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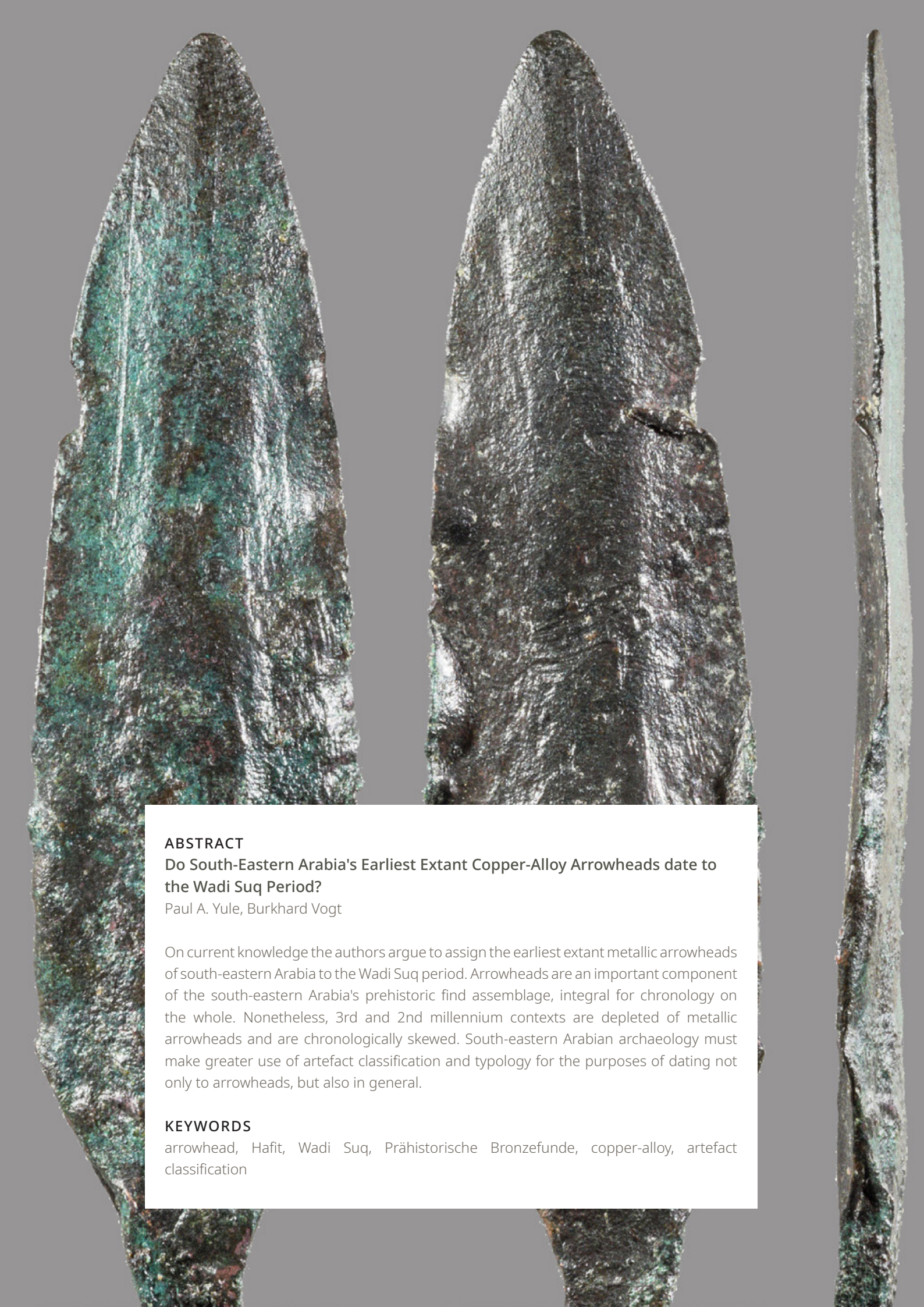


ABSTRACT

Do South-Eastern Arabia's Earliest Extant Copper-Alloy Arrowheads date to the Wadi Suq Period?

Paul A. Yule, Burkhard Vogt

On current knowledge the authors argue to assign the earliest extant metallic arrowheads of south-eastern Arabia to the Wadi Suq period. Arrowheads are an important component of the south-eastern Arabia's prehistoric find assemblage, integral for chronology on the whole. Nonetheless, 3rd and 2nd millennium contexts are depleted of metallic arrowheads and are chronologically skewed. South-eastern Arabian archaeology must make greater use of artefact classification and typology for the purposes of dating not only to arrowheads, but also in general.

KEYWORDS

arrowhead, Hafit, Wadi Suq, Prähistorische Bronzefunde, copper-alloy, artefact classification

PAUL A. YULE – BURKHARD VOGT

Do South-Eastern Arabia's Earliest Extant Copper-Alloy Arrowheads date to the Wadi Suq Period?

Introductory observations

1 Over the past millennia, arrowheads have varied infinitely in all aspects of form and size (see Wiethase 2016 for a good pictorial representation of this)[1]. In order to establish a basis for arrowhead chronology, in what follows the development of scholarly opinion is traced back to the mid-1970's. This includes both stratified south-eastern Arabian arrowheads in their archaeological find-contexts, and the development of ancient Near Eastern archery. As matters stand, both the early excavations of the 1980's and more recent examples in south-eastern Arabia offer evidence for the appearance of the earliest extant metallic arrowheads during the Wadi Suq period (Fig. 1). Improvements in the standards of various documentation methodologies for metallic artefacts within the region under investigation demand, in turn, renewed study of the arrowheads (cf. Fig. 2 a). Drawing standards range from simple outline sketches of corroded pieces to the creation of composite images, of restored ones varying according to the authors' respective experience, time, financing, motivation, and aims. Uncatalogued corroded arrowheads without cross-sections are the bottom line for serious research. Without the cleaning of corroded examples, neither their weight nor shape can be deduced.

1 The following abbreviations appear: BA=Bronze Age, MBA=Middle Bronze Age, LBA=Late Bronze Age, EIA=Early Iron Age, IA=Iron Age, LIA=Late Iron Age. The artefact-class designations first appeared in Yule 2001 in German. In Yule – Weisgerber 2015a, Yule 2018 and al-Jahwari et al. in prep. most are translated into English. Names which are known in traditionally Romanised form (e.g. Wadi Suq), appear without diacritics. Others are Romanised according to local speech patterns (e.g. al-Quṣaiṣ).
The authors have physically examined and documented most of the material presented below.
If not otherwise stated, the images derive from heidICON, pool: SKVO Oman.
Yule held this paper as a talk at 'Weapons of Arabia in ancient and modern times, 2nd Kuwait conference, on the Archaeology of the Arabian Peninsula', National Council for Culture, Arts & Letters / CEFAS, 25th – 26th of April 2017, at Kuwait University (Shuwaikh), Kuwait City. A version also was delivered at the Seminar for Arabian Studies in Leiden in 2019.
Given the proliferation of Iron Age chronologies for the central part of Oman, the present authors use the Lizq-Rumaylah nomenclature cf. Phillips 2010; Yule 2018, 43 Fig. 4.6. Cf. Düring – Olijdam – Botan 2018, no pagination fig. 9; Degli Esposti et al. 2018, 371–382.

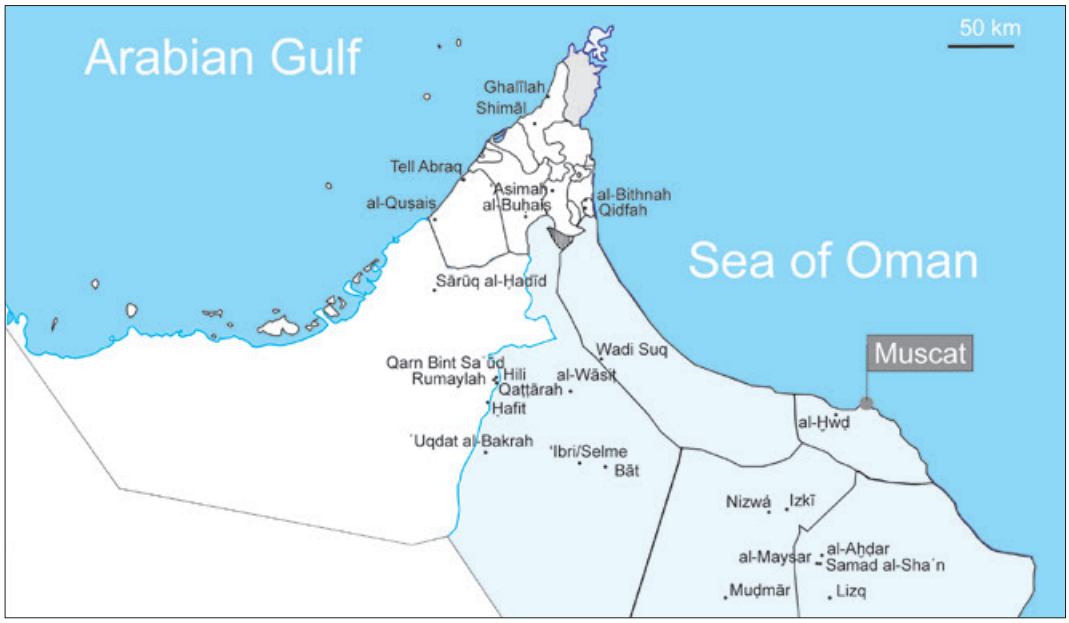


Fig. 1: Sites mentioned in the text

2 All fields of science require detailed ordering, and prehistory is scarcely an exception, such an order or classification of archaeological materials being a prerequisite for any scientific analysis. An essentially unstructured material is essentially granted thereby a structure; it is first with the classification of such formal characteristics that archaeologists can achieve an adequate overview of the variability of the material to be analysed (Eggert 2001, 122). Yet, in south-eastern Arabia, typologies and artefact classification are surprisingly seldom used for dating or other purposes, notwithstanding their pre-eminence in European and American archaeology. The necessity for formally defined standards within Arabian archaeology (e.g. find classification) seems to have been acknowledged by relatively few colleagues (exceptions: Mouton 1990; Yule 2001; Kennet 2004; al-Jahwari 2013). By contrast, a large international group of prehistorians have perfected every aspect of the recording and publishing of metallic artefacts. Indeed, H. Müller-Karpe, founder of the editorial series *Prähistorische Bronzefunde* (187 volumes, primarily regarding European prehistory) was convinced that, by means of unified drawing standards, and standardised nomenclature and publications, comparisons could be made, this effectively improving present understanding of the artefacts in question.

3 The arrowheads which are the subject of this essay are extant from the panoplies of otherwise usually robbed warrior burials, less so from other contexts. The following analysis of different contexts is intended to parse which are important to the present chronology and which are not. During the Bronze Age a transfer of the technology of metallic projectile points from Egypt and Mesopotamia to south-eastern Arabia is proposed here. The datings of arrowheads by different authors require discussion, updating, and re-evaluation.

