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IMTO - ITALIAN MISSION TO OMAN

EXCAVATIONS AND RESTORATION OF THE COMPLEX OF KHOR RORI

INTERIM REPORT (OCTOBER 2001-APRIL 2002)

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**EXCAVATION AND RESTORATION
OF THE COMPLEX OF KHOR RORI
INTERIM REPORT (OCTOBER 2001-MARCH 2002)**

The Italian Mission to Oman (IMTO) carried out two new archaeological campaigns in the Khor Rori area: the first in October-November 2001 (SUM01B) and the second in February-March 2002 (SUM02A)¹.

During the two last expeditions the field activities were focused mainly on the city of Sumhuram, but also the site of Ayn Ĥumrān, located in the piedmont area roughly 12 km NE of Salala, was investigated.

1. Excavations at Sumhuram

The main goal of the SUM01B and SUM02A field campaigns was to determine the character of the buildings in the part of the ancient town adjacent to the Gate Complex and to the palace (Area A), and to clarify the stratigraphy of the ancient site, to trace its different constructional phases. In addition, the small second entrance to the city located in its SE corner (Area B) of the site was re-excavated (Fig. 1).

1.1. *The area between the Gate Complex and the Palace*

At the Area A the excavations of the Building BA3 (square h11) located south of the Gate Complex, and the Building BA2 (square h11) located under the Building BA3 were completed². In addition, excavations of the two new buildings, Building BA4 (square h12) located in the corner formed by the city-wall M14 and SE wall of the Gate Complex (M4) and Building BA5 (square h10) located outside the SE corner of the palace against its wall M16, were started. All four buildings were constructed and inhabited during different phases of the city existence (Fig. 2).

¹ During the SUM01B campaign our working team was formed by the following members: Prof. Alessandra Avanzini (IMTO's director), Arch. Roberto Orazi (field-director), Prof. Alexander Sedov (chief-archaeologist), Mr. Raimondo Boenni (restorer), Mr. Gianluca Buonomini (restorer), Arch. Gabriella Burlazzi, Arch. Vincenzo Labianca (surveyor architect), Dr. Alessandra Lombardi (archaeologist), Dr. Mario Mascellani (land surveyor).

The SUM02A campaign saw the presence of the following members: Prof. Alessandra Avanzini, Arch. Roberto Orazi, Prof. Alexander Sedov, Dr. Chiara Benvenuti (archaeologist), Dr. Vittoria Buffa (archaeologist), Arch. Vincenzo Labianca, Dr. Alessandra Lombardi.

² Both the buildings were partly excavated in the SUM01A campaign. Cf. AVANZINI *et al.*, EVO 24 2001, pp. 32 ff.

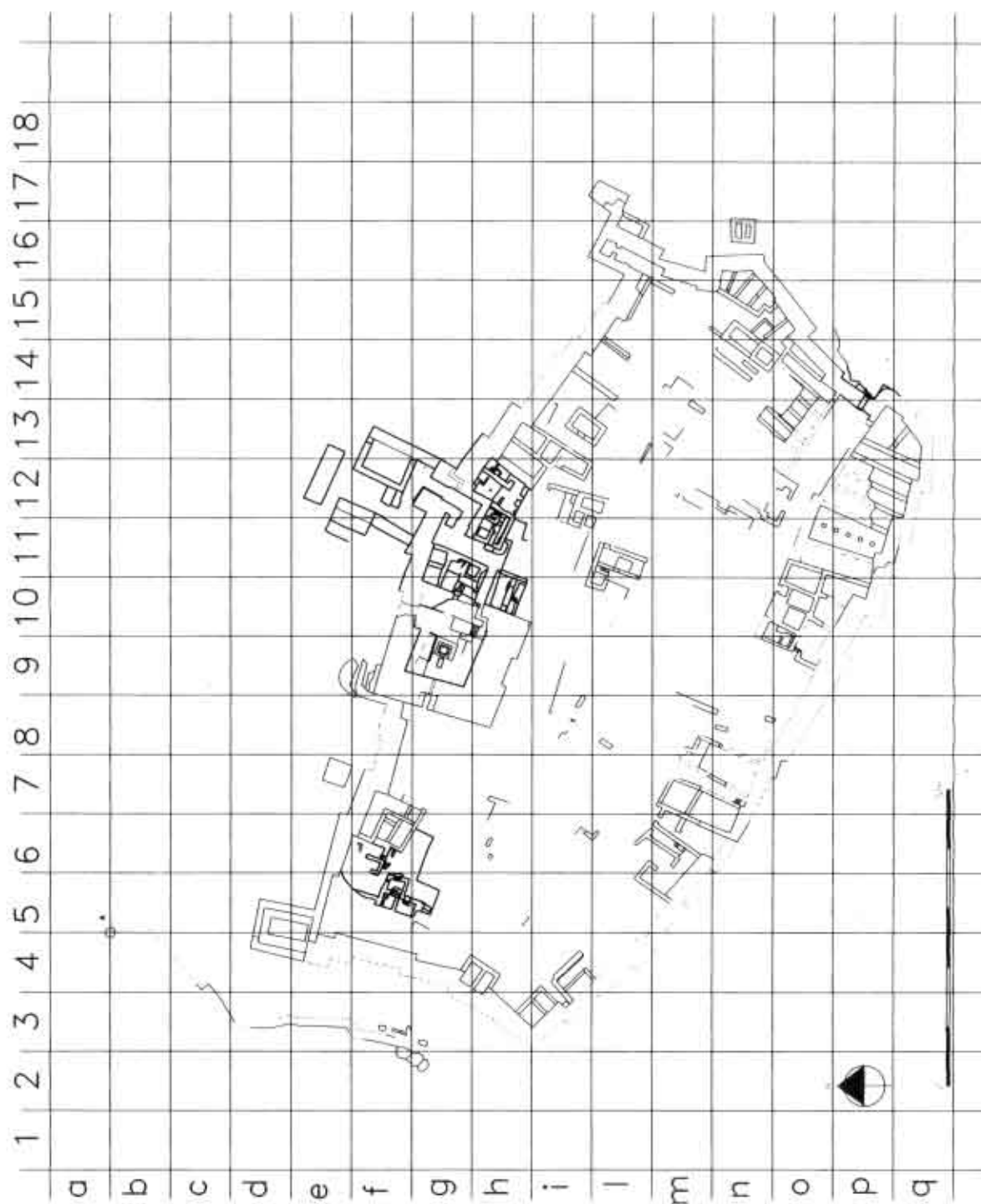


Fig. 1 - Sumhuram: general plan with reference grid.

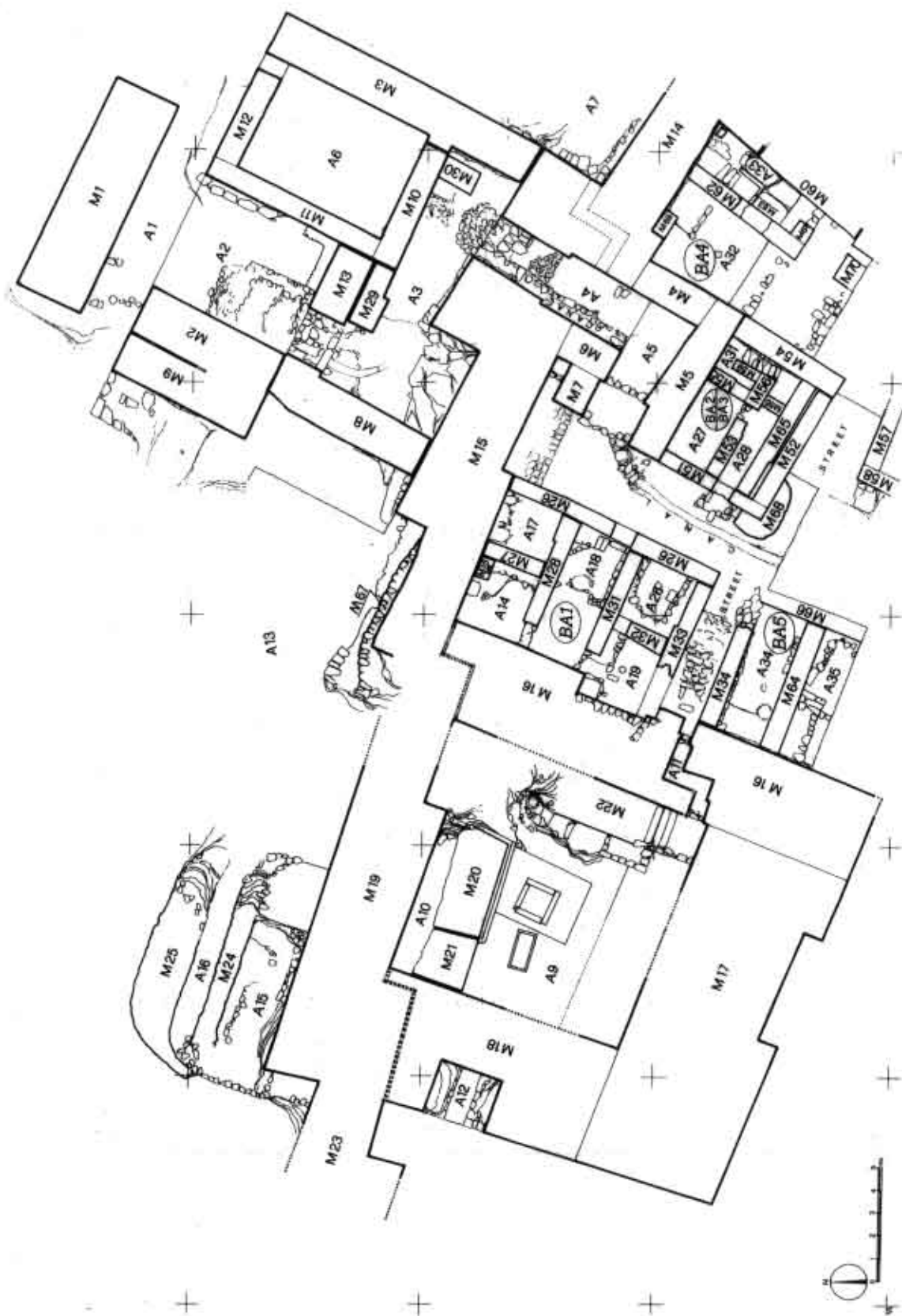


Fig. 2 - Sunhuram, general plan of the working area: Gate Complex; Area A; Palace.

Building BA3. The building consisted of three rooms: room A27, room A28 (both were partly excavated in the season 2001A) and room A31 (Figs. 2-4). The entire ruins of the building were covered with greyish loam mixed with a large amount of rough stones (collapsed walls of the surrounding buildings), a small amount of animal bones and marine shells, very few pieces of pottery (US21). The following small finds were discovered in the US21: fragment of a stone vessel (S296), stone polished tool (?) (S297), fragment of a stone tray (S169).

Room A27, which occupied the NW corner of the building, is rectangular, 2.1x4 m in size. A narrow passage, 0.7 m wide, in the SE corner (in the wall M53) connected it with the adjacent room A28. The passage was strengthened with a doorstep, 0.15 m high, made of rough stones. The floor of the room (floor US79) made of packed earth was reached at the point 35.80. In roughly 2.00 m from the floor of the room, in the NE wall (M5) of the building, two square holes, 25x10 and 30x15 cm in size and roughly 10-12 cm deep, were traced. Apparently, they were used to fix the wooden beams intended to support the room's ceiling. The filling of the room (US79) was greyish brown crumbled loam mixed with medium and small size rough stones fallen down from the top parts of the surrounding walls, a small amount of ashes and charcoal, a large amount of fish and animal bones, molluscs' shells *perna picta*, a small amount of pottery shards. A number of small finds was discovered in the filling of the room (US79) above the floor: fragment of a stone vessel (S294), fragments of whetstones, grinding stones and hammerstones (S290, S291, S292, S288, S289, S295, S293), bone handle of a metal (?) tool (B10), stone net-weights (S188, S287), shell pendants (Sh51), a stone inlaid for a finger-ring (?) (S298).

Room A28 occupied the southern part of the building. It's elongated room, 1.7-1.8x6.1 m in size. The entrance to the building from the square A8 was located in the NW corner of the room, in the wall M51³. The passage to the room A27 was roughly in the middle of the NE wall (M53-M56) of the room, and another passage, 0.6 m wide, in its NE corner connected the room with a staircase leading to the upper floor of the building. The floor of the room (floor US97) made of packed earth was strengthened occasionally with rough stones and/or sandstone slabs. It was reached at the point 35.90 (thus, it is about 10 cm higher than the contemporary floor in the room A27). The filling of the room was divided into two units: US96 (upper part of the filling) and US97 (lower part of the filling). US96 consisted of large amount of rough stones collapsed from the top parts of the walls of the building and mixed with greyish brown loam, fish and animal bones, molluscs' shells *perna picta* and *anadara*. The following small finds were discovered in the US96: fragment of whetstone (S299) and stone pendant (S300). Lithologically the lower part of the room's filling (US97) is similar to US79 registered in the room A27: it consists of greyish brown crumbled loam mixed with small stones, a small amount of ashes and charcoal, a large amount of fish and animal bones, molluscs' shells *perna picta* and *anadara*, a small amount of pottery shards. The following small finds were discovered in the US97: oil lamps made from big molluscs' shells *chlamys townsendi* (Sh52, Sh53, Sh54, Sh55), fragment of stone vessels (S306), fragments of whetstones (S304, S305), a conical-shaped stone inlaid or weight (S307), fragments of grinding stones (S301, S302, S303).

³ The entrance was unearthed in 2001A season (cf. AVANZINI *et al.*, EVO 24, 2001, p. 34).

