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The New Swedish Cyprus Expedition 2010 Excavations at Dromolaxia *Vizatzia*/Hala Sultan Tekke

Preliminary results. With appendices by P. Klingborg, F. and F. Kärfve, C. Hagberg, O. Svensson, S. Macheridis and L. Franz

Abstract*

Determination of the complete occupational sequence of the site, including investigation of pre-12th century levels which were thoroughly studied by P. Åström since the 1970s, is the main task of the planned project. During the course of the expedition (NSCE11) in spring 2010 a ground-penetrating radar survey (GPR) was carried out at Dromolaxia *Vizatzia*/Hala Sultan Tekke in Area 6, leading to the discovery of a large Late Cypriote complex. The compound is bordered to the north by a substantial wall, against which nine rooms (so far) could be exposed. Two occupational phases have been verified but there are indications of a third. The suggested functions of the various structures of the most recent phase are: living, working, storage and administration spaces. The rich find contexts point to the production of textiles and metal objects, and the locally produced pottery is generally of a high quality. There are also many imports, mainly from the Mycenaean sphere of culture. The locally produced vessels from Phase 2 include the "Creature krater" which is a masterpiece of a high artistic standard. Another piece of elevated artistry is the piece of a "Warrior vase".

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Introduction

After the untimely death of the author's former teacher and friend Professor em. Paul Åström in October 2008, the Swedish excavations were resumed at the Late Cypriote city of Dromolaxia *Vizatzia*/Hala Sultan Tekke under the direction of the author from Gothenburg University, Sweden. Surveys and excavations were carried out in Area 6 from the 7th of May to the 5th of June 2010. The basic team consisted of 18 archaeologists and students, most of them from Sweden, others from Austria, Denmark, Germany and Jordan. Amongst the team members are R. Feldbacher, MA, assistant field director, H. Ta'ani, technical archaeologist, M. Bataineh, architect, surveyor and draughtsperson, and P. Georgiou, responsible for the logistics.[1] Other persons involved in the project were the personnel from the Department of Antiquities in Larnaka and from the Police Aviation Unit.

Limited trial excavations were carried out in the northern part of Area 6 in 1972.[2] In addition to these, test trenches were dug just north of the fence of Area 6 in 1998.[3] The results from these soundings point to a settlement from Middle Cypriote III (?) to Late Cypriote I but also from Late Cypriote IIC to IIIA and later, a deduction that was based on the ceramic evidence. Amongst the earliest wares excavated then in Area 6 are White Painted Pendant Line Style, Proto White Slip, Monochrome, Bichrome Wheel-made, White Painted V–VI, Red-on-Red and Red-on-Black. Later wares included Late Helladic IIIA2 and Plain White Wheel-made II.

[1] The students include W. Försth, L. Franz, J. Gimmerstam, C. Hagberg, Fa. Kärfve, Fr. Kärfve, P. Klingborg, S. Macherides, M. Persson, I. Sulzenbacher, O. Svensson and N. Werther. A. Fischer participated part-time.

[2] E. Åström in Åström *et al*. 1983 (*HST* 8), 59–105; A. Hatziantoniou in Åström *et al*. 1983 (*HST* 8), 106–143.

[3] P. Åström *et al*. 2001 (*HST* 11), 57–61.

Objectives

Determination of the complete occupational sequence of the site, including investigation of pre-12th century levels, is the main task of the planned project.[4] Finds from layers which cover roughly 1650–1450 BC are of specific interest because of their likely impact on the ongoing chronological discussion on the date of the Minoan eruption of the Thera volcano, on which a consensus does not exist (see SCIEM 2000).[5] There is a difference of more than 100 years between the dates provided by radiocarbon (high) and those based on historical Egyptian dates, i.e. the sequence of pharaohs based on written sources (low). Amongst the key ceramics from this period are Proto White Slip and White Slip I. A White Slip I bowl, for instance, has been reported as deriving from the volcanic destruction layer on Thera itself. Another important argument in connection with the date of the Thera eruption is that Proto White Slip is only found in Hyksos layers at the Hyksos capital of Tell el-Dab'a in the Nile delta, whereas White Slip I is claimed to belong only to layers of the 18th Dynasty, which is again at variance with the radiocarbon dates.[6] In addition, White Slip I and other Cypriote wares, for instance, Bichrome Wheel-made Ware, are of essential importance concerning the study on relative chronology of Cyprus and sites in the Levant, chief amongst them Tell el-ᶜAjjul.[7] Therefore, the intercultural synchronization guided by Cypriote ceramic key wares[8] and the study of radiocarbon dates from essential contexts from the current excavations are amongst the main undertakings of the present project.

Area 6: Surveys and Recording

GROUND-PENETRATING RADAR SURVEY (GPR)

Method and instrumentation

Magnetic and electrical prospecting have been carried out over the years at the site.[9] In 1980 the first ever GPR survey conducted in the Eastern Mediterranean was carried out by the author at Hala Sultan Tekke in cooperation with Lund University's Faculty of Engineering.[10] The equipment was based on a prototype assembled at the Stanford University, USA. That survey was performed within and outside Area 8, covering some 5000 m² and using an analogue GPR system with 400 MHz and 900 MHz antennae. The 400 MHz antenna proved to be preferable to the 900 MHz antenna since the high frequencies, which in principle would have permitted more detailed data images, were strongly attenuated in the highly conductive topsoil. Twelve test trenches were dug, verifying the interpretation of the radar echoes with astonishing accuracy, viz. older stone structures were located below the level of the ongoing excavations. In addition, it was possible to trace the road leading to the harbour of the city.

In May 2010 a high-resolution GPR survey was carried out within Area 6 in order to facilitate the selection of the spot for the excavation (*Fig. 1*). Over the course of three days Area 6, measuring 2356 m² was scanned by I. Trinks from the Swedish National Heritage Board with the assistance of P. Georgiou (*Fig. 2*). For this georadar survey a state-of-the-art digital 500 MHz antenna system was used (Sensors & Software Noggin^{Plus}), the inline trace spacing was 2.5 cm and the crossline profile spacing was 12.5 cm. The overall length of the 371 measured GPR profiles amounts to 18855 m. A series of GPR depth slices, viz. horizontal data images corresponding to 10 cm depth intervals from the surface down to 200 cm depth, were generated using special processing software generously provided by A. Hinterleitner from *Archeo Prospections*, Vienna. The processed data images were instantly available via broadband connection between Larnaca and Vienna.

Interpretation of the GPR data and depth-slice images

Structures indicating architectural remains started to appear in the GPR images at a depth of approximately 30 cm below the surface and were visible down to at least 100 cm. The most clearly expressed anomalies were concentrated in the southwestern part of Area 6 (*Fig. 3*). There are, however, further rectangular structures, although not as distinct, in the central and eastern parts of Area 6. In the eastern half of the survey area a possible circular anomaly with a diameter of approxi-

[4] The excavations in Area 8 directed by P. Åström during the last four decades have revealed substantial remains which date mainly from the 12th century BC according to Åström (see *HST* 1–12). There are, however, differing chronological views suggesting an earlier date, e.g. Negbi 2005, 7.

[5] "The Synchronisation of Civilisations in the Eastern Mediterranean in the Second Millennium BC" is a long-term project administrated by the Austrian Academy of Sciences/Austrian Research Fund and coordinated by M. Bietak. The author of this report is responsible for the evidence from Jordan and Palestine including the synchronization of Cypriote pottery.

[6] Selected references to the chronological discussion: Merrillees 2001, 89–100; Fischer 2003, 263–294; Manning *et al*. 2006, 565–569; Friedrich *et al*. 2006, 548; Bietak & Höflmayer 2007, 13–23; Fischer 2009, 253–265.

[7] Fischer 2003, 263–294; *idem* 2009, 253–269.

[8] See e.g. Fischer 2001, 221–230; *idem* 2007, 71–78.

[9] Linington 1977, 13–27; Fischer 1980, 19–64.

[10] Fischer 1980, 48–62.

Fig. 1. Air photograph of Hala Sultan Tekke with Areas 6 and 8 indicated (processed by I. Trinks).

Fig. 2. The radar equipment during the survey (photograph by P. Georgiou).

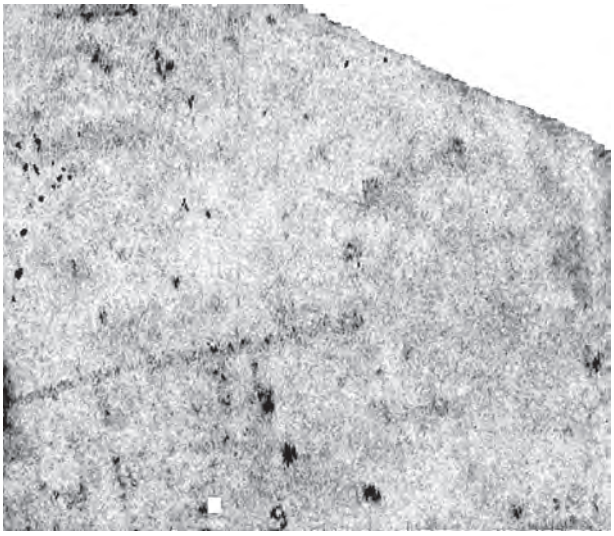


Fig. 3. Radar image showing the 50–60 cm depth slice.

Fig. 4. GPS survey (photograph by P.M. Fischer).

mately 20 m can be seen in the data at a depth of 40 cm below surface. As a result of the GPR survey it was decided to open a 10 m × 10 m square in the south-western corner of Area 6, where the radar images had indicated fairly detailed, stone-built architecture. The structures detected by GPR were subsequently excavated and consist of a compound at least 25 m long, bordered to the north by a wall running roughly east-west, against which a number of rooms were built towards the south. Using the GPR data we were able to discern fascinating details such as openings in the walls and circular stone structures within the compound, all of which were verified within narrow margins during the course of the excavations. The GPR results disclosed principally better images of architectural details in comparison with the earlier prospecting results which were obtained by electrical resistivity and magnetic surveys. Nevertheless, it should be highlighted that the penetration depth of the electro-magnet pulses of the GPR using the 500 MHz antenna system may not exceed much more than 2 m because of the strong radar attenuation in the highly conductive top-soil (see above). However, subsequent excavations demonstrated that most of the architectural features were within 2 m from top-soil.

Over the past 30 years GPR hardware and software have seen dramatic developments, resulting in considerably improved data images. This latest GPR survey confirmed that high-resolution georadar measurements are well suited to mapping ancient structures efficiently over large areas at one of the largest Late Cypriote cities.

OTHER SURVEYS AND THE EXCAVATION AND RECORDING TECHNIQUES

In order to provide accurate maps based on precise measurements a GPS survey was carried out with the kind assistance of the Department of Public Works/Sea Works, Nicosia (*Fig. 4*). A number of fix-points were measured with mm accuracy and with reference to heights above mean sea level (MSL).[11] The coordinates of the fix-points refer to the Cypriote Local Transverse Mercator (LTM) projection system, which has the same Central Meridian (33° E) as zone 36 of the Universal Transverse Mercator System (UTM). Consequently, the previously published maps of the excavated settlement and tombs (see *HST* 1–12) have to be corrected since measurement errors could be demonstrated.

The initial area of excavation (Trench 1 = T1), which measured 10 m × 10 m, was divided into four sub-trenches separated from each other by baulks 0.5 m wide. The sub-trenches were labelled T1A-D. A test trench (T2), six m² in size, was opened in the eastern part of Area 6 where the GPR survey indicated structures. During the course of the excavations T1D was extended 2 m towards the south, thus adding 9.5 m² to the total area of excavation (T3A).