4 Yule (Yule 2001) attempted his first chronological disambiguation of the arrowhead classes in the context of a larger study seeking to define dated artefactual assemblages in south-eastern Arabia, particularly those of the LIA. His classification and chronology rested largely on multi-period cemeteries at Samad and al-Moyassar. Computer coding, sorting, and dating of artefactual form-classes separate this work from previous studies. Given the large numbers of artefacts involved, it is more fruitful to pursue the dates of find-groups rather than individual finds. Yule initially understood some examples originating from Hafit tombs to date to that same period, an idea which remained unclear, and, in turn, did not appear within his published dating tables

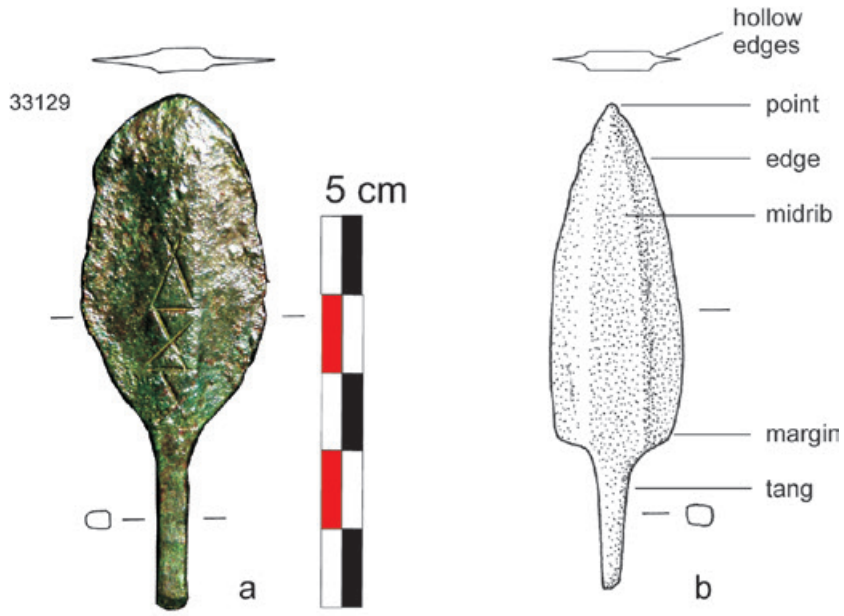


Fig. 2: a) This cleaned arrowhead from ʿUqdat al-Bakrah/Oman shows correctly the relation between the en face view and cross-sections. It has a flat mid rib, a tang, and concave lateral edges. b) Morphological nomenclature of a typical (Ar7) arrowhead

(Yule – Weisgerber 2001, Pl. 52; Yule – Weisgerber 2015a, 108 Pl. 52; Yule 2018, Pl. E); he ultimately abandoned this notion. A few Hafit tombs yielded Ar9 arrowheads, but none of the latter are compellingly of this same early date; for example, Hafit Grave Ha22 (Frifelt 1970, 372 fig 21D, class Ar6.2) and Grave Ha2 (ur-Rahman 1978–1979, 18 fig 7.3–4, class Ar9) both contained few other datable finds. Single EIA arrowheads without contemporary finds in Hafit-period cairn tombs are not credible sources for the arrowhead chronology of this period.

5 It is rare that a correspondence might be plausibly established between a given artefact class and a single archaeological phase (e.g. EIA III). The archaeological sources in question are anything other than intact or representative of what might have existed at a certain juncture. Proof of this is that new artefact classes currently appear nearly every year as new finds come to light. Find-contexts only amount to a *terminus post quem nun*, and may contain heirlooms. Distinguishing these from contemporary finds found in situ is the greatest challenge for chronologists. Large numbers of finds occur in secondary and tertiary contexts, this being often presumably a result of ancient grave robbing, as is attested by innumerable contexts such as Umm an-Nar-period beads excavated from LIA graves at Samad al-Shaʾn (e.g. Yule 2016, 46 Fig. 7.10, DA 10661) or hoards of metallic artefacts. At first glance, if two artefacts occur in the same context, this suggests contemporaneity. However, this begs the question as to whether both need have been manufactured simultaneously, or as to whether one or both were acquired earlier, or held over from a previous period. Weapons also could have been willed and inherited in grave inventories, as was the case in medieval Europe. Within the present dating strategy, ideally more important than the absolute dating of a given find-class is the formal integrity or homogeneity of each of its constituent members, and its relative chronology. However, following the heavily populated classes may well come small residual classes heterogeneous by necessity, and comprised of odds and ends. It should be added that arrowheads, although simple in their basic form, possess numerous small random differences, a fact which hinders their classification and chronologising. Ultimately, most classifications and typologies remain arguably mutable inductive logical systems, including that employed here.

State of research on south-eastern Arabian metallic arrowheads

6 Our story begins at the largest pre-Islamic site (surface 12,500 m² based on the published site plan) known, al-Quṣaiṣ in the Emirate of Dubai. During the 1970's, it yielded numerous pre-Islamic contexts and finds, the sheer quantities of these lending it vital significance. Situated some 9 km north-east of the creek of Dubai as the crow flies, there was some urgency in excavating this site in the wake of urban expansion, some of this pernicious, or, indeed, blatant (e.g. Taha 2009, 89). In 1981, the University of Cambridge accepted the excavator's report upon this site and analysis thereof to fulfil degree requirements. Two years later, his first preliminary report appeared in print (Taha 1982–1983). After a light re-working, his dissertation followed in monograph form (Taha 2009, 89; review: Simpson 2017) entitled "The Discovery of the Iron Age in the United Arab Emirates". Nonetheless, it was the preliminary reports of this pioneer excavation which set the tone for a generation of students of chronology, and not the monograph. Paradoxically, owing its late appearance, the final report only recently became available to archaeologists[2].

When Taha's excavation took place 45 years ago (June 1974/January 1975, January/April 1979, November 1979/March 1980), few of the sites in the central part of Oman and the UAE with their finds were yet available to him either as models for research/publication, or to support his chronology within this then-new field.

7 For the chronology of the arrowheads fashioned from copper-alloy, the majority at al-Quṣaiṣ derived from Area C and the 24 m x 14 m x 0.8 m little-described "Mound of the Serpents … in the middle of Settlement II" (Taha 2009, 12–13, 140). The excavator named this low, 18 x 11 x 0.9 m hillock such because he found six ex-voto flat copper-alloy serpents within it, and "a great majority of sherds bore serpent motifs". The excavator and others have suggested that they possessed a symbolic meaning (e.g. Benoist 2007; Benoist 2010; Benoist et al. 2012a; Benoist et al. 2012b; Mouton et al. 2012). The drawn cross-sections for Settlement I, the Mound of the Serpents, and Settlement II respectively on his plates 1, 9, 10 and 11 do not feature any metal-finds, although the text explains their presence there. Most of the "622" arrowheads from the excavation campaign of 1979 originated from the "Iron Age…Mound of the Serpents", which the excavator interpreted as a temple (Mouton et al. 2012, 3). The graves also yielded many arrowheads in copper alloy (gr. Area A/gr. I communal 19 arrowheads; A/II 35; A/III 7, B/II communal 35; C/II 5; C/VII 1; C/VIII 17; C/IX 3; C/XI 2; C/XII 6; C/XV 4; C/XX 1; C/XXII 6; C/VII 2; C/IX 1; C/XXIII 8; C/XXIV 6; C/XXVII 1 = 133). The settlements seem not to have yielded any examples (Mouton et al. 2012, 89–92), with the exception of the Mound of the Serpents, which to judge from the various snake representations in terracotta and numerous arrowheads, may well be an offering place akin to an EIA one documented at Muḍmār East (plan: Gernez et al. 2017, 103 fig. 2). A total tally of 755 arrowheads is achieved from the publication, this not corresponding to Taha's count of 785 for the entire site. Wheel-turned orange ware suggests an at least partial dating to the latter part of the EIA (Taha 1982–1983, 77; Taha 2009, 109).

8 From al-Quṣaiṣ, the pioneer Taha identified three "bronze" point types: 9C789 slim "eucalyptus leaf", 9D3 "square in section", and 9E2 "double-bladed" respectively (Taha 2009, 108, 120–121, 132 table iii, pls. 42–46, 49H). Two of these are both rare and

2 On pages 11–14, Taha updates his publication date to '20.04.08', but the title page shows the printing date of 2009. Yule first came to know the book from the review of St. John Simpson in February of 2017, and saw the book itself about a month later. It is unclear how the time lag between the official appearance in '2009' and Yule's awareness of the book in 2017 came about. Caveat: Yule examined only a few of Taha's excavated artefacts through the glass vitrine in the al-Ain Museum, and having become acquainted with them mainly through Taha's two preliminary reports.

problematic: Type 9D3 (Taha 2009, pl. 49H) appears to be an awl (cf. Yule 2018, 119 Fig. 4.27, class awl2)[3]. It is square in section, and pointed at both ends. Type 9E2 is split lengthwise, probably as a result of corrosion, and its form is thus accidental, rather than intentional. Its form cannot be ergologically explained, and is unique. In effect, Taha assigned virtually all of the arrowheads from al-Quṣaiṣ to his eucalyptus type (Taha 2009, 120–121 unnumbered text images). Rather futilely, he further devised a metric analysis for the arrowhead forms from different contexts on p. 121. The final report presents 68 of the reported "785" arrowheads as drawings (Taha 2009, pls. 42–46, 49), i.e. 8.6% of the total number. Unclear is to what is included and excluded, and for what reasons.

9 Equally problematic, a razor (R9 find-class, Yule 2018, 112–113 Fig. 4.25) from Communal Grave A appears within the report in a photograph on p. 63, described in the caption as "pieces of bronze", but not among the author's list of find-types. In the case of these uncleaned artefacts, the corrosion permits only a vague correspondence between the cross-section and the en face views (cf. Yule 2018, 295 pl. 46). For example, it hardly surprises when a 3 mm thickly corroded metallic implement is unwittingly identified as a spatula or knife, and not as a razor originally less than 1 mm in thickness with a sharp cutting edge (Yule 2018, 46).

10 In his final site report, Taha wrote varying chronological descriptions for the site: "The tentative chronology given to the site at the end of the first season between the 13th century B.C. and the beginning of the first millennium B.C. depended on relative material such as pottery goblets found in Mesopotamia." (Yule 2018, 12). In the same report, he narrowed the site dating to, "between the very end of the second millennium and middle of the first millennium B.C." (Yule 2018, 13). He also dated most of the finds to, "… Iron II and III (c. 1000–550 B.C.) … " (Yule 2018, 178). Yet, in a table on page 181 of the report, Taha dates al-Quṣaiṣ to "Iron Age III", that is, to perhaps between c. 900 and 300 BCE depending on which chronology is employed. At another juncture, the author seeks to, "… study the archaeology of the UAE, during the Iron Age period (1100–500 B.C.)" (Yule 2018, 39).

site	Cu-alloy	Fe	publication
al-Quṣaiṣ, Mound of Serpents	622	1	Taha 1982–3; Vogt 1985, 257; 1994; Lombard 1985, 130; Taha 2009
al-Quṣaiṣ, tombs	133	-	see above
Sārūq al-Ḥadīd, different	10000	-	al-Khraysha – al-Nashef 2007; pers. comm. R. Garba, L. Weeks
al-Buḥaiṣ graves	200	1	Jasim 2012
ʿUqdat al-Bakrah	73	2	Yule 2018, cat. nos. 1-73
al-Moyassar graves	38	41	Yule 2001
Nizwa grave N1985	27	-	Yule – Weisgerber 2015a
Shimal tombs	24	-	Vogt – Franke-Vogt 1987
Samad al-Shaʾn graves	14	848	Yule 2001
Ghalīlah tombs	10	-	Donaldson 1974
ʿAsimah graves	8	12	Vogt 1994
al-Wāsiṭ tomb W1	5	-	Yule – Weisgerber 2015a
al-Milayḥa graves	-	453	Mouton 1990
ed-Dur graves	-	168	Mouton 1990; Haerinck 2001
al-Fuwaydah graves	-	140	Yule 1999
Muḍmār, bldg 1	120	-	Gernez et al 2017 81–96
Muḍmār, Area 3	4000	-	Jean et al. 2018
al-Ḫwḍ hoard	270		Al-Jahwari et al. in preparation
total	15544	1666	-

Fig. 3: Statistics of the copper-alloy and iron pre-Islamic arrowheads from south-eastern Arabia