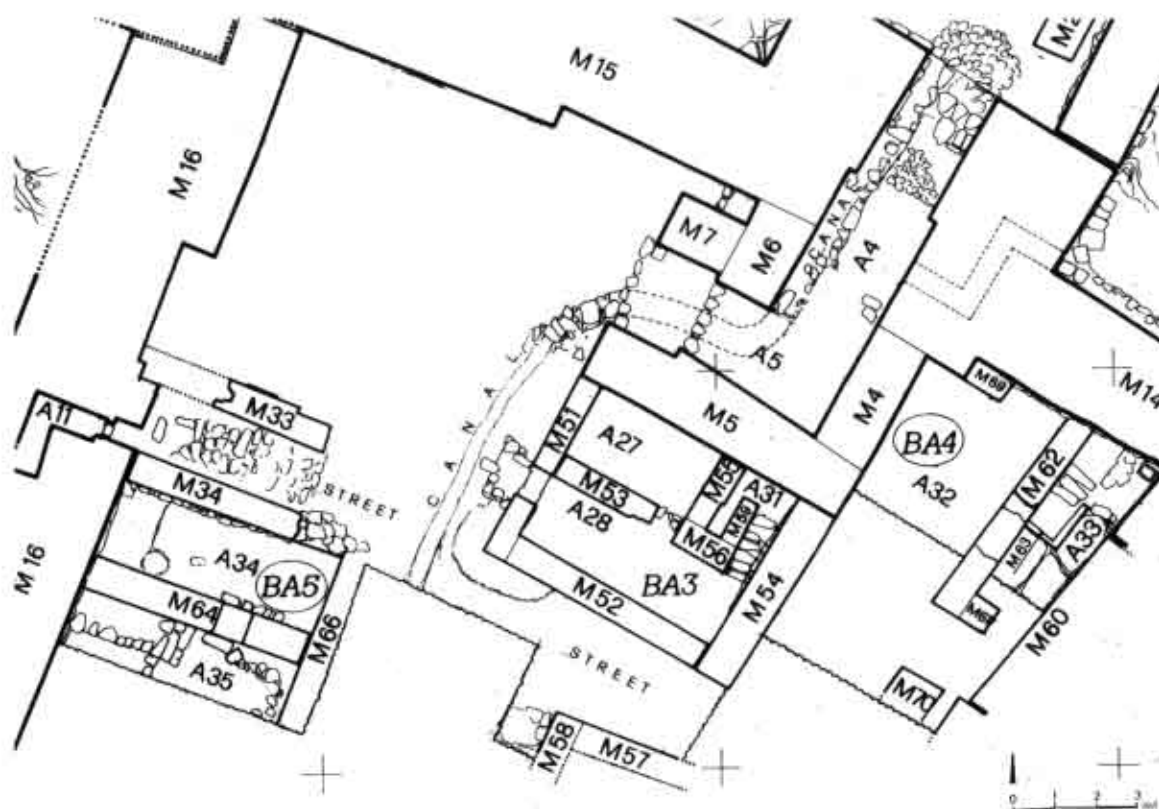


Fig. 3 - Sumhuram: Area A, plan of Building BA3.

Room A31 occupied the NE corner of the building. It's a small rectangular room, roughly 1.5x2.0 m in size. Walls M55 and M56 separated it from the rest of the building. The room was totally occupied with a staircase made from nicely dressed stone blocks (Fig. 5). It led to the upper floor of the building. Altogether eight steps were cleaned. On the top they end with the remains of what was supposed to be a stone pavement of the upper floor: three slabs of the pavement were discovered against the walls M55 and M5. It seems that two archaeologically complete storage jars found on the top of the building in the season 2001A were standing on this pavement. Lithologically, the filling of the room (US105) is similar to the filling of the adjacent rooms A27 and A28 (US79 and US97 respectively). It consists of greyish brown crumbled loam mixed with a very small amount of small stones. The eastern wall of the building (M54) and a thin subsidiary wall (M59) made from rough medium size stones bordered the staircase. The corner between walls M55, M56 and M59 was filled with greyish brown loam. No small finds were reported (Fig. 6).

Building BA2. It's one of the earliest structures discovered so far in Sumhuram. Its opening was possible by means of the partial removal of the ruins of the Building BA3 constructed later in the same area. Excavations allowed us to trace the general layout of the Building BA2 (Figs. 2, 7).

The building was built against the SW wall of the Gate Complex, and its outer walls



Fig. 4 - Sumhuram, Area A, Building BA3; general view from the east.



Fig. 5 - Sumhuram, Area A, Building BA3, from the south: to the right the staircase in A31.

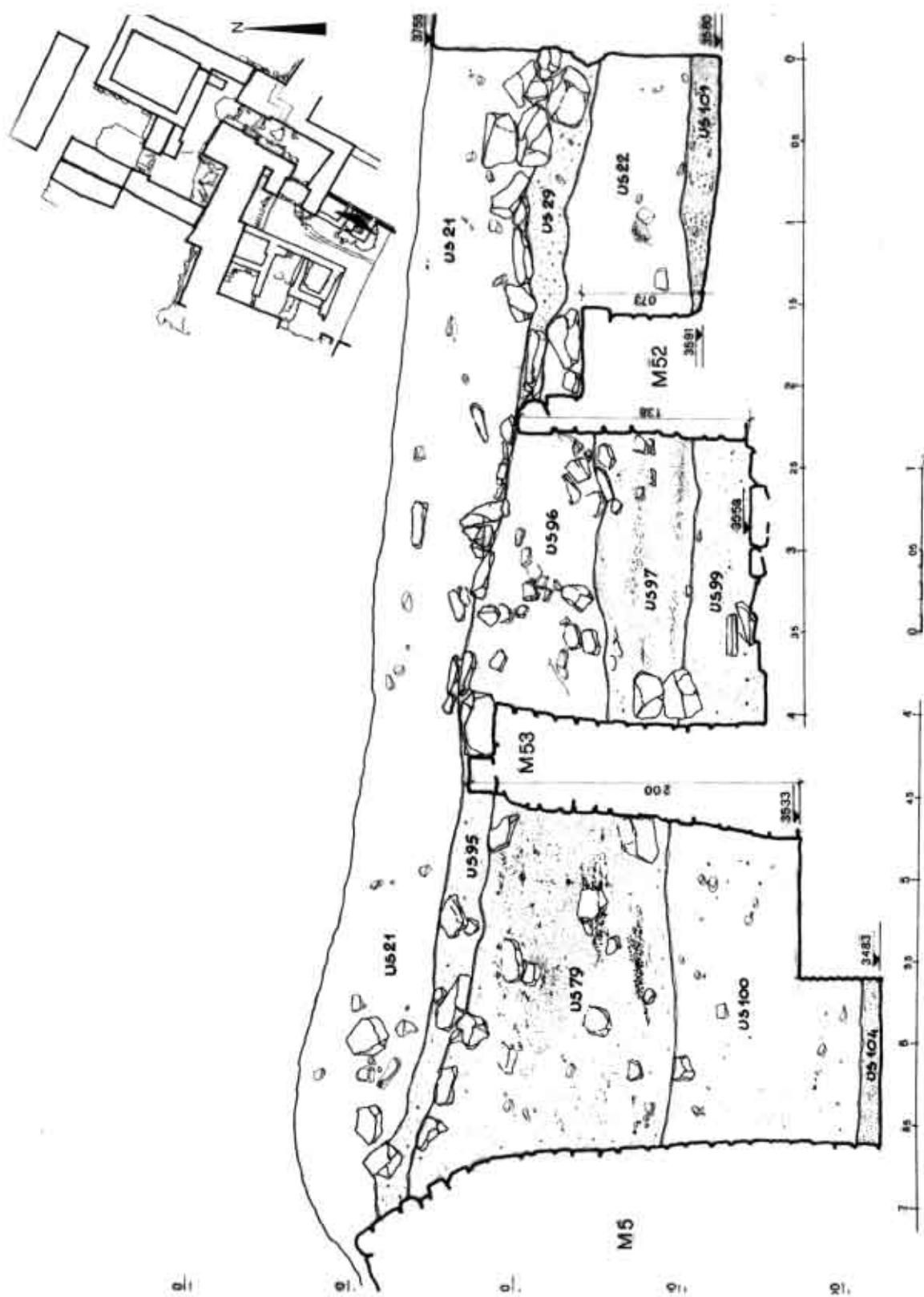


Fig. 6 - Sumhuram: stratigraphic section (N-S) of Building BA3.

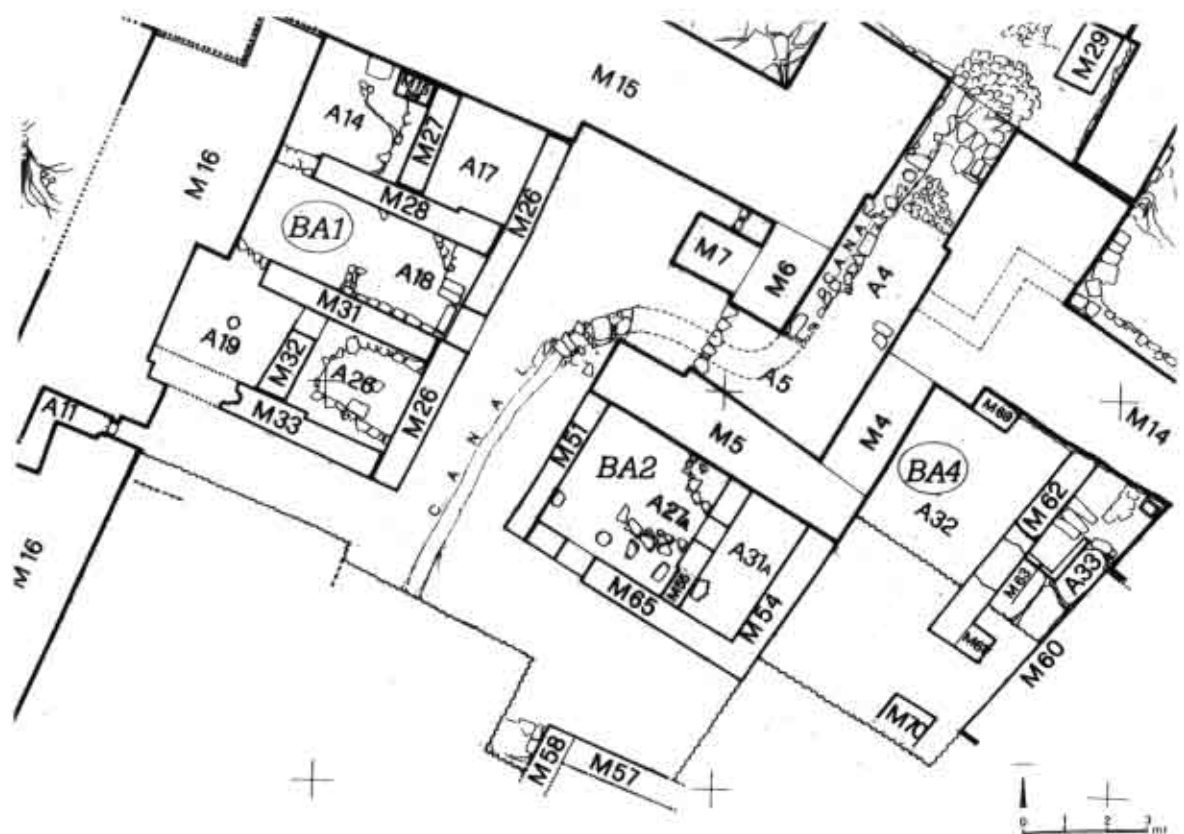


Fig. 7 - Sumhuram: Area A, plan of Building BA2.

were determined as follows: the wall M5 of the Gate Complex served as the NE wall of the building; its NW wall (M51) bordered the building from the square A8, and the SE wall M65 – from the «street»; the NE wall M54 separated the building from the adjacent complex (Building BA4). The internal dimensions of the building are 3.5x5.6 m. The width of the outer walls M51 and M65 is 0.75-0.8 m. The partition wall M55 divided the interior of the building into two rooms: square *room* A27a, 3.5x3.5 m in size, and rectangular *room* A31a, 1.5x3.5 m size⁴. The door between the rooms, c. 1.0 m wide, was opened in the middle of the wall M55. It had a doorstep, c. 0.35 m high. The SE corner of the room A27a was occupied by a niche, 0.8 m wide and 0.3 m deep, constructed in the partition wall M55. A stone block, 0.3x0.35x0.5 m in size, was placed at the base of the niche. The entrance to the building was not defined with certainty. Probably, it was situated in the SW corner of the building, where an inner threshold made of big flat stone block, 0.3x0.5x0.75 m in size, was discovered (unfortunately, the wall M65 was almost completely down to the last two courses, demolished during the construction of the Building BA3).

The initial floors of the Building BA2 were reached at the point 35.23-35.27 in the room A27a and at 35.22 at the room A31a. Both floors were constructed from the packed

⁴ The room was only partly excavated because of its location directly under the room A31 with staircase of the Building BA3.

earth. The NE corner of the room A27a was occupied with a slightly raised square bordered by four stone-blocks. It is rectangular in layout and 0.75x1.0 m in size. The upper surface of the square was plastered with mortar, and bore the traces of a big storage jar once standing in its centre. Against the NW side of the square and the wall M5 a semi-circular fireplace, 0.3x0.5 m in size, was constructed from medium-size un-worked stones (Fig. 8). The filling of the fireplace was dark brown loam mixed with ashes and charcoal. Part of another construction made from five elongated roughly dressed big stone blocks was discovered in the SE corner of the room A27a, just in front of the niche in the wall M55. Four round hammerstones were found *in situ* lying above the two central stones of the construction, and two more bigger stones, round and rectangular in shape, probably used as anvils, were discovered on the floor of the room between the structure and the wall M65. Part of the floor adjacent to the construction from the NW as well as its stones bore traces of intensive fire, while lenses of ashes were discovered above the floor all over the room, especially in its SW part. A number of iron tools were found during the cleansing of the floor: a nail, fragment of pointed tool with bronze handle, two fragments of another pointed tool, a piece of iron slag. In addition, excavations revealed also fragments of pottery, a fragment of bronze ring, beads made of stone, glass and shell, whetstones, grinding stones and hammerstones, two pieces of stone sticks, and 8 bronze coins (Co124, Co126, Co127, Co129 were found on the floor; Co123, Co125, Co128, Co131 were found in the filling above the floor).