A total station (electronic distance measuring device) and database were used for a high-precision contour map and the recording of all structures and small finds (*Fig. 5*). The photographic documentation included several digital cameras and a video recorder. With the excellent co-operation of the personnel of the Police Aviation Unit numerous still pictures and videos were taken during the excavations. The high-resolution air photographs covered not only the actual area of excavation but also other exposed parts of the ancient city and its surroundings.

[11] The GPS was calibrated against our total station, thus providing mm accuracy.

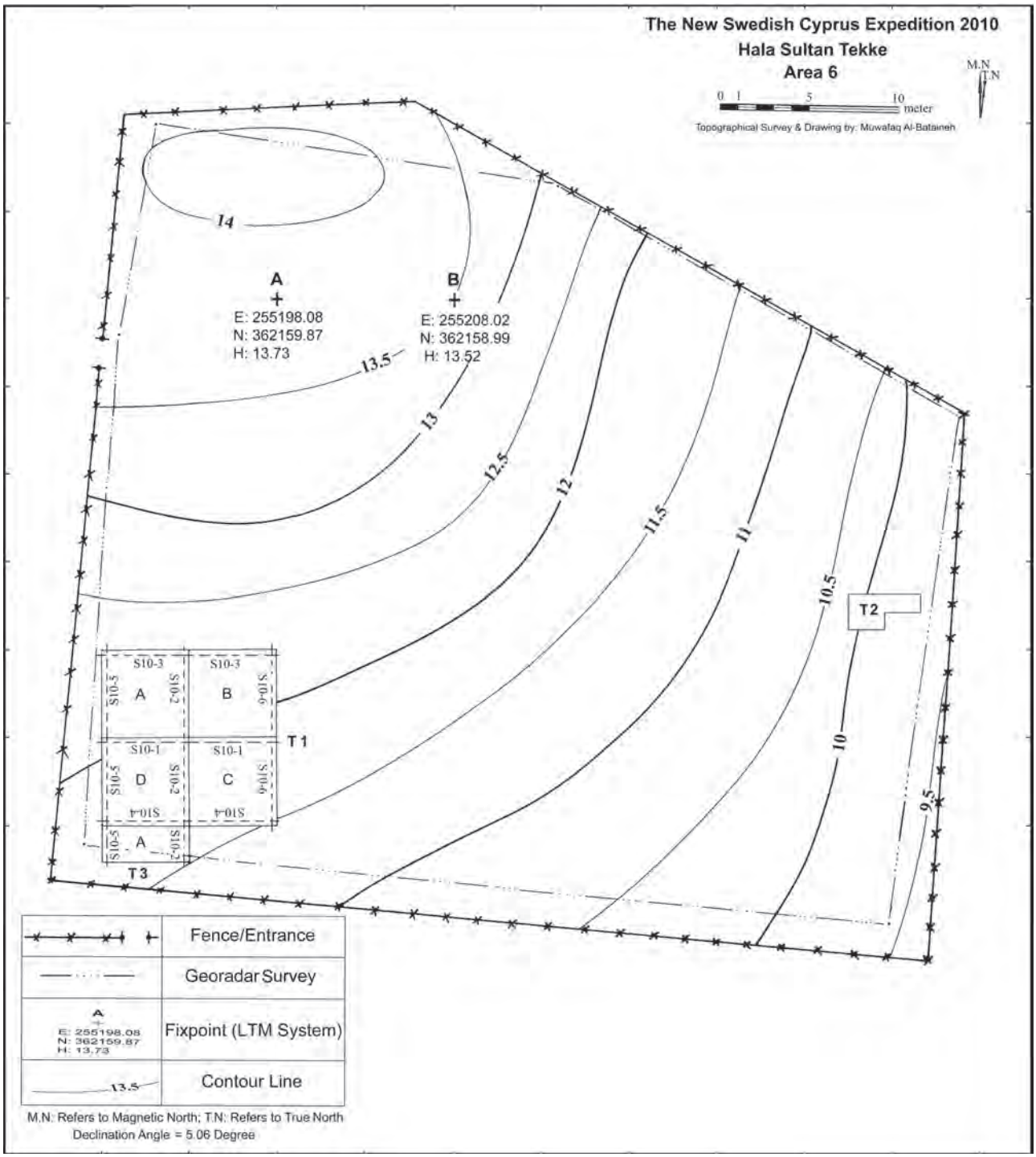


Fig. 5. Contour map of Area 6 with the 2010 trenches indicated (drawing by M. Bataineh).

The excavations were continuously supported by an electro-magnetic detector and an industrial vacuum cleaner powered by a petrol-driven generator. Vacuum cleaners have been used during our excavations for several decades. Tests have demonstrated that even thorough brushing of the excavated surface all too often smudges the surface, thus hiding minuscule features. An example during this season is an organic container filled with a yellow pigment which was not visible after brushing. The wall of the organic container, most likely of leather or a thick textile, was barely a few mm in thickness. Other examples are collapsed mud-brick walls where after vacuum cleaning the individual bricks could be discerned and measured.

In principle, most of the excavated debris was dry-sieved. The results from the strenuous dry-sieving have been "discouraging": only a handful of minor, not diagnostic sherds, bone fragments and a broken faience bead were discovered during the entire season.

Nomenclature

H for Dromolaxia *Vizatzia*/Hala Sultan Tekke with the last two digits of the year of excavation, e.g. H10 for Hala Sultan Tekke 2010.

A for Area, e.g. A6 for Area 6, that is the fenced portion in the northern part of the city near the harbour (salt lake).

T for Trench: a trench with a specific Arabic number is usually defined by a 10 m × 10 m square (the maximum size of a trench) whenever the topography allows. The numbering is consecutive regardless of area or year of excavation. 10 m by 10 m squares are as a rule divided into four sub-trenches and labelled with the suffixes A-D, e.g. T1C for Trench 1 Subtrench C.[12]

S for Section: e.g. S10-4 means Section 4 from 2010

R for Room + a running Arabic number for a walled space: e.g. R6 means Room 6.

N... for N and a running find number regardless of area or year of excavation is used for all Class 1 finds (see below). These finds (already defined as such when excavated) are usually complete or almost complete objects of any material. The find spot is recorded by the total station and the position and shape of the find are plotted on the relevant plan as N.... with the altitude above MSL (mean sea level).

L (with encircled numerals on the plans) for Locus: i.e. a limited feature within a stratum, for example, a pit, a hearth, a work bench, a spot of ash etc, but not walls (see below).

W for Wall: walls have their own serial number system with the prefix W ... within the entire city regardless of area or year of excavation.

Alphanumerical code (written on the finds): This code was completed in order to fit our database and to contain as much information as possible in the alphanumerical code alone (examples):

– Find Class 1: H10A6T1BL60N26, i.e. Dromolaxia *Vizatzia*/Hala Sultan Tekke 2010 – Area 6 – Trench 1B – Locus 60 – Find Number 26 (see above).

– Find Class 2: H10A6T1DL55-3, i.e. that this find (mainly ceramics) is the third find in Locus 55; these objects are usually defined as finds during pottery reading.

– Find Class 3: H10A6T1DL55, i.e. these finds are subordinate to a certain locus, i.e. sherds (mainly not diagnostic) and other objects from Locus 55.

Excavations (T1A-D and 3A)

COLLUVIAL SOIL

The surface within the area of T1A-D and T3A slopes 0.73 m along 12 m from north to south, and from west to east 0.14 m along 10 m. The thickness of the colluvial soil varies between 0.05 m and 0.15 m, the average being approximately 0.1 m. The dark brown coloured soil is quite loose and dry and contains many roots belonging to the shrub vegetation which was removed prior to the radar survey. It should be mentioned that there are only very few sherds which might be post-Late Cypriote, the vast majority being Late Cypriote, and no osteological material. The general impression of the structure of the colluvial soil is that the area did not suffer from post-Late Cypriote human disturbances or animal holes.

STRATUM 1 (*FIGS. 6–8*)

This stratum[13] contains the bulk of findings from this year's excavations. The thickness of the stratum is up to 0.8 m. It comprises roof constructions, mud-brick superstructures, stone-built wall foundations and several floors indicating sub-phases. In addition to the rich find assemblage it also produced architectural elements of limestone, which were once parts of door/roof constructions (see Appendix 2) and water/drainage systems (see Appendix 1), and ashlar masonry.

[12] The numbering of the Sub-trenches A–D is clockwise, viz. NW for A, NE for B, SE for C and SW for D.

[13] "Stratum" should only be considered as a term of convenience for use during the fieldwork and in the preliminary reports. It is used to designate a level of occupation regardless of the area of excavation and numbered from below colluvial soil as it is excavated. In the final report the designation "Phase" will be used where "Phase 1" is the most ancient.

Fig. 6. Air photograph of partly exposed Stratum 1 (photograph by Police Aviation Unit, Larnaka).

Fig. 7. Air photograph of Stratum 1 and partly exposed Stratum 2 (end of the excavations 2010; photograph by Police Aviation Unit, Larnaka).

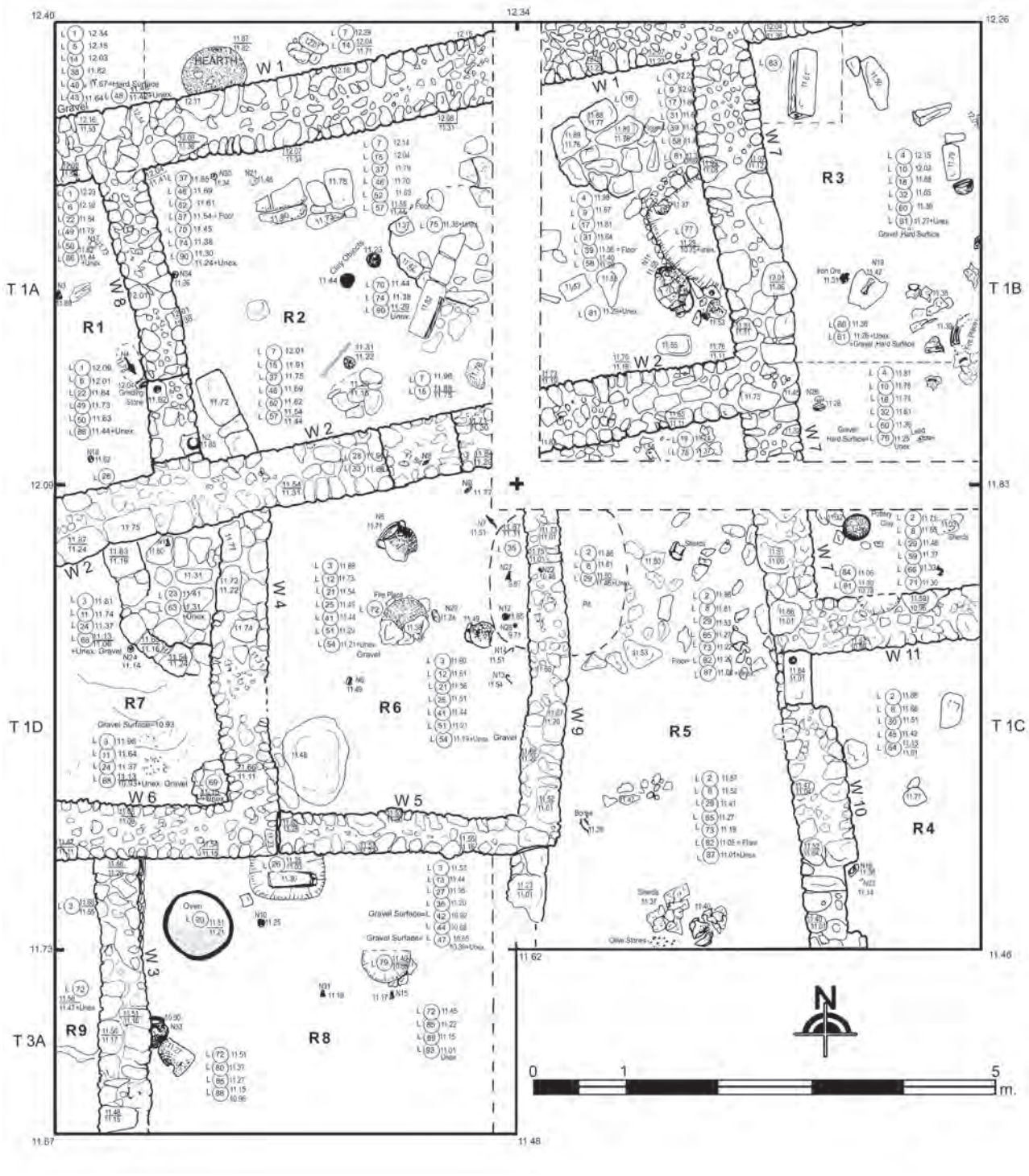
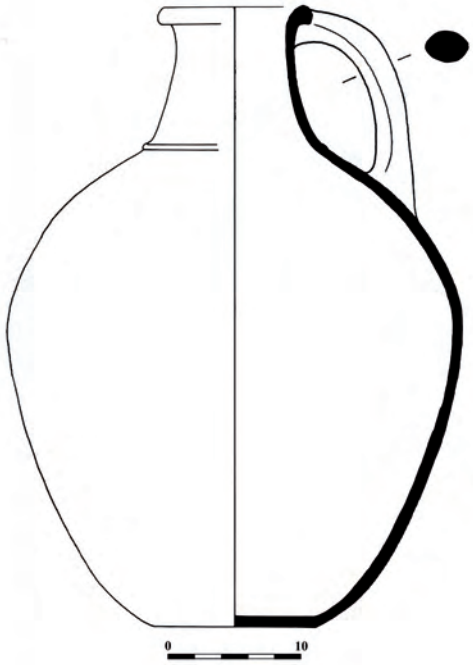


