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Public Bathing in Medieval Oman: The Qalhāt Hammām

Axelle Rougeulle, Fabien Lesguer

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الدراسات العُمانية



His Majesty Sultan Qaboos bin Said, Sultan of Oman

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MAP OF THE SULTANATE OF OMAN

GUIDE TO AUTHORS

The Journal of Oman Studies was established in 1975. It is published by the Ministry of Heritage and Culture in the Sultanate of Oman. It is a scholarly journal that publishes original and refereed research in both Arabic and English in areas relating to natural and cultural heritage relevant to the Sultanate of Oman. The journal publishes research in various areas of tangible and intangible cultural heritage. For example, the journal publishes research in various kinds of movable and non-movable archaeology, rock art, inscriptions and writings, sculpture, traditional architectures such as forts, castles and old neighborhoods. The journal also publishes research on modern buildings with unique architecture specific to Oman. It also publishes research on intangible cultural heritage such as research in the areas of Omani traditions and customs, different forms of expression including language and oral practices, various forms of performance arts, rituals, ceremonials, social practices, various forms of interaction with nature such as agriculture, falaj and irrigation system, traditional medicine, skills related to Oman's traditional handicrafts and others. The journal also publishes research dealing with topics related to Oman's natural heritage and these include studies of natural landscape, geological structure, natural sites like mountains, wadis, caves, flora and fauna of Oman. The journal also invites book reviews in relevant areas.

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All correspondences are addressed to:

Editor-in-Chief

The Journal of Oman Studies

Ministry of Heritage and Culture

P. O. Box 668, Muscat Postal Code 100, Sultanate of Oman

Tel: 0096824641572

Email: jos@mhc.gov.om or editor_chief@mhc.gov.om

Website: www.mhc.gov.om

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Foreword

The Journal of Oman Studies, published by the Ministry of Heritage and Culture in the Sultanate of Oman since 1975, has become one of the key sources of knowledge in the Sultanate. It is mainly concerned with publishing solid and original research in both Arabic and English in areas relevant to Oman's cultural and natural heritage, in both tangible and intangible forms. The Journal is, thus, useful to a wide spectrum of researchers, academics, students and general audience.

The Journal has a history that extends to more than four decades, going back to 1975 when it was first established. It has since then gained an excellent reputation within academic circles inside and outside Oman. The Journal is widely circulated among scholars interested in Oman's heritage and the papers published in the Journal have intrigued and benefited researchers and academics from different parts of the world. The subjects covered by the Journal are diverse covering various aspects of Oman's heritage. The Journal's Editorial Board follows a rigorous and confidential review procedure. The review process is carried out by a specialized international team of researchers, scholars and academics.

We are pleased to present Volume 20 of the Journal of Oman Studies to the world, which features a number of papers in the Journal's area of expertise. On this occasion, I would like to thank the researchers who have submitted their work for publication in the current and previous issues of this journal and would like to encourage all researchers interested in Oman's heritage to submit their research papers to the upcoming issues of this Journal.

Haitham bin Tariq Al Sa'id
His Royal Highness Minister of Heritage and Culture

Public Bathing in Medieval Oman: The Qalhāt Hammām

Axelle Rougeulle & Fabien Lesguer

ABSTRACT

Led since 2008, the archaeological researches at Qalhāt (Qalhāt Project/Qalhāt Development Project), in the South Sharqiyah Governorate of Oman, delivered the vestiges of a whole port city of the Middle Ages (13th-16th c. C.E.) with all its main features, its various quarters and street networks, the fortifications and gates, the great Friday Mosque and other religious buildings, a sūq and a warehouse, workshops and dwellings, and several administrative and public edifices. Among these is a hammām, the only building of this kind ever found in Oman, which was first discovered during preliminary excavations in 2003. The detailed architectural and technical study of the Qalhāt hammām delivered much information about its operation, its origin and its dating. It was most probably built, together with the north fortified gate of the ramparts, during the heyday of the city under the reign of the governor Sayf al-Dīn Ayāz and his wife Bībī Maryam, around 1280-1320; Qalhāt underwent at that time a main development as the second capital of the Hormuz kingdom, which was then developing as a leader of the Indian Ocean trade. Although this hammām is rather unique from an architectural point of view, its plan could be of Seljuq origin.

KEYWORDS: Bath, Hammām, Islamic Architecture, Oman, Middle Ages.

الحمامات العامة في العصور الوسطى في عمان : حمام قلهاات أكسل روجيل، و فابيان ليسجير

الملخص:

قدمت الأبحاث الأثرية التي أجريت منذ عام ٢٠٠٨م في قلهاات (مشروع قلهاات/مشروع قلهاات الترميم) في محافظة جنوب الشرقية بسلطنة عمان بقايا مدينة كاملة من العصور الوسطى (القرون من ١٢م إلى ١٦م)، مع كل ملامحها الرئيسية، وحراراتها وشبكات شوارعها المختلفة، والتحصينات والبوابات، ومسجد الجمعة الكبير والمباني الدينية الأخرى، ومخزن وسوق، وورش العمل والمسكن، والعديد من الصروح الإدارية والعامة. ومن بين هذه المباني هناك الحمام، وهو المبنى الوحيد من نوعه الذي تم العثور عليه في سلطنة عمان، وقد تم اكتشافه لأول مرة خلال التنقيبات الأولية التي أجريت في عام ٢٠٠٣م. وقد قدمت الدراسة المعمارية والفنية التفصيلية لحمام قلهاات معلومات كثيرة حول آلية عمله وأصله وتاريخه. وقد تم على الأرجح بناؤه، إلى جانب البوابة الشمالية المحصنة للأسوار، في ذروة ازدهار المدينة تحت حكم الحاكم سيف الدين أياز وزوجته بيبى مريم. وذلك في حوالي ١٢٨٠م-١٣٢٠م؛ وهو الوقت الذي شهدت فيها قلهاات تطوراً رئيسياً باعتبارها العاصمة الثانية لمملكة هرمز التي كانت آنذاك تتطور كرائدة في تجارة المحيط الهندي. وعلى الرغم من أن هذا الحمام فريد من نوعه من الناحية المعمارية، إلا أن مخططه قد يكون من أصل سلجوقي.

