reluctant to contradict what is still often considered an axiom in archaeological and historical literature: falaj irrigation was first "invented" in Iran in the eighth or seventh century B.C., where it was seen by Sargon II in his campaign against ULHU (Goblot 1979; Laessøe 1951; Lightfoot 2000: 215). According to this view, falaj technology was then transferred to Arabia and the rest of the Middle East during the period of the Achaemenid Empire (538–332 B.C.). Even when reference was made to the possible existence of pre-Achaemenid falaj in southeastern Arabia, scholars were unwilling to accept an indigenous origin. Lightfoot, for example, writes, "There may have been a few qanats in Oman predating the Achaemenid era (as early as 1200 B.C.) possibly introduced from the Iranian side of the Gulf as part of a normal process of contact and trade" (Lightfoot 2000: 221). There is, however, no evidence that falaj were known in southeastern Iran in this period, and indeed the only known and excavated settlement in this region, Tepe Yahya, was abandoned from the middle of the second millennium until the eighth

TABLE 2. Calibrated Ranges for Radiocarbon Dates from Iron Age Piedmont Oasis Settlements in Southeastern Arabia

Site	*Code*	*Material*	*Remarks*	*^{14}C Age*	*Calibrated 2 Sigma Calib 4.1*
Hili 17	PA-1926	Charcoal		2760 ± 40	997–828 B.C.
al-Thuqaibah	Ly-8939	Charcoal		2640 ± 40	896–869 B.C. (.086) 864–846 B.C. (.037) 844–778 B.C. (.876)
al-Thuqaibah	Ly-7762	Charcoal		2435 ± 40	775–398 B.C.
Rumeilah I	Ly-3076	Charcoal		3110 ± 170	1739–966 B.C. (.981) 964–920 B.C. (.019)
Rumeilah I	Ly-3783	Charcoal		2970 ± 150	1502–834 B.C.
Rumeilah I	Ly-3782	Date seed		2610 ± 90	967–963 B.C. (.003) 923–481 B.C. (.955) 467–412 B.C. (.042)
Rumeilah I	Ly-3708	Charcoal		2860 ± 150	1431–787 B.C.
Rumeilah I	Ly-3784	Shell	Calibrated with a marine calibration dataset with a global ocean reservoir correction	2860 ± 100	840–388 B.C.

TABLE 3. Calibrated Ranges for Radiocarbon Dates from Iron Age Mountain Settlements in Southeastern Arabia

Site	*Code*	*Material*	*Remarks*	*^{14}C Age*	*Calibrated 2 Sigma Calib 4.1*
Husn Awhala	Beta-91469	Wood charcoal	Construction beam	2610 ± 60	903–539 B.C. (.996) 528–523 B.C. (.004)
Husn Awhala	Beta-91467	Wood charcoal	Construction beam	2610 ± 60	903–539 B.C. (.996) 528–523 B.C. (.004)
Husn Awhala	Beta-91468	Wood charcoal	Construction beam	2670 ± 60	996–992 B.C. (.002) 977–762 B.C. (.994) 678–672 B.C. (.004)
Raki 2	Hd-18743	Charcoal		2804 ± 53	1125–830 B.C. (1.00)
Raki 2	Hd-18790	Charcoal		2764 ± 32	996–830 B.C. (1.00)
Raki 2	Hd-18789	Charcoal		2864 ± 34	1205–1205 B.C. (.001) 1188–1181 B.C. (.011) 1148–1144 B.C. (.004) 1128–966 B.C. (.846) 964–921 B.C. (.138)
Raki 2	Hd-18742	Charcoal		2787 ± 35	1003–834 B.C. (1.00)
Raki 2	Hd-18765	Charcoal		2807 ± 39	1048–835 B.C.

century B.C. (Magee 2004a). That the Iranian origin of qanat has remained an *opinio communis* despite a complete absence of any supporting archaeological evidence and despite a rereading of the relevant inscription that proves that falaj are not mentioned (Salvini 2001) is testimony in itself to the manner in which assumptions concerning the primacy of one region as a vector for technological innovation can stifle archaeological research and produce ultimately flawed conclusions.

A definitive statement concerning the appearance of falaj irrigation in southeastern Arabia is now pos-

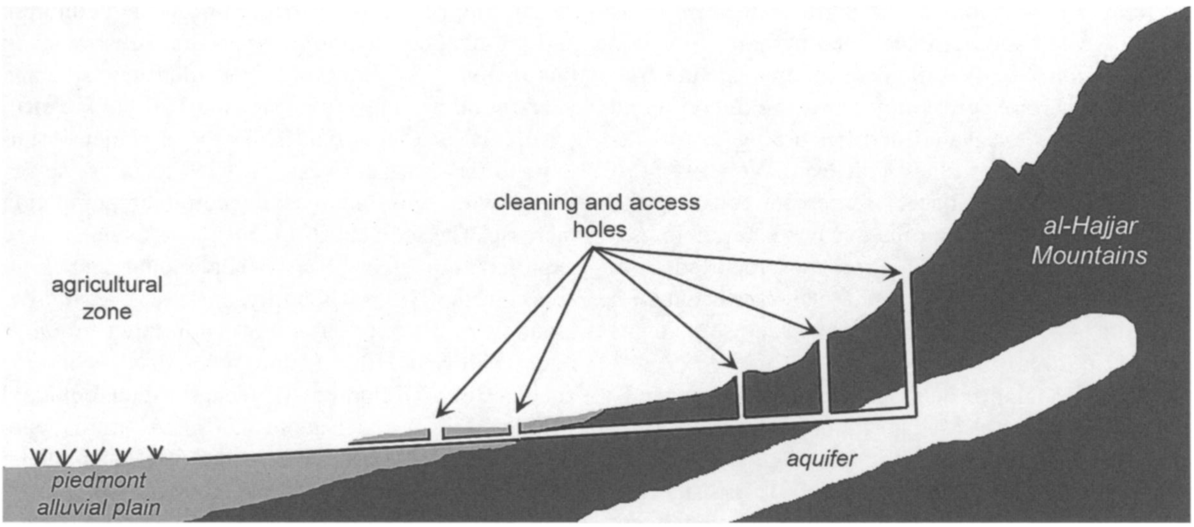

Fig. 2. Schematic section of a falaj system.

sible due to increased survey and excavation and many new ^{14}C dates. The channels that run from the underground systems and the cleaning holes that are used to service the falaj have been found in definite association with Iron Age II settlements in piedmont settlements of Hili in the al-Ain oasis (al-Tikriti 2002), Bida Bint Saud (al-Tikriti 2002), and al-Thuqaibah (Córdoba 2002).