Fig. 8. Plan of Stratum 1 (drawing by M. Bataineh).

Fig. 9 (left). Sherd of "Warrior" vase (photograph by P.M. Fischer).

Fig. 10 (below). Plain White Wheel-made jar (N11; photograph by W. Försth).



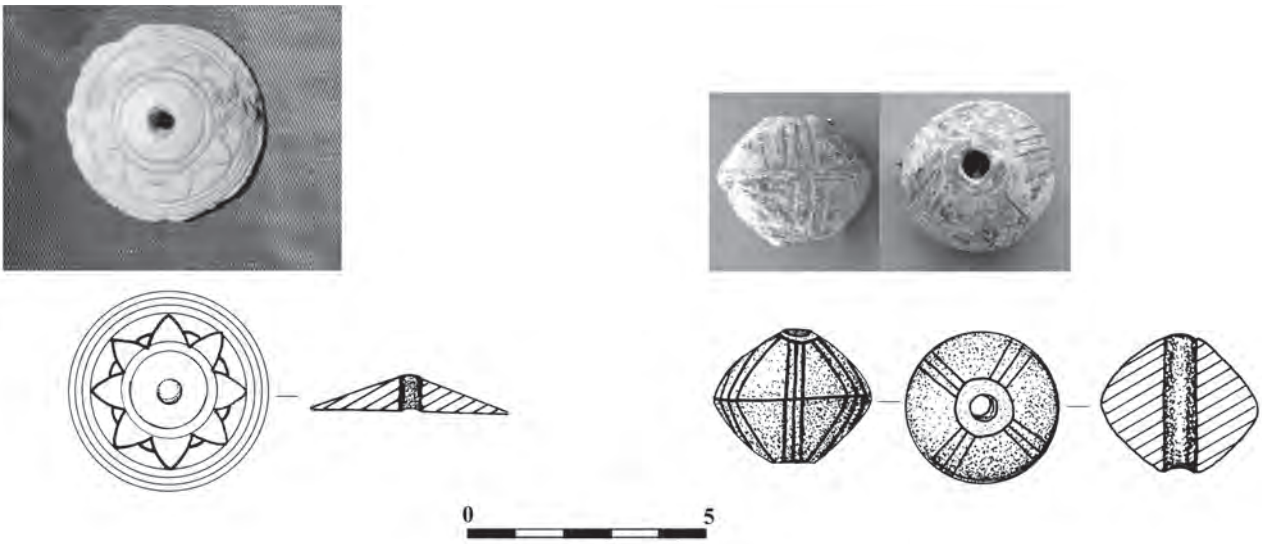


Fig. 11. Button of bone (N32, left) and spindle whorl of terracotta (N30 right; photographs by W. Försth, drawings by M. Bataineh).

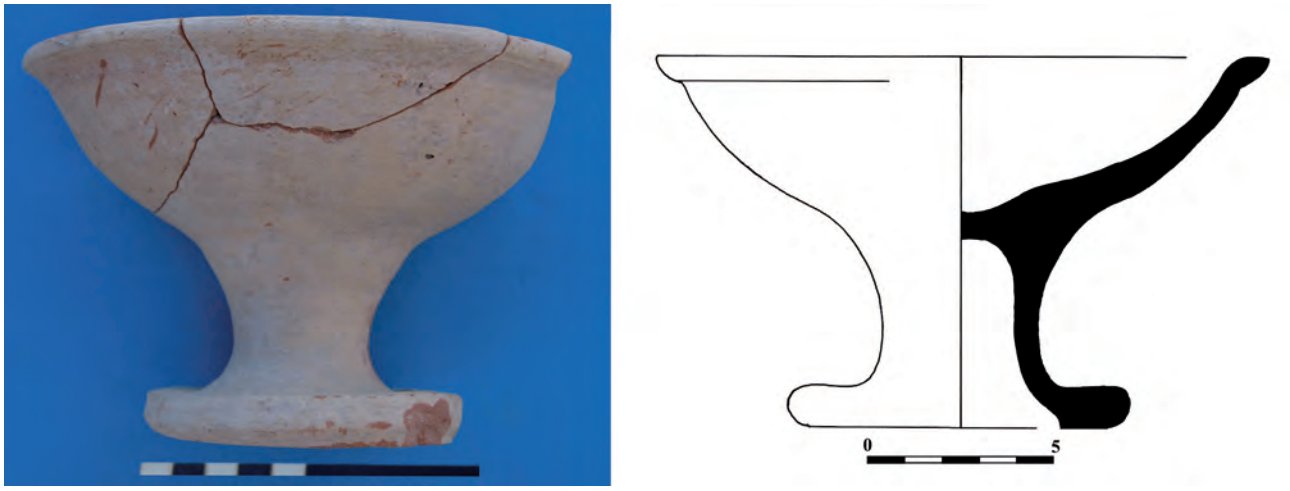


Fig. 12. Chalice of White Painted Wheel-made ware (N26; photographs by W. Försth, drawings by M. Bataineh).

Fig. 13. Plain White Wheel-made krater (N5; photographs by W. Försth, drawings by M. Bataineh).

All architectural remains are orientated roughly north-south/east-west with a slight deviation of the longitudinal axis towards the west in the northern and eastern part of T1. The architectural remains are dominated by a stone wall running east-west, 0.8 m wide, and preserved to a height of approximately 0.7 m (W1). This wall corresponds to the wall which is at least 25 m long, running from the western fence towards the east as indicated by GPR. Nine walled spaces to the south are separated from each other by division walls 0.4–0.7 m wide.

The small space between W1 and the northern trench border is most likely an outdoor area. There is a fireplace, 0.7 min. diameter, and there are sherds of fine tableware including a Late Helladic IIIA/B stirrup jar. One sherd from L40 is of special importance since it depicts the lower part of a warrior in an aggressive pose, holding a weapon (*Fig. 9*). Three colours were used: red for the body and the spear (?), black for the undergarment and white for the skirt and the shin guard. The perfectly painted leg recalls representations on Aegean frescos, and the white overpaint might be influenced or have its roots in the Minoan sphere of culture.[14] The fabric is not typically Mycenaean, and—although slightly burnished—it lacks the lustrous appearance of "typical Mycenaean" ware. Additionally, there are no characteristic Mycenaean details (with reference to the well-known Warrior Vase) but on the other hand it is flawlessly painted, possibly even more so than its Mycenaean counterparts. It may be the work of a fresco

[14] I am very grateful to Professor em. S. Deger-Jalkotzy, who forwarded most valuable suggestions.

painter, or a Cypriote painter working in a new way but drawing on traditional techniques.

The north-westernmost space (R1), 3.3 m wide and limited to the east by W8, is only partly excavated. Amongst the finds are a loom weight of white limestone (N3), a spindle whorl of dark, almost black, limestone (N18), a bronze ring (N17) and a bronze spearhead (N4). The latter was intact and covered by a flat stone (0.3 m × 0.2 m in size). It seems to be a foundation deposit, a sort of "guardian", buried close to the threshold to the oblong room to the east. Amongst the ceramics fine tableware dominates.

The room to the east (R2) is 6 m × 3.2 m in size. It could be entered via a 0.85 m wide entrance and a step of limestone. The space, once roofed, is bordered by W8, 1, 7 and 2. There is a threshold of limestone to the northwest in the entrance area, viz. the door opened to the west (see Appendix 2). Another entrance, a gap 0.8 m wide in W2 to the south, shows no door socket. There are architectural elements lying inside the debris of the collapsed roof, some decimetres above the floor, which makes it plausible that they were part of the roof construction. Amongst these are blocks of hewn, flat limestone which belonged to a water/drainage system (see Appendix 1). Other ashlar blocks of stone were found on the floor and might have served as bases for wooden roof supports. In the north-eastern corner of the room is a stone and pottery-paved working place, approx. 1 m in diameter (L16). Another stone-paved working installation, 0.5 m in diameter, is to the east of the southern entrance. In the centre of the room is a circular stone-lined installation (L75), the purpose of which might be associated with two conical clay objects, whose function is not clear. Nearby were the remains of an organic container (leather or thick textile), which was filled with a yellow pigment. In the eastern part is a "pit" at least 1.4 m wide, which lies below W7, i.e. has been dug prior to W7. The "pit" is not completely excavated. Finds from this room include a nearly complete Plain White Wheel-made jar with one handle (N11; *Fig. 10*), a whetstone (N21), a biconical spindle whorl of fired clay (see Appendix 4) with marked waist and vertical incisions (N30; *Fig. 11* right) and another biconical one of a dark grey stone (N34). An ostrakon from the rim and neck of a pithos with Cypro-Minoan signs, which were incised post-firing, should be mentioned. Amongst the ceramics fine tableware dominates. This roofed space was used for various activities, one of which may have been the decoration of pottery.

The room to the northeast (R3) is only partly excavated. It is 6 m long and limited by W7, 1 and 11. To the north and close to W1 are architectural elements of hewn limestone, amongst them a typical lintel from a door construction. According to the radar images there is in fact an opening in W1 just outside T1B, viz. just to the northeast of our present excavations, which might be the spot from which our lintel derives. Amongst numerous sherds of mainly coarse quality are two ceramic finds which are (almost) complete: one is a medium-sized Canaanite jar (N19) and the other a chalice belonging to the White Painted Wheel-made group of wares (N26; *Fig. 12*). There are pieces of copper slag and a large, irregular piece of melted lead. This room may have been a roofed (?) courtyard and used as a workshop.