الكلمات المفتاحية: استحمام، حمام، العمارة الإسلامية، عمان، العصور الوسطى.

1. INTRODUCTION

The hammām is the only building which was excavated at Qalhāt prior to the beginning of the Qalhāt Project. It was discovered and cleared in 2003 during the course of an Omani-Australian expedition directed by T. Vosmer, but only general information was then published (Vosmer, 2004:396-398). As this structure was planned to be conserved by the conservation team of the QDP during the 2016/2017 season of the project, a comprehensive study was launched in fall 2015 by the archaeological team. The backfill which had been carefully placed over the entire surface in 2003 to protect the floors was first removed, a further room was discovered and excavated east of the building, additional excavations took place in the fire chamber and service area to the west, and a detailed architectural and technical analyse was performed¹.

2. THE NORTHWEST CITY GATE

The hammām (B4) is located near the northwest extremity of the site, on a sloping terrace against the steep rocky bank of the Wādī Hilm, here about 40m high, down the western tip of the town wall at the foot of the mountain (figures 1-3). It is only via this terrace, probably of natural origin, that the coastal track could connect the wadi bed and the plateau where the site stands, and this area was the main access to the city on its north side. As such, in the medieval period it was extensively landscaped, but also recently when the modern coastal track prior to the highway was built in the 1960's, on a ramp which was cut into the foot of the plateau. Its original layout and evolution are therefore difficult to understand now.

The terrace was probably developed as early as the foundation of Qalhāt, around the 11th/12th centuries, to enable an easier access to the city. In any case it was certainly so when the town walls

¹ This study could not be entirely completed as excavations were stopped at the site in summer 2016, conservation work only being continued since then. Some information about this hammām has already been published on line, see Rougeulle, 2017b.

were built, around 1219 C.E. according to Ibn al-Mujāwīr and the archaeological data². But the study of the hammām reveals that the northwest gate of the city as it appears now can probably be dated to the reign of the Hormuzi governor Baha al-Dīn Ayāz Seyfin and his wife Bībī Maryam, c.1280-1320 C.E. The town underwent at that time a major architectural development, which almost certainly included the complete remodelling of the terrace as a fortified gate (see below, Conclusion).

As a main access to this now famous and wealthy city, this area then had ample defences (figures 2-3). To the south the city wall proper protected it, which stood at the edge of the plateau, about 20m higher. To the north stood a massive fortification, an irregular wall up to 2m in width, which was based down on the slope of the wadi bank and is now preserved on 6m of height, lower than the level of the terrace³. To the west, those two ramparts were connected by a wall extending from the extremity of the city wall down the bank of the plateau, although its connection with the wadi wall is not known, now destroyed by the modern track together with the outer access of the gate.

The eastern side is even more poorly known as it has been entirely remodelled by the later construction of a fortified square enclosure right on the edge of the plateau (figure 2). The dating of this enclosure (B3) is unknown, but its erection destroyed most of the Bībī Maryam mausoleum complex and it is certainly later than the final abandonment of the medieval city in the second half of the 16th century. Located as it is, it enabled a complete control on the coastal track, all travellers being obliged to pass through the enclosure on their way between Sūr and Qurayyāt. The original layout of the gate

² Ibn al-Mujāwir mentions twice the construction of the walls in stone and juss, one dated A.H. 615/1218 C.E in § 263 (Smith, 2008:270), the other dated 616/1219 in § 274 (id.:278). Archaeological soundings in several parts of the walls confirm this dating: The pre-wall layers yielded ceramics of the 11th-12th centuries (Iranian sgraffatos), and the early occupation layers yielded ceramics of the 13th-14th centuries (Yemeni 'Mustard' ware).

³ This retaining wall has been rebuilt slightly higher than the level of the terrace during conservation work, to avoid further erosion and insure protection for visitors.



Figure 1. Preliminary map of the medieval city of Qalhāt (c.14th-15th c.) and location of the hammām (the frame indicates the area illustrated in Fig.2).

on that side therefore is unknown, whether it was completely opened to the plateau or was closed by a wall with an inner door to the city, this gate thus acting as an airlock. The then existing rampart

probably had a continuous layout which followed the edge of the plateau, with a gate at the upper end of the track, and it still possibly was preserved when the new gate was created downslope.



Figure 2. Zenithal view of the area of the northwestern gate and of the hammām.



Figure 3. View from the Wādī Hilm of the northwestern gate before conservation work, the terrace, the city and wadi walls, and the modern track.



Figure 4. *The area of the hammām before the 2003 excavations, from the west (© T. Creissen).*

Due to erosion, the terrace extant before the onset of excavation in 2003 presented a flattish surface sloping from the east and south, down the plateau, to the west and north, on the wadi side, covered with many pebbles and cobbles, and some boulders (figure 4). But the study of the hammām proved that it was extensively landscaped in the medieval period. The fortification wall on the wadi side was built in front of the bank of the Wādī Hilm as a retaining wall to enlarge and frame the surface of the terrace. This surface was itself arranged, at least in its northern part near the wall, in successive artificial terraces. Two such structures were identified in the area of the hammām, with a seemingly angular or curved layout which looks more or less parallel to the edges of the plateau to the south and east⁴. The retaining walls were built of boulders from the

wadi or from bedrock, and the filling consisted of earth mixed with pebbles and coarse gravel. Their collapse and the further erosion thus produced a mix of stones, which is now quite complex to excavate and difficult to interpret, especially as the modern track destroyed the southern half of the terrace and the foot of the plateau, projecting new boulders downwards (figure 3). A wide spoil heap from the 2003 excavation also was stored to the east, and obscures the layout of the original street, possibly quite different from the actual track. As the QDP excavations there were only intended to clear and understand the hammām before conservation, the study of the gate itself was not carried out.