The discovered remains and character of small finds from the room A27a give some ideas about the possible function of the building. It's very tempting to interpret it as the ruins of a blacksmith workshop. In this case, the part of the construction in the SE corner of the room with traces of intensive fire can be considered as remains of an oven, round and rectangular stones nearby – as anvils, and raised square in the NE corner – as place for storage jar with cold water. A number of hammerstones found in the room A27a, as well as iron finds, fits well with such interpretation. It should be also pointed out that the exact position of the two iron axes (Fig. 9) found in the NW corner of the room A27, which belonged to the later Building BA3 during SUM01A campaign, was not clear⁵. They were found when a small sounding in the corner of the room was carried out, and were recorded as the finds from the floor US79 belonging to the room A27, but it seems in fact that both tools came from the strata located underneath the abovementioned floor, i.e. from the stratum designated as US100, which is the filling of the preceding room A27a of the Building BA2. The reconsideration of the location of these extraordinary finds gives more support to our interpretation of the Building BA2 as the remains of the blacksmith workshop.

The characteristic pottery fragments (Dressel 2-4 amphorae, Indian BRW) collected in the strata above the floor of the room A27a (US99 and US100) as well as coins found during the cleansing of the floor (two identifiable pieces belong to the Hadrami series *radiated head/winged caduceus* and *head/eagle*) allow us to date the construction and period of functioning of the Building BA2 rather precisely. It's no doubt the 1st-2nd cent. AD. Coins found in the upper filling of the room A27a between stones, which were placed to strengthen the floors US79 and US97 belonging, accordingly, to the rooms A27 and A28

⁵ See A. AVANZINI *et al.*, EVO 24, 2001, p. 35.



Fig. 8 - Sumhuram, Building BA2: structure with the fireplace in the N-E corner of the room A27a.



Fig. 9 - Iron Axe from room A27a (US100) of Building BA2.

of the Building BA3, give the date limit for demolition of the early Building BA2 and for construction of the late Building BA3. At least three of them can be tentatively, before cleaning, identified as the coinage of Ilī adhdh Yaluṭ, son of 'Ammīdhakhar (series *radiated head/bull*; type 5.3). Thus, such event took place, most probably, in the very early 3rd cent. AD, when, perhaps, the considerable reconstruction of the entire city of Sumhuram was made.

Building BA4. The building located in the corner formed by the city-wall M14, the SE wall of the Gate Complex (M4), and the NW wall (M60) of the room O1 unearthed by F.P.Albright was only partially excavated during the SUM02A campaign (Figs. 2, 10). On the general plan made by Albright it was designated as M22.

The top stratum at the area designated as US21 covered the entire ruins of the building. Its thickness was 0.3-0.45 m, and lithologically it consisted of light brown loose loam on top and reddish-brown, more compact loam underneath; it was mixed with big and medium size stones collapsed from the upper parts of the surrounding walls. In addition to pottery fragments, a number of small finds were revealed in the stratum: grinding stones and whetstones, fragments of limestone incense-burner and mortar.

The general layout of the building was not determined – we were able to clean roughly one third of the complex, parts of two rooms constructed against the walls M14 and M4 (Fig. 11).

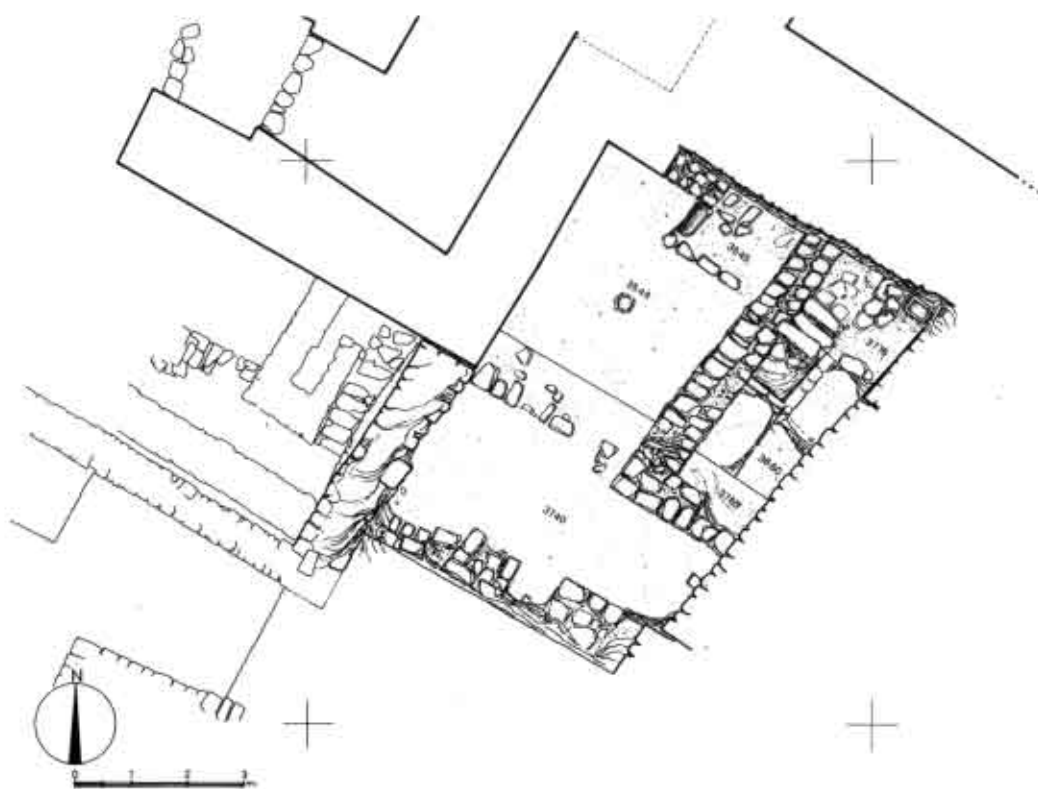


Fig. 10 - Sumhuran: detailed plan of the Building BA4.



Fig. 11 - Sumhuran, Area A: Building BA4 from the S-E.

Room A32 occupied the N corner of the building (Fig. 2). Its plan is trapezoidal, and dimensions are roughly 3.3-4.0x5.0 m. The northern corner of the room is occupied with an offset of the wall M14. A rectangular structure (M69), 1.15 m high, was built against the offset. Probably, its upper part was slightly demolished, and its upper surface was plastered with mortar (traces of mortar were discovered in the corner of the offset in 0.5 m up of the preserved upper surface of the structure). From the east the structure had a low step, 0.6x0.75 m in size, made from rectangular stone blocks. An almost complete storage pedestal bowl was discovered lying on this step. The NE corner of the room was separated by one course of elongated stone blocks placed on the floor. The size of this square is 1.4x1.7 m. Limestone bases of two pillars were discovered, one in the centre of the room, the other one in 0.6 m from the structure M69. The first one is roughly 0.5x0.5 m in size and 0.60 m high; the second one has the same size and is 0.40 m high. Five big whale's vertebrae were discovered in the filling of the room. In all probability they constitute the «body» of the pillars (the sixth vertebra was found on the floor below).

The filling of the room, 1.5-1.9 m thick, designated as US108, consisted of brown loam mixed with medium size stones from collapsed walls, fragments of mud-bricks (possibly from the structures located on the top floor of the building), a small amount of ashes and charcoal, animal bones and pottery fragments. Two open fireplaces were found at different levels in the unit, one of them – next to a concentration of marine shells. A number of small finds was revealed in the US108: fragments of bronze objects (MB70, MB72, MB78, MB73-75), grinding stone (S342), whetstones (S374, S378), pestle (S385), the lower stone of hand mill (S391), a small fragment of a bronze plate with SA inscription (MB71), a bronze awl (MB66), a glass bead (G15), a bronze coin (Co111), an oil lamp made from a *chlamys townsendi* shell (Sh64), and a small alabaster vessel with a partition in the middle (S83). A number of stone tools were found in association with one of the fireplaces: polishers (S353, S356), pestles (S355, S358), whetstones (S359, S360) and a mortar (S361).

The packed earth floor of the room was reached at the point 35.47-35.48 (Fig. 12). The stratum above it, 0.1-0.15 m thick, was designated as US113. It consisted of light greyish-brown loam incorporating pottery fragments, shells and animal bones. It revealed a number of small finds: whetstones (S398, S404), fragments of stone mortar (S413), two bronze coins (Co109, Co130), and two pieces of iron slags or ingots. The floor US113 was a hard packed light grey loam with white inclusions. Its level was rising slightly to the south. It seems that the floor had a sub-foundation of lime chips, and, in some areas, had been levelled with a pavement of small amorphous stones. Two open fireplaces were associated with the floor, both in the NE part of the room. A whale's vertebra was found on the floor. The following small finds were also found on the floor: two iron ingots (MI36), an oil lamp made from a *chlamys townsendi* shell (Sh70), grinding stones (S406, S409), and whetstones (S408, S410) (Fig. 13).

Room A33 is situated in the NE corner of the building. Its plan is also trapezoidal, and its dimensions are 1.75-2.2x5.0 m. It seems that the entrance to the room, c. 1.0 m wide, was located in its S corner. The entire space of the room was occupied with a staircase leading to the top floor of the building. Parts of two flights of stairs and a landing between them were unearthed. The lower flight was constructed against the wall M60, and led to the landing 1.2x1.5 m in size located in the NE corner of the room. The landing



Fig. 12 - Sumhuram, Building BA4: floor US113 in the room A32 (from the north).

was partly paved with flat stone slabs. A complete stone basin (S416) and a whale's vertebra were discovered *in situ* in the NE corner of the landing (Figs. 14-15). The upper flight of the stairs made from massive stone blocks was turned in the opposite direction in comparison with the lower one. It was constructed against the wall M62 separating the rooms A32 and A33, and was leant on the wall M63 built against the wall M62. The lower part of the wall M63 was made from roughly dressed stones, while its upper part was constructed from mud-bricks 21x30x8 cm in size (Fig. 16).

The room was completely filled with loose grey loam mixed with huge amount of charcoal, ashes and marine shells, animal bones and stones (US107). The stratum covered the landing and the steps of the lower flight of the staircase, and, probably, accumulated here quite a significant period of time: at least the stone basin (S416) in the NE corner was placed above this stratum, but on the other hand, the same stratum covered the basin. Lithologically the stratum US107 can be divided in three parts: the lower part consisted of greyish-brown loose loam; a fireplace was traced in its middle part consisting of greyish loam mixed with ashes and charcoal, a large quantity of fish and mammal bones, marine shells; the upper part of the unit consisted of reddish-brown loam incorporating charcoal and fragments of mud-bricks. The following small finds, in addition to the pottery fragments, were found in the US107: grinding stone (S312), whetstones (S316, S320, S340, S341), a loom weight (S334), two complete stone lids (S366, S367), pendant and bead made from shells (Sh59, Sh60), fragments of a bronze ring (MB69) and a glass vessel (G14), a bronze pendant (MB75) (Fig. 13).

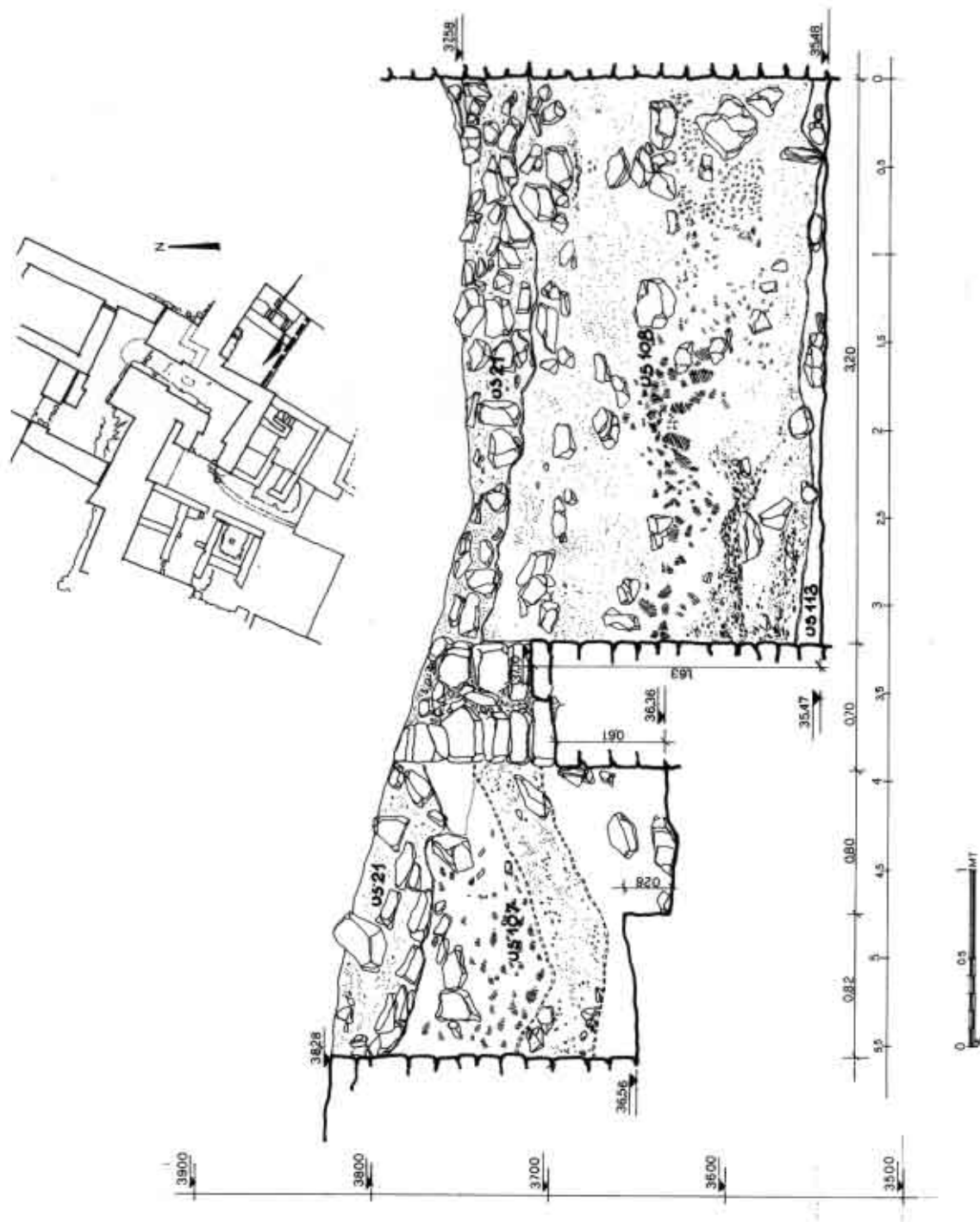


Fig. 13 - Sumhuram; stratigraphic section (E-W) of Building BA4.