Moving to the south, there is another partly excavated space (R4) bordered by W10 and 11. Inside this space is a stone-built structure which was used as a bench but which certainly belongs to structures from an earlier phase. There are two doorways via W10 into this room. Both have thresholds of limestone.

The next space to the west (R5), also only partly excavated, is limited by W9, 2, 7 and 10 and approximately 2.2 m wide and at least 6 m long. It is stone-paved in the northern half. The general appearance of this space together with the findings might suggest a kitchen. There are, for instance, numerous olive stones close to a broken ceramic container and bones intermixed with ash. Below W9 is a "pit" with a diameter of 1.5 m. It was dug prior to the building of W9 because the wall covers parts of the pit (see Phase 2 below).

The next room to the west (R6), approximately 3.5 m × 2.8 m in size, is bordered by W4, 2, 9 and 5. A fireplace, 0.5 m in diameter, is in the centre of the room and there is a stone bench, which might represent the remains of an older wall, to the south. There are a multitude of various find classes of which the following should be listed: two lead sling bullets (N8, N9; see Appendix 3), two complete bronze fishing hooks (N13, N14), a complete, leaf-shaped, bronze arrowhead (N7), a pestle of basalt (N6; 445g.) and a millstone of limestone (N20; 4052g.), a grooved bead of faience (N12), and a fairly complete krater of Plain White Wheel-made Ware (N5; *Fig. 13*).

The room to the west of the former is again only partly excavated (R7). It is bordered by W2, 4 and 6, and at its widest part is 3 m long. In the north-eastern corner is a 1 m × 1.5 m stone structure which is partly built of reused ashlar blocks. The structure is tightly paved with flat stones and most likely represents a grain silo. A loom weight of fired clay (N1) and a bronze ring with a flattened upper part (N24) come from the area close to the silo.

During the course of the excavations it was decided to extend T1D southwards in order to expose a wall (W13) which was visible in the section and which, beyond any doubt, belongs to an earlier period. The new trench (T3A) is 4.75 m × 2 m in size and very close to the southern and western fences. There are two only partly excavated rooms from the most recent phase of occupation. They are bordered by W3 and 6/5 to the east (R8) and W3 and 6 to the west (R9). The very limited exposed western room did not produce any indica-

tive finds whereas the eastern room contains an oven (L20, diameter 0.7 m) and next to it a pit 0.8 m × 0.6 m in size. Amongst numerous finds of ceramics were also a doughnut-shaped spindle whorl of diorite (N10, 25g)[15] and two loom weights of fired clay: N15 (77 g) and N31 (85g). A collection of White Painted Wheel-made Wares can be seen in *Fig. 14*.

It is our preliminary impression that Stratum 1 was destroyed during a military assault, judging by the state of the architectural remains and from the position of the sling bullets. However, substantial ash layers are not present.

STRATUM 2

This stratum is so far only visible in the western portion of T3A, close to the southern and western fence. At the very end of the season it was possible to expose minor parts of Stratum 2. Two walls are ascribed to it: W12 and 13 (R10). Bordered by these walls is a flat chavara floor from which two finds derive: one is an excellently finished button of bone (N32; *Fig. 11* left) with geometric incisions in a flower pattern, and the other represents one of the highlights of the 2010 season; a large krater which received the working name "Creature Krater" in acknowledgment of the dominating, skilfully painted motifs (N33; see below). The excavation of the krater was difficult and time-consuming: it was partly covered by W3 from Stratum 1. We were able to retrieve the krater almost complete, with the exception of (probably) two sherds which are still buried by W3.[16]

Below W9 from Phase 1 is a "pit" with a diameter of 1.5 m, which must have been dug prior to the construction of W9 because the wall runs over the pit. The western half of the pit was excavated down to a depth of roughly 2 m. At the bottom (?) of the pit a loom weight (N27) and a 152g spindle whorl (N28) were found. The complete excavation of this structure has to wait for another season. The pit was backfilled at the end of the season.

"Creature Krater" (N33, *Fig. 15*)

The krater is 42 cm high and has a maximum diameter of 49 cm. The diameter of the rim is 34 cm and that of the base is 15.5 cm. The volume is 19.6 litres. It has a flattened everted rim, two horizontally placed looping handles with roughly circular sections and a raised ring-base. It is wheel-made and hard-fired. The fabric is light reddish-brown and contains medium-fine inclusions.[17] The slip is light yellow and the paint is mainly dark brown but brownish-red to red nuances appear too. The decoration of the krater is divided into two zones. Above the belly is a panel of figurative and other ornamental elements which are arranged in a sort of multiple metope pattern (see in particular the back of the vessel). Below the belly are two groups of horizontal bands, four bands are immediately below the belly and three between the belly and the base. A broad band is painted along the rim including the upper side and the outside of the rim/lip. The handles are also partly painted. The krater seems to be a Cypriote product although in many respects it resembles Late Helladic IIIC counterparts as far as the overall shape and the type of decoration are concerned.

The main motif, which covers half of the upper part of the krater, is centred between the handles. It is dominated by two ungulates connected to each other by their horns. Between the ungulates is a tree to which the animals are tied. Two birds are standing on the ungulates' backs. Below the left ungulate is a canid. Between the birds and above the ungulates' horns are moon- and sun-like representations.

The back of the krater depicts two units of animal and geometric motifs which are divided by a triple-line framed pattern of multiple upside-down triangles. The two decorative units are bordered by two triple-line framed vertical zigzag lines. The three animal motifs are not strictly antithetic representations; they are separated by a field of six triangles standing on top of each other. There are two fish swimming away from each other and separated by three wavy lines. Two other fish are facing and touching each other, and there are two birds facing each other. The decorated panels to the left are separated from each other by triple lines whereas the panels to the right are separated by double lines. There are ten minor units with geometric motifs (description left/right unit from left to right and downwards); left: large scale pattern, concentric arcs, small scale pattern, framed vertical zigzag lines, chequer pattern, framed vertical zigzag lines; right: zigzag line dividing panel into hatched triangles, horizontal chevrons and a horizontal zigzag line.

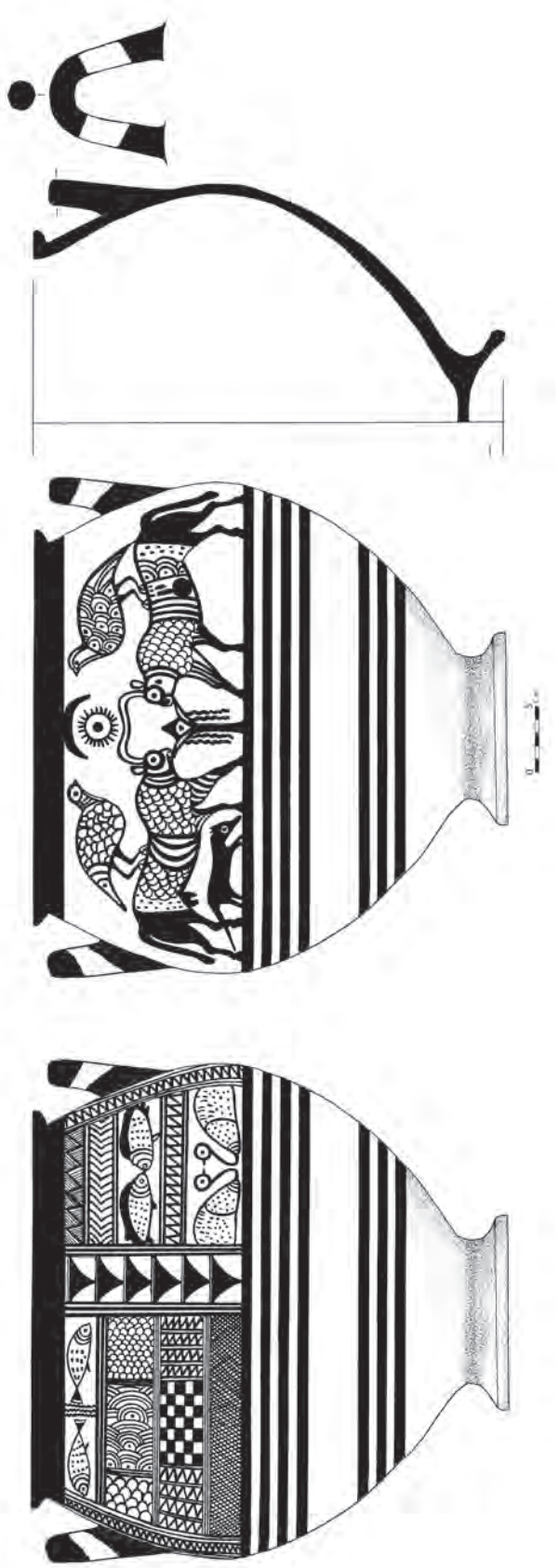
The preliminary interpretation of the animal motifs is as follows: the two birds are a peahen (to the left) and a peacock to the right. They are facing the symbols for the moon and the sun. The connected horns of the ungulates may represent the earth. The ungulates are a bull and a cow. The cattle are tied to the "tree of life" on which they are feeding. The upper part of the "tree of life" and the connected horns resemble a stylized heart. The solitary canid below the cow represents a dog. The animal representations on the back of the krater are two pairs

[15] Diorite at the site is a usually dark greyish-green igneous rock composed of mainly feldspar, biotite, hornblende and pyroxene. The mineral is heavier than limestone and very hard, which makes it difficult to work. Our electro-magnetic detector indicated diorite as an object with a high content of metal.

[16] The remaining sherds will hopefully be discovered during the next season.

[17] Concerning the size and nature of inclusions, see Fischer 2006, 26.

Fig. 14. Collection of White Painted Wheel-made vessels (drawings by M. Bataineh).



of different fish and a pair of swans. It seems to be obvious that the very skilled artist wanted to tell a story which can apparently be interpreted in various ways considering our lack of knowledge of the origin, purpose and production of the vessel. Was it ordered by a customer? Was it produced by an independent artist?

One interpretation is that the krater with the elaborate motifs represents a status symbol depicting a tale of life in general: of affection, reproduction, and dismay. The story contains positive components which dominate but there are also dark aspects in the artist's tale. It appears that the pairs of animals represent the two sexes necessary for the survival of the species. Essential for all life are also the sun and vegetation which are symbolized by the tree of life. Similarly indispensable for survival is the moon representing the night, the time for rest. On the "dark side" of the story is a "sinister" carnivore, the only solitary painted animal, which certainly could not have represented a threat to the ungulates, but to the birds which are conveniently placed on their backs out of reach of the carnivore. The back of the krater shows a pair of fish to the right and a pair of swans in an obviously affectionate pose, whereas the two fish in the left upper corner are swimming away from each other, symbolizing an act of separation—another reality of life—which is further accentuated by the three wavy lines which split them.

Another interpretation is that the krater represents a wedding gift where the past, the present and the future are symbolized. The two small, in principle identical, fish in the upper left corner on the back of the vessel which are swimming away from each other epitomize the couple before they met as infants at a time when childhood was more important than their differing sexes. The next composite metopic field to the right shows them more grown up as larger, now differentiated, fish with the male fish to the right, and—further into adulthood—swans in an affectionate pose. The same can be said about the cattle and the birds. The symbolic values for the tree of life, the sun and the sky/moon are certainly as suggested above, but the animals and tree (land) may represent the couple's wedding gifts/belongings. The solitary, dog-like animal, might just be another member of the common household or maybe a guardian, and was painted by the artist in order to break up the fairly rigid antithetic representation.