The ancient settlement of Hili consists of a large collection of sites that formed a major Iron Age II settlement (fig. 3). Surface indications and soundings suggest that Hili 14 consists of a large fortified settlement containing numerous smaller internal buildings. A falaj (Hili 15) emerges from its underground channel near the site. Its position next to the falaj, coupled with the fact that it is the only known fortified settlement within the Hili oasis, have led scholars to suggest that the function of the settlement was the control and redistribution of falaj products (Boucharlat and Lombard 1985; al-Tikriti 2002). This hypothesis is supported by the recovery of numerous typical Iron Age II storage jars (Boucharlat and Lombard 1985: pl. 70.3). Excavations conducted a few hundred meters from the Hili falaj revealed two pisé-constructed houses that should be considered part of the Hili settlement (al-Tikriti and Haddou 2001). The recovery of kiln structures, ceramic wasters, and an inordinate number of vessels suggests that this part of the settlement was engaged in ceramic production (Magee 1995; Magee et al. 1998). A single ^{14}C date from these excavations provides a terminus post quem of 997 B.C. (table 2: PA-1926). As noted above, this date is in complete accordance with other Iron Age II settlement dates and clearly suggests that the Hili oasis polity, with its falaj irrigation system, existed from the beginning of the Iron Age II period.

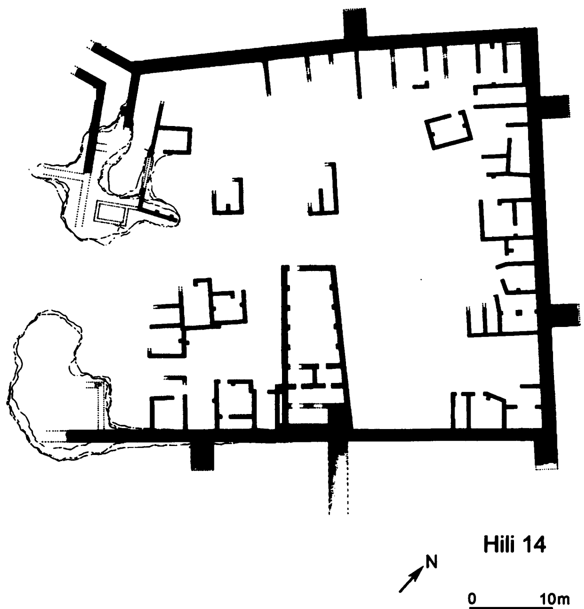

Fig. 3. Iron Age II settlement of Hili 14 (after Boucharlat and Lombard 1985).

Recent excavations to the north of the Hili oasis have revealed another intact falaj system associated with an Iron Age II settlement known as Bida Bint Saud. Numerous access holes and the underground channel were excavated and, according to the excavator, these were filled with Iron Age sherds (al-Tikriti 2002). The adjacent settlement consists of a single pisé building that the excavator refers to as a "House of the falaj." The ceramics reported from inside the falaj and the house are all consistent with the Iron Age II corpus from numerous settlements (al-Tikriti 2002).

The final falaj to be discussed was only recently excavated in the al-Madam Plain in the Emirate of Sharjah. It is found near the Iron Age II–III settlement of al-Thuqaibah (Córdoba 2003). This site consists of a mudbrick and pisé structure that underwent several phases of rebuilding. The excavators have suggested that the main function of the settlement was related to agriculture and pastoralism. Although it can be generically labeled as an Iron Age II–III settlement on the basis of the ceramics, relevant ^{14}C data have also been recently published (table 2: Ly-8939, Ly-7762). These dates suggest a terminus post quem for the occupation of the settlement of ca. 900 B.C.

The use of the falaj can be dated, therefore, from the early stages of the Iron Age II period or early first millennium B.C. This confirms that the falaj was not an Achaemenid-period technological adoption from Iran. That falaj irrigation was, in fact, a response to increasing aridity in southeastern Arabia at ca. 1000 B.C. has been explored elsewhere (Magee 2004a: 77–80), but it is worth reiterating here the main points of that argument. Varved sediments from the Arabian Sea suggest a "gradual progressing aridification" by 1100 B.C. (Lückge et al. 2001: 285) characterized by decreased winter *and* summer monsoon patterns, both of which affect weather patterns in Arabia. This climate change has also been indicated by terrestrial cores taken at Awafi in the northern United Arab Emirates which show "intense arid conditions" at 1000 B.C. (Parker et al. 2006). With decreased precipitation, traditional forms of irrigation, including trapping run-off through terracing and the construction of dams, would have been rendered ineffective. Simple wells would also have had limited success in tapping groundwater, as recharge to the aquifer declined and the water table dropped. Falaj irrigation is an effective response to these conditions, since it allows water to be transported from where it is accessible to the environmental zones where it is most needed.

The impact of falaj irrigation on the economic and political configuration of ancient settlements in this region was immense. It permitted intensive and year-round agriculture in the small 20–30 km strip of alluvial piedmont that flanks the al-Hajjar Mountains to the east and west. This led to larger settlements with presumably a concomitant population increase. The social costs of this phenomenon can be explored through analysis of individual settlement areas. In the Hili oasis polity, for example, a combination of fortified structures, domestic buildings (Rumeilah and Hili 2), and specialized economic zones (Hili 17) emerges (Boucharlat and Lombard 1985; al-Tikriti and Haddou 2001). A similar phenomenon can be observed in the al-Madam Plain, where a combination of domestic/agriculture structures (al-Thuqaibah) and fortified enclosures (Jebel Buhais) has been uncovered (Córdoba 2003).

It is, however, the recovery of columned buildings at both Rumeilah and Bida Bint Saud in the Hili oasis polity that most clearly demonstrates the economic and political impact of falaj irrigation (Boucharlat and Lombard 2001). These buildings are derived from an Iranian prototype called "the Columned Hall." In Iran, the most complete examples of this form have been found at Godin Tepe, Hasanlu in the Solduz Valley in northeastern Iran (Dyson 1965; 1989), and at Tepe Nush-i Jan (Stronach and Roaf 1978). In each of these settlements, the columned hall is the center of political power, although its use as a religious building has also been demonstrated (Dyson and Voigt 2003).

The artifacts found in the southeast Arabian columned halls highlight the elite activities of those who occupied or used them and renders unnecessary a perilous assigning of function on the basis of Iranian models. In the columned halls of Rumeilah and Bida Bint Saud, numerous examples of decorated bridged-spouted vessels (Boucharlat and Lombard 2001: 218) were found. This rare form, which is uncommon in other buildings in these sites, appears to have had a specific pouring function which, given contextual evidence from Muweilah (below), is associated with banqueting. Vessels decorated with appliqué snakes were also concentrated in these buildings (Boucharlat and Lombard 2001). Similar vessels have been recovered in an extensive religious complex recently excavated in Fujairah on the east coast of the UAE (Benoist et al. 2004). The use of incense is also attested, in the form of vessels with perforated walls that were most likely used for burning incense (Boucharlat and Lombard 2001: 218).

As is well known, incense is only found in discrete areas of the Horn of Africa and southwestern Arabia (Groom 1981). In the latter region and elsewhere in the Near East (Barnett 1985; Wapnish 1981: 111; cf. Haran 1995), it is a rare and luxury commodity that was traded widely (see Finkelstein 1988; 1992). The combination of elite banqueting equipment and objects that may have been used in a religious context within these columned buildings provides evidence for increasing social and economic differentiation, the likes of which are not previously attested for southeastern Arabia.