3. THE HAMMĀM

The hammām is a rectangular building, about 9.00m x 14.30m, which was probably covered with cupolas or vaults although nothing remains

⁴ Prior to the 2003 excavation, a line of boulders was visible on the surface further east, now beneath the spoil, which could indicate the presence of a third terrace.

of the superstructures. It lies roughly parallel to the wadi wall on the lower artificial terrace, 2.5m (east) to 1.5m (west) from the wall, at the altitude of c.21.00 (20.80m to 21.10m) (figures 5-6)⁵. To the south it is leaning against an upper terrace, at least 1.5m higher (altitude of present surface c.22.40m), whose retaining wall extended northwest to a big well contiguous with the wadi wall, c.7m from the hammām⁶. It seems to have extended northeast to the wall, thus entirely enclosing the lower terrace where the hammām and its service area stand. The access was from the east, down from the upper terrace along the wadi wall, probably with steps, although this part is now eroded. The height of the wadi wall superstructures above the level of the terrace is unknown, so we do not know whether the passage between this wall and the hammām looked like a corridor, or if the view was open on the wadi side. It was leading to the service area located in the western extremity of the terrace, between the hammām and the well.

3-1. THE ENTRANCE ROOM

The plan of the building shows three contiguous spaces lined from east to west. To the east is an entrance room (I, figures 5-7), c.7.50m long and 2.90m wide (21.75m²), which was accessible from the outside passage through a door in the north wall, about 1m wide and now mainly destroyed. To be level with the central part of the hammām which is erected on a hypocaust (see below), the floor of this room is c.90cm higher than the outside surface (altitude 22.00m) and it was accessible through three wide steps behind the door. The southern, back, part of the room is entirely covered by a wide platform, 3.10m deep and c.35-40cm high, slightly sloping from south (alt. 22.44m) to north (alt. 22.37m), which is also extending along the east wall, as a bench 70cm wide. The walls, floor, platform and bench are covered with a thick and strong beige/pinkish mortar.

⁵ Elevations are driven from GPS points associated with the WGS 84 / UTM area 40N repository.

⁶ It may be noted that hammāms are often erected below street level to facilitate water supply and temperature regulation, as in Yemen (Darles, 2014:220) or Iran (Floor and Kleiss, 1988).

The eastern wall of this entrance room, i.e. the outside eastern wall of the hammām, is poorly known. It is badly eroded from south to north, its northern end has nearly entirely vanished, as is the north wall. Its outside face could not be cleared due to the thick collapse from the upper terrace. The bases of three small coated niches are nevertheless still preserved to the south, c.35cm over the platform (figures 8). They are 30cm wide, at least 50cm high, and are spaced 40cm apart, the southernmost being positioned 30cm from the corner of the room. Their depth is unknown, as the width of the wall was not entirely cleared.

Backed by the upper terrace, the southern wall of the entrance room is that best preserved, up to 90cm high above the platform. Its thickness is unknown, possibly c.60-70cm, and the masonry visible on top, where the coating is broken, is made of boulders 25 to 30cm in width, bounded in an earthy and a rather soft mortar. Big boulders seem to have been used also to form the eastern and northern walls, some of them preserved in the lowermost course, up to 60cm in length. The masonry is here therefore quite different from the one used in the central part of the hammām, with smaller stones in a strong whitish mortar (see below). As a matter of fact, the southern wall and the lower preserved course of the northern wall are not bonded to the central part of the building but simply lean against its southeastern and northeastern corners, although the coating is the same. Thus it seems possible that this room is a later addition. But the continuity in the waste water evacuation system in all the building (see below) rather seems to testify to its contemporaneity, the differences in the masonries probably due to different technical requirements between the entrance room and the hot part of the hammām.

A filled basement lie under this entrance room, and it clearly was used as a dressing room (makhla' in Yemen, maslakh/mashlah in Syria/Lebanon, cemekân or soyunmalik in Turkish, sarbineh/sar-e bîna, sar(-e) hammām, or jâma-khâna in Farsi)⁷, a

⁷ As hammāms are foreign to Omani tradition, no local technical terms are known. Regional terms in Middle Eastern countries are varied, those mentioned in this paper are taken from: Darles, 2014:219 (Yemen); 'Abd al-Malik, 2014:204-205 (Saudi Arabia); Meier, 2014:751 and Table 3, Boqvist, 2014