STRATUM 3

Stones appeared on the very last day of the excavations east of W13 and may belong to an even earlier phase of occupation.

Fig. 15. "Creature Krater" (N33; drawings by M. Bataineh and P.M. Fischer).

Fig. 16. Bull's head of bronze (N29; photograph by T. Bürge, drawings by M. Bataineh).

Fig. 17. Selected bronze objects from Stratum 1 (photograph by T. Bürge).

Trial sounding (T2)

A test trench (T2) was opened in the eastern part of Area 6 near the eastern fence, where the GPR survey indicated a structure 1–2 m wide running roughly north-south. It is six m² in area and placed across the supposed structure which runs parallel to the other north-south walls in T1 and 3 at a distance of roughly 30 m.

A circular stone-built structure was found ca 0.3 m from the surface. It has a diameter of 1 m at the top, is 0.4 m deep and becomes narrower towards the base It is well-constructed from nine reused ashlar blocks of limestone. There is another ashlar block of limestone at the bottom of the pit which has been smoothed with a limy material. In addition to a number of Late Cypriote sherds, two finds are of special interest: one is a toggle pin of bronze (N25) and the other a complete bull's head of bronze (N29; *Fig. 16*), which lay on the limestone block at the bottom of the structure. The function of

the bull's head is most likely that of a weight.[18] The structure is interpreted as a grain silo or a container for other foodstuffs. The north-south running "structure" indicated by GPR turned out to be a natural (?) ridge of gravel.

A preliminary note on the radio-carbon dates

Six radiocarbon samples were taken from Stratum 1. The samples were processed by the VERA-laboratory in Vienna (Vienna Environmental Research Accelerator) by E.M. Wild and P. Steiner. One sample (VERA-5409HS) could only be dated by using humic acids. The 2σ-dates cover roughly Late Cypriote IIC to III.

Preliminary conclusions

A large, Late Cypriote complex has been discovered in the southern part of Area 6 where no substantial structures were found during test soundings in the 1970s. The use of various surveying and recording techniques turned out to be of great assistance. For instance, the GPR survey indicated a compound, a minimum of 25 m in length, of which only minor parts in the south-easternmost part of Area 6 were partly exposed during the 2010 season. The subsequent excavations verified the GPR results to a high degree. The major part of the compound lies outside the present fence to the west and the south. There are at least two phases of occupation represented, of which only the most recent (Stratum 1) could be exposed during this season. The compound is bordered to the north by a more substantial wall against which a number of rooms/spaces were built, nine of which were partly exposed during this year. The suggested functions of the various structures are those of living, working, storage and administration spaces. Numerous loom weights and spindle whorls of fired clay and stone all point to the production of textiles, and copper slag and lead to the production of metal objects. There is an abundance of finds which include jewellery, tools and weapons of bronze, amongst which are a bull's head, finger rings, bracelets, toggle pins and fishing hooks (selected items in *Fig. 17*). Other objects are of stone and bone, the latter including a nicely decorated button. In general, the locally produced pottery is of high quality and so are the imports mainly from the Mycenaean sphere of culture. Stratum 1 was probably destroyed during a military assault; however, substantial ash layers are absent. The Creature Krater, which belongs to Stratum 2, is a masterpiece of a high artistic standard. In order to expose additional portions of this most interesting compound Area 6 will be extended to the west and south.

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Table 1. Radiocarbon dates of samples from Stratum 1.

Laboratory number	*Sample*	*Material*	*$\delta^{13}C$ [‰]*	*^{14}C-age(1σ) [BP]*	*Calibrated age (2σ) (INTCAL09/OxCal 3.10)*
VERA-5407	H10A6T1A L90	charcoal (twig?)	-23.7 ± 0.7	2980 ± 35	1380BC (3.6%) 1340BC 1320BC (90.6%) 1110BC 1100BC (1.2%) 1080BC
VERA-5408	H10A6T1B L32	charcoal (twig)	-33.5 ± 1.6	2955 ± 40	1310BC (95.4%) 1020BC
VERA-5409HS	H10A6T1B L61 Humic acids	charcoal (twig)	-28.5 ± 1.2	3005 ± 55	1410BC (95.4%) 1050BC
VERA-5410	H10A6T1C L82	olive stones	-22.7 ± 2.3	2955 ± 35	1300BC (95.4%) 1040BC
VERA-5411	H10A6T1DL55-1	charcoal (twig)	-27.1 ± 1.4	3005 ± 35	1390BC (95.4%) 1120BC
VERA-5412	H10A6T1DL55-2	charcoal	-27.0 ± 1.4	2935 ± 40	1270BC (95.4%) 1000BC

[18] Courtois 1986, 69–90.

Appendix 1: Two possible water channels

BY P. KLINGBORG

Material

Two blocks of stone (F1 and F2; *Fig. 18*), which could be remains of what might have been a rather advanced Bronze Age water system, were exposed during the 2010 season. These will be discussed below, the aim being to determine their function.[19]

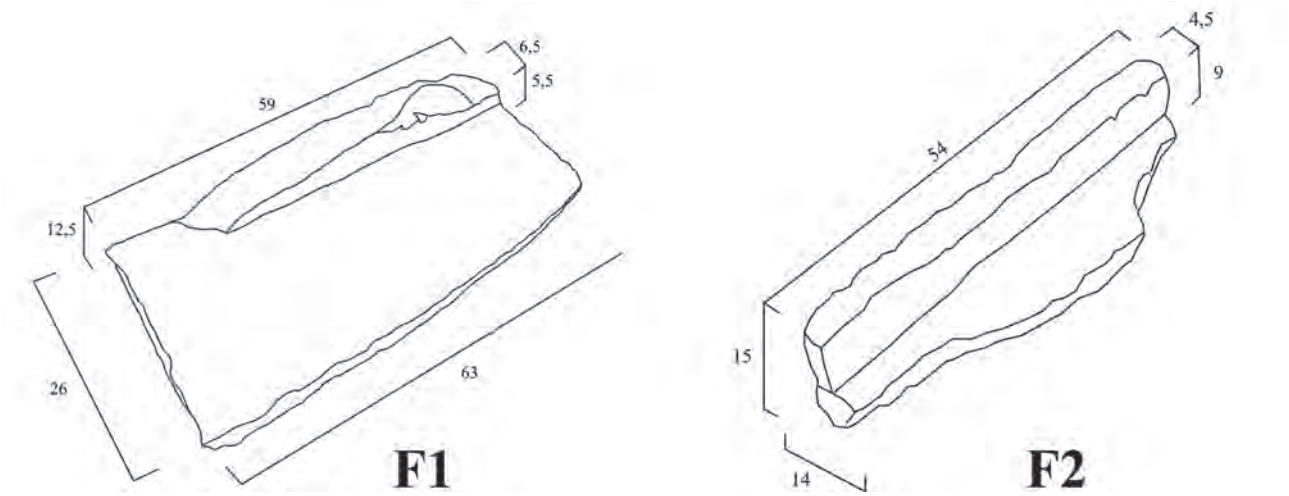

Fig. 18. Two possible water channels (drawings by P. Klingborg).

Block F1 was found in R2, where it was lying upside down at some distance from the wall and therefore was obviously not found in its original position. It may have been reused. The stone is 26 cm wide, and has a 7 cm thick bottom which is slightly convex and a 6.5 cm thick wall. If it formed part of a water channel it appears to have been broken off and would originally have been wider—there is, however, no indication of a second upright wall. Two other, much smaller, very badly damaged fragments were also found next to this larger piece. It is unlikely that any more pieces of the same feature will show up in future excavations as the fragments was found within a clearly defined room.[20]

Block F2 was found in a similar manner in R3, but it is possible that additional pieces of the same fragments will come to light if the excavated area is enlarged. As with F1, the block appears to be incomplete and one wall could have been broken off. However, F2 is thinner than F1 (bottom: 6.5 cm, wall: 4.5 cm), appears to be much lighter, is not convex in shape and has a break in the wall of about 90 degrees. Both pieces are evidently only partly preserved. They both lack edge if they were ever any kind of water channel.

Parallels

A direct comparison with materials from other sites is difficult—the size of any drain, water channel or pipe would change considerably depending on local conditions and desired function. However, it is clear from the general shape of F1 and F2 that they could very well have been part of some kind of water channel. This is evident from similar structures from the Bronze Age until much later periods and even in

[19] The term 'drain' (even though 'water channel', 'block with channel', 'channel' and 'spout' are also used) is commonly used in excavation reports to describe finds like these. I will however refrain from calling them drains, as it is very difficult to tell what their specific function was, and using any such term would imply a function which cannot be proved. I will thus simply accept that they were used to channel water (i.e. call them water channels), fresh or foul, in one direction, until there is decisive evidence one way or the other.

[20] Virgin soil was never reached here, which makes it possible, even if a little improbable due to the differences in level, that further pieces will be found.

modern cities. Late Bronze Age examples come from Asia Minor, the Levant, Greece or Crete.[21]

One good example from Crete can be found in House C at Tylissos; a wealthy villa where it seems that maybe a very similar (but not identical) channel was used to lead water into a cistern.[22] Similar water channels come from Festos. Other examples, both smaller and larger, can be found at Knossos but consist of different designs of masonry and terracotta. It should also be noted that the Knossos drain circuit was constructed several hundred years earlier than the building at Hala Sultan Tekke.[23]

The earlier excavations in Area 8 at our site produced some parallels. A number of U-shaped stones, not unlike ours, can only be interpreted as water channels; some of them connected with a bath or well-house.[24] Nineteen of these have been published in *SIMA,* but unfortunately only a small number have been properly measured.[25] Width, which can be useful for a comparison is, however, commonly provided.[26] Out of the nineteen pieces previously recorded only two are wider than F1 (one with a maximum width of 28 cm, the other being 29 cm), while the average width of all water channels is only 20 cm. However, it should be noted that F1 would have been the widest block if we added a second wall. F2 would fit well into the pattern with its width of 14 cm plus a hypothetical second edge. Another interesting factor, even if somewhat difficult to apply here, is the channel width.[27] This has been measured in only three cases, but all of these have a width of 6–7.5 cm, a number which fits in well with the width of F2, while the channel of F1 would be almost three times as wide. However, there are cases where it looks as if the channel of some larger blocks which have been published as drains might be almost as wide. Unfortunately this cannot be confirmed by published measurements.[28] We may also note that the bottom of F1 is, if only slightly, thicker than any water channels previously found at the site.

Discussion

The initial use of F2 seems to have been that of a water channel, perhaps reused later for some other purpose, even though one edge is incomplete. F1 on the other hand, although superficially similar, was perhaps never used as part of a water system, judging by previously excavated parallels at our site. In addition, there are no indications of a second wall and the design differs from others found at the site.

Even though it is argued here that the blocks were found in reused positions, it should be considered possible that they were *in situ* as they could have originated from the roof. It is difficult to argue for this position though, as there are no known parallels during the Bronze Age, as far as I know, and also because we know that the shape was used at ground level in Area 8.

If we still assume that F1 may have been a water channel, where was it originally brought from? Where would the Bronze Age inhabitants of Hala Sultan Tekke have required such a massive water system? The partly uncovered compound from 2010 has impressive dimensions and such a building might have needed a water supply and drainage system that matched its importance and status. Future excavations might answer this question. Nevertheless, the author's present opinion is that F2 probably was a water channel (reused in the context where it was found), while F1 was not.