The recovery of numerous large storage jars in the columned buildings at Rumeilah and Bida Bint Saud suggests that this emerging differentiation was linked in some way to maintaining economic order, most likely the distribution of water from a falaj or the cereals that resulted from falaj irrigation. The discovery of 15 pyramidical or other shaped stamp seals in the Hili oasis polity at Rumeilah and Bida Bint Saud (K. G. Stevens 1992; Lombard 1998) supports this hypothesis. These are made in semi-precious stones, such as jasper, and locally available softstone and lead. It would be facile to argue that such stamp seals are *necessarily* indicative of a centralized redistributive economy; similarly shaped and decorated examples are known, for example, from Neolithic contexts in Syria (Akkermans and Verhoeven 1995). However, that 15 stamp seals, out of a region-wide total of 17, have been found in these falaj-based settlements suggests a functional link to the control of staple resources. It cannot be argued that this uneven distribution reflects an imbalance in archaeological fieldwork, as numerous settlements have been excavated on the coast (Potts 1990a; 1991), in the desert (Magee 2004b), and in the mountains.

The emergence of a complex polity in which elites controlled staple products and legitimized their authority by engaging in ritual activities involving banqueting and the use of rare commodities is, of course, easily recognizable to scholars researching complexity in the ancient Near East. Although at a much smaller scale, it replicates many of the paradigms employed in understanding the emergence of state-level societies in Egypt and Mesopotamia. In southeastern Arabia, however, the piedmont oasis is only one aspect of settlement dynamics, and there is no evidence that any of the oasis polities ever exercised authority over the landscape as a whole. As we noted in the introduction, the Iron Age II period witnessed the emergence of settlements in all environmental zones in southeastern Arabia. Assessing the economic, social, and political organization of those settlements that lie beyond the agricultural piedmont zone is now becoming possible with intensive fieldwork in the desert and coastal zones.

Moving Out from the Oasis: Settlement Intensification in the Desert Zone

Since 1994, an international team led by the author has been excavating the ancient settlement of Muweilah, situated about 15 km from the present coastline in the Emirate of Sharjah, United Arab Emirates (Magee 1996b; 2001). The site consists of a single period of occupation representing several subphases of the Iron Age II period. The archaeological remains, which are covered by mobile sand-dunes and scattered scrub vegetation, are well preserved, and walls are regularly extant to 1 m in height. There are no agricultural soils present today, and cereal cultivation in the past would have been restricted to that practiced in the shaded areas between date palms. The many thousands of carbonized dates and date seeds recovered indicate the importance of date palm cultivation, and date palm wood is also one of the most commonly used woods for construction (Tengberg 1998).

Initial interpretations of the settlement were heavily reliant on environmentally deterministic assumptions. For example, Mouton argued that nomads who were traveling to the rich inland agricultural oases probably occupied the site (Mouton and Boucharlat 1991: 6). In fact, excavations, ground-penetrating radar, and magnetometry have indicated that at the center of the settlement (Area C), there are several large buildings enclosed by a double mud-brick and stone-constructed enceinte (Magee 2004b). There is evidence for a complete destruction of these buildings in the form of a thick layer of ash in all occupation deposits. Accelerator mass spectrometry (AMS) and radiometric determinations on short-lived samples (carbonized dates) suggest that this destruction took place sometime after 800 B.C., while a date from under a wall suggests that the buildings were in existence sometime after 920 B.C. (Magee 2004b).

Several distinct buildings have been excavated in Area C (fig. 4). There are several residential buildings with small rooms that are grouped around a large central courtyard (fig. 5). They are accessed from the south and east via a stone-constructed gateway. Evidence for domestic occupation consists of Iron Age II storage and serving vessels (fig. 6), grinding stones, and animal bones which are differentially

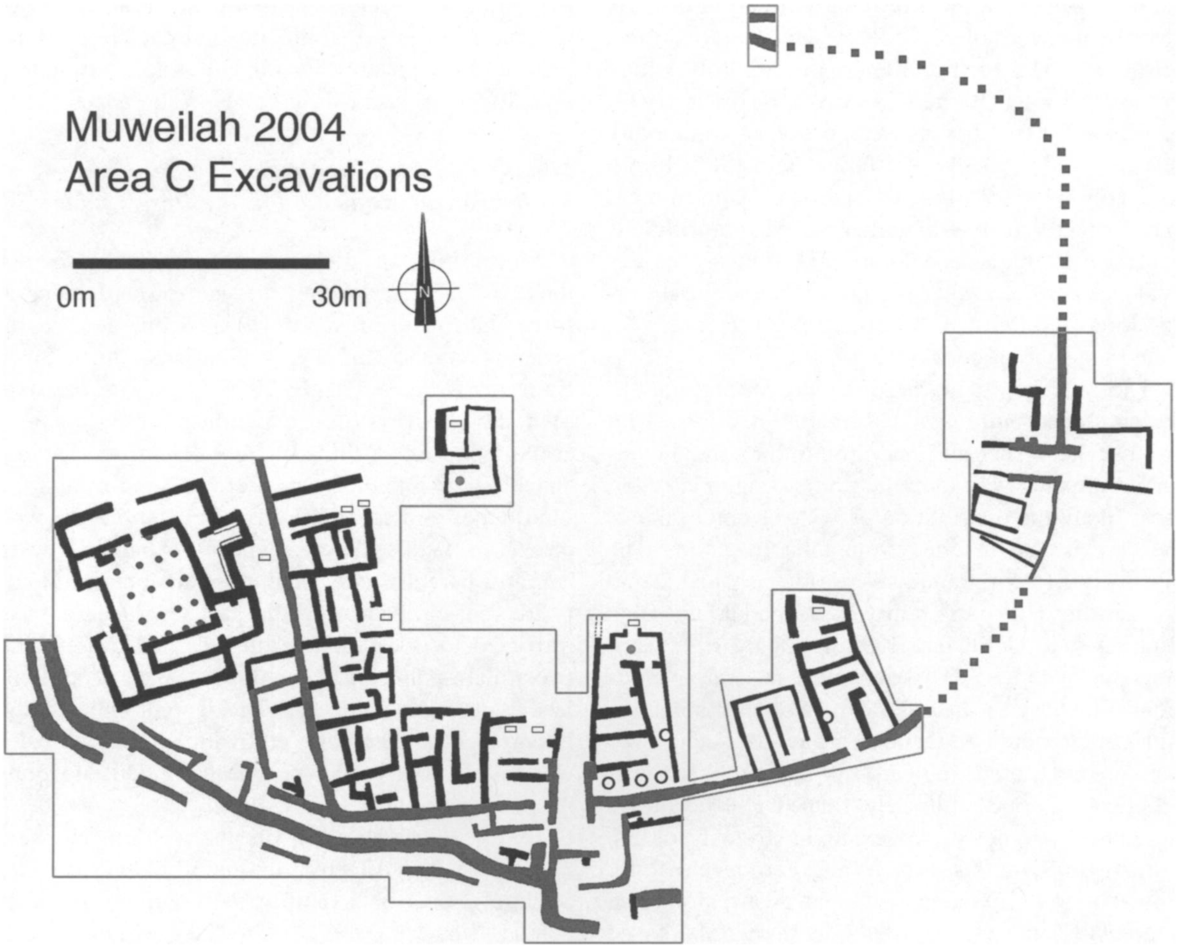

Fig. 4. Area C, Muweilah (Emirate of Sharjah), United Arab Emirates.

distributed throughout the settlement. Cooking installations, such as *tannours* or clay ovens (fig. 7), are a common feature of these buildings, which most often face the courtyard. A *madbhasa*, or date press, the earliest yet documented in southeastern Arabia, was also located near the southern gateway (fig. 8). These buildings are comparable in every way to those found in the piedmont settlements such as al-Ain and al-Madam but are much larger than some individual buildings recovered at those sites.