11 Methodologically difficult to accept in the final report is also the juxtaposition of an well-known EIA axe of the A5 class with a heterogeneous group of copper-alloy arrowheads (Taha 2009, 120; Yule 2018, 70 Fig. 4.16), the implication being that the

3 Updating of the abbreviations and their translation into English: Yule 2018.

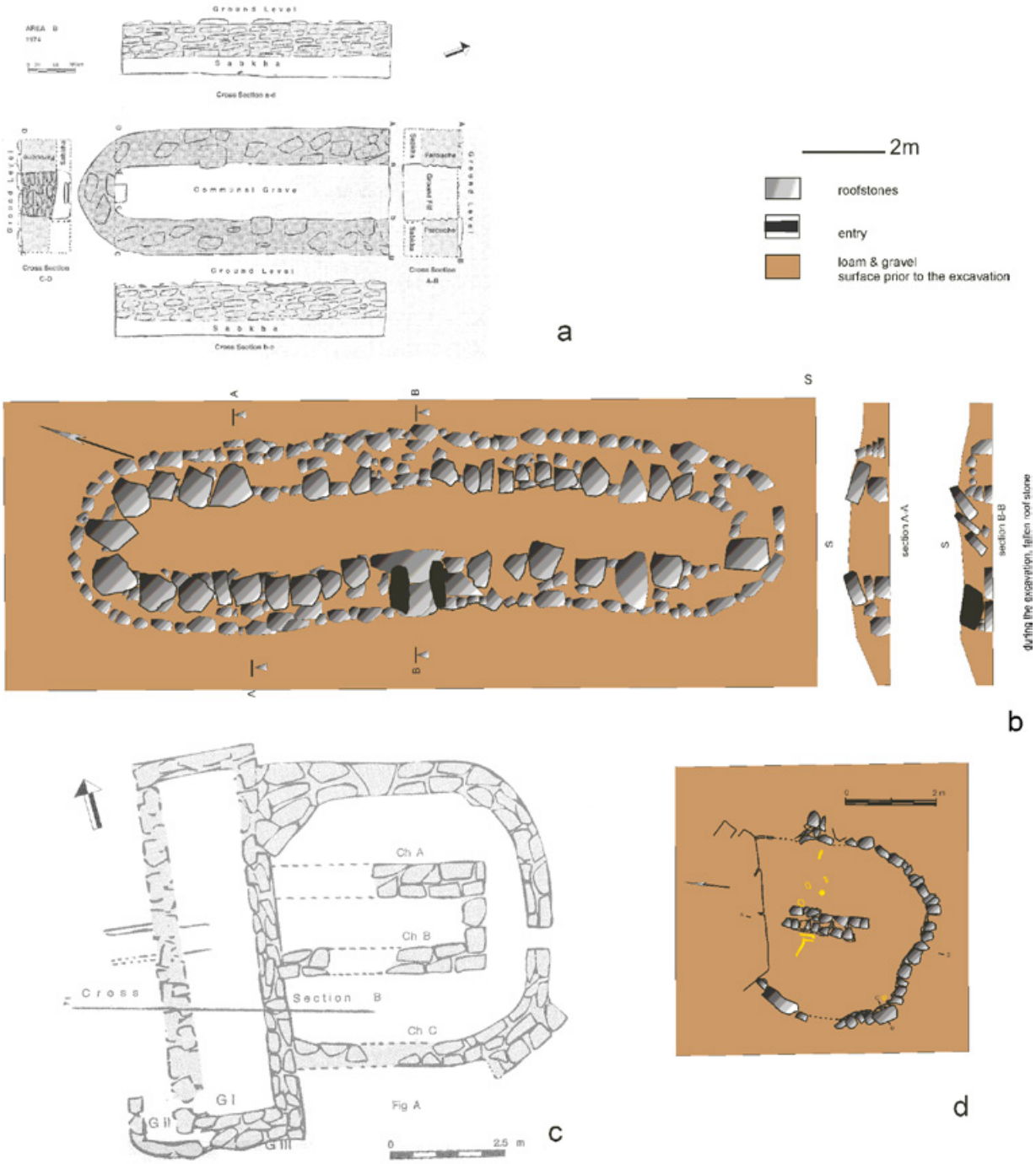


Fig. 4 a) Corridor tomb in al-Quṣaiṣ area B. b)Corridor tomb Shimāl Sh1. c) Truncated tomb al-Quṣaiṣ area A. d) Tomb al-Wāsiṭ W1. The tombs Sh1 and W1 originated respectively in the Wadi Suq Period and LBA and date those shown in Figs. 3a and 3c to the Bronze Age

well-dated EIA axe dates the melange of arrowheads at this "EIA" site (for the dating, see below).

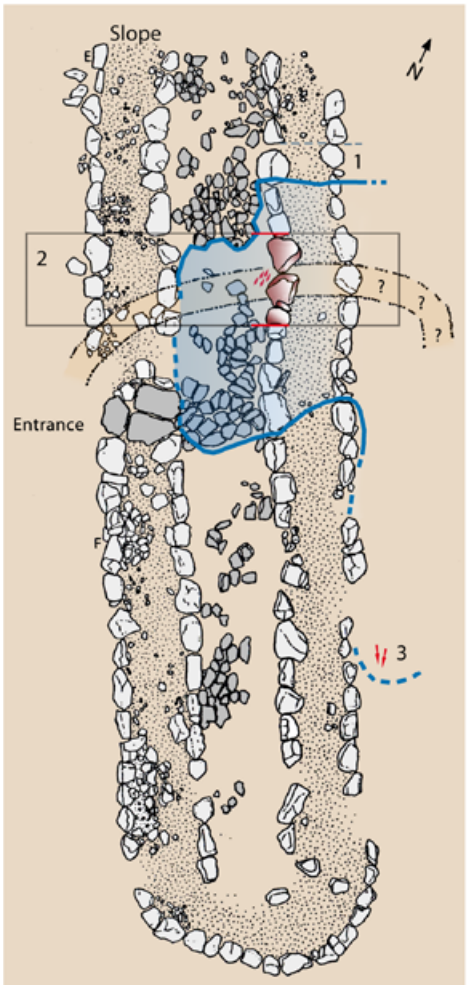
12 Despite the excavator's EIA dating (as in the book title) of al-Quṣaiṣ, there is evidence for the presence there of Wadi Suq or LBA habitation, this downplayed by Taha in the final report, as has been noted. In 1984, the Shimāl Sh1 corridor tomb in Ra'ṣ al-Khaimah and its finds were already published and arguably already available to that author. The plans of the tomb architecture, the corridor tomb in Area B (Fig. 4 a), and the truncated al-Wāsiṭ W1-type tomb in Area A (Fig. 4 c) predate the EIA, this confirming the suspicions of the excavator himself (Taha 1982–1983, 78 note 1; dating queried by Vogt 1985, 193; Lombard 1985, 130; Taha 2009, 218–219, pls. 2 & 3). These tombs are comparable to related Bronze Age corridor tombs, and truncated tombs such as those displayed in Figs. 3b and 3d respectively.

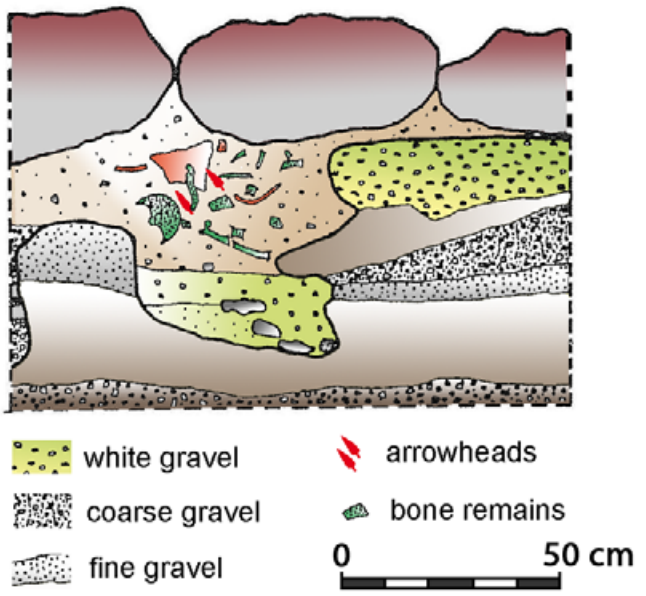
13 In fact, most of the pottery published in the al-Quṣaiṣ report (Taha 2009, 243–261 pls. 19–22, 24–28 etc.) dates to the EIA Lizq/Rumaylah period, as known from the Oman Peninsula and, furthermore, the central part of the Sultanate, i.e. EIA II and III (chronology: Schreiber 2010, 82 fig. 1). The EIA absolute chronology and nomenclature for south-eastern Arabia form a discussion *per se* in themselves (Magee 1998; Magee 2014; most recently Degli Esposti et al. 2018), well exceeding the scope of this essay. Diagnostic low bowls with constricted rims find comparisons with those at most EIA sites in the entire region (Yule 2014, 38 Fig. 15 C12; Schreiber 2007, Taf. 2–4 (Izkī)). Nonetheless, some of the pottery at al-Quṣaiṣ Areas A and B also compare nicely with LBA pottery, such as the footed goblets of Taha's Type 2A20 (cf. Taha 2009, 112, 251 pl. 23 with Velde 2003, 106 fig. 4.1–3, "LBA"). That most of these are wheel-thrown (Taha 2009, 112), poses an argument for a dating prior to the EIA, which mostly evidences hand manufacture. The upshot is that the different classes of copper-alloy arrowheads and their stratigraphic contexts presented when the report was written arouse suspicions that there might be more than one period evident within the chronology of the arrowheads present at the site. The pioneer excavator faced considerable challenges in arriving at a general and site chronology with few dated outside comparisons, and it is hardly our intention to criticise such trailblazing work overly harshly by today's standards.

Other studies

14 In his 1979 MA thesis and 1985 doctoral dissertation (both at Université Paris I) on the EIA of eastern and south-eastern Arabia, including the island of Bahrain, P. Lombard was the first to focus on copper-alloy arrowhead chronology. This find category was the first and most important part of his discussion of the metalwork of his *Aire Oman*. He distinguished between tanged arrowheads of the "*type à sole*" (tanged) and "*type à douille*" (socketed, Lombard 1985, 206, fig. 105.368–370) respectively. He further sub-divided these into "*oblancéolée*" (point wider, Lombard 1985, 206, fig. 105.355–57) and "*foliacée*" (leaf-like, Lombard 1985, 206, fig. 105.359–63) points, which include several correspondences in the classification used here (Fig. 11 and 12) based upon a far larger and more heterogeneous body of examples than that available to Taha. On the strength of examples from the sites of Rumaylah, Qarn Bint Saʿūd, Qaṭṭārah, and al-Quṣaiṣ, Lombard assigned copper-alloy arrowheads, finely smithed with a broad midrib and hollow lateral edges (Fig. 2 a and Fig. 2 b) to the EIA (Lombard 1985, 207). Unfortunately, he did not consider their predecessors, but simply attributed most available copper-alloy arrowheads to the EIA, basing this upon examples from disturbed contexts little-studied at the time. Understandably, as a pioneer it was not his intention to strive for a finer classification of the finds so as to create a chronological tool.