Fig. 14 - Sumhuran, Building BA4: room A33 with limestone basin (from the west).



Fig. 15 - Limestone basin (S416) from A33.



Fig. 16 - Sumhuran, Building BA4: room A33 with mud-bricks wall M63.

The Building BA4 was definitely constructed during the earliest phase of Sumhuran, at the same time as the Gate Complex. It seems, according to the pottery assemblage from its ruins, that it was in function during the entire period of the city's occupation.

Building BA5. Part of the structure denoted as Building BA5 was excavated against the SE wall (M16) of the palace, next to its entrance and near its SE corner (Figs. 2, 17).

On the top the entire trench (6.0x5.0 m in size) was covered with the stratum US78 (wind-blown accumulation of loose loam and sand mixed with small stones) and stratum US21 (more compact brown loam mixed with big and medium size stones collapsed from the wall M16). In addition to the small amount of pottery fragments, a fragment of stone mortar was found in the US78, and a fragment of stone polisher (S321) in the US21.

The ruins of the wall M34 were unearthed here during one of the previous campaigns at the site⁶. As we can judge from our excavations, the upper part of the wall M34 was contemporary to the upper part of the parallel wall M33, and both walls were constructed during the 3rd phase of the city's existence. At this phase a huge square A8 was rearranged in front of the palace immediately behind the Gate Complex, and two parallel walls M33 and M34 marked the two sides of the narrow street led to the entrance of the palace. The floor US22 traced almost all over the square A8 was connected with this phase. The part of the wall M34 served also as a foundation support of a narrow staircase

⁶ Cf. A. AVANZINI *et al.*, EVO 24, 2001, p. 34.

(Fig. 18) constructed against the wall M16 of the palace in the NE direction (five steps remained *in situ*). The staircase led from the floor US109, which is equal to the floor US22 in the other parts of the trench, to the premises located, most probably, somewhere on the top of the walls of the palace. It seems that the second flight of the abovementioned staircase must be placed above the zigzag entrance to the inner courtyard of the palace. The staircase was used also during the next phase, the 4th one of the city's existence, designated as the square A8 by the floor US29. The dimensions of the staircase are 0.75x2.5 m; its preserved height is about 1.0 m (five steps made of rough stones and secondary used stone blocks). A fragment of a small glass bowl (G17) was found on one of the steps of the staircase.

The following small finds were revealed in the stratum US29: three bronze coins (Co104, Co106, Co105 – fragmented), a fragment of rubbing stone (S322) and an iron slag or ingot. Connected with the stratum US29, there was a pit (US111) in the SW corner of the trench (dug from the floor US29). Its filling consisted of dark brown loose loam mixed with a large amount of ashes, animal and fish bones, fragments of pottery. In addition, the following small finds were revealed from the pit's filling: two complete oil lamps made from *chlamys townsendi* shells (Sh61, Sh62), an alabaster hammerstone (S322), a sandstone mortar (S333), a fragment of bronze stripe end (MB65) and a bronze coin (Co108). The stratum US22 (= US109) provided us with more small finds: four bronze coins (Co112, Co114 – from floor US22 – Co113, Co110 – from US109), an oil lamp made from a *chlamys townsendi* shell (Sh65), a bone bead (B12) and a glass bead (G16), a pestle (S368), a whetstone (S381), a hammerstone (S382), a pivot stone (S368) found on the floor US109 under the staircase, an incense-burner (S369). Also in the SW corner of the trench another pit dug from the floor US22 was traced. Its filling designated as US112 consisted of not very compact loam mixed with small stones and a large amount of marine shells. One bronze coin (Co107) was found in the US112.

The Building BA5 was totally demolished by the construction of the floor US22 (= US109 in the northern part of the trench), which revealed a stone pavement in the southern part of the trench. The staircase and the wall M34 were constructed above the ruins of the earlier wall M34a, which was one of the outer walls of the Building BA5, its NE outer wall. The SE outer wall of the building, the wall M66 was discovered along the SE side of the trench. It is 0.75-0.8 m wide. So far one complete room and a part of the other were excavated in the Building BA5.

Room A34 was separated by the partition wall M64, parallel to the wall M34a (Fig. 19). Both walls (M64 and M34a) as well as the eastern outer wall of the building (M66) were made of roughly dressed stone blocks. The room is rectangular in the layout, and 2.3x6.0 m in size. Its earth packed floor US110 (mixed with some portions of mortar) was discovered at the point 36.25. There was a slightly raised platform, 1.25x2.3 m in size, nicely plastered with mortar in the NW part of the room against the wall M16. The platform was connected with the floor US110 and its elevation was at 35.62 point. Two pits, 0.5 m in diameter and 0.2x0.4 m in size, filled with loose brown loam mixed with a large amount of ashes and charcoal, small amount of animal bones and pottery fragments were dug into the floor near the S corner of the platform and roughly in the centre of the room (US115 and US116 accordingly). The entrance to the room was located, probably,



Fig. 19 - Sumhuram, Building BA5: rooms A34 and A35 (from the east).

in the middle of the partition wall M64. It was c. 1.0 m wide, had an inner doorstep made from big flat stone block. A stone bench, 0.3x1.2 m in size, was constructed against the wall M64 immediately next to the entrance. The location of the main door of the building, the entrance from the street, was not found. Probably, it was situated somewhere in the unexcavated part of the building. The stratum above the floor, designated as US110, consisted of loose dark brown and dark reddish brown loam mixed with charcoal, animal bones and pottery fragments. The following small finds came from the US110: six bronze coins (Co115, Co116 – filling above the floor, Co117 (completely broken into small pieces), Co118 (in fragments), Co119, Co122 – all four from the floor), a glass bead (G19), an iron nail (MI37) and iron plate with a hole, grinding stones, a stone lid (S396), two hammerstones (S397, S401) and a weight (S407), a lamp made from a *chlamys townsendi* shell (Sh68).

Room A35 was only partially excavated (Fig. 19). Its length is 6.0 m, and excavated width is 1.6 m. Like in the adjacent room A34 there was an inner door-step (elongated stone block) placed on the floor. The floor was reached at the point 35.68. It seems that a rather badly damaged stone bench was constructed in the NE corner of the room against its NE (M64) and SE walls (M66). The NW corner of the room, next to the entrance, was occupied with a stone staircase, of which only three lower steps were preserved. The dimensions of the staircase are c. 1.0x2.0 m, and its preserved height is about 0.6 m. From the SW the staircase was supplemented with another stone construc-

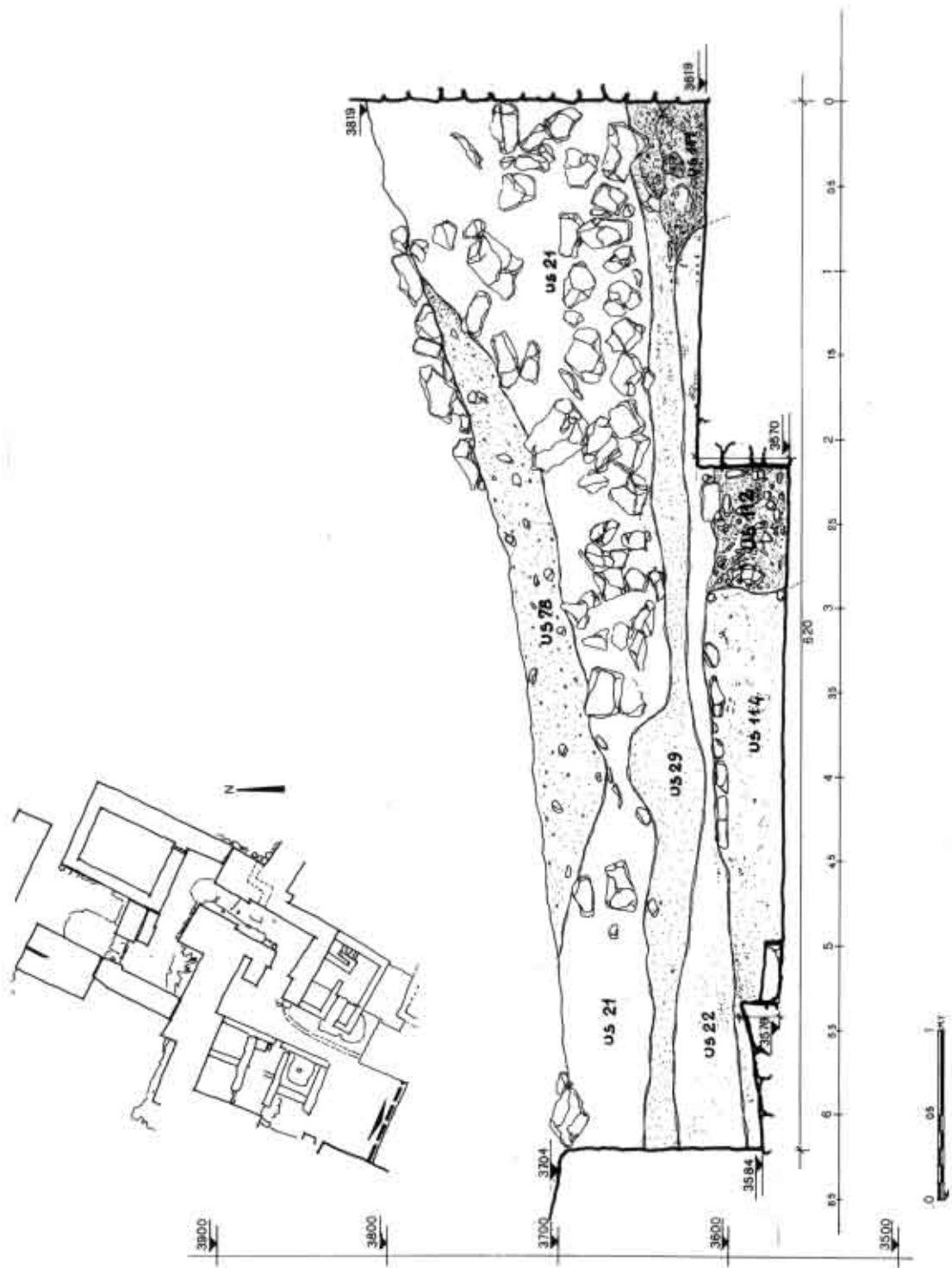


Fig. 20 - Sumhuram: stratigraphic section (E-W) of Building BA5.