A columned building (called Building II) was discovered in 1998 alongside these residential areas. Its excavation has provided detailed evidence for the economic and political structure of the settlement as a whole. It consists of a multiroomed, freestanding structure entered from the north via a double entryway containing paving stones (fig. 9). In the center is a large room measuring approximately 12 × 10 m, in which the floor level is sunken below the level of the surrounding rooms. The remnants of a 5 × 4 stone-made column arrangement were evident in this room. Imprints of wooden columns are evident on some of the bases, and burnt lengths of wood were found throughout the central room. In design, therefore, this building mirrors those found in the oasis settlements of Hili and Bida Bint Saud but is slightly larger than both of those examples.

The artifacts found in Muweilah Building II provide evidence for exactly the same practices attested at the columned buildings in the oasis settlements of Rumeilah and Bida Bint Saud. Over 40 bridge-spouted vessels have so far been recovered from this building (fig. 10). Nearly all of these were found in a room in the southeast of the building, which is accessible only from the main columned room. The vessels were made of local *and* imported fabrics,

Fig. 5. General view of Building I, Muweilah.

suggesting that it is their use as pouring vessels, rather than whether they were imported or the product of a specialized workshop, that gave them some form of status. As noted above, a role in banqueting might be tentatively hypothesized because of their form. The recovery of a bronze ladle in Building II (fig. 11), which within the Near East is normally associated with banqueting (Moorey 1980), would seem to confirm this function. The discovery of several poorly fired miniature bridge-spouted vessels in a pit dug outside of Building II (fig. 12) suggests a ritual component to these activities. These vessels are so poorly fired that they could not have been used more than a few times and, in two cases, are decorated with appliqué snakes, comparable to examples from Rumeilah and Bida Bint Saud. Finally, an incense burner was found in the central room of Building II (fig. 13). This is a more elaborate form of those found in the columned buildings at Rumeilah and Bida Bint Saud. Like those examples, it is made from local clay and decorated in local style but with a figurine of a *Bos indicus* on top.

A key question posed by the excavation of Muweilah is, what was the economic basis for a settlement that appears as socially and politically differentiated as the piedmont oasis settlements engaged in intensive falaj-based agriculture? Both Muweilah's environmental location and the archaeobotanical evidence (Tengberg 1998) suggest that the settlement was not engaged in intensive cereal cultivation.

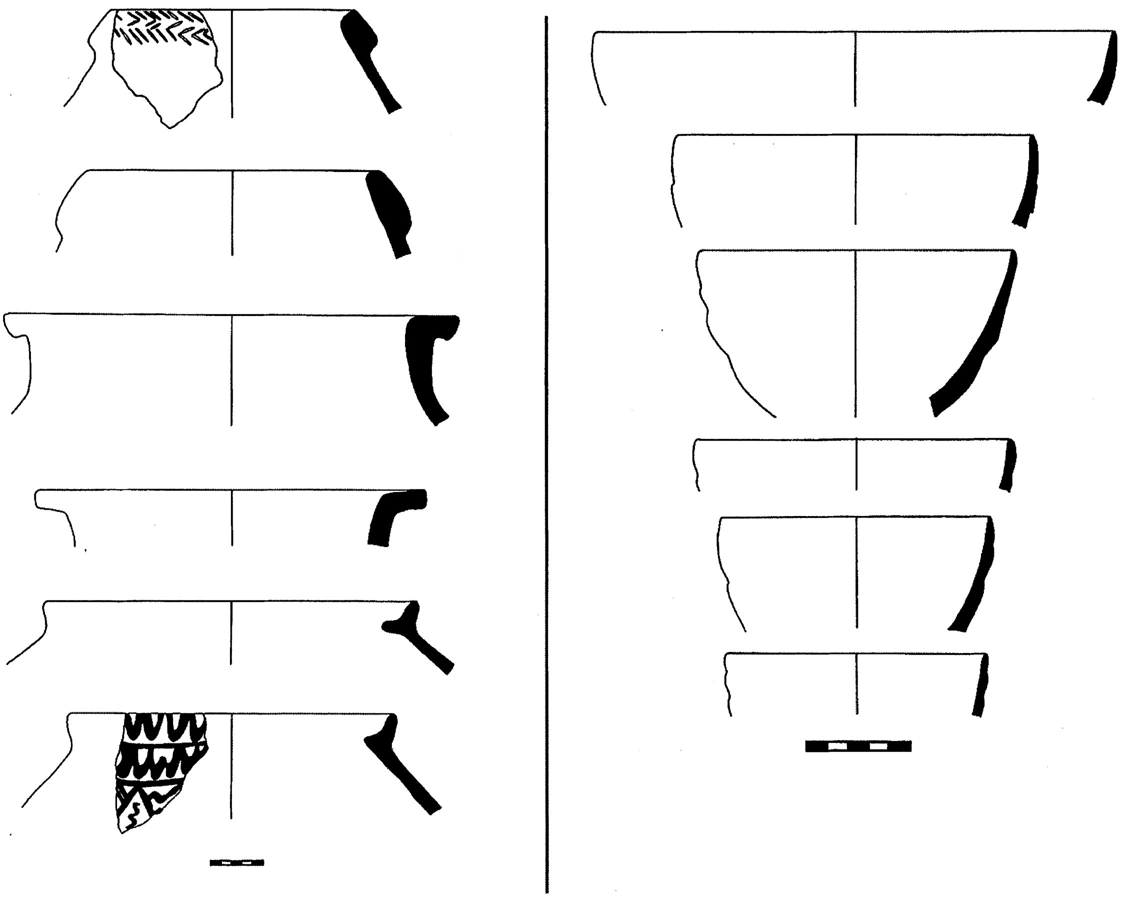

Fig. 6. Iron Age II pottery from Building I at Muweilah. Scale in centimeters.

The absence of stamp seals, which we hypothesize were used for the administration of agricultural products, is also important to note in this regard. Research has focused, therefore, on assessing what resources were available in this desert environment that might have encouraged the emergence of a relatively complex polity. Data collected thus far suggest that, as with falaj-based oases, there was an adaptational innovation—the exploitation of domesticated camel—which can most adequately explain this process.