15 In his Göttingen dissertation of the same year, B. Vogt reviewed the copper-alloy arrowheads from the entirety of south-eastern Arabia and some from Iran (Vogt 1985, 255–261, Taf. 123 & 124). Several copper-alloy tanged points are scored ornamentally, with lines and angles e.g. x||x|<|>|<|>| (Lombard 1985, 206–207). These (Fig. 2 a, 8, 16.22, 18) were taken to be important for typology/classification, and thus dating. On the available evidence, Vogt did not date any arrowheads prior to the Wadi Suq period. He dated those from the important Mound of the Serpents at al-Quṣaiṣ by means of associated "*série tardive*" stone vessels, as from Hili H8, i.e. as dating to the early 2nd mill. (as in Potts 1992 I, 250–251 fig. 30f–i). These he considered as having developed typologically parallel to the "*série intermédiaire*", the most popular of the "classical" Wadi Suq stone vessels (style nomenclature: David 1996). In Vogt – Franke-Vogt 1987 publicly updated the discussion of the dating of the Wadi Suq period and its constituent find-groups on the strength of excavated finds from Shimāl (see, in greater detail, below).





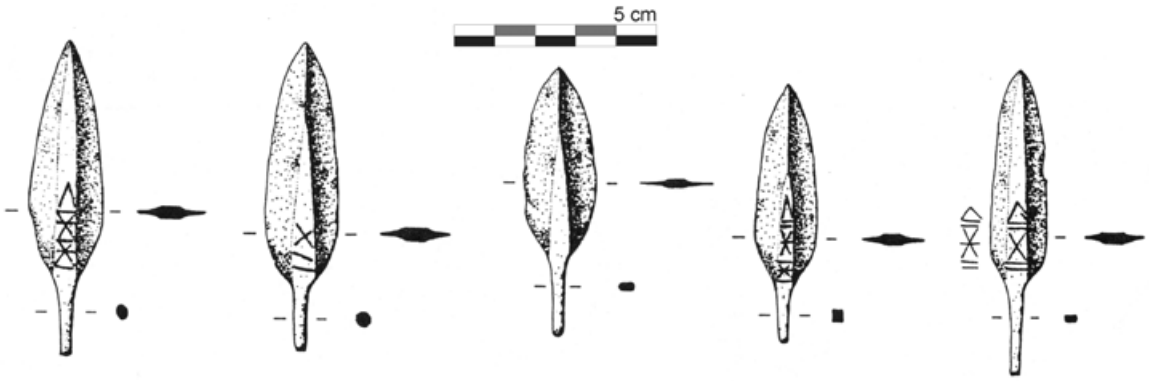


Fig. 5: Plan of Shimāl tomb Sh102

Fig. 6: Section toward the NE in the sounding shows the trench

Fig. 7: Photo of the cross-section of Sh102 as in 5b

Fig. 8: Selected Ar2 arrowheads excavated from Shimāl tomb Sh102

Main sites for the Bronze Age and Early Iron Age arrowhead chronology

1 Shimāl Sh102, Emirate of Raʾs al-Khaimah

16 Some 20 arrowheads (Fig. 8) occurred in a trench, perhaps from an older tomb, below the corridor tomb of Shimāl Sh102, which appeared in the final report (plan and profile views: Fig. 5, Fig. 6 and Fig. 7). Unfortunately, this context received little attention within the publication's text, not even in the section on arrowheads. Later, the excavator of Sh102, C. Velde, described the stratigraphy of Sh102 as being mixed (Velde 2003, 112 note 2), albeit the project leader, B. Vogt, argued for a LBA dating for the entire context based on plan and profile drawings (Vogt – Franke-Vogt 1987, 35). The stratigraphic position of the pre-tomb ditch, to which R. Carter also refers (Carter 1997, 40: "older deposit or perhaps foundation deposit") cannot be doubted. The photo and the

Fig. 9: Selected cleaned arrowheads from warrior grave N1985 (LBA context, find-class Ar5)

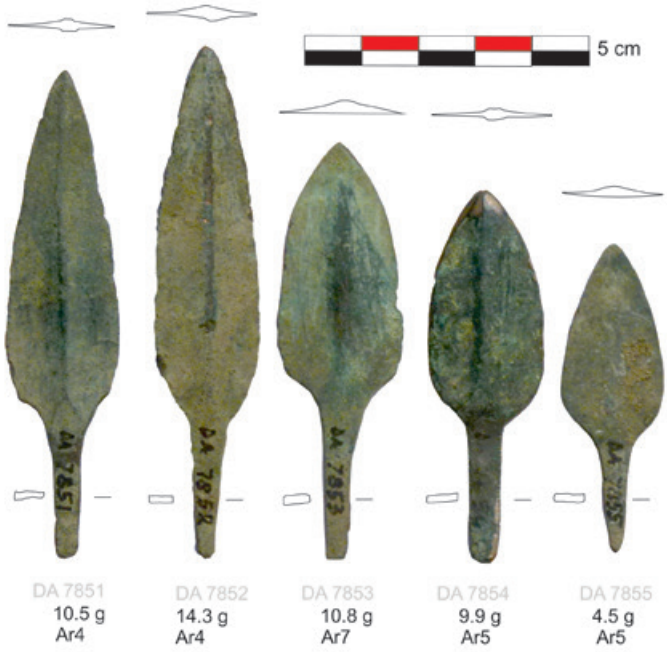


Fig. 10: Cleaned arrowheads from tomb W1 (LBA context)

cross-section drawing both verify the presence of the trench replete with arrowheads (Fig. 7 and Fig. 6 respectively).

17 In fact, both B. Vogt and C. Velde arrived at the same obvious conclusion, namely that tomb Sh102 and its finds were disturbed, probably through re-use, tomb-robbing, or both. Vogt dated the lowest layers to LBA, but Velde (Velde 2003, 112 note 3) understood them to contain mixed Wadi Suq to EIA I finds. Besides this, and, in turn, for other reasons, Vogt considers the constituent arrowheads to date to both the Wadi Suq and LBA periods. In his authoritative chronology article of 2003, C. Velde renamed the 'late Wadi Suq' period to 'LBA'. Yet, he did not explicitly take a stand therein on exactly which kinds of arrowheads occurred in Sh102, which in fact are of the Yule's Ar2 class (defined below).

2 al-Wāsiṭ Tomb W1 and Nizwa Grave N1985, Governorates of al-Bāṭinah & al-Šarqīyah

18 In 1984 and 1985 respectively, two key finds of contextualised metallic arrowheads came to light within the northern and central parts of the Sultanate, one in the small communal tomb of al-Wāsiṭ W1 in Wādī Ǧizzī, and another in the individual grave of a warrior, Nizwa N1985 (al-Shanfari – Weisgerber 1989), both of which were

class	description	dating	comments
Ar1	'Cu', short rhomboid leaf, flat midrib, hollow edges	W, LBA, EIA	
Ar2	'Cu', often oblanceolate, wide and flat midrib, hollow edges, long tang, rectangular in section, often decorated, often better workmanship	W, LBA, EIA	
Ar3	'Cu', leaf thin, no midrib, cross sections vary	W, EIA	
Ar3.1	'Cu', spatulate leaf, no midrib	EIA	new class
Ar4	'Cu', oblanceolate, arris midrib, short tang with rectangular sections	LBA, EIA	
Ar5	'Cu', rhomboid to deltoid leaf-shape, thin cross-section	LBA, EIA	
Ar6	'Cu', sharp midrib, deltoid leaf, sharp midrib, slim	LBA, EIA	
Ar6.1	'Cu', slim deltoid leaf, sharp midrib, margin angular	EIA	
Ar6.2	'Cu', short deltoid leaf, thick midrib	EIA	
Ar6.3	'Cu', small, short deltoid leaf, roundish midrib in cross-section	EIA	new class
Ar7	'Cu', slim deltoid/elliptical leaf, biconvex blade, wide midrib	LBA, EIA	
Ar7.1	'Cu', slim deltoid, straight, parallel, and in some cases trapezoidal, wide midrib	LBA, EIA	
Ar8	'Cu', forward-weighted, oblanceolate, obtusely angular edges	EIA	
Ar8.1	'Cu', forward-weighted or parallel edges, roundish midrib, tang form heterogeneous	EIA	new class
Ar8.2	'Cu', forward-weighted, leaf flat, arabesque curve tip	EIA	new class
Ar9	'Cu', forward-weighted leaf, angular, margin may terminate perpendicularly, broad midrib, tang sections rectangular	LBA, EIA	
Ar10	Fe, broad lanceolate blade, leaf cross sections biconvex, of the tangs rectangular	EIA, LIA	
Ar11	Fe, middle length (7.8 cm), margin is wide, thick section, symmetrical in shape, relatively heavy	LIA, PIR	
Ar12	Fe, parallel edges, middle length	LIA PIR	
Ar13	Fe, long, thin, edges slightly biconvex, both with and without a midrib	LIA	
Ar14	mostly Fe, fewer 'Cu', leaf cuneate, medium length	LIA	
Ar15	'Cu'/Fe, 'bolt tips': cross-section rectangular, cross-section of the tang circular	EIA, non-Samad LIA, LIA	
Ar16	Fe, lanceolate leaf, very long, narrow, thin cross-section	non-Samad LIA	
Ar17	Fe, broad, biconvex cutting edges, cross-section strongly biconvex	LIA	
Ar18	Fe, very long, lanceolate leaf, some with a slight midrib, thick in section	LIA PIR?	
Ar19.1	'Cu', lanceolate leaf, large, thin in section	W	
Ar19.2	'Cu', lanceolate leaf, bilobate, socketed, distinct midrib	Achaem., Sas.	
Ar19.3	'Cu'/Fe trilobate 'Scythian'	Achaem., PIR, Sas.	
Ar19.4	'Cu', in section leaf highly profiled, proportionately thick in cross section	EIA	new class
Ar-	'Cu'/Fe, unicata, fragments, non-recogniseable	not limitable	

Fig. 11: Statistics of the copper-alloy and iron pre-Islamic arrowheads from south-eastern Arabia. The term 'Cu' refvrs to copper or copper alloy. The find usually are not chemically analysed (source: al-Jahwari et al. in prep.)

published years later in complete form (Yule – Weisgerber 2015a, 12–97). N1985 yielded 27 arrowheads (selection Fig. 9), but W1 only five (Fig. 10). The limited number of individuals in the tomb (18) forms one reason to postulate a limited date of use for the latter. The soft stone vessels, metal-finds, and such arrowheads form a distinctive combinatory pattern of a limited number of artefactual classes, especially for the weapons unlike that of the EIA. The pottery was mostly LBA, but Wadi Suq-style pottery also occurs. Clearly, contexts rarely contain stylistically homogeneous pottery analogous to Ḥafīt/Ğemdet Naṣr-style pottery, for example. This pottery occurs stratified both within and outside of its own period (analagous to the pottery of the Ğemdet Naṣr period, cf. Potts 1986, 129–130). The same holds for a few stylistically EIA sherds at the early Samad LIA al-Moyassar M34 fortlet (Yule 1999, 141 Fig. 18.6, 7). All in all, tomb W1 appears to have been in use for a limited period. For this reason, the dates of both tombs could be readily estimated. Weisgerber assigned both contexts W1 and N1985 and their contents to the LBA, and dated W1 some 200 years prior to N1985 (pers. comm.) contrasting them with EIA finds. In the classification of arrowhead shapes (Fig. 11, 18), the arrowheads neatly from Ar2 examples from key contexts which here appear to begin earlier (Fig. 8 and Fig. 16).

19 Since the early 1980's, increasingly arrowheads have come to light from south-eastern Arabia; a few have been cleaned and can provide a clear idea of their actual appearance (e.g. al-Shanfari – Weisgerber 1989, 22 fig. 3, pl. 2; Yule – Weisgerber 2015a, 58–59 Pls. 2–3; Yule 2018, Pls. 1.1–2.73). Such studies arranged them into a relative chronological order as the material became available (e.g. Yule – Weisgerber 2001, Pl. 52; Yule – Weisgerber 2015a, 108 Pl. 52; Yule 2018, Pl. E).