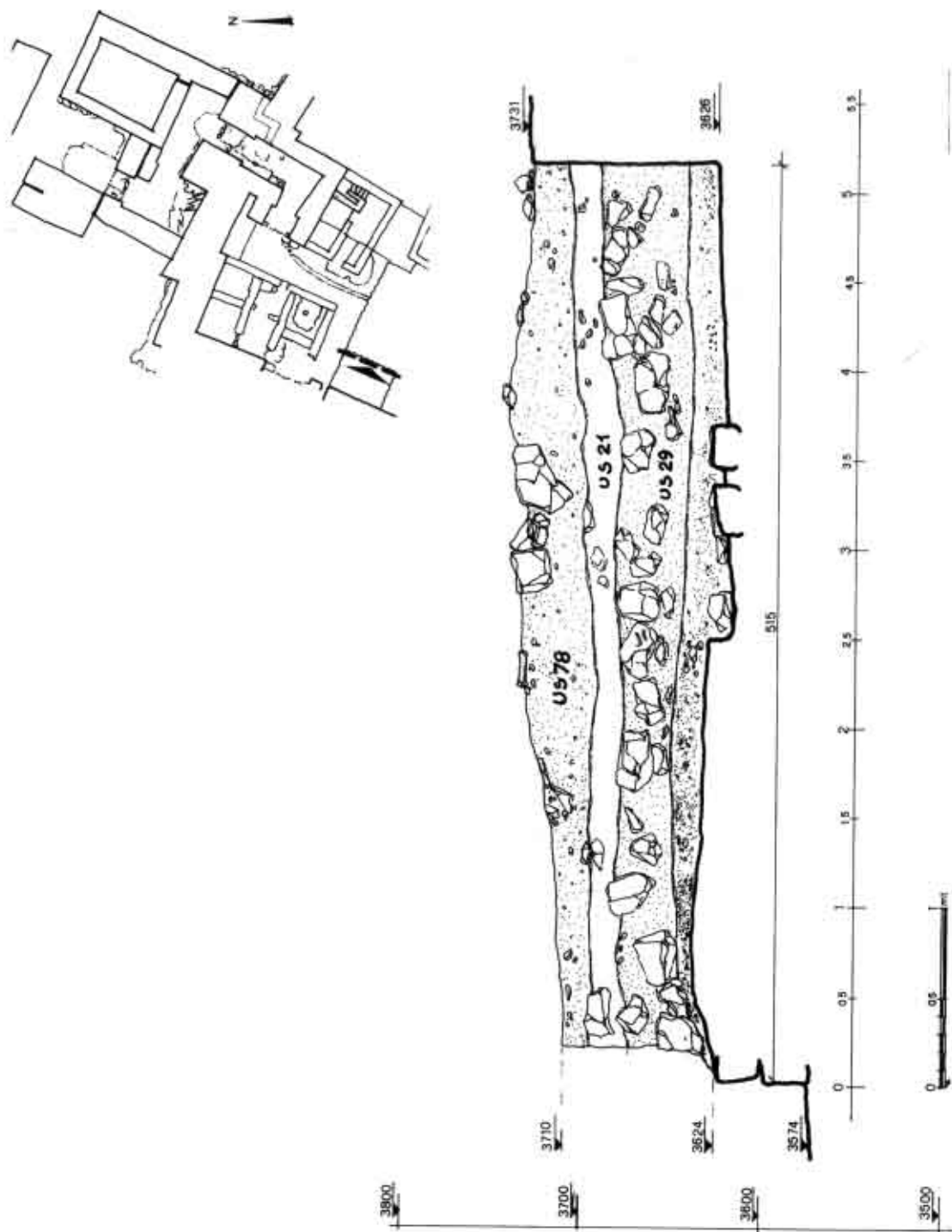


Fig. 21 - Sumhuram: stratigraphic section (N-S) of Building BA5.

tion, which was only partly excavated (thus, its function remained unclear). The floor of the room was made of packed earth. The stratum US114 consisted of dark brown loose loam mixed with charcoal, a large amount of animal bones and pottery fragments, and contained, sometimes, big stones from the collapsed part of the surrounding walls, was traced above it. The following small finds came from the US114: fragments of glass vessels (G18, G20), a bronze stick (MB81), an oil lamp made from a *chlamys townsendi* shell (Sh69), and two bronze coins (Co120, Co121 – both from the floor) (Figs. 20-21).

It is not clear when the Building BA5 was constructed, but during the second period of the city's existence it was definitely in use. During the third phase of the city's existence the Building BA5 as well as the Building BA1 were completely destroyed. The floor US22 covered remains of all structures in the square A8. The staircase leading to the top of the wall M16 of the palace was the only construction raised on this floor.

«Streets» and square A8. Outside the buildings BA3 and BA5 part of the «street» leading from the entrance of the palace to the SE direction, its crossing with the square A8 between the Gate Complex and the palace and, probably, with the «street» leading along the wall M66 of the Building BA5 in the SW direction was unearthed (Figs. 2, 22). The outer corner of the building excavated by Albright in the city interior (the corner formed by the walls M57 and M58 was designated as Building BA6) was cleaned. Due to the lack of time we were able to excavate only the upper level of the «streets» and square – following the so-called US29 floor. It was made of packed earth and was some-



Fig. 22 - Sumhuram: «street» leading to the Palace (from the S-E).

times plastered with mortar. Some of the areas like, for instance, the sidewalk along the outer wall M58 of the Building BA6, had a kind of pavement made from flat stone slabs. Lenses of ashes and, probably, remains of temporary open fireplaces were traced on the floor US29. The top deposits above the floor US29 can be described as units US21 and US29. The first one is lithologically similar to the filling above the ruins of entire building BA3 (in fact, this is one unit, US21). It consists of greyish loam mixed with a large amount of rough stones (collapsed walls of the surrounding buildings), a small amount of animal bones and marine shells, very few pieces of pottery. The second one, US29, contained more compact and hard loam mixed with rough stones, bones, shells and pottery fragments. A fragment of stone vessel (S309), a fragment of grinding stone (S308) and a lamp made of one half of a *chlamys townsendi* shell (Sh56) were found in the US29.

1.2. Small gates in the S-E defence city wall

The main goal of excavations at the new area (Area B) located in the SE defence wall of the city, near its SE corner, was to clarify the character of the small gates situated there (Fig. 23). While mapping the site, it was necessary to clean the outer facade of the gates and adjacent parts of the city wall. The results can be summarised as follows.

The small gate in the SE city-wall was c. 1.0 m wide (Fig. 24). There were two, probably wooden, doors – inside and outside the gates, both about 0.7 m wide. Both doors had stone doorsteps, 0.35-0.4 m high. The doors were connected by the passage, about 2.3 m long, constructed in the «body» of the wall. The floor of the passage was made of packed earth, and against the outer door a threshold made from three big stone blocks was constructed (Fig. 25). On the exterior the gate was supplemented with two steps leading down towards the bedrock, on which the ancient wall had been built. The steps, 0.3 and 0.2 m wide, 0.7-0.8 m long, and 0.35 and 0.4 m high, were unearthed against the outer door. To the south of the gate the city wall had an offset, 3.5 m wide, with rectangular plinth and round outer curve. The width of the city wall to the south and north of the gate is 2.5 m. The exterior of the city wall north of the gate was cleaned for a distance of 5.0 m, where it had another offset a bit more than 1.0 m wide. The ancient wall was built directly above the bedrock, and had a narrow, 0.9-1.3 m wide, sidewalk along its foundation. This sidewalk is, in fact, the step of the bedrock.

Remains of a structure were discovered next to the outer door. It was built on the sidewalk against the exterior of the city wall. The general dimensions of the structure are 1.0x2.0 m. On both sides it was bordered by massive stone blocks raised up at a height of c. 0.5 m. The width of the borders is about 0.5 m. The central part of the structure was paved with two flat stone slabs, 0.25-0.3x0.5 m in size. In general, the structure looks like a pedestal for, probably, a stele once placed in its centre (Fig. 26).

The filling outside the city wall was denoted as US106. Its major top part was formed from the dumps of American excavations at Sumhuram in early fifties, while the lower part consisted of big stones collapsed from the city wall. A small amount of shells, animal bones and pottery fragments was found in the US106. In addition, it reveals grinding stones, a whetstone, two shell pendants and an inlay made of shell.

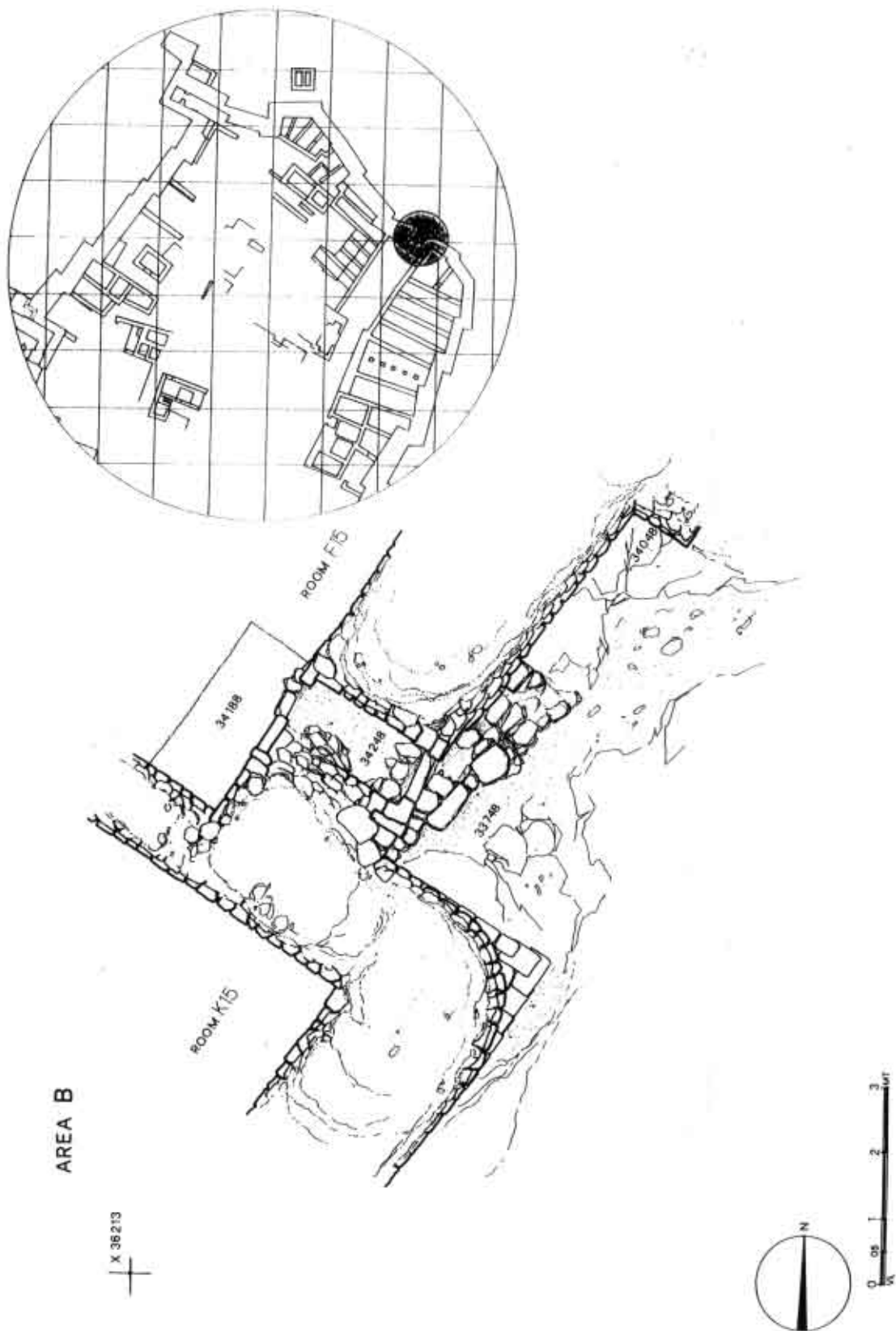


Fig. 23 - Sunhuram: detailed plan of Area B.



Fig. 24 - Sumhuram, Area B: the small gates viewed from the interior of Sumhuram.



Fig. 25 - Sumhuram, Area B: the internal passage of the small gates (from the south).



Fig. 26 - Sumhuran, Area B: general view of the small gates and the city walls, from the north.

2. Architectonic and geometrical survey at Sumhuran (Figs. 27-30)

The main object of this project has been to determine the absolute heights of all the spaces excavated in the recent campaigns. At the same time we singled out and measured the heights of all the points relative to the altimetric heights of the structures in order to be able to construct a 3D model of the entire complex. To this purpose we noted the level curves inside the city walls so as to complete the geomorphology of the settlement by connecting these measurements with the curve levels of the territory near the complex. The field work was done in about 10 days and produced 3024 topographical points over a polygon covering 20 stations and a difference of level of about 11 metres.

The data surveyed in the September-November 2001 campaign (SUM01B) were used to start to build two three-dimensional models, one for the whole city of Sumhuran and one for the gate complex⁷.

⁷ The three-dimensional processings were realised by Enrico Carli and Francesco Carnevali, final-year students at the University of Ancona, under the supervision of Prof. Gabriele Fangi.

The data surveyed on the field were elaborated to construct the three-dimensional representation, that was then used for dressing and virtual multimedia exploration operations. Two system for digital modelling were tested: DEM (Digital Elevation Model) for the digital representation of heights, and DSM (Digital Surface Model) for the digital representation of surfaces.

The models were then applied to the part of territory that was immediately around the city of Sumhuram. They highlighted the emerging architectural structures, the various heights of the city's different parts and those of the space surrounding the city walls. From the latter the city's natural defence on its eastern, southern and western sides, due to the ground's steep slope, was apparent, as well as the concentration of the defensive structures on the plainer northern side.

The three-dimensional model of the city gate was used to carry out the example of a virtual visit of the entrance way to the city. Virtual reality offers great possibilities of visual interpretation, allow us to introduce the time factor (building phases, decay) and the real time interactive exploration of data.

In this first phase, the «dressing» operations of the three-dimensional model were done by means of the creation of a sampling of the wall surfaces.

The second phase will concern the model «dressing» through the use of the real architectural surfaces that were surveyed with digital photogrammetry techniques.

3. Excavations at 'Ayn Ḥumrān

The main purpose of excavations at 'Ayn Ḥumrān was to find the so-called «local» material (pottery assemblage etc.) roughly contemporary to Sumhuram (such a coincidence was postulated by Yu. Zarins⁸).

The site of 'Ayn Ḥumrān is located in the piedmont area, in roughly 12 km NE of Salala, on the natural rock in 1.5-2.0 km from the mountains' springs and the modern cultivated area (Fig. 31). Wadi beds originating from the springs surrounded the rock with ruins. The entire complex of the ancient monuments consisted of several parts: (1) the fort on the top of the rock; (2) the village on the lower terrace in app. 500 m N of the fort; (3) the cemetery at the foot of the rock, against its southern slope; (4) traces of irrigation constructions reported by Zarins' team⁹ in the close vicinity to the site.

Two soundings were carried out: at the village (sounding A) and at the fort (sounding B).