The date and location of camel domestication is still much debated. A late third-millennium B.C. date has been argued on the basis of archaeological evidence from Egypt (Ripinksy 1983) and archaeozoological evidence from Umm an-Nar Island in the Emirate of Abu Dhabi (Hoch 1979). Midant-Reynes and Braunstein-Silvestre have convincingly demonstrated that none of the findings from Egypt provide unequivocal evidence for domestication, as opposed to knowledge and/or hunting of wild camels (Midant-Reynes and Braunstein 1977). The Umm an-Nar evidence, while commonly accepted (e.g., Hoyland 2001; Köhler-Rollefson 1993), has recently come under renewed scrutiny by Uerpmann and Uerpmann (2002). In an analysis encompassing Bronze Age material from sites in southeastern Arabia, they make a convincing case that the Umm an-Nar evidence represents the remains of hunted wild camels. This very much reopens a debate, the intricacies and details of which far exceed the limits of this paper. In any case, explicit evidence such as Shalmaneser III's (853 B.C.) record of the defeat of Gindibu and the capture of camels; Tukulti-Ninurta II's (890–884 B.C.) record of camels as tribute; and a relief of a camel and rider from Tell Halaf in Syria leave little doubt that domesticated camels were known in the Middle

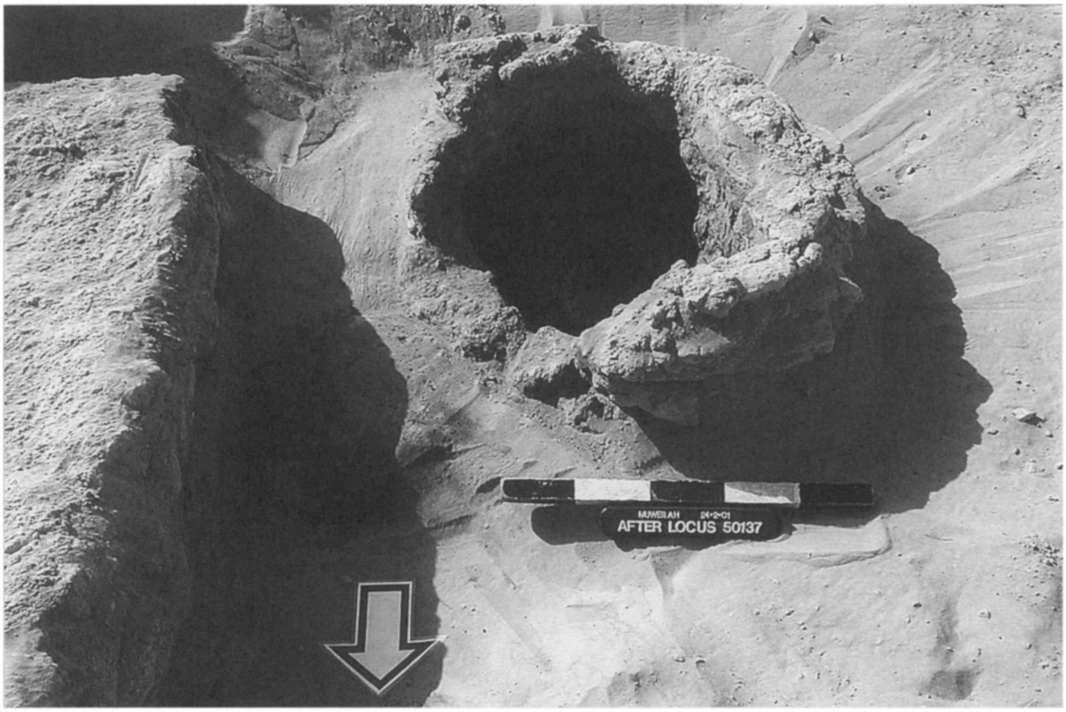

Fig. 7. Cooking installations and tannours in Building I at Muweilah.

Fig. 8. A possible *madbhasa* or date press in Building I at Muweilah.

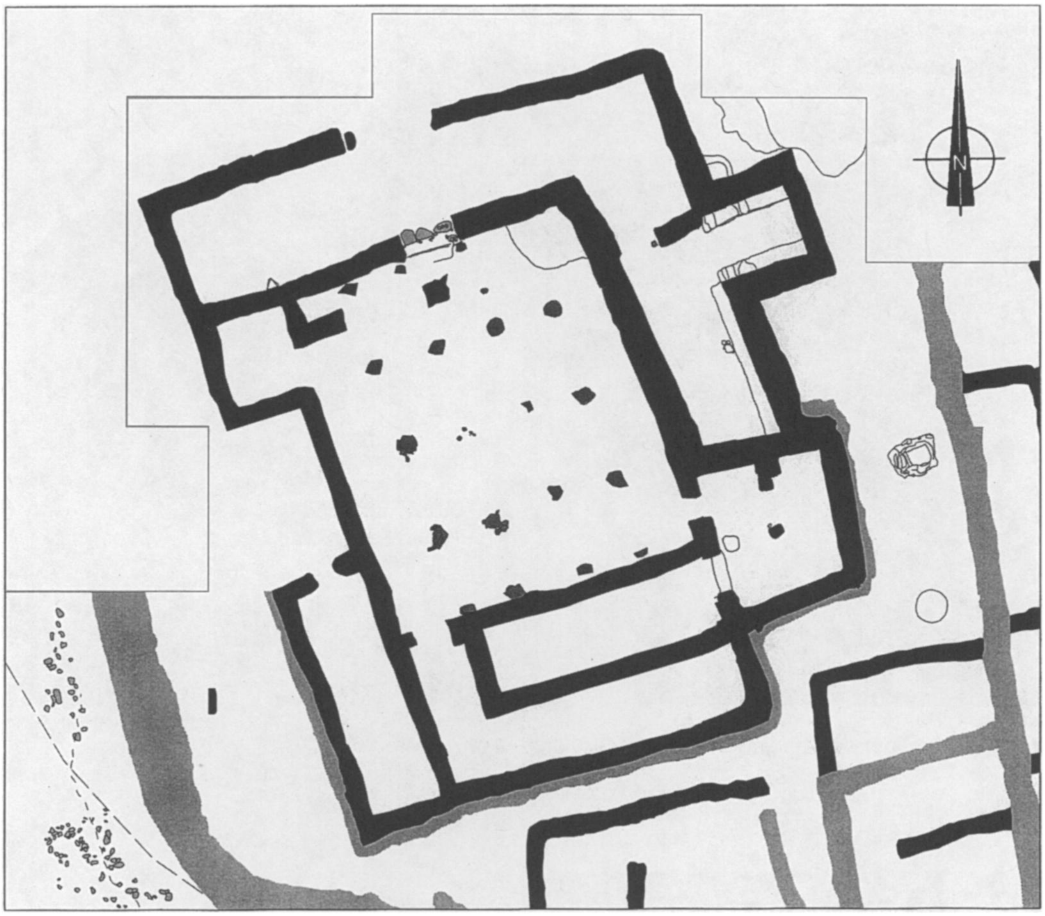

Fig. 9. Building II at Muweilah.

East by the second century of the first millennium B.C. (Heimpel 1980: 331). This is supported archaeologically by Wapnish's (1981) analysis of archaeological material from Tell Jemmeh in the southern Levant.

Uerpmann and Uerpmann's (2002) analysis of archaeozoological material from the stratified settlement of Tell Abraq suggests that for southeastern Arabia, the appearance of domesticated camels can be dated to the beginning of the Iron Age II period. The relative quantity of camel bones in the Iron Age I and II periods suggested to the Uerpmanns that domesticated camels were introduced, rather than domesticated within southeastern Arabia. Iron Age II artifacts from Muweilah confirm aspects of the Uerpmanns' argument. In addition to numerous neck and leg figurines, a near-complete camel figurine and a separate torso figurine have been recovered from Building I (fig. 14). Both are made from local clay and decorated with black and red lines. On the upper back of the camel is a representation of a load or a cushion saddle, not dissimilar to that seen in the Tell Halaf relief. Whether or not it is a saddle or a load is less important than the obvious implication that the camel represented by the figurine is domesticated. These figurines are unique in Near Eastern archaeology, and a more detailed analysis of them is forthcoming. For the moment, it suffices to note that they are among the earliest securely dated coroplastic reflections of unequivocally domesticated camel. Furthermore, preliminary analysis of archaeozoological evidence from Muweilah suggests that the exploitation of domesticated camel was significant: domesticated camel occupies the same proportion of the faunal component as cattle does at other sites (Uerpmann and Uerpmann 2002: 257).