3 ʿAsimah, Emirate of Raʾs al-Khaimah

20 In 1994, B. Vogt published arrowheads from the multi-period ʿAsimah tomb of As100 identical in form to those from Sh102, re-iterating a "late Wadi Suq" dating for this Ar2 artefact-class (stratigraphy of the arrowheads: Vogt 1994, 94). Shortly thereafter,

P. Magee updated the arrowhead discussion and, employing the "incising" (the actual removal of metal) of the arrowheads as the main classificatory attribute, argued to date copper-alloy projectile points to the "late Wadi Suq" period, i.e. LBA, at the earliest (Magee 1998, 1–2). He also supplemented Vogt's foreign comparanda from Iran. Magee himself observed that decorated and plain arrowheads share the same forms. Since the main attribute in sorting these copper-alloy points was material and scored decorations, the actual point shapes as a dating mechanism bear little influence in his discussion. Most of these belong to what has been designated as the Ar2 find-class both here and elsewhere (Fig. 11 and 18). Magee dated finds from the tombs of Shimāl Sh102 and Ghalīlah G2 to the LBA (Magee 1998, 2, 3), as have other authors. His LBA dating of decorated arrowheads rests on those from Tell al-ʿAjjul in southern Palestine with their broad midrib and concave edges (Fig. 16.16–10.18; Magee 1998, 8), which date to the same time[4]. This important and sizeable material published in the Gaza volumes I–V dates mostly to the LBA (e.g. Tubb 1977), rarely earlier. The basis for Magee's LBA arrowhead dating derives from the two aforementioned finds of contextualised arrowheads, W1 and N1985, both of which contain no Ar2 points which occur earliest in Wadi Suq contexts.

4 al-Bithnah, Emirate of Fujairah

21 Within the report of tomb 4 from al-Bithnah, a large T-shaped structure, 13 chronologically mixed copper-alloy (Corboud et al. 1996, 75–79, 76 fig. 57; 155 pl. 24), and some iron arrowheads later in date (Corboud et al. 1996, 81 fig. 61) are documented. The authors base their classification of the points with the EIA dating of P. Lombard of 1985 for the copper-alloy points and that of M. Mouton (Mouton 1990) for the ferrous examples. The pottery and stone vessels there are of EIA date. The copper-alloy arrowheads appear in various states of preservation and three display ornamental scoring. The aforementioned authors omit the published arrowheads from graves N1985 and W1 when arriving at their dating of the artefacts.

5 al-Buḥaiṣ, Emirate of Sharjah

22 Published in 2012, the graves excavated at al-Buḥaiṣ yielded several closed grave contexts with arrowheads and new find-classes to the 2nd and 1st millennia repertory (Fig. 12; Jasim 2012, 182 fig. 218). The excavator identified Ar2 arrowheads as EIA types (Jasim 2012, 170), perhaps because of the EIA dating cited for the finds in al-Quṣaiṣ and because graves at al-Buḥaiṣ contain them along with EIA and other period artefacts. S. Jasim dated one grave (Bhs22) containing Ar2 arrowheads but scarcely other finds, to the EIA. However, al-Buḥaiṣ also displays clearer Wadi Suq primary contexts: Grave Bhs66 is particularly interesting since it contained numerous Ar2 arrowheads in a rich, plausibly purely Wadi Suq-period context together with other diagnostic artefactual categories (e.g. D6 dagger, MeOB8 bowl, socketed spearheads, R6 razors etc.).

6 ʿUqdat al-Bakrah, Governorate of al-Daḫilīyah

23 In 2012, 74 copper-alloy arrowheads in various shapes came to light within an EIA metal-melting depot and workshop, a context known as ʿUqdat al-Bakrah in the western part of the Wadi Ḍānk, Sultanate of Oman (al-Bakri – Genchi – Tosi 2013; Genchi – Giardino – Castelluchia 2013; Yule – Weisgerber 2015a, 26; Yule 2018, 54–55 Figs.

4 Unfortunately it (e.g. Petrie 1931) rarely shows cross-sections or closer provenance. Petrie only vaguely alludes to the latter-day storage by naming 13 towns and institutions (e.g. "Bolton" or "Tokyo"). Within the Petrie Palestine Project, R. Sparks has tracked down some 3000 artefacts in museum collections shedding light upon the connections between his often complex, even inscrutable field recording and publication practices (Ucko 1998; Sparks 2005; Sparks 2013b, 151–153). Attempts at dating by means of these projectile points from Petrie's published sketches of uncleaned points is compromised from the very beginning (as in Pedde et al. 2000, 41–42, Taf. 32). Nonetheless, many undoubtedly date to the LBA (Tubb 1977, 192–193 fig. 1a–1c).

4.11 and 4.12; Gernez 2018, 173–174). If the metallic artefacts are acquired from graves, a secondary context, then their remanufacture on this site into other saleable objects is tertiary. Most of the metallic artefacts were professionally cleansed of corrosion and conserved so as to enable storage, exhibition, and study at the National Museum in Muscat. To judge from the find-classes represented at ʿUqdat al-Bakrah, the majority of the 654 total metal-finds recovered there corresponds in shape and date to those known from tombs such as al-Buḥaiṣ or Selme (Yule 2018, 143; Gernez 2018).

7 Sārūq al-Ḥadīd, Emirate of Abu Ẓabī

24 At the time of writing, the authors received a few small images of 468 unpublished arrowheads recovered from Sārūq al-Ḥadīd in extensive surface excavations since 2003 (al-Khraysha – al-Nashef 2007; bibliography: Weeks et al. 2017; Weeks et al. 2018, 12 fig. 9), now on display in the site museum in Dubai of that same name. Sārūq al-Ḥadīd is both a primary and secondary metal working site. While it was inhabited for centuries by a substantial population, no major architecture has yet been unearthed. Once documented, these stratified artefacts will certainly have an impact upon arrowhead chronology, although this can hardly be anticipated here. Only a few examples hailing from this site which yielded over 10,000 uncovered examples are all incised (pers. comm. L. Weeks). Even higher arrowhead counts exist for this site.

8 Ādam, Muḍmār east, Buildings 1 & 2, Area 3, al-Daḫilīyah governorate

25 In 2016 A Parisian team under the direction of G. Gernez excavated a group of several buildings which contained EIA ceramic, metallic artefacts and faunal remains. Building 1, a roofed stone and mud brick building, yielded numerous metallic finds, the most interesting of which came to light in a room, 3036. This closed room scarcely measures 2.5 x 2.5 m. Stratified were groups of weapons, including miniature bows, bowstrings, quivers and miniature arrows, all recording stratigraphically (Gernez et al. 2017, 102–111). Building 2 contained fewer finds.

26 Most importantly Area 3 is located on a slope and overlooks Building 1. the 2017 season yielded a stone wall associated with several thousand EIA pottery sherds (site description and find analysis: Jean et al. 2018, 127–137). 17 sherds showed snake motifs. Most important ae the abundant metallic finds which include 4000 arrowheads and 294 other metallic finds, mostly weapons. These include well-known types such as D8 daggers.

27 These contexts are dated to EIA II (Gernez – Giraud 2017, 92–96). This concentration of undamaged Ar2 arrowheads demonstrates that they still were in production during the EIA. The same holds for EIA Sārūq al-Ḥadīd, as just noted. The question as to when, how, and if such enormous find quantities will be published remains open. The occurrences of Ar2 arrowheads in this context clearly lengthens the production period for these and the morphologically related D5 daggers which display the same flat blade and concave cutting edges, lengthening it. The excavators interpret the whole site complex as a cultic area. Given the stratigraphy, this site is among the most important for a study of prehistoric arrowhead development in the region.

9 al-Ḫwḍ, Muscat governorate

28 In 2004 during the landscaping on the campus of the Sultan Qabus University, on a slope the bulldozer broke into a deposit of what turned out to be 331 artefacts evidently of EIA date. The hoard was subject to study for a publication prior to its donation to the National Museum (al-Jahwari et al. in prep.). The majority (272) of the artefacts published for some time-alloî arrowheads. The largest class are Ar2 and variants.

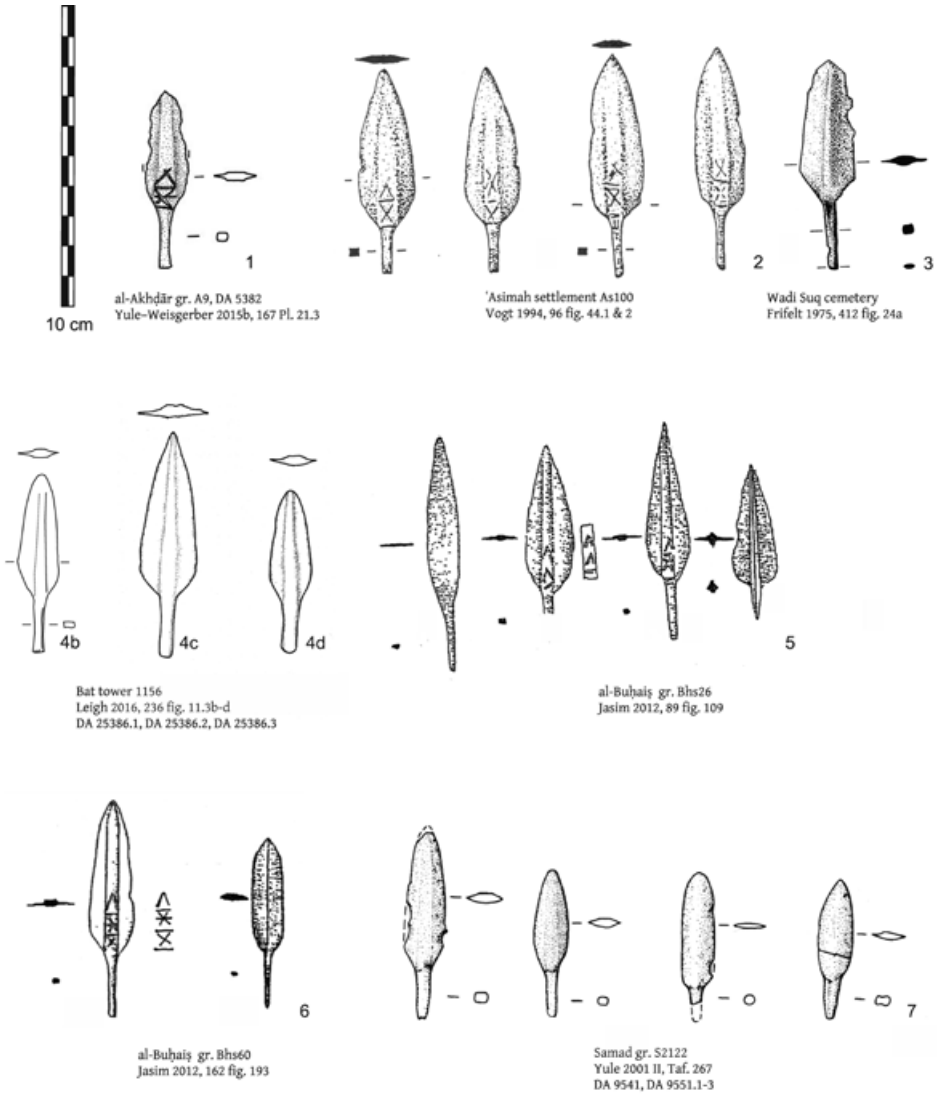


Fig. 12: Selected copper-alloy mostly Ar2 arrowheads from primary Wadi Suq contexts with few or no 'EIA' finds, different scales (various sources). Not all of the points from the Wadi Suq period are Ar2, but this is the most populated arrowhead class

Fig. 13: Arrowhead DA 21844 from Bāt tomb 1156

Other sites

29 Contexts published some years ago may be dated to the Wadi Suq period (Fig. 12: 12.1, 12.2, 12.7). Further dating information surfaced in 2015: A single-period early Wadi Suq context, Bāt Tower 1156, yielded three copper-alloy arrowheads, this strengthens an earlier dating for copper-alloy arrowheads (Fig. 12.4; also: Mortimer 2016, 149 fig. 6.32 middle). Two of the points are assignable to Class Ar2, the third to Ar4 (see below)[5].