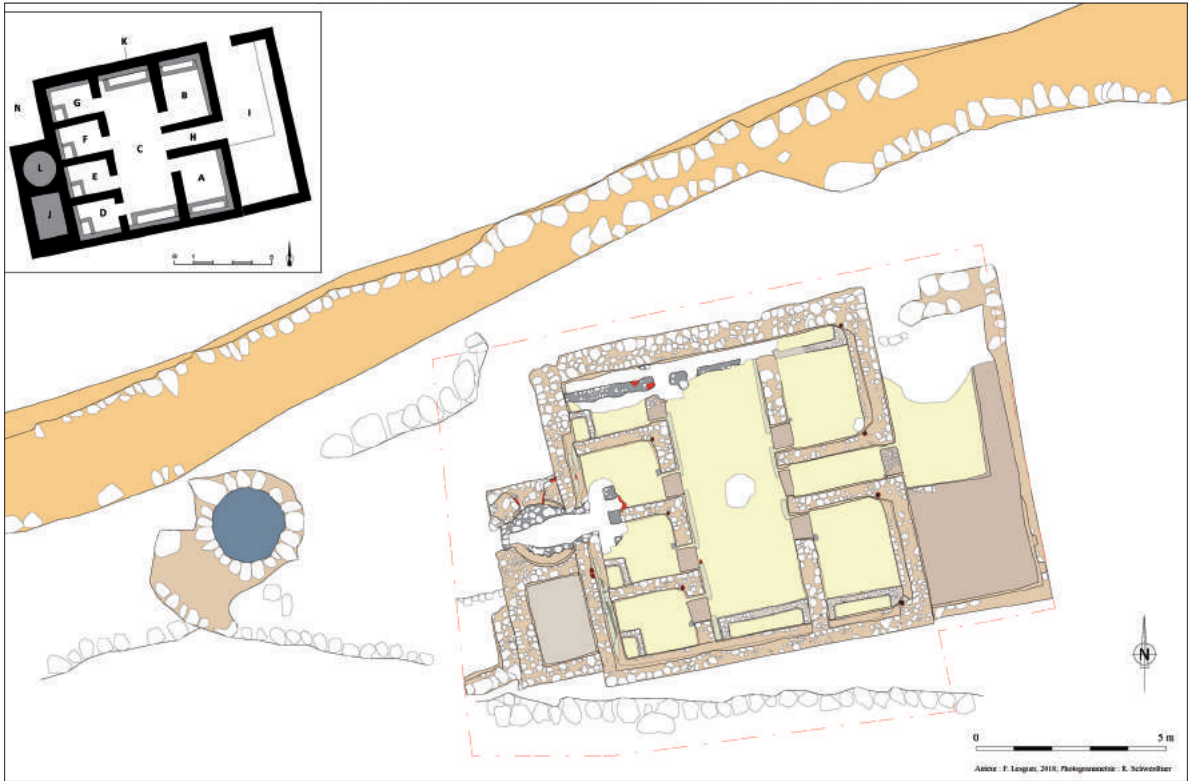


Figure 5. *Plan of the hammām.*



Figure 6. *Orthophotograph of the hammām during the conservation work.*



Figure 7. General view of the hammām from the east.

room at ambient temperature where the clients of the hammām could change, storing their personal belongings in the niches, and relax on the platform and benches (*dikka* in Yemen, *maṣṭaba* or *ḡulūs* in Syria). No trace was found of a central fountain or basin, a very common feature in the dressing room of Islamic hammāms. It was also probably the place where the person in charge stood to check and collect fees. , and

3-2. THE HOT ROOMS

A door 80cm wide opens in the center of the

(Syria, Jordan); Yasmine and Hindi, 2014:629-630 (Lebanon); Castiglia and Bevilacqua, 2008:307-311 (Albania); Rizopoulou-Egoumenidou, 2014:109 (Cyprus); Floor and Kleiss, 1988, Sarmiento and Kazemi, 2014:139-140, Akbari and Nikpour, 2015 (Iran).

western wall of the entrance room, near the platform, with jambs 40cm wide, thickened by an additional layer of mortar, 5cm thick, on both sides (figure 7). It opened onto a corridor (H), 90cm wide and 3.20m long, which leads to a longitudinal space (C) which crosses the entire building north-south, 7.60m long and 2.60m wide (c.19.75m²). Six rooms open onto this central space: two large ones (A and B), 2.20 x 3.00/3.20m (6.80m²), are located east, and flank the corridor, and four smaller ones (D-G), 1.90m to 2.00m long and 1.60m to 1.65m in width (2.65m²), are on the opposite west side (figures 5-6).

This main part of the hammām (*ṣadr* in Yemen, (*bayt al-*)*wast/.**ânî* in Syria, *ḡuwwānī ḥarāra* in Lebanon, *sicaklık* in Turkish, *garmkhaneh/garm-ḵhāna* in Farsi) was built as a single architectural unit (figure 5). The lower courses of the walls are

made in cobbles from small (c.10cm) to medium (20-25cm) size, together with some coral blocks, embedded in a thick white-pinkish mortar with many inclusions of coarse gravels (1-2cm) (figures 9 and 10); the upper courses, when preserved, show a larger proportion of coral⁸. The peripheral walls measure c.70/75cm in thickness at their base, but only c.45cm in their upper reaches, above a narrow bench 19/20cm in width and 40/45cm high which lines these four walls (see below). The walls between the central space and the western and eastern wings are 45/47cm thick, and the partition walls between the rooms and/or the corridor are 30/32cm thick. Except for the northern destroyed part, they are preserved at least to 50cm in height, 170cm for the southern wall which is backed by the retaining wall of the upper terrace. All rooms are coated, on the walls and floors, with a strong and smooth beige hydraulic plaster (saruj), a later one, slightly coarser, being visible in some parts. The average level of the floors is slightly lower than the one in the entrance room, altitude between 21.85m and 21.95m, depending on the room (see below 3e).

All the rooms, except the entrance corridor, contain a basin or a tub, which is surrounded by a low wall, 15/18cm thick and 35/40cm high, with the summit rounded (maghtas in Yemen, aḡrān/aḡrina/ḡurn in Saudi Arabia and Syria, maghtas or kurna in Turkish, khazineh/kazīna in Farsi). The small hot rooms (zulmi in Yemen, khilwa in Saudi Arabia, khalwa, maqṣūra or bayt ḥararāt in Syria, halvēt in Turkish, khalvat in Farsi) D-G have a small basin c.55cm x 40cm in the southwestern corner (figure 9). The large ones A-B have a tub c.1.50m long and 35/39cm wide which lines the interior of the southern and northern walls (figure 10). Due to the presence of a vertical pipe in the corner of the walls (see below) the east peripheral wall of the tubs is wide and forms a small platform (figure 11). The central room C, has a larger tub, 2.00m long and 40cm wide, against the southern wall, possibly also against the northern wall now destroyed, although this should make the waste water evacuation more

⁸ The collapsed fragments of the upper parts of the walls which were excavated during the 2003 expedition consisted mostly of coral clumps (T. Creissen personal communication).

difficult. A smooth greyish coating covered the basins and tubs.

All the rooms were equipped with a door c.70cm wide which opened inwards and, when closed, abutted a threshold raised 5-10cm above the level of the floor. The imprint of a rectangular socket for the pivot of the door is visible in each room in the floor (figure 9). The entrance corridor had one door at each extremity, this central part of the hammām thus being clearly separated from the entrance room. Fragments of arched barrel-vault masonries were found during the 2003 excavations near the door to room A and passageways could have been surmounted by an arch (Vosmer, 2003:12).

3-3. THE HYPOCAUST

After the superstructures of the fortification wall collapsed into the wadi bed the hammām was strongly eroded toward its northern end. Its northern wall was nearly entirely destroyed together with parts of the attached floors, and this revealed that the central part of the building was erected on top of a hollow basement, the floor of which was covered with a layer of ashes and fragments of masonry from the roof (figures 8). Although narrow and difficult to access, we cleared it as much as possible for conservation purposes, from the north but also from the west where parts of the floors were destroyed in rooms E and F. Its plan can therefore be reconstructed with some certainty (figure 12).