Regardless of whether or not camels were introduced or locally domesticated, the choice to use

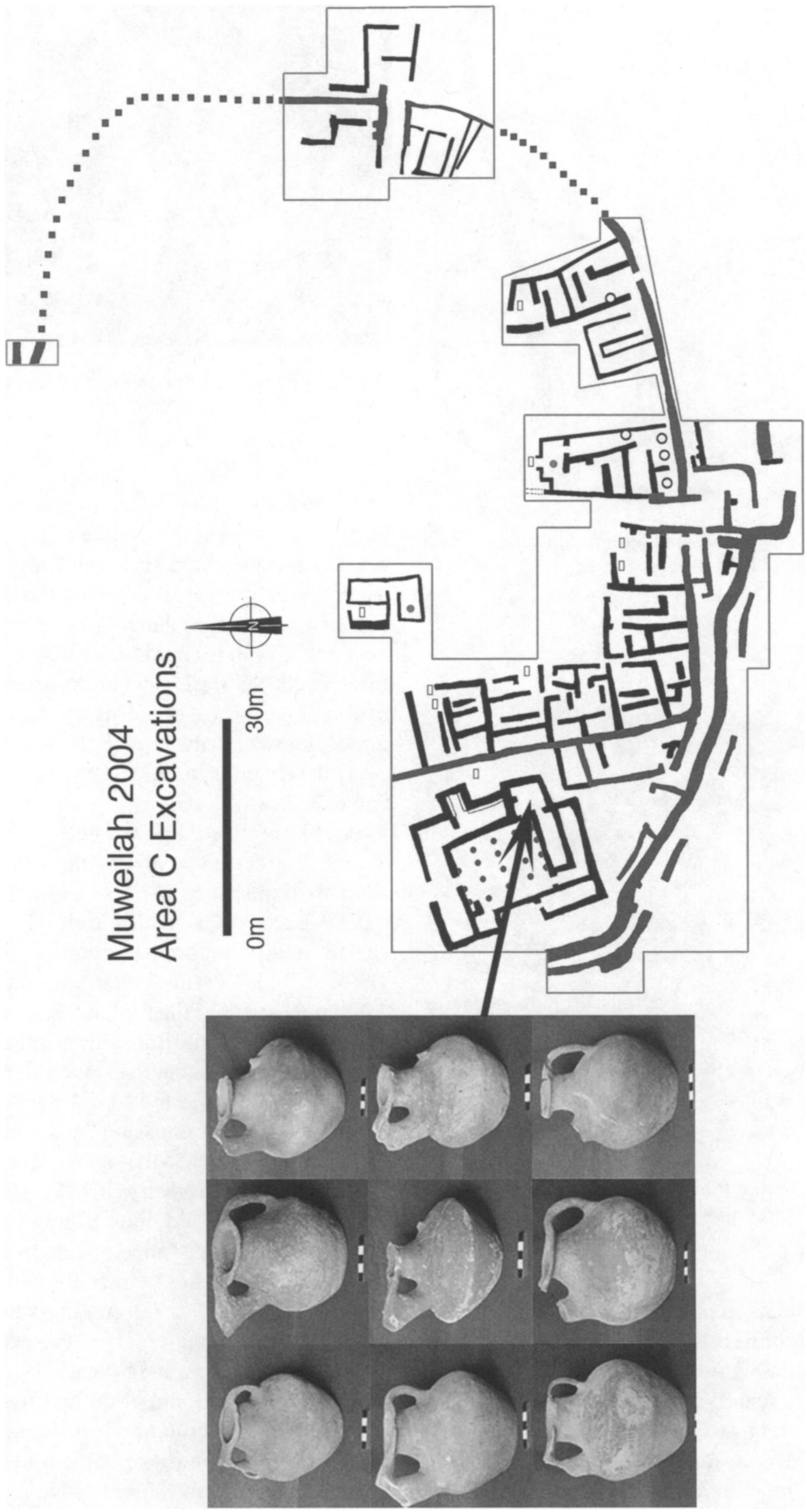

Fig. 10. Bridge-spouted vessels and their location in Building II at Muweilah.

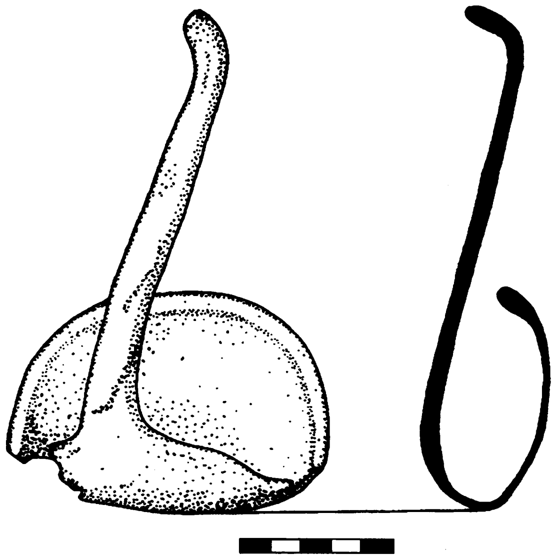

Fig. 11. Bronze ladle from Building II at Muweilah. Scale in centimeters. Height: 18 cm.

Fig. 12. Poorly fired bridged-spouted vessel from pit outside Building II at Muweilah.

Fig. 13. Incense burner from the central room of Building II at Muweilah. Width at base: 29 cm. Height: 24.5 cm.

domesticated camels must be viewed as an adaptive strategy that permitted the exploitation of deserts in eastern Arabia. Domesticated camels had the potential to significantly alter human habitation of this environment in two interrelated ways. First, the desert provides an ideal resource specialization zone for camel breeding. The presence of the shrub *ghaf* (*Prosopis cineraria*) in the modern and ancient environment of Muweilah (Tengberg 1998) would have provided foraging for camels. The rarity of other grasses and plants that could have facilitated intensive sheep/goat or cattle herding meant that camels could graze with less competition. In essence, the desert becomes a resource specialization zone for the breeding of camels. Second, as is well known, camels have the ability to engage in cross-desert trade to an extent unmatched by other domesticates.

Ample archaeological evidence left as a result of the destruction of the settlement attests to Muweilah's importance in inter- and intraregional trade routes. Excavations in Buildings I and II have revealed many imported ceramics (Magee 2004b). These include ceramics that may have been traded down the Gulf and then inland, such as pseudo-Barbar ceramics from Bahrain, torpedo-shaped jars from Mesopotamia, and several smaller vessels that may have been imported from Iran. Analysis by proton-induced X-ray emission/proton-induced gamma emission (PIXE-PIGME) and inductively coupled plasma-mass spectrometry (ICP-MS) of some of these sherds has suggested their foreign origin (Magee 2004b). Such a wide range of imported ceramics has not been reported from either Rumeilah (Boucharlat and Lombard 1985) or Tell Abraq (Potts 1990b; 1991), the only other contemporary settlements from which there are detailed ceramic data.