⁸ Cf. YU. ZARINS, *The Land of Incense. Archaeological Work in the Governorate of Dhofar, Sultanate of Oman 1990-1995*. Sultanate of Oman, 2001, pp. 112 and 122.

⁹ See YU. ZARINS, *op. cit.*, pp. 17 ff.



Fig. 27 - Three-dimensional model of the city of Sumhuram. View from the east. In the foreground the frankincense stores.



Fig. 28 - Three-dimensional model of the city of Sumhuram. View from the west. In the foreground the turret of the N-W corner.



Fig. 29 - Three-dimensional model of the Gate Complex. View from the north.



Fig. 30 - Three-dimensional model of the Gate Complex. View from the west.



Fig. 31 - ^cAyn Humrān fortress: general view from the east.

3.1. *Ayn Humrān village*

The village is located on the lower terrace, north of the fort. The ruins are badly damaged by ancient and modern activity of the locals: in addition to termite mounds, a number of graves, probably Islamic, could be traced on its territory. Traces of stone foundations of structures can hardly give more information to the site planning than those reported by Zarins in the very sketch plan of the ruins¹⁰.

Sounding A. The sounding was carried out on the SE edge of the village, where «pottery dump» was reported. It was executed as a trench stretched along the south-north direction, and divided in three 3x4 m squares. A section, 0.6 m wide, was left between the second and the third squares (numbering was made from the south to the north) (Fig. 32). As the result of excavations, parts of two adjacent but not connected dwelling complexes separated by a «street» were unearthed (Fig. 33). A layer of light brown loam covering the ruins of the structures was denoted as US1. It was about 0.15-0.2 m deep, and fragments of proposed Islamic pottery were found in this layer.

Complex I. A part of large *room 1* was excavated in the northern dwelling complex. It was nearly 3 m wide, and its unearthed length was about 2.5 m. Walls M2, M3 and M4 made of un-worked medium size stones surrounded the room from the south, east and

¹⁰ See YU. ZARINS, *op. cit.*, p. 120, Fig. 54.

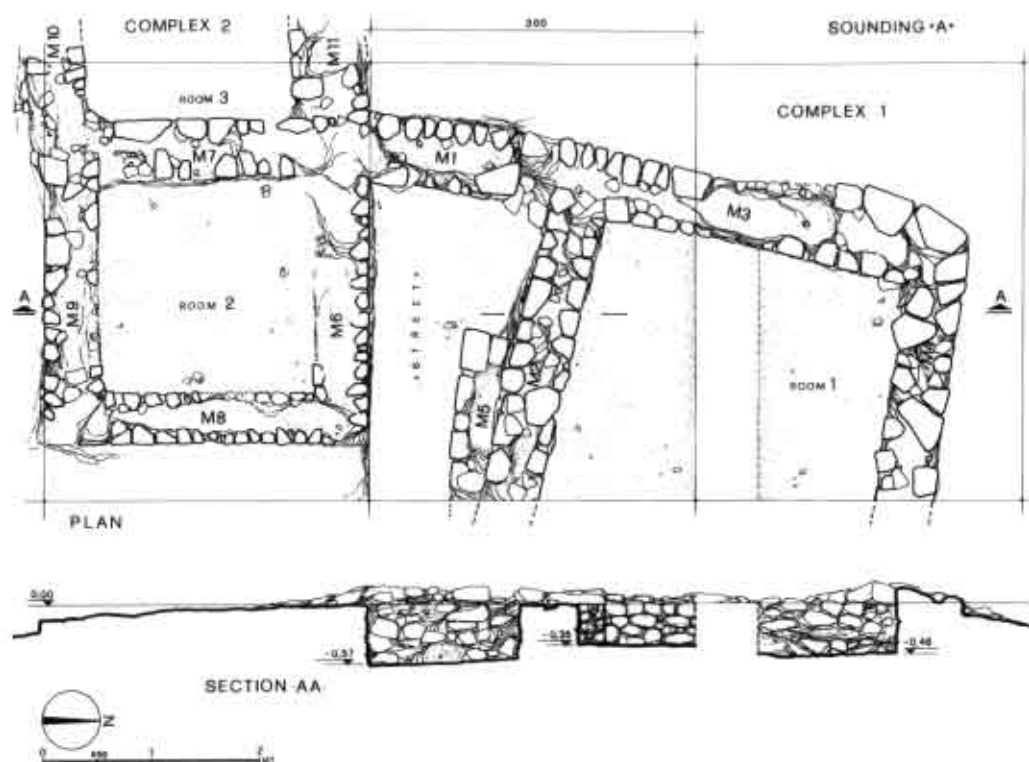


Fig. 32 - 'Ayn Humrān village: plan and section of sounding A.



Fig. 33 - 'Ayn Humrān village: sounding A, general view from the north.

north respectively. A short wall M5 was added against the exterior part on the wall M2, but its function remains unclear. The filling of the room 1 was denoted as US3. It consists of light brown loam mixed with a large amount of medium size stones (collapsed walls of the dwelling), wadi pebbles, and a small amount of fish and animal bones and pottery fragments. In the southern part of the room faint remains of an open fireplace were traced. An almost complete terracotta figurine of a bull (Fig. 34) was found on the floor of the room in close vicinity to the fireplace. The floor of the room (bedrock) was reached in 0.5 m from the modern surface of the site.

Complex 2. The southern complex has a slightly different orientation than the previous one. A complete *room 2*, 2x2 m in size, and small part of a *room 3*, 2.0 m wide, were traced there and partly excavated. Walls M6, M7, M8, M9, M10 and M11 made of wild stones surrounded the rooms. A trench in the southern part of the room 2 reached the floor (bedrock) in 0.57 m from the modern surface of the site. Its filling denoted as US4 consisted of light brown loam mixed with wadi pebbles and very small amount of pottery fragments.

«*Street*». A narrow, 1.15-1.55 m wide, «street» separated two dwelling complexes. From the east the «street» was blocked by wall M1 made of un-worked stones. The abovementioned «pottery dump» partly excavated by Zarins' team, was located in the «street» against the wall M1. We found more than 2000 pottery shards in the rest of the «dump». The «dump» covers almost the entire excavated part of the «street», although the number of pottery sherds was significantly reduced in the western part. The filling of the «street» was denoted as US2. It consists of light brown loam mixed with wadi pebbles, fish and animal bones, and a large amount of pottery sherds. The floor level (bedrock) of the «street» was reached in about 10 cm deeper than in the adjacent rooms.

3.2. *Ayn Humrān fort*

The second sounding was dug at the fort on the top of the rock. Two defence walls surrounded the central building of the fort: the external and the internal one.

Sounding B. The sounding was made against internal defence wall, near its NW corner. It was executed as a trench, 3x6 m in size, stretched along the defence wall and divided into two squares 3x3 m (Fig. 35). As a result, a part of defence wall (M1), about 6 m long, was cleared up (Fig. 36). Its width is a bit less than one meter (0.95 m). Small partition walls

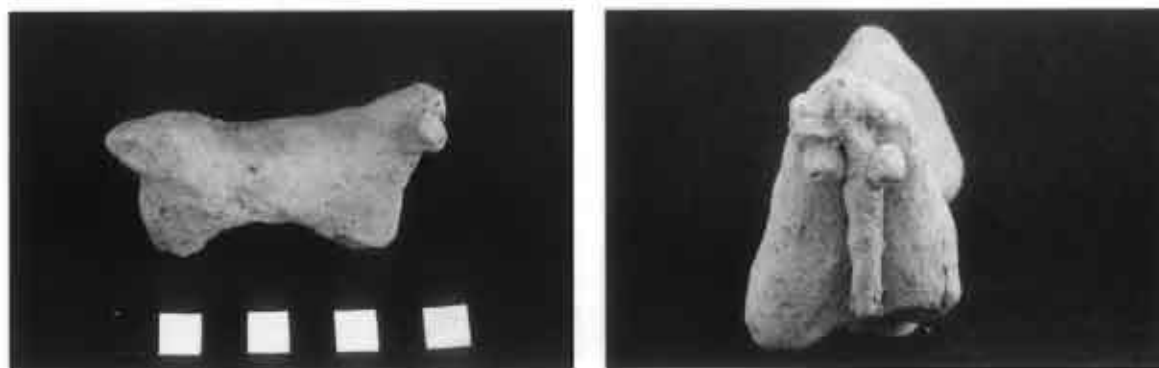


Fig. 34 - Terracotta figurine of a bull from 'Ayn Humrān village.

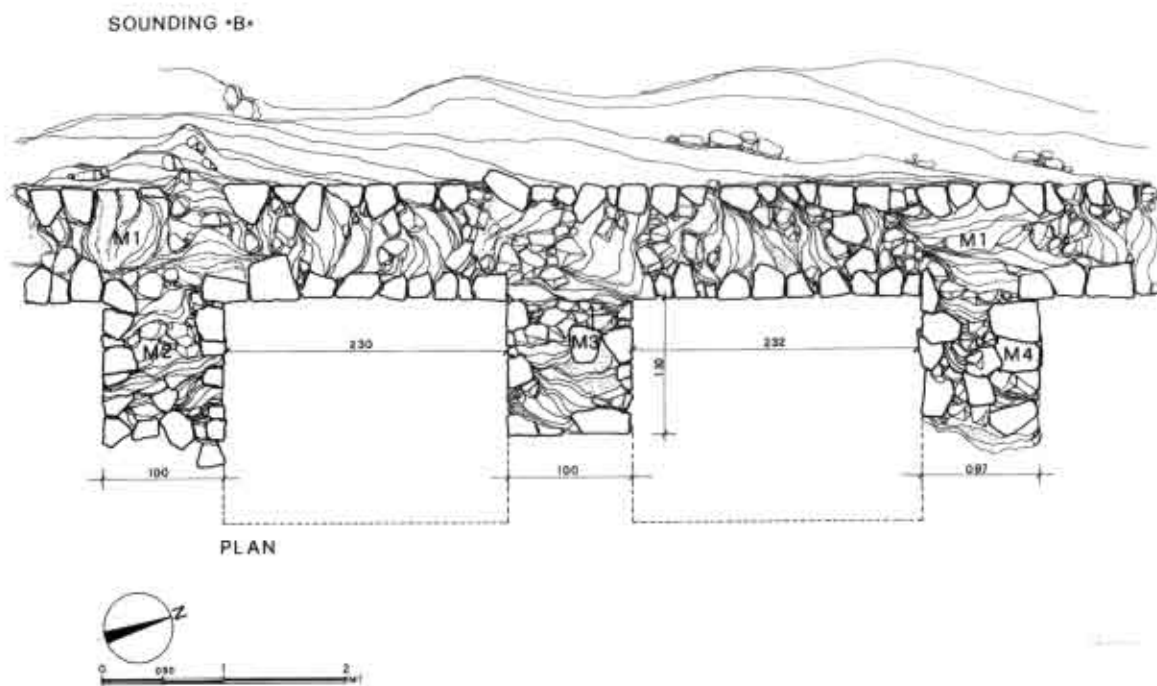


Fig. 35 - 'Ayn Humrān fortress: plan and section of sounding B.



Fig. 36 - 'Ayn Humrān fortress, sounding B: inner defense wall (from the S-E).

(M2, M3, M4) or pilasters, about 1.0 m wide and 1.1 m long, were constructed against the internal surface of the defence wall (M1). Thus, the entire space along the internal defence wall was divided into small, 1.0-1.1x2.3 m in size, premises widely opened towards the central structure of the fortress. Probably, the main purpose of pilasters was not to separate «rooms» along the defence wall but to strengthen it, like it was, for instance, in the defence mud-brick wall surrounded the town of Shibām in the Wadi Ḥaḍramawt.

The part of the sounding between pilasters M2 and M3 was denoted as US1, while those between pilasters M3 and M4 – as US2. The filling of both units was consisting of compact light brown loam mixed with medium size un-worked stones (collapsed parts of the defence wall and pilasters), pebbles and a very small amount of pottery shards. The US2 revealed mixed ceramic material – along with fragments of vessels similar to those found at the sounding A; a number of Islamic pottery sherds was also discovered.

Two soundings at *ʿAyn Ḥumrān*, in the ruins of the village and along the internal defence wall of the fortress, revealed rather strange and not clearly identifiable pottery assemblage. Unfortunately, the main homogeneous body of the ceramic corpus from the site has no direct parallels in any material from the southwest or southeast Arabia, which makes it impossible to come to any conclusion about its dating so far. The presence of limited amount of Islamic pottery sherds showed very clearly that the site, especially the fortress, was reoccupied during that period.

An indian inscription from Sumhuram

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As known from the *Periplus of the Erythraean Sea* the port of Moscha Limen, corresponding to the modern harbour of Khor Rori, has had some commercial relations with India: «...and after these, a harbour, designated for loading the Sachalite frankincense, called Moscha Limen. Some vessels are customarily sent to it from Kane; in addition, those sailing by from Limyrike or Barygaza that passed the winter, because of the season being late...» (32: 29-32). Archaeological evidences have confirmed this information: finds of ceramics and of a coin of Indian origin, issued by the Kushanian king Kanishka I¹¹.

In Sumhuram a postsherd was recently found bearing the traces of three characters of obvious Indian origin (Fig. 1). The second letter is less visible than the first, the third than the second, nevertheless they are all quite surely readable: *-la-tha-vā*. We have, in all probability, the beginning of a word, since quite a lot of words could begin with *latha-* (*ratha*). The first character *-la* is absolutely not of the same type of writing as the character *-la*, which was used in the Indian inscription from Qāni¹²; it is of more round shape. The second character *-tha* is of ellipsoid form, which is quite a rare writing¹³. All three syllables are connected with a line, traced in the same paint as the inscription itself. The destination of this line is not fully clear. Maybe it was a kind of painted decoration. If we take this line to be a part of the second sign, then it must, most probably, to be read as *-thā*. The third sign could be easily taken for *-cha*, but the comparison to the already known forms shows that the most probable reading is *-vā*.