The basement ceiling measures 105cm in height. The level of its floor is at alt. c.20.80m, slightly under the surface of the terrace and slightly over the natural bedrock in the area, which seems to be rather irregular and was reached at 20.52m in the fire chamber, 20.76m in the nearby entrance of the basement. Therefore the hammām probably was built directly on the natural ground, perhaps more or less smoothed, before the artificial terrace was levelled with a backfill against the wadi wall. The peripheral walls are 70cm thick and are comprised of boulders (c.30-35cm), as are the lower courses of the superstructures which were built in connection. The northern wall rests on a wider row of larger



Figure 8. *General view of the hammām from the north.*



Figure 9. *General view of room D.*



Figure 10. *General view of room B.*

boulders bounded with mortar, as a foundation. The interior space measures 92cm from the floor to the ceiling, and is divided into three separate parts by a west-east wall which runs under the partition wall between rooms E and F and subsequently divides itself in two branches which underline the middle part of the central room C and then the corridor H. This central part of the basement was most certainly backfilled, when the northern and southern parts were empty, acting as two hypocausts (*shawāri'* in Yemen, *zuqāqāt* in Syria, *sarādīb* or *külhan* in Turkish, *gorbehro* in Farsi). In each hypocaust east-west rows of small pillars support the walls and floors of the hammām. According to the location, two to four rows occur, 30cm wide and regularly spaced 35cm apart.

Two different qualities of masonry occur in the northern hypocaust, which was entirely cleared. In the western third, near the fire chamber which stands against the western wall of the hammām (see below), beneath the small rooms D-G, the hypocaust

is particularly well built (figure 13). Here the pillars are quite regular, slightly pyramidal, ranging from 34 to 28cm in width, and are spaced about 40cm apart in the row (72cm for the intercolumniations from axis to axis). They are 47cm high and are entirely covered with a plain and even plaster coating similar to that of the floor. Two red baked bricks which are leaning one against the other to form a triangular intrados culminating at 72cm, top the openings between the pillars. The bricks are 3.5cm thick, generally 33cm long and 28cm wide, although the dimensions may vary, resulting in asymmetrical arches. The upper part of the arcades, 30cm wide and up to 20cm above the arches, is fully masoned with pebbles (10cm maximum) mixed in a thick yellowish mortar which often is burnt. It is covered with a rough coating now preserved only in traces. The eastern two-thirds of the hypocaust are less well-preserved, probably because they were built in a coarser way (figure 14). The pillars are less regular in form and the arches are often

destroyed, seemingly only corbelled as no traces of brick occurred in this area.

These lines of pillars support a roof which acts as the sub-floor of the hammām proper. The western part of this roof consists of rectangular red bricks, 50 x 28cm and 7cm thick, contiguously set across the compartments (figure 13). To the centre

and east limestone slabs occur (figure 14). On this surface a thin level of plaster lies topped by a concrete layer of medium pebbles in strong cement (thickness 5.5cm), which is in turn covered by the two successive floors (2cm and 2.5cm). The total thickness between the hypocausts and the hammām therefore reaches 17cm (figures 8 and 14).



Figure 11. *The tub in room A.*

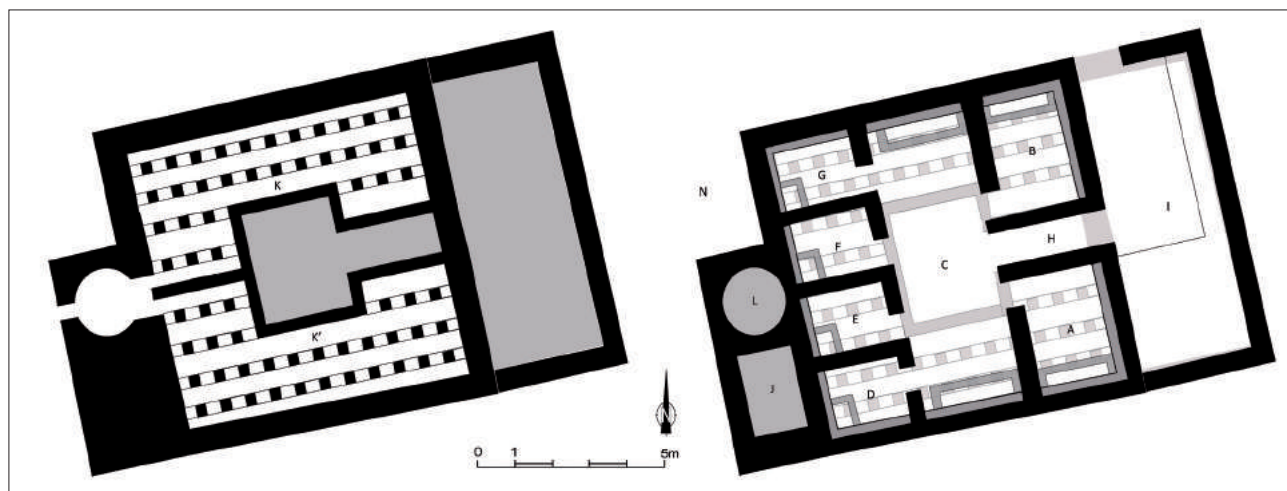


Figure 12. *Schematic plan of the hammām: ground level with hypocausts (left) and upper main floor (right).*



Figure 13. *The northern hypocaust, west part under the hot rooms F-G.*



Figure 14. *The northern hypocaust, east part under the central room C.*

3-4. THE SERVICE AREA

The passageway between the northern wall of the hammām and the wadi wall leads westwards to a small courtyard at the back of the building (N) which could have been closed by a fence given the presence of a line of boulders at the end of the passage (figures 5 and 6). Roughly triangular in plan, this service area was bordered by the fortification to the north, by the well and the retaining wall of the upper terrace, now collapsed, to the southwest, and by the hammām to the east. Here, against the centre and southern part of the western façade of the building, a massive rectangular construction stands 2 x 5.30m and still preserved to 2.20m in height, which shelters the fire chamber and two water tanks (figures 5, 6 and 15).