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[21] A list of useful publications is provided by G. Hult in Åström *et al.* 1977 (*HST* 3), 79. It should be mentioned that terracotta drains appeared as early as the 6th Millennium BC in Mesopotamia (Wilson 2000, 152).

[22] Picture and identification provided in Cadogan 1976, 148.

[23] Wilson 2000, 158.

[24] E.g. G. Hult in Åström *et al.* 1977 (*HST* 3), 77–79, including a discussion on the nature of the room.

[25] Fifteen of these have been measured, but the methods, *i.e.* what measurements were taken, have varied considerably, most of them only providing length, width and height, while I would prefer to compare the size of the water channel itself. This information is from Åström 1998 (*HST* 10), Åström *et al.* 2001 (*HST* 11) and Åström *et al.* 2007 (*HST* 12).

[26] Length is difficult to use as almost all of the pieces have been broken off, while the height difference between F1 and F2 is too small to be useful here.

[27] The size of the channel section would be even more useful, but measurements providing that information are only given in one case (F 1288, see Hult 1981, 16).

[28] E.g., see fig. 39 and 42 in Hult 1981, 16.

Appendix 2: Three thresholds from 2010

BY FANNY KÄRFVE AND FREDRIKA KÄRFVE

Material

Three thresholds made of limestone, and with pivot cavities,[29] were unearthed in Area 6. One was exposed between R1 and R2, placed in the wall W8, running north-south. The other two thresholds were found in W10 also running north-south, dividing R4 from R5. The aim of this study is to highlight a somewhat overlooked architectural element, which has an important role in the understanding of spatial divisions of structures.

The first threshold (between R1 and R2) is in fact a sort of ashlar block[30], situated in the southernmost part of Wall 8 and on the western flank of the wall, closer to R1 than to R2. The length of the eastern side of the threshold is 64 cm and of the western side 36 cm. The width is 42 cm. The threshold thus takes up almost half of the width of W8. The circular pivot depression is in the threshold's northern part. East of the threshold is a step in the shape of a large rectangular stone slab leading into R2. The second threshold is in the northern part of W10, between R4 and R5. The rectangular stone slab is placed on the eastern side of the wall, facing R4. It is 124 cm long and 56 cm wide, approximately half the width of W10. The circular pivot depression is in the north-western corner of the threshold. The third is situated in W10 too, and between R4 and R5, but in the southern part of the wall. This threshold is placed on the western flank. Its length is 40 cm and its width is 46 cm. The circular pivot depression is in the eastern part of the stone.

Parallels

To the best of our knowledge the first traces of ashlar thresholds in Cyprus can be dated to the end of the MBA. Nevertheless, this type had already been in use elsewhere, namely during the 3rd and 2nd millennia BC in Egypt, Ugarit and Crete.[31] Architectural elements made of ashlar blocks are common finds in these regions, also in otherwise non-ashlar built buildings.[32] Hittite and Mycenaean thresholds tend to have massive subterranean parts, characteristics less marked in Cyprus, whose thresholds show more resemblance to those found in Crete and in Ugarit.[33]

During the LM period the worked stone thresholds of Crete show traces similar to those found at our site. Both size and thickness vary, as well as the shape of the pivot depression. In addition to the round depressions there are also square cavities. Thresholds can be found in a large variety of structures, e.g. living rooms, storage rooms and corridors.[34] In Ugarit, during the LBA, it is common to find ashlar masonry and blocks for door jambs and thresholds in domestic architecture. The thresholds would consist of either a monolithic stone or several slabs and have rabbets and pivot depressions. This ashlar technique can be found in taverns, domestic houses, workshops and also in grander buildings.[35]

In comparison with the thresholds in Area 8 in Hala Sultan Tekke, the thresholds from our site are similar in terms of material and masonry, but there are differences in size, form and shape. In Area 8 the thresholds are more often made of monolithic slabs, and the pivot depressions are either round or square. There are also traces of wear and curved grooves on some of the thresholds, which is not the case with the stones in Area 6.[36] A couple of thresholds in Area 8 have raised edges on their long sides, to function as door stops.[37] These varieties do not (so far) exist in Area 6.

[29] Here, thresholds are equivalent to a block of stone with a round and smooth cavity placed off-centre. In this cavity rested a pivot stone attached to a wooden post. The terminology concerning thresholds varies in the literature, e.g. the earlier reports from the site discuss thresholds *and* pivot stones in the sense of a stone with a cavity.
[30] An ashlar block in masonry means a hewn block with a rectangular, visible face when set in place.
[31] Hult 1983, 61.
[32] Rabbets for wooden posts or pivot stones are significant for thresholds found in Egypt, Anatolia and Crete but also in Cyprus, e.g. in Enkomi as well as at our site, see Hult 1983, 77–78 and 88.
[33] Hult 1983, 77–78 and 88.
[34] Shaw 1996, 355–356.
[35] Hult 1983, 23–29.
[36] Hult 1978, figs. 90–91.
[37] Hult 1981, 15, 19 and fig. 45.

Discussion

There are nine partly excavated spaces in Area 6, which indicate a rather large building. So far, only three thresholds have been found *in situ*[38] even though the compound has several more entrances. In each doorway with a threshold (with a pivot depression), there has originally been a door separating the adjacent space.

In Area 8 there is a clear pattern within House A, where the thresholds are placed between rooms of semi-public nature.[39] The inner courtyard is surrounded by rooms (a kitchen, a bathroom and some storage rooms) some of which have thresholds in their doorways. The same pattern seems to occur in Area 6, where one threshold marks the entrance from a possible outdoor space (R1) to the "living room" (R2).[40] The other two thresholds are placed in doorways leading from a large room (R5), a possible kitchen, into a room (R4) which was most likely used for storage. The separation of spaces by a door could have been based on a need for privacy; either personal (bathroom) or to protect private belongings (storage rooms). Locks have not been found but closed doors served mainly as a symbolic divider, and were perhaps as effective as a locked door would have been.

The position of the three doorways is also of interest. Two of them (between R1 and R2 and between the northern R4 and R5) are situated in the corner of the rooms, whereas the third (between the southern R4 and R5) is situated in a wall which is not completely excavated. It is therefore not possible to decide its position in the wall. One natural reason for positioning doorways in corners is to keep the wall solid. With this solution it is also possible to use only one door jamb.[41] This kind of architectural solution only applies to one of the doorways (between the northern R4 and R5) in Area 6, since the doorway between R1 and R2 has a diminutive wall on its southern side, which connects with the perpendicular wall (W2). The positioning of doorways in corners is an architectural design seen elsewhere in Cyprus.[42] Furthermore, the arrangement of the doorways may show the significance of the rooms. In Mycenaean architecture there are examples of doorways positioned in corners, and these doorways often lead to minor rooms. Doorways leading into larger rooms are often positioned in the centre of walls and on the axis of rooms.[43]

The positions of the cavities in our thresholds yield some information on the direction in which the doors opened, despite the absence of wear on the exposed parts of the thresholds. The door between R1 and R2 most likely opened from south to west. The same direction is anticipated for the northern threshold between R4 and R5. It is probable that the southern threshold in the same wall also opened from south to west.

The fact that only three thresholds were found (*in situ*) may tell us something about the material.[44] In Mycenaean architecture wooden thresholds have been found.[45] Even in Cyprus the use of wooden thresholds has been verified: one wooden threshold has been discovered in Bamboula at Kourion.[46] Therefore, there is a possibility that the use of thresholds could be more common than the surviving archaeological material shows.

In summary, our three thresholds follow a pattern common elsewhere in the Eastern Mediterranean, where the use of ashlar thresholds in otherwise non-ashlar built buildings was not uncommon. The thresholds in Area 6 separate rooms which have been provisionally interpreted as living and storage rooms from an outdoor space. These spaces bustled with life, which made it both natural and necessary to shield private life from the public sphere.

[38] The positions of our ashlar blocks indicate that they were found *in situ* and functioned as thresholds. Furthermore, there are no marks suggesting that the thresholds might have been reused, e.g. the presence of more than one cavity. If a threshold contains both a round and a square pivot hole this suggests reuse, which is the case with thresholds found in e.g. Minoan Crete, see Shaw 1996, 355. During the excavation of Area 6, a small threshold was removed from the baulk running through R5 (and dividing T1B from T1C). This threshold was apparently not *in situ*: it was found in the fill placed in a random position and had two pivot depressions.

[39] Hult 1981, 18–20.

[40] The function and nature of these rooms are so far hypothetical, but nevertheless useful for this discussion.

[41] Wright 1992, 474.

[42] E.g. in Area 8 at Hala Sultan Tekke, see Hult 1978, figs. 39–43, and at the LBA site of Bamboula at Kourion, see Weinberg 1983, 56; Wright 1992, 475.

[43] Shear 1987, n. 43 on 35; 61 and 145.

[44] Local materials were used for thresholds, e.g. limestone in Cyprus and Crete, see Shaw 1996, 355.

[45] Shear 1987, n. 6 on 16.

[46] Weinberg 1983, 56.

Appendix 3: A note on lead sling bullets from 2010

BY C. HAGBERG

Material

Two ellipsoid sling bullets of cast lead were found in 2010 (dimensions and weights in *Table 2*): the first (N8) which is slightly deformed at one end, was found at the opening between rooms R2 and R6; the second (N9) was found 25 cm southeast of the first in R6 near the opening, at a level 7 cm lower than the first, with no trace of damage. None were inscribed or incised (see below). The aims of this preliminary study are: 1) to investigate the find context 2) to study the possible production of lead sling bullets at the site, and 3) to test evidence of possible hostile activities.

Both sling bullets are within the range of dimensions and weights of previously published sling bullets from the site.[47] Their lengths vary from 2.6 cm to 4.1 cm, their widths from 1.3 cm to 2.9 cm and their weights from 32g to 47g. Of the eleven previously published sling bullets from Hala Sultan Tekke, five are inscribed or incised. The pottery from the loci where bullets N8 and N9 were found contains, *inter alia*, White Painted Wheel-made II/III and White Slip II, which would suggest a possible preliminary dating to LC IIIA1/2 according to previous publications.[48] This is compatible with the suggested dates of the previously discovered sling bullets, viz. LC IIC–IIIA.[49] However, Åström *et al*. state that the LC IIC dating obviously is not valid for one of the sling bullets (N 2001), which he states is more recent since the layer has been disturbed by the plough.[50]

Discussion

The discovery of sling bullets in Areas 6, 8 and 22 found *in situ* allows two possible conclusions: one is that some sort of military activity has occurred in the area, and the other is that lead sling bullets were produced here. Looking at the two sling bullets from 2010, N8 and N9, it is worth noting that they were both found at the opening between R6 and R2 but closer to R6. This, together with the damage to sling bullet N8, makes a military act possible. One can only speculate on various scenarios, namely, that the bullets were launched from R6 towards R2 at the moment when the door was closed and bounced off, or that they were just lost during an attack. A lump of lead was found a couple of metres to the east in the southernmost part (L60) of R3. In the same room, there are remains of melting activities including a possible furnace. R3 is preliminarily considered as an outdoor area used to produce metal objects. Therefore the production of lead sling bullets is a possibility. Nevertheless, all suggested scenarios may be valid; the possibility of production does not have to exclude the possibility of an attack on the area and vice versa.

[47] Öbrink 1979, 44–45; Hult 1981, 7–44; Hatziantoniou 1983, 68–124; Åström & Nicolau 1980, 29–33; for the discovery of the majority of the sling bullets, see Fischer 1980, 28–32.
[48] See, e.g. Åström & Nys 2007, 56–57.
[49] Åström & Nicolau 1980, 29–30.
[50] Åström & Nicolau 1980, 29.