There are not so many palaeographic parallels for the signs on the postsherd from Sumhuram, especially as far as the second sign *-thā* is concerned. As to the first sign, the biggest difficulty for the palaeographic analysis is presented by the most inner element of this character. Normally it is turned outwards. In the inscription under examination, on the contrary, it is turned inwards, while the very end of it is nevertheless turned outwards. One of the very few parallels we see in the Siroda (Goa) plates of Devaraja of the 6th century AD and in the Kanari inscriptions of the Rāṣṭrakūṭa Dhruva of the late 8th century¹⁴. As to the 2nd sign the only quite close parallel we managed to find is the manuscript writing of early 6th century AD, however it comes from the Matura and other regions of north-western India¹⁵.

¹¹ A.V. SEDOV, *New Archaeological and Epigraphical Material from Qana (South Arabia)*, AAE, 3, p.126. The coin was published for the first time in W.F. ALBRIGHT, *The American Archaeological Expedition in Dhofar, Oman, 1952-53*, Washington, 1982, pp. 91-92; pl. 41, fig. 83 (Publications of the American Foundation for the Study of Man. Vol. VI), but it was erroneously interpreted as bearing the South Arabian legend.

¹² M.D. BUKHARIN, *First Indian Inscription from south Arabia*. In: *Qāni². Le port antique du Ḥaḍramawt entre la Méditerranée, l'Afrique et l'Inde. Fouilles russes, 1985-1994*. Sous la direction de J.-F. Salles et A.V. Sedov, Brepols, 2002 (forthcoming).

¹³ E. g. the syllable *-tha* in the inscriptions from Western India is usually written almost round; cf. *Archaeological Survey of Western India*. Vol. IV, London, 1883. Chapter XIV, Inscriptions. *Passim*.

¹⁴ A.H. DANI, *Indian Paleography*. Oxford, 1986. Pl. XVIIIb.1; Pl. XVIb.12. See also J.F. FLEET, *Stone inscriptions at the Jaṭiṅga-Rāmeśvara hill*, EI, vol. 4, 1896-1897, pp. 213-216 (A.: Inscription of Vishnuvardhana-Vijayaditya, AD 1064).

¹⁵ M.S. BOWER, EI, vol. 4, 1896-1897, pl. XIIa, 11.



Fig. 1 - Inscribed sherd from Sumhuram.

We have the best parallels for the third sign. Its writing was almost the same as the one used in the Kondamudi plates of the Brhatphālayana ruler Jayavarman of early 4th century AD, which would very well correspond to the archaeological dating of the layer, in which the inscription has been found. However, the regions under his power lay in the Āndhra and neighbouring regions¹⁶. From generally the same territory we have the Ganga inscriptions of the 8th century, where we see also very good parallels for the sign - *la*, which we have in the inscription from Sumhuram¹⁷. In the 2nd-3rd centuries AD the regions around Bombay were under the strong influence (at least cultural, and the strongest in the West of Deccan) of the Sātavāhanas, who had conquered the country of Āndhra. Maybe it is not too daring to suppose, that the postsherd under examination comes from Gujarāt, is dated by approximately the 4th century and was inscribed during the period when the Sātavāhanas were at power in Gujarāt, and that it therefore reflects the continuity of the relations between the Barygaza region and south-east Arabia.

As to the meaning of the inscription, the Sātavāhana influence in Gujarāt in the 3rd-early 4th centuries AD is no surprise: it was obviously written in Prākṛit and must mean the same as the Sanskrit *-rathava* [...], i.e. something related to any kind of wheeled transport or a person, related to it – coachman, charioteer. Quite a number of the proper names could begin with *rathava*-. On the other side, if we take *vā* as the beginning of the following word and regard *ratha* separately, *ratha* also meant some kinds of plants, e.g. Dragons blood – *Calamus Rotang*, L., *Dalbergia Ougeinensis* L.¹⁸ (Sanskrit *trinisha*, *sejanduna*).

There is another hypothesis on the meaning of this inscription, though it may look too courageous. The Prākṛit *-latha* may be identical to the Sanskrit *rājya* and means the country of destination. Since the notion of e.g. the «Roman country» – *Romanukkharaṭṭham*¹⁹, was known to the inhabitants of the Southern India, this supposition does not seem too unrealistic. With the same probability *-latha* may be related to the name of one of the Indian peoples, e. g. *laṭa* although this hypothesis looks less probable.

¹⁶ DANI, *op. cit.*, pl. XVIIb, 1.

¹⁷ *Ibid.*, pl. XVIIb, 6; see also other inscriptions of the 7th century from the territory of Āndhra: DANI, *op. cit.*, pl. XVIIb, 7, 9-10, 12.

¹⁸ *Sanskrit-English Dictionary Etymologically and Philologically Arranged with Special Reference to Cognate Indo-European Languages* by Sir Monier-Williams. Delhi, 1976, p. 865.

¹⁹ F. DE ROMANIS, *Romanukkharaṭṭha e Taprobane: sui rapporti Roma-Ceylon nel I sec. d.C.*, *Helikon*, vol. 28, 1988, p. 56; F. DE ROMANIS, *Romanukkharaṭṭha e Taprobane: Relations between Rome and Sri Lanka in the First Century A.D.* In: *Crossings. Early Mediterranean Contacts with India* (ed. by F. de Romanis - A. Tchernia), New Delhi, 1996, pp. 192-201.

Indagini palinologiche nel sito archeologico di Sumhuram (Khor Rori) in Dhofar (Oman) Primi risultati

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Le indagini palinologiche rappresentano un valido strumento per la ricostruzione della flora antica. Tale risultato, oltre ad avere un evidente interesse dal punto di vista strettamente botanico, costituisce la base per le ricostruzioni paleovegetazionali, e quindi del paesaggio vegetale del passato, ed offre indicazioni preziose circa le caratteristiche ecologiche e climatiche dell'area in esame. Per questo motivo le indagini palinologiche vengono sempre più frequentemente affiancate alle ricerche archeologiche nei siti di scavo.

Il sito di Sumhuram in Dhofar, qui preso in esame, è situato lungo la costa meridionale della Penisola Arabica nei pressi di Taqa, sulla piana di Salala, e si affaccia su un piccolo estuario formato dallo wadi Darbat. Oggi l'estuario (khor) è isolato dal mare da una barriera di sabbia e contiene acqua con bassa salinità (Hoorn & Cremaschi, in stampa). Attorno ad esso si sviluppa una stretta fascia di vegetazione igrofila che offre rifugio ad una ricca fauna. Il khor è inserito in un contesto più generale caratterizzato da notevole aridità e da suolo molto scarso. La copertura vegetale è povera, poco più abbondante lungo il corso dello wadi Darbat.

L'età dei sedimenti di superficie dei khor lungo la costa arabica meridionale sembra risalire al tardo Olocene (ca 2400 anni BP); dati geomorfologici indicano che un tempo essi erano aperti sul mare e pertanto potevano costituire porti naturali (Hoorn & Cremaschi, in stampa). Lo stesso Darbat, durante le annate di maggior piovosità, è in grado di tagliare la barriera di sabbia permettendo il contatto diretto tra l'acqua dolce dell'estuario e l'acqua di mare.

Non sappiamo come si presentava il khor tra il I sec. a.C. ed il III d.C., periodo durante il quale il porto era attivo (Avanzini, 2000). Le indagini geomorfologiche e palinologiche precedentemente svolte (Hoorn & Cremaschi, in stampa), se chiariscono l'evoluzione dell'estuario, non focalizzano l'attenzione su questo aspetto, che invece risulta essenziale per una ricostruzione archeobotanica esauriente.

Per questo motivo sono state intraprese nuove indagini palinologiche proprio all'interno dell'area di scavo. Di queste vengono qui presentati i primi risultati.

La raccolta del materiale per le analisi (campioni di sedimento) è stata svolta tra il 19 ed il 25 marzo 2001. Le sezioni stratigrafiche che presentavano caratteristiche idonee a questo tipo di studio sono state individuate nelle aree A8, F6, A13 (due sezioni), per un totale di 26 campioni.

Per valutare la qualità e la quantità del polline e delle spore che oggi si depositano sulla superficie del terreno e che quindi rappresentano l'apporto pollinico della vegetazione spontanea attualmente presente attorno al sito, sono stati raccolti campioni di alghe incrostanti e campioni di terreno. Non si tratta di substrati ideali a questo tipo di studio, ma l'aridità del luogo non permette lo sviluppo di cuscinetti di muschio, materiale di elezione per questa finalità.

Studiare la pioggia pollinica attuale costituisce un punto fermo fondamentale per l'interpretazione dei risultati delle analisi palinologiche relative al passato. Infatti, dal momento che non tutte le piante producono la stessa quantità di polline né disperdono questo

con la stessa modalità ed efficienza, informazioni di grande utilità si possono ricavare mettendo in rapporto diretto una realtà osservabile (la vegetazione attuale) e la sua rappresentazione (lo spettro pollinico²⁰). Queste informazioni aiutano a ipotizzare quale vegetazione fosse presente nel passato sulla base dello spettro pollinico ricavato dalle analisi palinologiche.

Una delle difficoltà dello studio condotto nel sito di Sumhuram è rappresentata dalla scarsa disponibilità di materiale bibliografico dedicato alle flore polliniche dei paesi tropicali in genere e della Penisola Arabica in particolare. Per questo motivo, al fine di identificare i granuli pollinici presenti nei campioni attuali ed eventualmente anche in quelli dei campioni del passato, è stata effettuata in stagioni diverse una raccolta delle piante in fiore presenti nello scavo ed in altre località del Dhofar.

Tra i campioni di polline raccolti è stato incluso quello di *Boswellia sacra* Flueck., la pianta dell'incenso (Figg. 1-5).

Per l'analisi del polline contenuto nei sedimenti, i campioni raccolti sono stati trattati con acidi forti (acido cloridrico ed acido fluoridrico) a freddo e con basi forti (idrossido di sodio) a caldo. Si è proceduto quindi ad una serie di filtraggi e all'arricchimento in liquido pesante.

L'identificazione è stata svolta al microscopio ottico, dopo aver posto il campione trattato in acqua e glicerina 50% v/v.

Il polline attuale è stato sottoposto ad acetolisi (Erdtman, 1960), quindi osservato in acqua e glicerina 50% al microscopio ottico oppure al microscopio elettronico a scansione, previa disidratazione e metallizzazione con oro.

I primi risultati ottenuti sono relativi ai campioni attuali (alghe incrostanti) ed a quelli provenienti dalla sezione dell'area A13. Tale sezione è stata tagliata in corrispondenza di un angolo delle mura che poteva costituire un riparo all'esterno della cinta muraria. Presumibilmente non si trattava di un luogo completamente al chiuso e presentava caratteristiche idonee allo studio palinologico.

Le unità stratigrafiche (US) interessate sono state: la US 94 con un campionamento; la US 93 con due campionamenti; la US 92 con un campionamento; la US 84 con quattro campionamenti dei quali tre in serie verticale ed uno effettuato in una lente inclusa nello spessore dello strato; la US 77 con un campionamento²¹.

Anche da un'indagine preliminare, come quella qui presentata, risulta evidente la sostanziale differenza tra lo spettro pollinico attuale da un lato, e quelli del passato dall'altro. Infatti il primo è caratterizzato da alte percentuali di polline di Chenopodiaceae ed Amaranthaceae che, complessivamente, costituiscono il 45% del totale di polline e spore contenute nel campione, mentre negli spettri più antichi le Chenopodiaceae e le Amaranthaceae sono presenti con percentuali trascurabili.

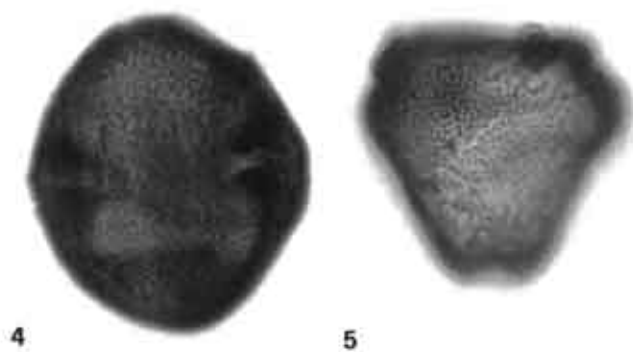
Nello spettro pollinico attuale anche le Gramineae hanno una percentuale rilevante (28%); esse sono rappresentate da più morfotipi pollinici e quindi attribuibili a piante di-

²⁰ Si chiama spettro pollinico l'elenco delle piante alle quali si attribuiscono i granuli pollinici e le spore contenuti in un substrato con riportata a lato l'indicazione delle quantità relative.

²¹ Le Unità Stratigrafiche campionate costituiscono una sequenza di strati fuori dalle mura cittadine, addossati nell'angolo formato dai muri M8 e M15 (cfr. A. AVANZINI *et al.*, 2001, pp. 12-15).



Figg. 1-3 - Granuli pollinici di *Boswellia sacra* come appaiono al microscopio elettronico a scansione nelle visioni equatoriali (1-2) e polare (3).



Figg. 4-5 - Granuli pollinici di *Boswellia sacra* osservati al microscopio ottico in visione equatoriale (4) e polare (5).

verse. Seguono le Cyperaceae (7%) e *Salvadora* (4%). Gli altri granuli ritrovati sono presenti in percentuali che non superano l'1%.