30 At the same time, 18 unpublished, cleaned, copper-alloy arrowheads went on exhibit in the new National Museum in Muscat, albeit without any explanation as to the "Umm an-Nar" dating found on the label (Yule 2018, 56 Fig. 4.13). A team from Bochum excavated most of them from tomb 154 from Bāt, which contained disturbed finds of the Wadi Suq, EIA, and Samad LIA periods (pers. comm. C. Schmidt 29.05.2017; Böhme 2012). The arrowhead classes of Ar1, Ar2, Ar6, Ar6.2, and Ar9 are represented in this assemblage. These do not, in fact, render dating evidence, but rather can only be dated on the strength of the arrowhead chronology proposed in the present study. They have to be discarded in our task as a primary context. However, Fig. 12 (8.4b) is

5 Yule re-drew Fig. 12.4b (Yule 2018, 56 Fig. 4.13.14, incorrectly: "Bāt tomb 154" instead of Bāt tomb 1156). The cross sections of Figs. 8.4c and 8.4d are not plausibly drawn. These two arrowheads can neither be found in the Ministry of Heritage and Culture, nor in the National Museum. After cleaning, Fig. 12.4b went on exhibit with other arrowheads from Bāt; its excavation number is incorrectly labelled. Its museum inventory number is 2012.970. Figs. 8.4c & d cannot be located.

Fig. 14: Occurrence of Ar2 points, the largest find-class or arrowheads. 'Cf.' mean that there is a similarity to a given class, but it is not similar enough to be necessarily chronologically significant (adapted from al-Jahwari et al. in prep.)

Comparisons derive from diverse, but chronologically heterogeneous contexts:
W: Bāt tower 1156 (Leigh 2016, 236 fig. 11.3c; Mortimer 2016, 149 fig. 6.32 middle).- Al-Buḥaiṣ Bhs17.- Bhs60.- Bhs66 (6x) (Jasim 2012).- Samad S2122 (2x) (Yule 2001a I, 300).- Wadi Suq Wa1126 (Frifelt 1975, 412 fig. 24f). Cf. Surkh Dum-i-Luri sanctuary, area 3, 3A-2A (Schmidt et al. 1989, 258, 278, pl. 177c).-
EIA: Al-Ḥağar site 1 9A/B (Lombard – Kervran 1989, 70 fig. 125D).- ʿUqdat al-Bakrah (Yule 2018a, cat. nos. 1–16).- al-Ḫwḍ hoard (cat. nos. 1–58).- Salūt (Sasso 2018, cat nos. 28, 36, 42, 59).-
EIA II: Bhs23 (2x).- Sārūq al-Ḥadīd Horizon II (Weeks et al. 2018, 12 fig. 9).- Muḍmār East 3 (Jean et al. 2018, 13 fig. 9.2021.3f, 1029.1, 20163a, 2025.3, 201.1c, 2021.16a, 2021.3a).- **Salūt HS II:** (Sasso 2018, 33, 39, 48).-
EIA II, EIA III: ʿAsimah 'fort' As97 (Vogt 1994, 145 fig. 62.26).- Bhs30.- Bhs78 (2x).-
EIA III: Rumaylah *chantier* 3 (Lombard 1985, 208, fig. 105.356; Lombard – Boucharlat 1985, pl. 62.7).-
Virtually unstratified: Ġalīlah Gh2 (Donaldson 1984, 306 fig. 26.1, 6, 7, 8).- **Mixed, surface, not specified:** ʿAsimah As100 (2x) (Vogt 1994, 96 fig. 44.1, 2).- Bawšar (Yule 1999b, 69 Fig. 23.152 B-).- Al-Buḥaiṣ Bhs8.- Fašǧa Fsh1 (4x) (Phillips 1987, fig. 38.10–13).- Ġalīlah G2 (5x) (Donaldson 1984, fig. 26.1–2, 4–5, 9).- Madḥāʾ x6 (unpublished recording Yule 2012).- Rumaylah (Boucharlat – Lombard 1985, 68, pl. 62.5; Lombard 1985, 208, fig. 105.362; Weisgerber 1988, pl. 164.5).- Sārūq al-Ḥadīd (Weeks et al. 2017, 49 fig. 19.- Sharm (Weeks 2000, 183 fig. 3 all except second row third from left (S-290); 185 fig. 6 top row).- Qidfah Qi (>3x) (Corboud et al. 1988, 35 fig. 7).
W, LBA, EIA II: Al-Buḥaiṣ Bhs23.- Šimal Sh102 (19x)(Vogt – Franke-Vogt 1987, figs. 1921).- **W, LBA:** Bhs3 (Jasim 2012, 37 fig. 39.3).- Bhs66 (184 fig. 219.3).- **W, LBA, PIR:** Šimal Sh1 (Donaldson 1984, fig. 13.3).- **W–EIA II:** Al-Buḥaiṣ Bhs26 (2x).- Bhs64 (5x).- Bhs77.- **W, EIA:** al-Aḫḍar A9, (Yule – Weisgerber 2015b, 167 Pl. 21A9.3).- Bhs17 (3x).- **LBA, EIA II:** Bhs27 (95 fig. 116.4).-
EIA II, PIR: Bhs85 (4x).-
Suggested dating: W, LBA, EIA

source	dating
Taha 1983, 78	2nd mill., mid 1st mill.
Lombard 1985, 206	EIA
Vogt 1985, 255–61, Taf. 123-4	W
Vogt – Franke-Vogt 1987, 35	W, LBA
Potts 1990/2 I, 253: Sh102	LBA
Carter 1997, 101	W
Magee 1998, 5; 2014, 192	LBA
Yule 2001a I, 103	Hafit
Velde 2003, 112	not dated
Taha 2009, 177	EIA
Potts 2012, 82	W
Magee 2014, 192	LBA
Yule – Weisgerber 2015a, 29	W, EIA II?
Vogt 2016 personal com.	W, LBA
Righetti 2016 I, 308	LBA
Yule 2018, 57	W
here:	W

Fig. 15: A variety of estimates for the earliest known appearance of metallic arrowheads in south-eastern Arabia have appeared. These are ordered by publication date

incorrectly drawn. In reality for this piece (Fig. 13) the cross-section reveals a normal arrowhead of the Ar2 class, arguably the earliest known metallic arrowhead in SE Arabia.

31 The most characteristic copper-alloy arrowheads with a broad midrib and hollow planished edges, are designated Ar2. Fig. 12 and Fig. 14 display the occurrences of such known points in archaeological contexts. While the earliest examples occur during the Wadi Suq period, none occur in closed LBA contexts (both terminus post quem and terminus ante quem). About a third of these contexts contain EIA material, which is abundant per se. Most Ar2 points derive from the surface or from mixed contexts. Admittedly, perhaps only 15% at the very most of contextualised examples, perhaps even less, point to the Wadi Suq period as the onset for the earliest metallic arrowheads. Should the points from Sarūq al-Ḥadīd and Muḍmār be included, then what used to be considered a diagnostic Wadi Suq class is more EIA than Wadi Suq.

32 The rarity of find-rich, single-period archaeological contexts containing arrowheads prior to the LBA has caused researchers to understand the inception of copper-alloy arrowheads to have occurred in precisely this same period (Fig. 15). Most archaeologists of the Gulf region share an uncertainty which results from suspected early finds which turn up in later contexts and from a minimal use or lack of group/type building for dating purposes. Recently published Wadi Suq contexts containing metallic

arrowheads (Fig. 12) counter a suggested onset in the LBA or EIA. This agenda of a late onset results from excessive faith in undefined, mixed contexts within the archaeological record (e.g. al-Quṣaiṣ), despite the continued appearance of unexpected new forms of finds from new excavations (e.g. Muḍmār), a fact reaffirming the imperfection of the extant archaeological record.

33 In fact, metallic arrowheads dated by context to the Wadi Suq period have been published for some time (e.g. Fig. 12.7, from Gr. S2122), but have escaped scholarly attention. Others of this date appeared recently (Fig. 12.4, Bāt Tower 1156). However, if this period begins around 1800 BCE together with the Ar2 arrowhead class, one balks at having both endure unchanged until the end of the EIA in c. 300 BCE – some 1500 years. On the other hand, if we attribute the vast majority of arrowheads with broad and flat midribs as well as hollow edges to the LBA and EIA, this also leaves the millennium-long Umm an-Nar and Wadi Suq periods with neither lithic nor metallic contextualised arrowheads during an otherwise continuous and blossoming tradition of archery both in the Near East and globally, an implausible notion (see below). It might just as easily be argued that pre-Islamic archery was completely absent in south-western or central Arabia, given the lack of published arrowheads there – as some may believe, although this is hardly plausible. Absence of evidence is not evidence of absence.

Engraving of arrowheads

34 P. Magee concludes that basically engraved arrowheads are not directly related in their decoration to other Near Eastern examples and advocated that what now are designated as Ar1 and Ar2 arrowhead classes belong to the LBA, a dating which he later reaffirmed (Magee 2014, 192). Since the majority of arrowheads indisputably engraved with cuneiform post-date 1200 BCE, their identification as a source for scored decoration on one or both faces of south-eastern Arabian copper-alloy arrowheads is weak (Magee 1998, 9, who assembled the source materials). Moreover, most such weapons engraved with cuneiform bear only the dealer provenance, "Luristan" (as noted by Medvedskaya 1982, 68), rendering them in principal weak as an archaeological source, at least to a field archaeologist. Six decorated examples from the early 2nd millennium with simple scored ladder motifs from Old Assyrian Kültepe Ib in central Anatolia (Fig. 16: 14 & 15), and points from Tell al-ʿAjjul (e.g. Fig. 16: 16) are completely unrelated to projectiles inscribed with cuneiform (Magee 1998, 6 table 1, 2–7= Fig. 16.14 & 15). The present authors agree with Magee that cuneiform is a doubtful inspiration for the decoration of south-eastern Arabian arrowheads.

Conclusion

35 Most important for a classification of arrowheads to be used for chronology are the actual shape, size and details of workmanship of the projectiles. Since a given form-class may include both scored and otherwise identical plain examples, the shape is more essential than the scored decoration for dating.

36 After around 2000 CE, archaeological research in the UAE generally quantitatively overtook that of the Sultanate of Oman, albeit the latter's situation has now improved, with some 30 field projects presently underway (Anon. 2017, 16–18). It is understandable that the majority of the specimens useful for the creation of a copper-alloy arrowhead chronology were excavated from UAE sites. Datings made in the early days of Gulf archaeology for arrowheads or anything else are no match for more recent better documented evidence.