The recovery of imported and local metals concentrated in the columned building (Building II) implies that the control of some trade goods formed a key component in the existence of hierarchies at

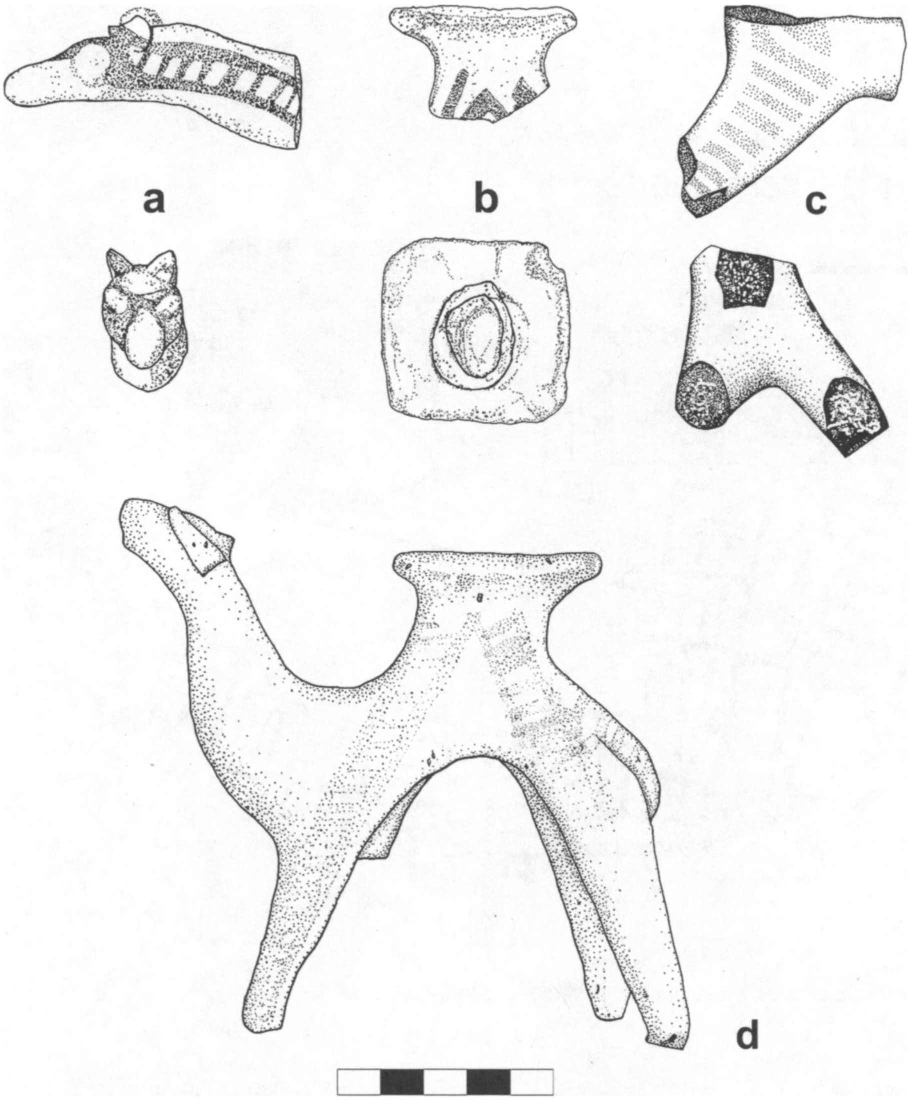

Fig. 14. Camel figurines from Building I at Muweilah. Scale in centimeters.

the settlement. Until recently, it remained axiomatic that the southeast Arabian Iron Age was without iron (Lombard 1989). So far, over 20 iron artifacts have been found at Muweilah, many from one room of Building II (fig. 15). The absence of any iron facilities or production refuse at Muweilah or any other settlement nearby suggests that iron was almost certainly imported. Iran appears as the most likely source, but one cannot rule out Yemen or other parts of Arabia. Another precious traded commodity was bronze. Over 1,500 small pieces of bronze have been found in Building II, including recently cast objects, as indicated by the presence of the sprue (fig. 16). Bronze-working relied on the trade in both local and foreign materials. It can be assumed that the copper was coming from the Oman Mountains, but of more importance is the tin that is found in about a fifth of the analyzed bronze objects. This tin must have a foreign source, even if there is, as yet, no agreement on the actual locale. Finally, unique evidence for overland contact with other parts of Arabia is attested in the form of a three-letter inscription in