- THE FIRE CHAMBER

The fire chamber (*milla* in Yemen, *bayt* (al-) *nār* in Saudi Arabia and Syria) is located inside the north part of the massif, in the axis of the hammām. It was unfortunately partly destroyed together the western wall of the hammām on top of the alandier and the floors of rooms E and F, and thus cannot be described in detail. Nevertheless we can identify its two chronological phases (figure 16).

During the first phase the fire chamber was circular, 1.80m in diameter with walls c.60cm thick. It was dug down to the bedrock (alt. 20.52m) and it was covered with a dome culminating c.1.50m higher, corbel-built with bricks, the imprints of which still are visible in the extant mortar. In the lower part of the western wall a door enabled the users to fuel the fire and rake out the ashes. In the opposite eastern wall was the alandier, a passageway 1.40m wide leading to the north and south hypocausts, on both sides of the plain wall; due to the collapse of the wall of the hammām, the height of this passageway is unknown, possibly not much lower than that of the hypocausts, 90cm. An opening with converging walls, 90cm wide outside and 40cm wide inside, is located in the northern side of the massif (figure 15). Its base is

at the altitude 21.64m and the top is not preserved, seemingly an arch or lintel made of corbelled bricks and stone slabs, starting at alt. c.22.10m. It therefore opened onto the outside face of the dome of the fire chamber, and its function is unknown.

The chamber deteriorated and was repaired. The fireplace was reduced to a narrow corridor between the door and the alandier by the construction of two stone features flanking both sides of the ancient circular chamber, which were covered with a thick clay coating now only partly intact, and the stones themselves burnt black. The new fireplace is 0.80m wide; the width of the western new door is 0.40m, with a new passageway built of a few courses of stone on top of ash layers from the previous fire chamber, the threshold at alt. 20.83m, i.e. 30cm beneath the surface of the courtyard outside. The width of the new access towards the hypocausts was reduced to 0.50m. The summit of the new fire chamber masonries reaches the base of the original dome and covers the lower imprints of the bricks, so it is not clear whether the dome was entirely destroyed, or only weakened, the masonries built to reinforce its base. The evolution of the north opening is unknown.

This fire chamber was filled with “a very deep layer of charcoal” (Vosmer, 2004:397) As it was not completely emptied during the 2003 excavation, it was possible to study the lower part of the filling, which includes successive layers of ashes, black and white, charcoals and burnt fish bones over a lower layer of reddened clay floor on top of disintegrated bedrock (figure 17). In 2003 the excavator interpreted the fish bones as possible traces of squatter occupation (*ibid.*), but it is possible that the fire in the hammām, as in the pottery kilns B41, was partly fueled with fish remains and also possibly with other organic materials. In reality one of the main problems met in the management of a hammām is the fuel supply.

- THE WATER TANKS

On top of the fire chamber a circular boiler tank stands (*barma* in Yemen), c.1.70m in diameter, now



Figure 15. Zenithal view of the western massif with the fire chamber and tanks.

mostly destroyed (area L). The depth of this tank is unknown, at least 50cm deep, but possibly much more. It was most probably covered to help keep the water warm which was heated by the fire below. Immediately south of this tank, in the southern part of the extension, a rectangular tank (*minqāṣa* in Yemen), 2.10 x 1.50m, is located atop of what seems to be a massive basement as no access to a subfloor inside chamber is visible. The bottom of this tank is situated an average 35cm higher than the floor of the circular tank nearby (see below). But it is approximately at the same altitude as the present surface of the upper terrace lying to the south. This tank for cold water stood possibly in the open air. Its original height is

unknown, as it now is only preserved up to 30cm in height. The water was most likely replenished by means of a channel, now destroyed, located on top of the retaining wall of the high terrace and linking the northwestern corner of the tank and the well which is situated a c.7m to the northwest.

- THE WELL

Inside this well measures 1.90m in its width, its upper part built by a surrounding wall 1.00/1.10m thick mainly made of two facing of large boulders (up to 50cm) with a filling of cobbles (10-15cm). Now it is some 12m deep and is filled with debris (figure 18). It was not dug into the level of the terrace, but rather was built prior to the erection of the wadi wall, starting from the level of the water table in the wadi bed, its back side most probably cut in the edge of the bedrock ridge of the bank, at least in its lower section. The builders then erected the wadi wall against it. The well is now partly eroded on its northern side but to the south its mouth reaches the level of the upper terrace where it is bordered by a massive platform of small stones bounded in a very strong pinkish mortar, c.1m high. This is probably the coping layer of a channel which leads from the well towards the cold water tank of the hammām.

3-5. AIR AND WATER CIRCULATION SYSTEMS.

Four different air and water circulation systems served the hammām (figure 19).

- WARM AIR CIRCULATION.

The hot air produced in the fire chamber was drawn through the alandier into the hypocausts on both sides of the separating wall, thanks to an air flow between the door of the fire chamber to the west and vertical terracotta pipes in the corners of the rooms to the east, which acted as flues from the hypocausts to the roof of the hammām (*maḍārid* in Yemen)⁹. One such conduit is located inside each

⁹ Fragments of such pipes occurred in quantity in the collapse layer during the 2003 excavation (T. Creissen personal communication).



Figure 16. *The fire chamber.*



Figure 17. *Section in the fire chamber showing layers of ash.*



Figure 18. *The well west of the hammām, from the northeast.*

of the small rooms D-G, in the northeastern corner, two are located inside the large rooms A and B, in the northeastern and southeastern corners. The pipes average 10cm in diameter and are masoned alongside the corner which therefore shows a bevelled profile (figures 9-11). Thus these rooms were heated through the floor and also through some of the walls. We located no pipe in the central room C, and its central part was insulated from the heat of the hypocausts thanks to the underfloor filling, its northern and southern extremities only, below the tubs, being heated. As for the corridor, it was also protected from the heat of the hypocausts as a result of the filling in the basement below, and from the heat of the rooms by the door.