Table 2. The sling bullets from Hala Sultan Tekke: dimensions (cm), weights (g) and some remarks.

Sling bullets	*Length*	*Width*	*Thickness*	*Weight*	*Area*	*Year*	*Remarks*
N2001	3.7	1.8	1.6	45	6	1972	Inscription
N6029	3.3	1.4	1.2	34	22	1973	4 vertical incisions
N2100	3.2	1.5	1.5	34	6	1977	
N1144	3	1.6	1.6	42	8	1977	Inscription
N6091	3.7	1.6	1	35	22	1978	Inscription
N6093	3.4	1.8	1.4	46	22	1978	
N1166	3.4	1.5	1.4	40	8	1978	Inscription
N1161	3.3	1.3	1.3	32	8	1978	
N1167	3.6	1.6	1.3	43	8	1978	
N1172	3.6	1.6	1.5	47	8	1978	
N1176	3.6	1.6	1.4	45	8	1978	
N1167A	2.8	1.3			8	1979	
N1179A	3.4	1.5			8	1979	
N1186	3.1	1.5			8	1979	
N1187	3.4	1.9			8	1979	
N1191	3.6	1.9			8	1979	
N1194	3.2	1.6			8	1979	
N1211	3.8	1.6			8	1979	
N1223	3.4	1.7			8	1979	
N1254	3.4	1.6			8	1979	
N1255	3.5	1.7			8	1979	
N1258	3.2	1.6			8	1979	
N1264	2.6	1.6			8	1979	
N1304	3	1.4			8	1979	
N1309	3.3	1.5			8	1979	
N1313	3.5	1.7	1.4		8	1979	
N1322	3.8	1.5			8	1979	
N1323	4.1	1.5			8	1979	
N1324	4	1.6			8	1979	
N1326	3.5	1.6			8	1979	
N1330	3.4	1.6			8	1979	
N1278	3.6	1.4			8	1979	
N1279	3.2	1.9			8	1979	
N1189	3.6	1.5			22	1979	
N1198	3.3	1.6			22	1979	
N1200	2.8	2.5			22	1979	
N1201	3.6	1.4			22	1979	
N1202	3.8	2	0.9		22	1979	Flattened
N1268	3.5	1.7			22	1979	
N1272	3.6	1.6			22	1979	
N1274	2.6	1.6			22	1979	
N1277	3.1	1.5			22	1979	
N8	3.1	1.6	1.2	35	6	2010	Damaged
N9	3.5	1.5	1.4	34	6	2010	

Appendix 4: Textile production tools from 2010

BY O. SVENSSON

Material

This study deals with textile-production-related tools from the excavations at Hala Sultan Tekke in Area 6 which were found spread over the opened area. They consist of five spindle whorls and five loom weights, the low number of which permits only preliminary conclusions. They may, however, point to the production of certain textiles. The five spindle whorls fall within normal size and weight parameters.[51] The five loom weights from Area 6 range from 53–105g.

SPINDLE WHORLS

N10: discoid, diorite, H 1.67 cm, Ø 3.1 cm, Ø hole 0.8 cm, Wt 25g.
N18: biconical, limestone, H 2.0 cm, Ø 2.1 cm, Ø hole 0.5 cm, Wt 11g.
N28: discoid, diorite, H 4.0 cm, Ø 5.0 cm, Ø hole 1.5 cm, Wt 132g.
N30: biconical, terracotta, H 2.79 cm, Ø 3.25 cm, Ø hole 0.6 cm, Wt 25g (*Fig. 11* right).
N34: biconical, stone, H 2.77 cm, Ø 3.18 cm, Ø hole 0.8 cm, Wt 37g.

Based on experimental research, where data for spindle whorls weighing 4, 5, 8, 10, 18, 20 and 30g were collected,[52] it is clear that weight is the most important factor determining the properties of the spun thread.[53] Based on these experiments probable production data for our spindle whorls are demonstrated below, assuming a semi-linear development between whorls of differing weights. Similar estimates have been made for the produced threads' diameters and their optimal warp tensions.[54] The whorls that are heavier than 30g are problematic and it is at this time only possible to make rough estimates of the threads produced. Another factor which greatly affects the type of thread produced is the preparation and properties of the wool used.

According to the properties of our spindle whorls it is clear that quite different threads were produced. N18, for instance, would produce between 900 and 1700 meters of yarn per 100g, depending on quality and preparation of the wool. N10 would produce between 450 and 1000 metres. While it is not possible to say exactly how the thread diameter would differ depending on the whorl's weight, it has been demonstrated that whorls weighing less than 20g produce fine threads suitable for textiles with a high count of threads/cm, while heavier whorls were used to produce threads for coarser clothing and sail cloth.[55] The extreme weight of N28 is problematic: it has been suggested that these heavy spindle whorls were used to spin thick twine from, for instance, linen fibres, or possibly used for plying.[56]

LOOM WEIGHTS

N1: conical, terracotta, H 5.1 cm, W 2.7 cm, Th: 2.2 cm, Ø hole: 0.4 cm, Wt 53g.
N3: elliptical discoid, limestone, H 7.8 cm, W 5.1 cm, Th: 2.5 cm, Ø hole: 1.5 cm, Wt: 105g.
N15: truncated pyramidal, terracotta, H: 5.9 cm, W: 3.9 cm, Th: 2.8 cm, Ø hole: 0.48 cm, Wt: 77g. N27: truncated pyramidal, terracotta, H: 7.5 cm, W: 3.3 cm, Th: 3.5 cm, Ø hole: 0.7 cm, Wt: 104g. N31: deformed pyramidal, terracotta. H: 6 cm, W: 3.7 cm, Ø hole: 0.5 cm, Th: 4.1 cm, Wt: 85g.

Our loom weights were most certainly used in a vertical warp-weighted loom.[57] In such a setup, the loom weights are attached to several warp threads in order to create downward tension. This will create two separate rows of loom weights, since each weight in the front row of the loom must have a corresponding weight in a back row. It is important to have correct tension, since a faulty tension can result in snapped threads or a misshapen fabric.[58] The required tension of the warp depends on the quality and the thickness of the threads. For instance, a fine thread spun with a whorl weighing 4g would require a warp tension of about 10g.[59] This means that a loom weight weighing 100g would optimally have ten threads attached to it.

Experiments have demonstrated that the most important attribute of the loom weight—apart from its actual weight—is its thickness,[60] since to a great degree this determines the

[51] Crewe 1998, 13f. She suggests that any centrally pierced whorl-shaped object with a diameter of at least 20mm and a weight of 10g should be considered a possible spindle whorl.
[52] Andersson *et al.* 2010, 165; Andersson & Nosch 2003, 205.
[53] Andersson *et al.* 2010, 165; Andersson & Nosch 2003, 205.
[54] Andersson *et al.* 2009, 378.
[55] Andersson & Nosch 2003, 198.
[56] Crewe 1998, 13.
[57] Barber 1991, 92.
[58] Andersson *et al.* 2010, 166–167.
[59] Andersson *et al.* 2010, 166–167.
[60] Andersson *et al.* 2009, 389.

warp thread count of the produced fabric.[61] In this analysis, the weight and thickness of each loom weight will be used to calculate the number of warp threads per loom weight (calculated by dividing the weight of the loom weight by the supposed warp tension), warp threads per cm (calculated by multiplying the number of warp threads per loom weight by two and dividing this sum by the loom weight's thickness) and the suitability of a hypothetical setup with similar loom weights. Our estimations are made by: 1) looking at the ratio between warp threads and loom weights (5–30 per weight is optimal, 30–40/4 is possible; more than 40/<4 is unlikely), and 2) analysing the number of threads per cm. Optimal thread counts would be 5–30 for warp threads of 10–20g warp tension, 5–20 for warp threads of 20–30g warp tension and 5–10 for warp threads of more than 30g warp tension. Possible thread counts would be 30–40 for thin warp threads of 10–20g warp tension, 3 for thick warp threads of 40g warp tension. Unlikely thread counts are more than 40 or less than 4 warp threads for threads of 10–20 warp tension, more than 20 or less than three for threads of more than 30g warp tension.[62] We base our calculations on 10 g, 20g and 30g warp tension in order to estimate which kind of textile was produced.

Our loom weights differ quite a bit in weight and this is mirrored in their suitability for different setups. The lightest, N1, is optimally used for threads needing less than 10g warp tension, while the heaviest weights (104–105g) could possibly be used to weigh down threads needing 20g warp tension or more. Despite the weight differences the recovered loom weights could all be used for approximately the same setup.

Discussion and conclusions

All five of the analysed loom weights are optimally used for warp threads that require *c.* 10g warp tension, and in the case of N1 perhaps even less.[63] Textiles woven with such thin threads are fine with a high number of threads per cm. It seems that our loom weights were used to weave fine textiles.

Our spindle whorls cover a broader weight spectrum. N18, the lightest, was most likely used to create fine threads for garments. The others (N28 excluded) were probably used to spin yarn for quite coarse cloth. The different weights influence the amount of yarn produced: between 100 m and 1700 m yarn per 100g raw wool could be produced, depending on raw material and the type of spindle whorl.

[61] Andersson *et al.* 2009, 394.
[62] Andersson *et al.* 2009, 392–393.

[63] Thanks go to Dr Eva Andersson Strand, Dr Marie-Louise Bech Nosch and Dr Peter M. Fischer for their guidance and support. Any remaining factual errors are entirely the author's responsibility.

Appendix 5: Preliminary report on the osteological material from Hala Sultan Tekke 2010

BY S. MACHERIDIS

Material

The aim of this preliminary study of the bone material from the excavations at Hala Sultan Tekke in 2010 is to examine animal husbandry, the importance of hunting and fishing and local diet and changes in domestic stock during the Middle and Late Bronze Ages. Comparisons were made with a number of osteological investigations relevant to material from Hala Sultan Tekke.[64]

The analysis of 1,915 fragments with a weight of 6684g includes, in addition to species classification, estimations of age, sex and withers heights. Taphonomic factors, such as weathering, trampling and signs of gnawing, slaughter and fire, were noted. A total of 1466 fragments are still unidentified, which indicates how much this material has been affected by the properties of the soil.[65] The vast majority of the bones were covered by hard calcifications, in almost all cases impossible to remove without destroying the bones.[66] Twenty three percent of the material could be identified. Most of the bones derive from rooms R3, 5 and 8 (approx. 73%) and roughly 13% were found in R6. A less significant number of fragments come from R1, 2, 4, 7 and 9.

Results

The results show that two-thirds of the domestic stock were caprovines, cattle being the second most common animal. Pigs comprise approx. 9%. Horses, which have not been reported earlier from the site, and donkeys are represented in the material.[67] Some canid fragments and a cat have also been verified. Wild game includes cervids such as red deer (*Cervus elaphus*) and fallow deer (*Dama sp.*). These fragments are the first reported evidence of fallow deer from this site.[68] Furthermore, the only evidence of fish is the presence of tuna (*Thynnus thynnus*). No bones of avian fauna were discovered, although virtually all soil was dry-sieved.