37 Finds of arrowheads imperfectly reflect the history of early archery in Arabia. Firstly, the related organic remains seldom survive decay. Secondly, more intensively re-

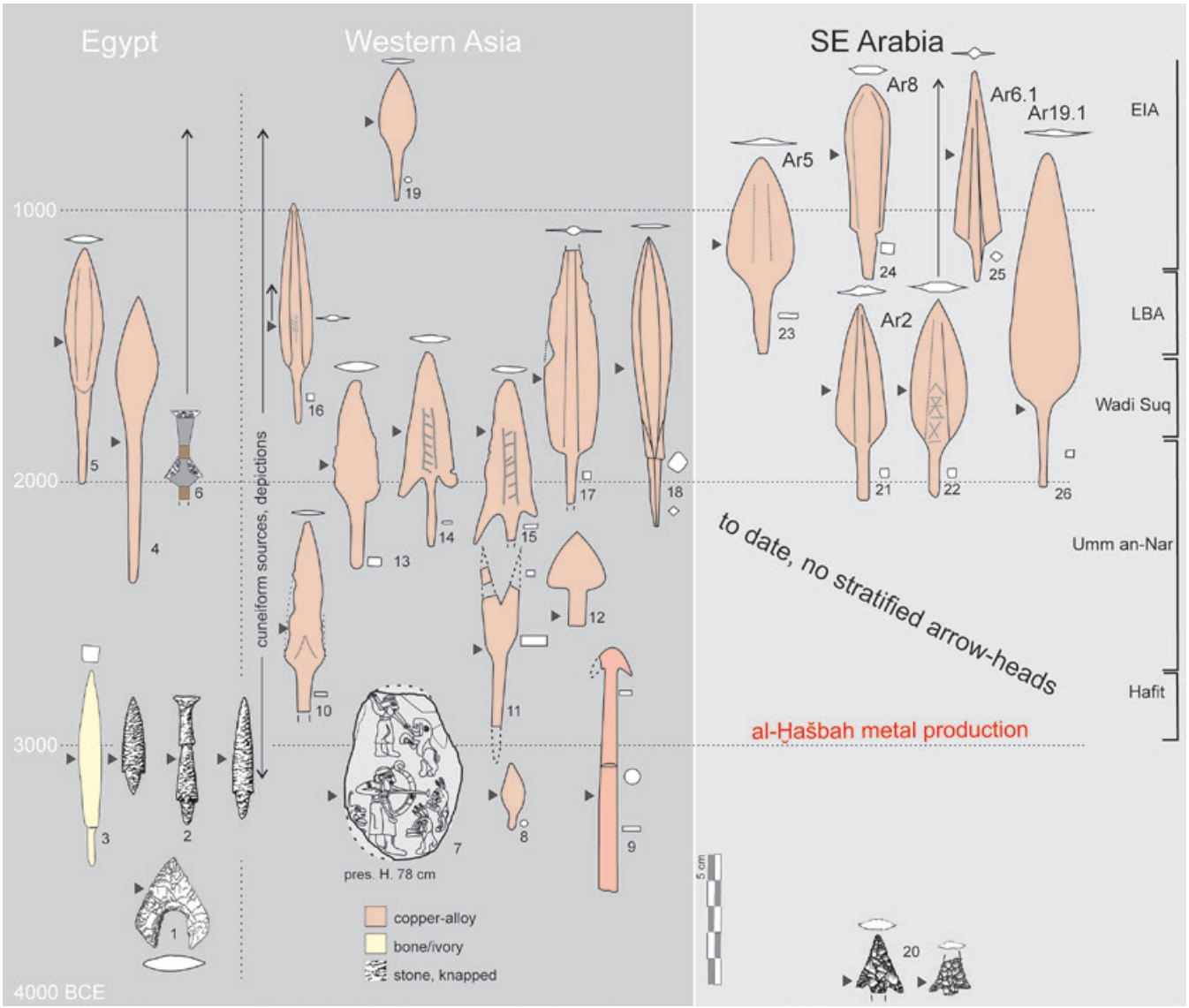


Fig. 16: Classes of copper-alloy arrowheads in south-eastern Arabia. The datings of the different classes differ in their validity

Fig. 17: Key to Fig. 16

no.	find-spot	dating	source
1	Fayum area Cii-W	Fayum A, neol.	Caton-Thompson – Gardner 1934, pl. xxxix4
2	Tomb of Zer, Abydos	dyn I	Clark et al. 1974, 357 fig 7.7–9, 11
3	Tomb of Den, Abydos	dyn I	Clark et al. 1974, 357 fig 7.2
4	Abydos, Sankhara	dyn XI	Petrie 1903 part 2, 31, pl xv.9; 1917 pl xli1
5	Thebes, Asasif, excavation	1550–1458 BCE	MMA 16.10.460
6	var. contexts type A3	MK NK Late	Clark et al. 1974, 362 fig 9
7	Uruk, stratum IIIb, rm. 206	Uruk III	Nöldeke 1934, Taf. 12
8	Fara. De 38/39	Uruk III	Martin 1988, 222 no. 315
9	Uruk, Me XV-5, Riemchengebäude	Uruk III	Müller-Karpe 2004, no. 2105
10	Ur, royal cemetery	ED III–Ur III	Müller-Karpe 2004, no. 1563
11	Fara	ED III	Heinrich–Andrae 1931, Taf. 40c=Martin 1988, 233 no. 362
12	Susa	'25th century'	de Mecquenem 1934, 214 fig 58.10; Tallon 1987 I, 150 tab. 7
13	Tell al-ʿAjjūl, area G level 810'	MB	Petrie 1934, pl. XXX.?, Petrie Palestine Project database
14	Kültepe Ib	early 2nd mill.	Erkanal 1977, Taf 17.54
15	Kültepe Ib	early 2nd mill.	Erkanal 1977, Taf 17.55
16	Tell al-ʿAjjūl, city	LB I or late MB II	Petrie 1931, pl. XX.57=Tubb 1977, 192 pl. 1a
17	Ḫafāǧī, hill C	Old Babylonian	Müller-Karpe 2004, no. 366
18	Tell al-ʿAjjūl tomb or level 607?	LBA	Petrie 1932, pl. XVII.150
19	Nimrud	Neo-Ass.	Curtis 2013, pl xi.152
20	al-Milayḥa	c. 4000 BCE	Jasim – Uerpmann – Uerpmann 2016, 27
21	Bāt tomb 1156	Wadi Suq, early	Leigh 2016, 236 fig 11.3
22	ʿAsimah, Ra's al-Khaimah, As100	Umm an-Nar	Vogt 1994, 96 fig 44.1
23	al-Wāṣit W1 DA 7853 (Ar7)	LBA	Yule – Weisgerber 2015a, 70 Pl 14.69
24	al-Buḥaiṣ Bhs20	EIA	Jasim 2012, 218 fig 262.4
25	Rumaylah, period I	EIA II	Boucharlat – Lombard 1985, 68, pl. 62.1
26	al-Aḥḍar cemetery	Wadi Suq, early	Yule – Weisgerber 2015b, Pl 13.1-6

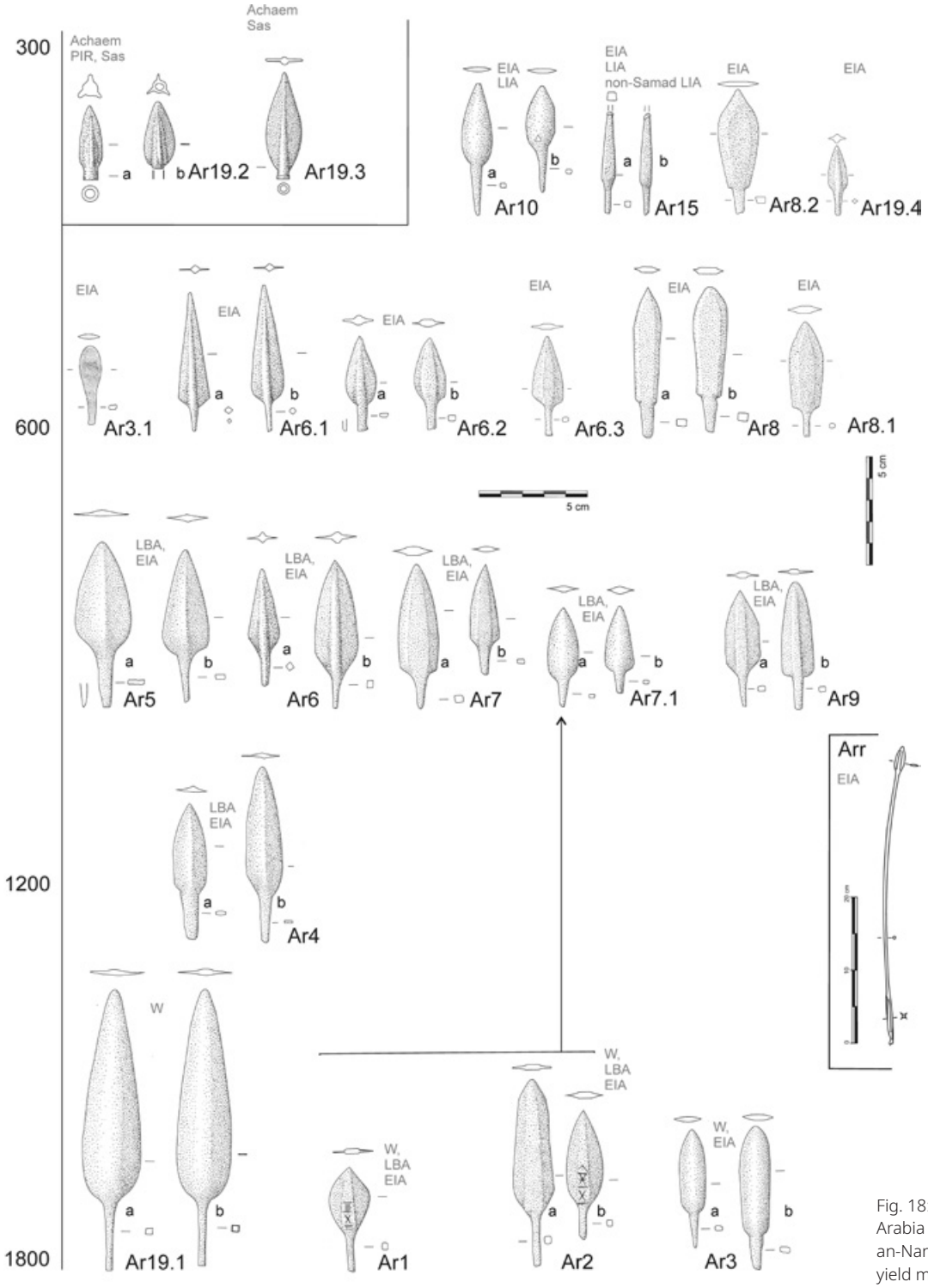


Fig. 18: Although in south-eastern Arabia secure Hafit and Umm an-Nar contexts have yet to yield metallic arrowheads, at this same time, they are abundant in neighbouring Egypt and Western Asia where they form a continuous tradition. The triangle on the left side of each artefact marks the ideal dating point in the table. The Mesopotamian short chronology is used

searched geographic areas of Arabia are likely to yield more arrowheads. For example, the south-west and central regions have yielded very few prehistoric metallic points. Yet, it would be absurd to assume that south-western Arabian forces without archery could stand against foes known to have used it. Analogously, later Roman and Parthian archery in warfare became absolutely essential and must have generally influenced the warfare of the day. Traumatic defeats such as the Parthian victory over the Romans at Carrhae (eastern Anatolia) in 53 BCE owing to Parthian archery ushered in changes in the Roman army. Within this technological transfer, advancements in archery are identical to today's arms races in their intention. Such developments are spottily represented in actual arrowhead finds.

38 The 29 different find-classes of south-eastern Arabian copper-alloy arrowheads cited here can be explained in a variety of ways, spatial, temporal, functional and aesthetic origins (Fig. 18). Nine further LIA classes of points, mostly from iron, lie outside the focus of the present study (Classes Ar10–Ar18: Yule 2001, 106 Abb. 5.10.2 (in German); Yule 2019, 164 Fig. 12 & Table 3 (English)). Identifiably different point shapes for special purposes are rare, although a few trefoil arrowheads have occurred in UAE sites, such as at the EIA III Rumaylah Chantier 3 (Fig. 18; Boucharlat – Lombard 1985, 60, pl. 62.11), and Bhs20 at EIA al-Buḥaiṣ (Jasim 2012, 78 fig. 95.1–95.2). The constituents of small and formally simple classes such as Ar6.2 and Ar9 are best dated by similar examples from EIA contexts. Re-examination has not at least presently identified any arrowheads from intact Hafit or Umm an-Nar contexts.