- HOT AND COLD WATER CIRCULATION

The hot water from the circular tank, L and the cold water from the rectangular tank J were drained to the hammām by means of two small ceramic pipes which penetrated the wall at the floor of each tank (figure 20). The pipes from L are nearly entirely destroyed, those in the northeastern corner of J are conical, smaller in diameter on the tank side (5cm) than in the hammām (12cm), possibly to reduce the water flow. They lead to two separate canalization circuits, one turning right and supplying water to the southern half of the building (rooms E and D, then C and A), the other one turning left to the northern half of it (rooms F and G, then C and B although this part is destroyed) (figures 10, 11, 21, 22). These canalizations were made of cylindrical terracotta pipes fashioned in sections 45cm long and 8.5cm in diameter (*sawāqī* in Yemen). One end narrowed to 6.5cm in order that the pieces could be fitted together. They are set in thick mortar on the benches against the peripheral walls, the cold water canalizations on top of the hot water ones as the rectangular basin is c.30cm higher than the circular one (alt. 22.53m, 22.22m at the opening of the pipes). Only the benches against the eastern walls of rooms A and B do not support anything.

Although very little is left today of the pipes and their mortar, the canalizations were carefully masoned on top of the benches, which so were elevated a further c.40cm. The perpendicular partition walls of the rooms seem to have been built afterwards, at least in the lower extant part which leans against an initial coating of the benches (figure 20). To the south, the walls on both sides of room C abut the bench in their lower part, their upper part built in connection with the peripheral wall over a corbel made of limestone slabs projecting out of the façade of the wall 70cm above top of the original bench, 30cm over the canalization (figure 11). The façade of the wall between canalization and corbel show the same coating as the rest of the wall and therefore seems to have been left empty, although the presence of a hole in the partition walls between the central room C and rooms A and D is difficult to explain.



Figure 19. *Photogrammetric plan of the hammām and plan of the water circulation systems (red: hot water / blue: cold water / green: waste water).*

Nothing remains either of the system of taps which certainly were located in the pipes up the basins and tubs to enable the supplying of water in each room. The detailed study of the levels of the southern system shows that the benches, and therefore the pipes, were slightly sloping up, the altitude from 22.28m in room E to 22.38m in room A, probably to control the water flow and therefore to avoid waste.

- WASTE WATER CIRCULATION

The last circulation system of the hammām is the one to evacuate effluent waste water from the basins and from the cleaning of the rooms out of the building. All of the floors in the rooms, basins

and tubs, show different inclines which converge towards a drainage system. Each basin or tub has a floor sloping in the direction of a small pipe at the base of the peripheral small wall, which sometimes is masoned, sometimes in terracotta (figures 11 and 20). The slope is about 5cm in the basins, 7cm in the tubs, and the diameter of the pipe is c.3cm. The floors of the rooms also are inclined from the exit of the tub pipe and the periphery of the room to the door, a slope of about 7/8cm in the large rooms, A-B, and 3/4cm in the small ones, D-G. The water was then evacuated to the central space C by means of a gap in the raised thresholds along one of the jambs, as a small channel about 10cm deep and 10cm wide (figures 9 and 10). Waste water



Figure 20. *The hot and cold water circulation systems from the tanks and on the benches; and the waste water canalization from the basin in room E.*

from the entrance room was evacuated to room C through similar channels along the northern side of both thresholds of the corridor. All channels in the thresholds were connected to similar perpendicular channels running along the western and eastern sides of the central room C. In front of each door they lie below the floor of the thresholds and room C, as terracotta or masoned pipes (inside diameter 8cm), with an overall slope of c.15cm between the south and north sides of the room. The two channels then transgressed the now destroyed northern wall of the hammām, either through two separate exits or connected into a single one, depending whether a tub was located against the northern wall or not. Ultimately the effluent flowed down into the wadi bed through the fortification wall, although nothing of this remains.

3-6. OPERATION OF THE QALHĀT HAMMĀM

The distribution of rooms and the air circulation

system help us to understand the functioning of this hammām. As already mentioned, the hypocaust system passes below rooms A, B, D, E, F, G and under the extremities of room C. Moreover, the arrangement of the chimneys enables the draft of hot air to reach rooms A and B. All these are therefore hot rooms. Indeed, in the plans of medieval hammāms, the hypocaust and the chimneys are only found in the hot rooms (Cherif, 2014:245) and, generally speaking, chimneys make the difference between hot and tepid rooms. Except in the case of monumental hammāms where the hypocausts and chimneys extend below the tepid rooms in order to heat them weakly (Cherif, 2014:246).

In the classic distribution of the rooms in a hammām one proceeds first from a dressing room, then to tepid rooms, and finally to hot rooms. The originality of the Qalhāt hammām results from the fact that this building has no tepid rooms (*awsaṭ* in Yemen, *wuṣṭānī/waṣṭānī* in Syria, *waṣṭānī ḡuwwānī* in Lebanon, *soğukluk/iliklik* in Turkish). The circulation in this hammām passes directly from

the dressing room to the hot rooms, except for the corridor H with its two doors, which could have acted as a kind of transition chamber.

Another singularity of this hammām is the probable absence of a steam circulation system. Usually an opening in the boiling room leads the steam from the barma into one of the hot rooms. Here, the arrangement of the small rooms E and F does not plead for the hypothesis of such an opening. The steam was therefore most probably produced directly from the water spilled by the users on the floor heated by the hypocaust¹⁰.

In the medieval period, two types of hammām plans exist, the retrograde linear plan, of Roman tradition, and a plan which centers on a main room, of Byzantine tradition (Ecochard, 1940). At Qalhāt the plan centers on the central room, C.

A hypothesis of general circulation in this hammām is possible. After undressing in the entrance room, the users access to the main hot room C to sweat directly on the floor. Then the massage and the soaping phase begin to remove dead skin. This phase can occur in the central room C or in the large rooms A and B. Visitors could rinse themselves directly with warm water from the tubs. Then the intimate toilet could be done in the small rooms D-G using the basins. Finally to relax, the visitors could return to the changing room.

The partial destruction of the fire chamber does not enable us to understand fully how it functioned. However, repairs in the fire chamber often are necessary because this part of a hammām deteriorates the fastest and requires the most maintenance. Probably, the bottom masonry of the hot water tank contained a metal sheet (dast in Yemen), a common feature aimed at facilitating the heating of the water; this should explain why this part of the building has been plundered and destroyed. As for the use of fish bones as fuel, it is rather uncommon. However, the use of faunal remains is attested in some occasions, as in the 5th century baths of Bosra in southern Syria (Fournet

¹⁰ C. Darles explains that, in present-day Yemeni hammāms, visitors come to sweat. They lay directly on the ground over-heated by the hypocaust, which is regularly sprayed with water in order to produce steam (Darles, 2014:221).

and Lepetz, 2014:616) or in a hammām of the 19th century in Mecca (Abd al-Malik, 2014:203).