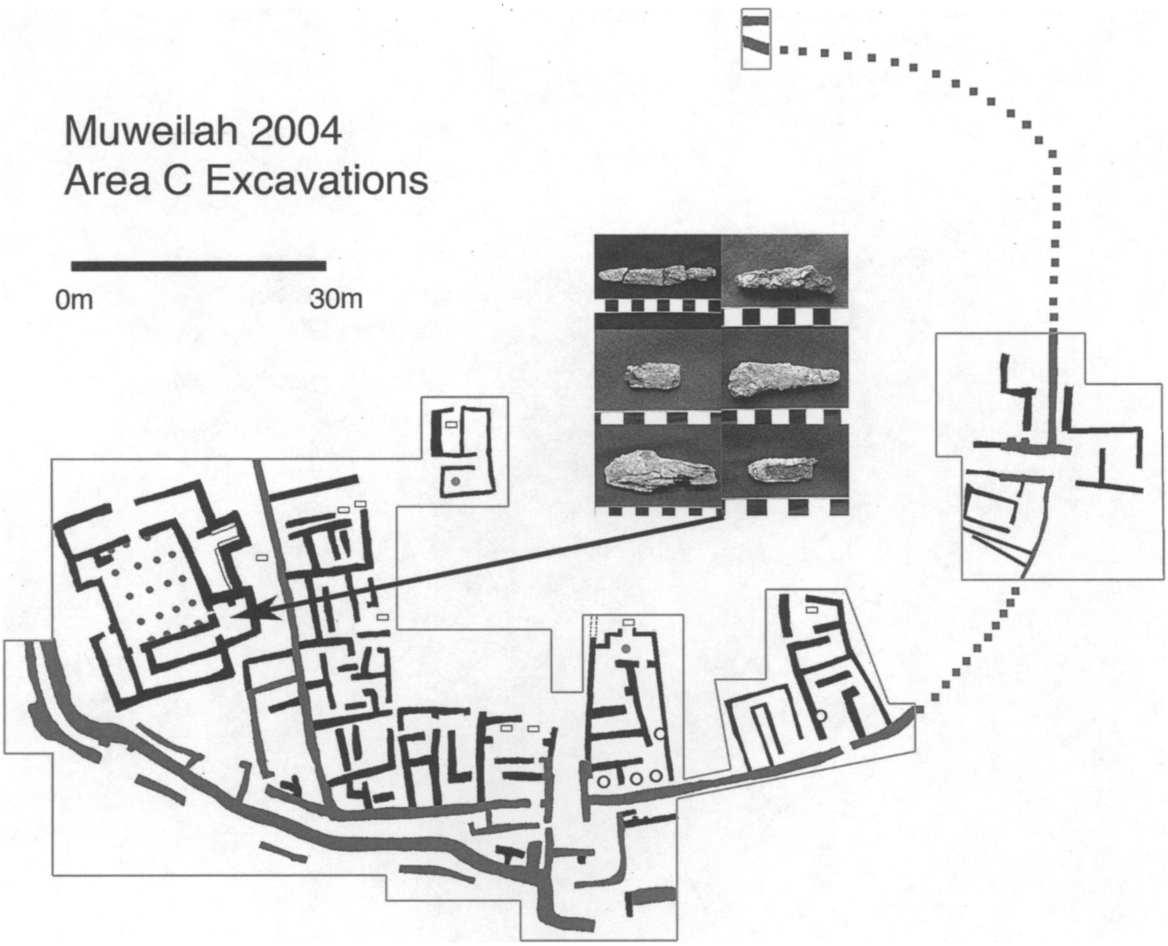

Fig. 15. Iron artifacts and their location in Building II at Muweilah.

Monumental South Arabian. This script was common in the Sabaean kingdom in the first millennium B.C. and attests to contact with the powerful South Arabian kingdoms that were emerging during this period (Müller 1999; Magee 1999b). The incense burners at Muweilah, Rumeilah, and Bida Bint Saud provide an obvious clue to the rationale for contact with Yemen.

The control of traded goods and the mechanisms of trade (routes and camels) resulted in social and economic differentiation at Muweilah comparable to that found in the inland piedmont villages. However, across southeastern Arabia as a whole, no individual settlement, or environmental zone, contained all the necessary resources to maintain social order and economic viability. Inland settlements required foreign and local goods and marine foods that had to travel across the desert. Desert and coastal settlements required copper, ceramics, and other goods from the oases and mountains and, almost certainly, cereals that could be grown intensively in the falaj-irrigated piedmont plains. The viability of settlement in the entire region was ultimately based, therefore, on the ability to maintain intraregional trade contacts with other settlements. The uniformity of banqueting practices in columned buildings at Rumeilah, Bida Bint Saud, and Muweilah suggests that such activity provided a very powerful context in which to ensure communication and trade. As a commensal activity, banqueting was an opportunity for elites within each of these settlements to interact with each other, to forge economic and political ties, and to ensure that social order within each settlement was maintained. It could be tentatively suggested that the foreign ori-

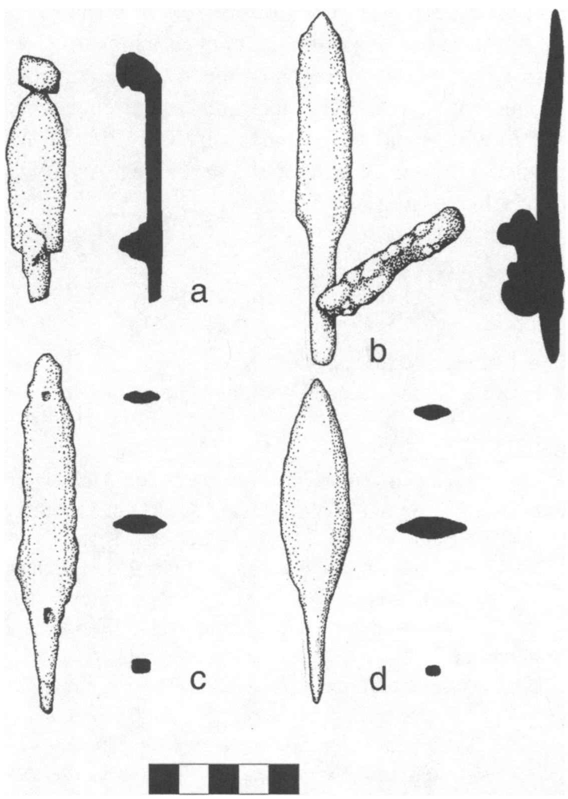

Fig. 16. Arrowheads containing sprues indicating that they had just been cast from Building II at Muweilah. Scale in centimeters.

gin of much of the equipment and context for this banqueting ensured that these activities took place within a framework of parity between settlements. No single settlement had a monopoly over any of these resources; rather their foreign nature ensured that they provided a "level playing field" for intra-regional interaction, even if they ultimately were used to manifest local power.

This economic and political system appears to have continued through the first few centuries of the first millennium B.C. in all the major environments of southeastern Arabia. With each new excavation year, new settlements are added to those detailed here, and new insights are provided into the manner in which settlements interacted and adapted to the distinctive environment. At present, the data are highly suggestive that this system breaks down sometime around 600 B.C. Even if evidence were available on the causes of this settlement decline, it is beyond the purview of this paper. However, it is worth noting that surveys and excavations have revealed very few settlements datable to after 600 B.C. and that this situation appears to continue until the third century B.C., when new forms of settlement emerge (Potts 1991).

CONCLUDING REMARKS

The southeast Arabian Iron Age illustrates that desert landscapes, even those for which no literary or epigraphic evidence is available, are not blank spaces on the map of the ancient Near East. Rather, the challenges presented by an environment that is richly varied but never obvious in resource potential provoked human adaptation that resulted in a distinctive form of regional complexity. In this paper, we have highlighted the use of falaj irrigation and the exploitation of domesticated camels as critical to this process. When utilized within the sharply demarcated environment of southeastern Arabia, these encouraged settlement throughout the region, thus ensuring the emergence of a tightly integrated and regionally acephalic economic system. Contact with other regions in the Middle East was important in these developments, providing some models for the elite practices that maintained social and economic order. However, the impetus for the adoption of these practices was purely autochthonous and cannot be viewed as an emulation of foreign modes of existence brought about by external intervention.

At present, the archaeological evidence characterizes the main features of this phenomenon, but there are several unanswered questions that remain fundamental for understanding this process. A critical issue is the initial chronology of this period and the relative sequence of settlements in different environments. It has been argued elsewhere (Magee 2003) that the limited ^{14}C data available thus far from settlements do not permit us to assert which settlements were the first to experience settlement intensification. Tighter control over the stratigraphic sequence and more ^{14}C assays with the incorporation of now widely available mathematical modeling of dates should permit us to test whether or not intensive falaj irrigation in the inland was the initial catalyst for changes throughout the region. To assume, however, that this was the case would be ultimately reductionist and cast southeastern Arabia as a mirror, albeit smaller, of larger-scale processes elsewhere in the Middle East.

More research is necessary throughout the mountain and coastal regions of southeastern Arabia. While many settlements in the former environment are known, little is understood of their adaptational base and relationship with other settlements. Coastal shell middens need in-depth investigation so as to ascertain the relationship between settlements in this environment and those of the more fertile inland regions. The data gathered thus far will provide an important context for these future research questions. At the moment, it is unequivocal in suggesting that although this region may have been on the periphery of ancient states, its inhabitants experienced economic and social vicissitudes that were, in the first instance, driven by indigenous processes. As such, it is worthy of study in itself.

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