39 The available material related to archery within prehistoric south-eastern Arabia is not truly representative. Although the principle weapon throughout antiquity, archery's technological development is paradoxically only just now emerging. A longer research tradition and better survival conditions are the reasons that the archery remains are richer from the Stone Age onwards in Egypt and Mesopotamia alike. The paucity of metallic arrowhead finds from the Early/Middle Bronze Age in south-eastern Arabia is unrelated to their original abundance, today abruptly characterised by enormous EIA finds, as at Sārūq al-Ḥadīd. As opposed to Egypt, with its protracted tradition of knapped arrowheads persisting even into the late period (Fig. 16: 6), that tradition breaks off in south-eastern Arabia, perhaps around 4000 BCE (Fig. 16: 20). Completely absent are simple bone points for hunting small animals and bludgeon points for breaking bird wings and, in turn, forked examples to cut necks and legs, specialised projectiles otherwise well documented in Egypt and Mesopotamia (e.g. Fig. 16: 11), and arrowheads with chisel points (Fig. 16: 7).

40 In searching for external comparisons to the north, Mesopotamia lends itself nicely, which archaeological attestations from the Halaf through the Akkad periods (Salonen 1965, 109–111, Taf. xxvi–xvii; Gernez 2007) onwards, and textual evidence from the Sumerian period onwards (Salonen 1965, 195; Seidl – Stol 2015, 617–618), this due to a longer and more intensive state of research. This evidence seems to have gone unheeded (Yule 2018, 144–146). During the late 2nd millennium, the number of finds increases in volume, complemented by numerous textual mentions, especially of bows (nicely summarised in Civil 2003, 51 with a bibliography), but also of arrows (Römer 1998), this clearly suggesting a chronological continuity of archery technology through the Sumerian, Akkadian, and Ur III periods. Most of the textual evidence, such as the names of weapons, is Neo-Assyrian (900–612 BCE). However, tanged triangular, ovate, and lanceolate arrowheads in flint and obsidian remained in use in Mesopotamia from at least the 3rd quarter of the 3rd millennium BCE until at least the mid-2nd millennium BCE, often with no traces of metal arrowheads (Moorey 1994, 62 citing Mallowan). Moorey adds that early metallic finds would have been extensively recycled as an explanation, underlining the discrepancies between the quantities of Neo-Babylonian and Neo-Assyrian metallic finds uncovered as compared to that recorded in the cuneiform texts (Moorey 1994, 264–265).

41 The famous lion hunt stela from c. 3000 BCE (Fig. 16: 7) excavated from Uruk/Warka is a key early archaeological attestation for archery, displaying a king shooting lions, evidently by means of chisel-pointed arrows (sources: Zutterman 2003, 123 note 21). During the 2nd millennium, the bronze, tanged, leaf-shaped arrowhead was the prevalent form throughout practically all of Western Asia (Curtis 2013, 39; e.g. Tallon 1987, 151, 348, no. 16; II, 133 fig. 350d (Ur III)). Other early specimens originate from Kültepe Ib (Fig. 16: 14 & 15), although, in turn, many 2nd millennium examples cannot be precisely dated as early or late, as is the case for Susa (Helwing 2017, 285 cat. nos. 366–368). Neo-Assyrian Nimrud possesses by far the largest quantity of arrowheads,

with 427 catalogued examples of what J. Curtis describes as a leaf-shaped and tanged iron point (Fig. 16: 19).

42 As for ancient Egypt, far more relevant early archery sources have survived (organised diachronically: Clark et al. 1974; Yadin 1963, 8, 62–63, 80–82, 295–297) to support the arrowhead chronology. Dyn. XI already displays simple, flat foliate, tanged arrowheads fashioned from "copper" (Fig. 16: 4). New Kingdom copper and iron tanged points from Egypt and Nubia are both ribbed and flat (Fig. 16: 5, ibid.). Socketed, foliate-bladed, and vaned arrows follow in Egyptian contexts of the late period (ibid.). During the New Kingdom, stone, bone, ivory, glass, and metal arrowheads are all extant, demonstrating a far more advanced development of projectiles than might be suspected solely on the strength of the Mesopotamian evidence.

43 Relevant for the development of 2nd millennium metallic arrowheads in the Near East is also a famous Egyptian stela depicting Amenhotep II shooting arrows through copper ox-hide ingots. By this point in time the advanced technology of metallic arrowheads would seem to have been all but perfected, having been honed for centuries. Although it is difficult to explain as to how a metallic point could penetrate a 3–5 cm thick ingot, for even a porous one made of "blister copper" (on their porosity: Merkel 1986, 260; Hauptmann et al. 2002, 4; Hauptmann et al. 2016, 759: "extreme porosity"), the royal archer seems to have accomplished precisely this, should his text be taken literally. The arrowheads of his day had developed a midrib in order to penetrate enhanced body armour.

44 If any technological transfer is effective over time and space, then it is within the field of defence, this including archery technology and ballistics. Already prior to 1500 BCE, copper and bronze arrowheads were far too well-established within the Mesopotamian and Egyptian archaeological and textual record to expect few or no examples within neighbouring south-eastern Arabia. Archaeologists generally underestimate the ingenuity of early technologies. Nonetheless, developments in archery equipment may not be a process involving consequent progressive improvements in performance (Kooi – Bergman 1997, 134); the different design types of artefacts may represent individual solutions to the problem of creating a mobile weapons system in step with surrounding cultural developments.

45 The aforementioned new and old evidence from stratified contexts in south-eastern Arabia, throughout the 2nd millennium BCE and the global development of archery technology all indicate a widespread use of metallic arrowheads as early as the Wadi Suq period (beginning 2000–1900 BCE), if not earlier. The main reason for what some authors previously took to be their apparent LBA emergence derived from a striking quiver find from grave N1985 published in 1989, but arrowheads from Wadi Suq contexts published in 2001, 2012 and 2016 escaped notice. The raised Wadi Suq dating herein advocated corresponds with the dates of other associated find categories in differing contexts. During the Hafit and Umm an-Nar periods, significantly lacking in south-eastern Arabia are not only metallic arrowheads, but also knapped stone examples. While one can explain the former to have been intensively gleaned from tombs for re-cycling, this explanation can hardly pertain to the latter. Metallic arrowheads must have been highly prized treasure in Hafit and Umm an-Nar tombs. It is more plausible to explain their absence as being as a result of intensive metal gleaning, than that they simply did not exist. Grave robbing is a far more efficient way to obtain metal than the mining, roasting and smelting of ore.

46 The inclusion of quotidian objects such as arrowheads within burials may not have been considered appropriate prior to the LBA of south-eastern Arabia (al-Rawi 2015, 343 citing Philip 1989). During this period in Gaza, Egyptian hunter-warriors brought this grave good custom to Tell al-ʿAjjul (e.g. Sparks 2013a). Nonetheless, such a practice is undocumented prior to this both in Egypt (pers. comm. R. Sparks) and in

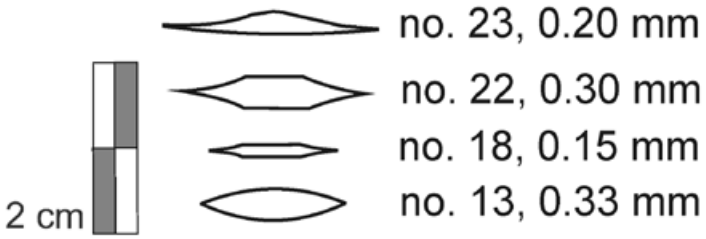


Fig. 19: Differences in the cross-sections of arrowheads from the MBA (13), LBA (18), class Ar2 (22) and class Ar5 (23) of Fig. 10 & Table 5 (Yule)

south-eastern Arabia. Large, well-crafted arrowheads of elite warriors may have a parallel in one grave dated to the Wadi Suq period at al-Aḥḍar belonging to Class Ar19.1 (Fig. 16: 26). The broad midrib seems to appear earlier in the Levant at Qaṭna (al-Rawi 2015, 343 figs. 4a–4d) and Tell al-ʿAjjul than in south-eastern Arabia (Fig. 16: 5, 16–18). Their dating is also more secure owing to the number of contexts and their state of documentation. These display a more precise mastery in the smithing, as may be witnessed in superb examples such as Fig. 16: 18, which is thinner and more symmetrical than those from south-eastern Arabia. Cross-sections (Fig. 19) show these largely LBA arrowheads to be more finely worked.

47 At the same time, a Hafit-period copper production is evident in SE Arabia (Yule – Weisgerber 1996, 141; Schmidt – Döpper 2017, 219). For this reason, it might be expected that Hafit and Umm an-Nar-period contexts may yield their own evidence for metallic arrowheads in these periods. For the time being, the published chronological tables for the pre-Islamic classification of metallic finds may stand (arrowheads: Fig. 18; all metal-finds: Yule 2018, Pl. E), but this will certainly change. When Umm an-Nar and Hafit-era arrowheads do emerge at some juncture, they will probably be simpler than those presently earliest-known, i.e. should have no midrib (cf. Fig. 19: 18 & 22). Such examples seem to appear in Mesopotamia in the mid-2nd millennium (Fig. 16: 5, 16–18). In absolute terms, regardless of absolute chronology chosen, the assigning for the time-being of the Ar2 find-class to the period of Wadi Suq (and later) and not to the EIA, as previously believed, encompasses about a millennium, a problem in and of itself.

48 Finally, the authors find that find-classification and typologies are too rare within south-eastern Arabian archaeology. Since they form a basis in European and Near Eastern archaeology alike, then why not also in Gulf archaeology? This notwithstanding, the present authors have taken issue with Taha's typology for arrowheads, in which all examples essentially belong to a single type. The future lies in intelligently designed find classifications by means of which a chronology might be constructed.

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ZUSAMMENFASSUNG

Do South-Eastern Arabia's Earliest Extant Copper-Alloy Arrowheads date to the Wadi Suq Period?

Paul A. Yule, Burkhard Vogt

Die Untersuchung der prähistorischen metallischen Artefakte Südostarabiens entwickelt sich schnell und fast konvulsiv. Es leidet jedoch an einem Mangel an Forschungs- und Veröffentlichungsstandards und einer Diskussionskultur. Nach heutigem Kenntnisstand argumentieren die Autoren, die frühesten erhaltenen metallischen Pfeilspitzen Südost-Arabiens der Wadi Suq-Zeit zuzuordnen. Die zahlreichen Pfeilspitzen sind ein wichtiger Bestandteil der prähistorischen Fundinventar Südostarabiens, die für die arabische Chronologie insgesamt von wesentlicher Bedeutung ist. Dennoch sind die Kontexte des 3. und 2. Jahrtausends unerklärlicherweise frei von metallischen Pfeilspitzen und daher chronologisch verzerrt. Die südostarabische Archäologie muss die Klassifizierung von Artefakten zum Zwecke der Datierung stärker nutzen. Pfeilspitzen, die früher auf die Mitte des 2. Jahrtausends datiert waren, sind jetzt eindeutig teilweise in der frühen Eisenzeit datiert.

SCHLAGWORTE

Pfeilspitze, Hafit, Wadi Suq, Prähistorische Bronzefunde, Kupferlegierung, Artefakt-Klassifizierung

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