Among most species, the number of bones suitable for age assessment was small. A total of 46 fragments from sheep/goats indicate higher slaughter frequencies towards older ages. Also, the mortality range amongst cattle points toward this, although only ten fragments could be age-estimated. Furthermore, no more than five fragments were sex-assessed: two female and two male caprovines, plus one bull (of cattle). The withers heights of the goats were calculated to be on average 64.5 cm. One sheep bone gave a calculated height of 50 cm. The withers heights of two donkey fragments were calculated to be 93 and 117 cm. Bones of cattle could not be measured, but "medium-sized" has been mentioned in earlier literature.[69]

The distribution of the bones in the various rooms may provide information about their use. In this respect R5 especially and also R3 and R8 are of importance. The elemental distribution within the two most common animals (i.e. sheep/goat and cattle), indicates that R5 was used primarily to handle bodies in terms of slaughter and dressing. A few worked bone fragments point to a possible small-scale bone industry. Remains of slaughter waste can also be seen in R3. These bones are concentrated in the southern part of the room, which could possibly have been another place for waste disposal. In R8, the majority of the bones come from the eastern part and they are probably food waste.

The decrease of pigs in the domestic stock during the MC and LC periods has been reported from several sites in Cyprus. Ekman believes that the apparent change in animal husbandry due to deforestation and a more arid climate was advantageous to caprovines, but not to pigs.[70] Schwartz, too, suggests that cattle grew in importance at the expense of the pig.[71] Moreover, Knapp *et al*. consider that a decrease in pigs and an increase in cattle are typical signs of deforestation and

[64] From earlier excavations in this site, osteological investigations have been carried out by J. Ekman on bones dated to the later part of the Late Cypriote period. J. Schwartz' work on zooarchaeological material from this period includes the following sites: Athienou, Phlamoudhi Melissa, Vounari, and Toumba Tou Skourou; see Ekman 1974, 166–176; Schwartz 1974, 215–220.

[65] Taphonomy is the study of all factors that affect the bone after its death.

[66] This problem is also acknowledged by Ekman 1974, 164.

[67] Although not found in Hala Sultan Tekke, horses have been reported from other Late Cypriote sites, for instance, Athienou in Schwartz 1974, 217. There is no evidence of E. *caballus* from earlier periods, although equid bones have been noted from several sites, e.g. Kalopsidha in Gejvall 1966, 128–132; Lapithos in Gjerstad 1934; Dhali Agridhi in Schwartz 1974, 217.

[68] Ekman 1974, 166–171.

[69] Ekman 1974, 164.

[70] Ekman 1974, 169.

[71] Schwartz 1974, 217.

improved agricultural technologies.[72] Plausible as these theories are, this change could also have other explanations. The low numbers of pigs at the site combined with the data of the older ages at death among sheep/goats and perhaps even cattle in the material from Hala Sultan Tekke are tendencies that have been interpreted as signs of urban environment in, for instance, medieval Scandinavia.[73] Hala Sultan Tekke is one of the major LC cities and this may also be reflected in the osteological material.

In spite of the site's closeness to the sea, only three fragments of fish were found. This number is most certainly not representative of the original amount of bones deposited and no doubt depends on unfavourable taphonomical conditions. Even so, taphonomy might not be the only answer. It is also possible that fish was not so important in the diet.[74] Hunting was concentrated on cervids. In our material, ca 4% of the identified fragments derived from cervids. This number is quite astonishing considering the lack of cervids on the site in previous studies. The fallow deer, which is present here, was supposedly heavily decimated throughout the Late Cypriote period and is scarcely found.[75] Most likely, wild game was not common on the menu.

Conclusions

Animal husbandry in Hala Sultan Tekke was mostly based on sheep/goats, but also on cattle. The pig was of secondary importance. Both donkeys and horses were used as working animals, and consumed when too old. The animals hunted were mainly cervids. Fish bones are scarcely found, and probably did not make up a big part of the diet. The decrease in amount of pigs kept during the Late Cypriote period could also be explained by social changes.

[72] Knapp *et al*. 1990, 157.
[73] Vretemark 1997.
[74] See also the discussion of the low share of marine components in the diet of Bronze Age Argolid in Triantaphyllou *et al.* 2008, 3028–3034.
[75] E.g. Sinda in Åström 1972; Ekman 1974, 166–171; Schwartz 1974, 217.

Appendix 6: A note on decorated pottery with animal representations

BY L. FRANZ

Material

The aim of this brief study, which is mainly based on the reports published in *SIMA* XLV (*HST* 1–12), is to provide a summary of animal representations on LC pottery from Hala Sultan Tekke. The study is by no means complete. However, the following subjects will be discussed (see *Table 3*):[76] animal species and frequency of representation,[77] vessel type, ware and combinations with other animals. Other queries to which answers will be sought are: is it possible to draw conclusions based on the frequency of a particular species in relation to other species? Can certain animal depictions and specific vessel types or ware be observed?

A recurring problem is the state of preservation of the objects: in some cases, only a little part of a pictorial representation is preserved. As a consequence, seven of the 24 objects/sherds recorded in this report are insecure classifications of species, or even something completely different. Due to the fragmentary state of preservation, the vessel types of 14 of the 24 objects cannot be determined.

Results and discussion

The analysis of the material from the published excavations from 1972–2010 showed a total count of 24 objects with animal depictions, seven of them insecure cases. Multiple occurrences of a single type of animal on a vessel were not taken into account, for the simple reason that most objects are in a state so fragmentary that the original number of depictions of one species on the vessel cannot be determined, thus influencing the result. For example, if the "Creature Krater" (due to its complete state of preservation) were to count as four fish, one vessel would increase the overall count of fish representations by 50%, disregarding the high probability that most of our fragmentary single animal depictions stem from vessels originally bearing a higher count of occurrences of one species as well.

Including the insecure cases, birds (12, of which three are swans) and fish (8) are the animals with the highest rate of occurrences and also appear combined in two cases. Four objects bear depictions of cattle, one of which is the "Creature Krater" (N33) from 2010.[78] This krater shows a total of 11 animal representations: two cattle, four birds (two of them swans), four fish and one canid. Further animals with less frequent rates of occurrence are horses (1), hippocampus' (1) and sea-anemones (1).[79] There are two representations of non-specifiable quadrupeds, one of which might be a goat.

The determinable vessels comprise four kraters and six bowls, but 14 of the 24 vessels cannot be classified due to their fragmentary state (see above). The low number of determinable vessel types does not (at present) allow a possible correlation between vessel type and animal species. All objects are classified as White Painted Wheel-made III (in one instance just White Painted Wheel-made without further specification).

This year's excavations produced three objects of White Painted Wheel-made ware with depictions of animals: the above mentioned "Creature Krater" (N33, *Fig. 15*; see the discussion in the main report), one representation of a swan on the interior of a vessel (L36-1, *Fig. 14:2*), and a sherd showing the legs of a bird and the tail of a fish (on the exterior; L41-4, *Fig. 14:1*).

L36-1. White Painted Wheel-made III fragment of an open vessel with a plain rounded rim (diameter approx. 17 cm), medium-hard fired, light greyish-brown fabric, medium-fine, light greyish-yellow slip, decoration on the interior consisting of a swan painted dark brown. The swan is similar to those on the "Creature Krater" (N33), especially the rounded head with a central eye and the dotted body. However, the swan on L36-1 has its beak pointing upwards, as opposed to the horizontally placed beaks of N33, and it lacks the parallel lines between the necks and the bodies. F7012 is classified as "wheel pattern?" but could be a swan as well, although the angle between "head" and "back" is odd.[80]

L41-4. White Painted Wheel-made fragment of a jug, hard-fired, light yellowish-brown fabric, fine, light yellow slip, decorated on the exterior in dark brown depicting the legs of a bird, tail of a fish and a beak (?) The animal motifs are separated by double and triple lines both straight and curved, creating a sort of panel to which no parallels could be found.

[76] Due to limitations concerning the extent of the preliminary report on the findings from NSCE11 this study will not deal with the artistic intents of the various painters.
[77] Multiple occurrences of one species on a vessel were not taken into account for reasons explained below.
[78] See the excavation report by P.M. Fischer in this volume.
[79] Concerning hippocampus and sea-anemone decorations: see the fairly complete preserved "Hippocampus Krater": Åström 1988, 173–175.
[80] Åström 1998, 117.

Conclusions

The animals depicted on LC pottery found in the city of Hala Sultan Tekke so far are: birds, fish, bulls, horses, hippocampus', sea-anemones and dogs. There are other representations of quadrupeds that cannot be classified. The count of bird depictions is the highest, but the low overall number of animal depictions available at present does not permit statistical conclusions. The same is true for conclusions concerning the vessel types, although it may be observed that bowls and kraters are the only determinable vessel types represented. In all cases, the ware is White Painted Wheel-made.

Table 3. Statistics of types of animals, vessel types and ware.

Animal species	*Frequency (insecure)*	*Vessel types*	*Ware*	*Combined species*	*References*
bird	9 (1)	unknown (1), unknown, closed vessel (3), krater (2), bowl (3)	White Painted Wheel-made III (8), White Painted Wheel-made (1)	bird/fish (1); bird/bull/swan/fish/dog (1)	*HST* 5, 33. F6158 (Öbrink 1979); *HST* 5, 34. F6217 (Öbrink 1979); *HST* 5, 39. F 6123 (Öbrink 1979); *HST* 8, 109. F 2400 (Hatzantoniou 1983); *HST* 8, 113. F 2301 (Hatzantoniou 1983); *HST* 9, 76. F6510 (Niklasson-Sönnerby 1989); *HST* 9, 105. F7004 (Åström 1989); H10A6L41-4 (NSCE, this volume); H10A6T3AL94N33 (NSCE, this volume).
swan	3 (1)	unknown (2), krater (1)	White Painted Wheel-made III (3)	bird/bull/swan/fish/dog (1)	*HST* 10, 117. F7012 (Åström 1998) [classified as "wheel pattern"; identification as swan suggested by author of this article]; H10A6L36-1 (NSCE, this volume); H10A6T3AL94N33 (NSCE, this volume).
bull	4 (2)	unknown (1), unknown, closed vessel (1), krater (2)	White Painted Wheel-made III	bird/bull/swan/fish/dog (1)	*HST* 5, 34. F6228 (Öbrink 1979); *HST* 10, 67. F7007 (Åström 1998); *HST* 11, 42. F1717B layer 3A (Åström 2001); H10A6T3AL94N33 (NSCE, this volume).
fish	8 (2)	unknown (3), unknown, closed vessel (2), krater (1), bowl (2)	White Painted Wheel-made III (7), White Painted Wheel-made (1)	bird/fish (1); bird/bull/swan/fish/dog (1)	*HST* 8, 112. F2074 (Hatzantoniou 1983); *HST* 8, 113. F2203 (Hatzantoniou 1983); *HST* 9, 101. F7000 (Åström 1989); *HST* 10, 9. F1190 (Åström 1998); *HST* 10, 63. F1793 (Åström 1998); *HST* 10, 123. F7012 (Åström 1998); H10A6L41-4 (NSCE, this volume); H10A6T3AL94N33 (NSCE, this volume).
quadrupeds (general)	2 (1)	unknown, closed vessel (1), bowl (1)	White Painted Wheel-made III		*HST* 4, 5. Top of wall F1023 (Hult 1978); *HST* 5, 41. F6014 (Öbrink 1979).
horse	1	unknown, closed vessel (1)	White Painted Wheel-made III		*HST* 8, 113. F2203 (Hatzantoniou 1983).
hippocampus	1	krater (1)	White Painted Wheel-made III	hippocampus/sea-anemone	*RDAC* 1988, 173–175. Inv. no. 1566 (Åström 1988).
sea-anemone	1	krater (1)	White Painted Wheel-made III	hippocampus/sea-anemone	*RDAC* 1988, 173–175. Inv. no. 1566 (Åström 1988).
dog	1	krater (1)	White Painted Wheel-made III	bird/bull/swan/fish/dog (1)	H10A6T3AL94N33 (NSCE, this volume).

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