Mettendo in rapporto questi dati con la flora e la vegetazione che si osserva attorno al sito, risulta evidente l'importante apporto pollinico delle Chenopodiaceae oggi presenti nel sito di Sumhuram e attorno ad esso. Si tratta di piante che vivono su substrati poveri, adattate all'aridità e che tollerano un certo livello di salinità nel suolo. *Salvadora*, che cresce rigogliosa lungo il lato della città che guarda il khor ed il mare, pur con la sua maggiore abbondanza *in situ*, contribuisce assai meno alla pioggia pollinica. Della vegetazione presente lungo le rive dell'estuario, solo le Gramineae e le Cyperaceae testimoniano chiaramente la loro presenza nello spettro. Infine, l'apporto delle piante che crescono lungo lo wadi Darbat e lungo la scarpata a monte di Khor Rori risulta complessivamente trascurabile.

Come già accennato, negli spettri del passato l'apporto pollinico delle Chenopodiaceae ed Amaranthaceae risulta scarso. Inoltre queste piante si rappresentano con un minor numero di morfotipi pollinici, suggerendo anche una minor varietà di piante presenti.

Le piante meglio rappresentate sono invece le Gramineae. La loro percentuale raggiunge valori così alti nelle US 94 e 93 che si può supporre la loro presenza *in situ*. Questa ipotesi è avvalorata dal fatto che spesso i granuli (Fig. 6) si ritrovano in gruppi compatti e



Fig. 6 - Granulo pollinico di una graminacea (Gramineae) al microscopio ottico - US 84.

Fig. 7 - Granulo pollinico di *Commiphora* sp. al microscopio ottico - US 84.

perciò non idonei ad essere trasportati dalle correnti d'aria. In particolare, nella US 93, che corrisponde ad una fase di occupazione del sito, l'elenco di piante rappresentate risulta più ricco dell'attuale. Vi compaiono, tra l'altro, *Commiphora* (Fig. 7), *Olea*, *Ficus*. Queste piante vivono oggi in stazioni fresche, lungo le pendici della scarpata o sull'altopiano retrostante la pianura costiera, in aree esposte all'influenza dei monsoni. La presenza nello spettro pollinico di varie piante arbustive ed erbacee appartenenti alla famiglia delle Compositae, delle Malvaceae (Fig. 8), delle Leguminosae – tra le quali ben rappresentata *Indigofera* – delle Cruciferae suggeriscono una maggior, seppur limitata, disponibilità di acqua rispetto all'attuale.

La US 92 è risultata sterile dal punto di vista palinologico, e piuttosto poveri sono risultati i campioni della US 84. Si tratta di sedimenti ricchi di piccoli frammenti di carbone che, generalmente, costituiscono un substrato poco idoneo alla conservazione del polline. Anche i granuli che si conservano più facilmente perché più resistenti, come quelli delle Chenopodiaceae, sono risultati qui corrosi, deformati e quindi mal identificabili. I quattro campioni, comunque, offrono un quadro concorde della situazione. Risultano



Fig. 8 - Granulo pollinico di una malvacea (Malvaceae) al microscopio ottico - US 84.

ancora ben rappresentate le Gramineae e le Cyperaceae e l'elenco floristico è ancora abbastanza ricco.

La US 77 non si discosta molto dai campioni precedenti, se non per un impoverimento dell'elenco delle piante ritrovate. Dominano ancora le Gramineae, rappresentate da diversi morfotipi pollinici. Seguono le Cyperaceae e le Chenopodiaceae.

Come prima conclusione si può dunque affermare che gli spettri pollinici relativi al passato risultano più vari di quello corrispondente all'attuale. Dunque la flora nel passato doveva essere più ricca di quella che troviamo oggi nella stessa area. Gli spettri pollinici suggeriscono anche la presenza di Gramineae in stretta prossimità del punto di campionamento in livelli corrispondenti al periodo di occupazione del sito.

Il quadro generale emerso dalle analisi concorda nelle linee principali con quanto risultato dagli studi precedenti (Hoorn & Cremaschi, in stampa), che in sedimenti databili attorno ai 2200 ± 50 anni da oggi segnalano una dominanza delle Gramineae e percentuali piuttosto basse di Chenopodiaceae e Cyperaceae.

Pertanto durante il periodo romano, il porto di Sumhuraam doveva essere inserito in un ambiente più fresco e più verde dell'attuale.

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Documentation and restoration project of the historical houses of Salala

ROBERTO ORAZI

Introduction

Salala is today a modern city that is growing thanks to the construction and development of important infrastructures. Among these, the new port situated to the west of the city is of paramount importance as it will give a new stimulus to commerce and industry.

Another certain contribution to development of Salala will come from the hotel-tourism sector. The city is in fact quite near the four monumental complexes which form part of the «Frankincense trail» and are mentioned in the World Heritage List: al-Balid, Khor Rori, Shisr and wadi Dokha.

In this context the safeguarding and restoration of the historical buildings take on an especial importance. Buildings from the XVIII or XIX centuries which have been gradually abandoned and are noticeably damaged are still numerous in the al-Hafa quarter near the sea and in Salala al-Wusta, which is right in the centre of the modern city.

Contrary to past proposals which suggested saving at least one house in order to make a «museum», today's proposal is based on modern concepts of environmental conservation. These internationally recognized principles attribute a determining importance not just to single «monuments», but also to the context of minor or popular architecture which makes up a «complex of historic, architectonic and cultural value».

In theory, this complex could also be made up of buildings which do not each have especial artistic value, but which together make up a historical document which should be safeguarded, restored and left to our descendants.

Value of the project

The intervention is intended to restore the historical nucleus of the city by means of various direct and indirect steps which are related on different levels and involve multiple aspects.

The project for recovery of the historic centre of Salala has a series of aspects which are worth remembering.

The economic aspect of an operation such as this one should be mentioned, above and beyond the indubitable historical-cultural value inherent in the recovery which gives value to the existing architectural heritage. This aspect will show above all in an increase in the value of the land and buildings, and could lead to help and contributions for the proprietors who themselves help the project, to the expropriation and purchase of land for public domain in order to realize the projects, and to investments on the part of private sponsors.

The tourist aspect seem to be equally important. Visits to the historic centre will be part of a tour connected with the archaeological park of al-Balid, and that of Khor Rori, with the city of Shisr and the «Frankincense Garden» (wadi Dokha). It will be useful to plan hotels and eating places, as well as the preparation of guided visits with local personnel properly instructed in the principle languages, the printing of publicity brochures, and the sale of local handicrafts.

And, lastly, the possibility of formative and occupational development must not be forgotten. This aspect will be found mostly in the activation of all the works for which local workers are needed, both for simple jobs and for jobs that require more training (geometric plans, technical drawing, carpentry, etc). The workers will be trained in courses that will make them competent in a few years to undertake similar projects in other historic complexes. This sort of program should set up a process of development or increase in activities, directly and indirectly involved, that range from the provision of supplies (extraction or production, packaging, transport), to the income deriving from tourism, and the development of local handicraft.

The singling out and verifying of a specific methodology of intervention will be just as important. This will be gradually defined with the understanding of the original urban plan and of the first living modalities, through the reading and interpretation of traditional uses of space (internal-external, between different lots, subdivision of property, etc.), the functional recovery of the open spaces with infrastructures (parking, green areas, walking paths), the definition of the general principles that may have value as intervention criteria to be applied in other centres. Indications and recommendations about working techniques, types of materials, and decorative elements will be defined.

The phases of the project

There will be four distinct phases of the project:

First phase: assessment of consistency and state of decay

This phase, which has got a first illustration by means of a brief booklet and a CD, is going to be carried on by the following steps:

- creation of a general plan with the identification of the area to be safeguarded, the houses to be restored, the houses to be demolished etc;
- identification of all houses to be restored with a progressive number on the general plan;
- creation of an automatic link between each numbered house and the related set of photographic documentation;
- creation of the IT architecture for the arrangement of an archive related to the architectonic elements of the houses to be restored: plans and elevations; windows; doors; ceilings; architectonic details.

Second phase: detailed geometrical survey

This second phase will be carried on through the organization of a specific team of Italian and Omani students. This will allow to gain two main objectives:

- to acquire a detailed documentation of all the registered houses;
- to train an Omani team of 3 or 4 persons (students from the faculty of civil engineering) in order to create the personnel for a permanent *Documentation – Centre* of the Office of HE the Advisor in the Salala area: (topographer for the total station, digital photogrammetry, use of CAD, traditional drawing).

The work could be carried on concentrating the geometrical survey and the training within one month, to be repeated two or three times a year.

Third phase: organization of the IT Archive, the Building Handbook, the Rehabilitation Plan

The third phase must be started in Italy and then progressively continued in Oman in the new *Salala Documentation Centre*. This third phase has two main objectives:

- the creation of an interactive IT program in which all the surveyed documentation is registered and automatically related to each registered house;
- the creation of a *Handbook for the historical houses of Salala* where all the registered building elements will be shown and explained with detailed drawings. The main purpose of such a publication is to provide those willing to restore their house with the proper documentation on traditional building materials and techniques;
- the preparation of a *Rehabilitation Plan*. The *Rehabilitation Plan* regards the detailed organization of the whole area with the definition of private and public zones, the location of parking places, pedestrian paths; religious buildings (Mosques), school, shops etc. In the *Rehabilitation Plan* a number of rules will be established in order to define the architectonic elements of urban design (like electrical porters, street lamps, fountains, benches, green areas, trees, etc.) and the reference points to the *Handbook for the historical houses of Salala* as for as building materials, techniques and colours are concerned.

Fourth phase: work organization (technical and financial instruments)

Technical aspects

The fourth phase is the operative one and concerns the realization of the project on the basis of the *Rehabilitation Plan* and the *Handbook for the historical houses of Salala*.

Financial aspects

Taking into consideration that the urban infrastructures will be on the expenses of the Municipality, as far as the rehabilitation of old houses or the construction of new ones are concerned, several possibilities can be arranged:

- a pool of Banks to deliver low interest mortgage loans to the owners of the houses (private multiple ownership);
- a pool of investors to carry on the whole project (single private ownership).



Fig. 1 - Historical houses of Salala. «The concept of an historic monument embraces not only the single architectural work but also the urban or rural setting in which is found the evidence of a particular civilization, a significant development or an historic event. This applies not only to great works of art but also to more modest works of the past which have acquired cultural significance with the passing of time» (The Venice Charter, 1964).



Fig. 2 - Historical houses of Salala. Sometimes coloured plaster is used to articulate the floors and rows of windows; long horizontal bands and panels of grey plaster alternating with off – white – as in the two easternmost houses.



Fig. 3 - Historical houses of Salala. The walls are coated with gypsum plaster or left naked in their light – beige and sometimes grey – brown rough limestone walling.

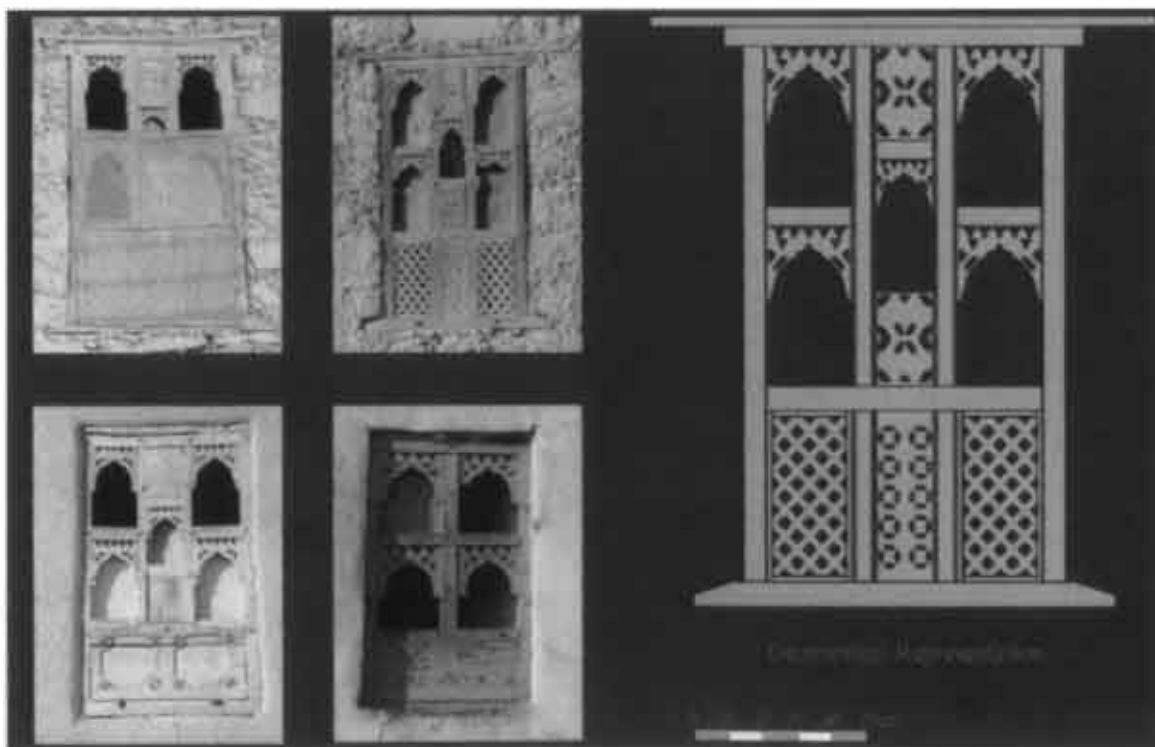


Fig. 4 - Historical houses of Salala. Often windows are simply set almost flush in the outer wall in a simple rectangular opening; the range of windows is then emphasized by a band of off – white plaster. Sometimes an arch encloses the timber window lending it added grace.