4. CONCLUSION

The hammām of Qalhāt is an extremely interesting building. It is, first of all, the only hammām ever built in Oman, past and present, and as such it is a unique testimony of the Omani architectural heritage, and a main asset for our knowledge of the history of Qalhāt. No detailed information was published about the ceramics collected during the 2003 excavation¹¹, and the material excavated in 2015 is extremely scarce and undiagnostic. The dating of the building is therefore not known. It is nevertheless more than probable that it was founded during Qalhāt's heyday, under the reign of Ayāz and Bībī Maryam (c.1280-1320 C.E.); especially as it is clearly contemporary with the creation of the northwestern gate, which also included the building of the terrace, of the well and of the fortification wall, a huge masterwork. The hammām was probably in use throughout the 14th century, and at least during part of the 15th century, but the date of its abandonment remains unknown. Maintaining a hammām requires an important investment and it is possible that it was abandoned when the city declined in the 15th century, well before its sack by the Portuguese in 1508.

Qalhāt's hammām differs from others in the Middle East, during the pre-Islamic and Islamic periods¹², and it is therefore of great interest for our knowledge of this very specific type of buildings, and for the history of Islamic architecture as well. The bathhouse tradition in the Arabian Peninsula is rather recent and, at the moment, no example has been found yet for the pre-Islamic period in this area (Darles, 2014:216). However, the presence of

¹¹ According to the preliminary report of the previous excavations, "from the pottery that was recovered, the structure appears to have been in use over only a few centuries, from perhaps the 13th into the 15th or 16th century" (Vosmer, 2003:13), but this pottery is said to derive from the floors and from the collapse layers.

¹² Around 500 hammāms, dated from the antique period to the present, were recorded in the Eastern Mediterranean world in the course of the Balnéorient Project (Boussac et al., 2014:5).

baths is attested at that time in peripheral regions. In Jordan, several baths from the Nabataean period are known, as at Jabal Khubthah (Tholbecq et al., 2015), Khirbet ed-Dharih (Durand, 2015), and Sabra (Fournet and Tholbecq, 2015). In Egypt, baths existed since the third century B.C.E. (Boussac et al., 2014:2). In Mesopotamia and Persia, the building of public baths has been multiplied during the 6th and 7th centuries, symbolizing the alliance between kings and non-Magian leaders (McDounough, 2009:272).

In Arabia, the earlier recorded hammām dates to the beginning of the Umayyad period. Many hammāms were thereafter in activity during the Umayyad and especially the Abbasid periods, on the hajj roads as in the holy cities of Mecca and Medina ('Abd al-Malik, 2014:200). In the mid-10th century other hammāms were built in San'a in Yemen, a country where 70 such structures, ancient and recent, are registered to-day; they are located in seventeen cities of the highlands and mountains, but none is found on coastal towns, or in Hadramawt except at the pilgrimage site of Qabr Hūd (Darles, 2014:216). In Bahrain, a part of a medieval hammām of the 14th-15th centuries was excavated under the late Hormuzi layers at Qalhat al-Bahrain (Kervran et al., 2005:331-334 and pl. 87-91). One room only was cleared, 4.10m x 2.60m. A rectangular basin 1m x 1.70m was located in its northwestern half, fed with water from the adjacent room thanks to a channel on a narrow bench 1m high against the northeastern wall. The room was covered with cupolas and had a door in the southern corner. A hammām was also excavated in a house on Hormuz Island but no further detail is published about it (Bakhtiari, 1978).

Data on 14th century Arabian hammāms is therefore very scarce, and this makes difficult the comparison work and the study of the architectural influences at work in the hammām of Qalhāt. Between the 12th and 14th centuries, two systems of rooms distribution coexist, notably in Damascus (Sibley and Jackson, 2012:158). The first one is a retrograde linear organization where the bathing spaces are organized along an axis. The second

one is a central organization around a main room. The origin of the centred plan is not certain. M. Ecochard considers that this organization has a Byzantine origin (Ecochard, 1940:51-112), whereas N. Ergin argues that it is an influence of the Persian iwans in the Seljuq hammāms of the 12th century (Ergin, 2015:546). In the neighboring regions, the earlier excavated hammāms have linear plans, as in Siraf in Iran (Whitehouse, 1971:11) or in Khirbat al-Dusaq in Jordan (Vigouroux et al., 2015). Moreover, during this period in Cairo the hammāms did not have hypocausts (Abu al-Futuh, 1999:97). N. Ergin notes that in Anatolia, the Seljuq hammāms had a plan which centered on the hot rooms (Ergin, 2015:546) at a time when contemporary hammāms in Damascus had a centered plan on the tepid rooms (Sibley, 2007:279).

In Qalhāt the hammām has a centred plan on the hot rooms and a hypocaust, which could thus indicate a Seljuq architectural influence. As is the case for the nearby Bībī Maryam mausoleum, the Turkish origin of the Hormuzi governor Baha al-Din Ayāz Seyfin and his wife Bībī Maryam¹³ possibly explains this influence. In all cases, their Hormuzi background explains the presence at Qalhāt of such a public facility, totally foreign to local traditions.

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¹³ Both were ancient Turkish slaves of the Hormuzi prince Mahmūd al-Qalhātī.

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CONTRIBUTORS ADDRESSES:

Dr Axelle ROUGEULLE

National Centre for Scientific Research - lab The Orient & The Mediterranean (CNRS-UMR 8167), 27 rue Paul Bert, 94200 Ivry sur Seine - France, arougeulle@gmail.com , +33 666 72 01 84.

Fabien LESGUER

Doctoral student at University Panthéon Sorbonne - Paris, CEFAS USR 3141, lab Orient & the Mediterranean (CNRS-UMR 8167). fabien.lesguer@gmail.com