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The Red Sea in Pharaonic Times

Recent Discoveries along the Red Sea Coast

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**Mahmoud Abd el-Raziq, Georges Castel,
Pierre Tallet, Grégory Marouard**

The Pharaonic Site of Ayn Soukhna in the Gulf of Suez 2001-2009 Progress Report*

For over twenty years, from 1976 to 1999, the site of Mersa Gawasis remained the sole example of direct contact between pharaonic civilisation and the Red Sea. The site of Ayn Soukhna was first brought to attention in 1999[1] (Abd el-Raziq, 1999) and has been studied since 2001 by a joint team from the Institut français d'archéologie orientale and the University of Paris-Sorbonne. Recent archaeological excavations at the site have firmly established that it was used extensively throughout most of the pharaonic era in much the same way.[2] Ayn Soukhna lies on the western coast of the Gulf of Suez [fig. 1]. It is in fact the Red Sea site closest (some 120 km of sand tracks across the Eastern Desert) to the region of Memphis, which was probably the most ancient capital of the unified Egyptian state. In addition to this privileged situation and connection with a major administrative centre, the site enjoys other advantages: the harbour is sheltered from the prevailing north wind, there is no coral reef, and a small oasis has developed around the hot water spring that lends its name to the whole area. The archaeological site *per se* covers a 500 m × 300 m area between the foot of the 800 m Galala el-Baḥariya mountain overlooking the site and the present-day coastal road to Hurghada farther south. When the site was first discovered, interpretation was hampered by numerous modern installations—several pipelines and a high voltage power line, rubble

* All the illustrations are published by "mission Ayn Soukhna".

1. Abd el-Raziq 1999.

2. All the rock inscriptions that were apparent when the site was discovered were published, together with a detailed description of the site, before the start of the actual excavations (Abd el-Raziq *et al.*, 2002). The results of the successive fields seasons, reflecting the evolution of our interpretations of the site, have been made public through regular publications (Abd el-Raziq, Castel, Tallet 2004; Abd el-Raziq, Castel, Tallet 2006; Tallet 2006) and yearly preliminary reports in the *Bulletin de l'Institut français d'archéologie orientale* and *Orientalia*. A first study of the ceramics (Defernez 2004) and regular updates on the epigraphic material (Tallet 2002, 2003a, 2003b, 2005) are also available. The archaeological field work on the site has been made possible thanks to the generous funding of a number of French companies with Egyptian branches: we would like to thank Total Egypt, Edf-Egypt, Gaz de France, Air Liquide, la Société du Métro du Caire (Bouygues et Vinci), and Colas Rail for their help.

from construction work for a road and a hotel on the coast, probably partly erected over the archaeological remains [fig. 2-3]. The most visible component is a large cliff face overlooking the site, which features some fifty hieroglyphic, hieratic, Greek and Coptic inscriptions, thus providing a general picture of the site's history and use over several millennia [fig. 4].

1. The Rock Inscriptions

The pharaonic period that is best represented among the inscriptions is the Middle Kingdom, with several reports on missions undertaken at the site providing the specific year of a pharaoh's reign. The most ancient of these engraved stelae bears the name of the last king of the 11th dynasty, Mentuhotep IV (ca. 2000 BCE): beneath the ruler's full-length representation and titulary, three columns of text outline the expedition:

> *rnpt-zp 1: jwt mšʿ n nswt; ṯnw n mšʿ pn 3000 n s r jnt mfkȝt, bjȝ, ḥsmn (?), jnw nb(w) nfr(w) n ḫȝst*
>
> *Year 1, arrival of the king's men; workforce: 3000, to bring back turquoise, copper,[3] bronze (?) and all fine products of the desert.*[4]

The text provides some idea of the size and importance of the site, which seems to have harboured large expedition crews, judging from the figures mentioned. Another stela found next to this document provides supporting evidence: it mentions 4000 men recruited for the same purpose a few years later, in the reign of Amenemhat Ist, successor to Mentuhotep IV and founder of the 12th dynasty.[5] Even more significant is the mention of turquoise, a stone that ancient Egyptians could find only in South Sinai. The inscription therefore seems to point to a close connection between Ayn Soukhna and the Sinai Peninsula, which is corroborated by two other documents:

– a hieratic inscription from year 9 of Senusret Ist (Amenemhat Ist's successor) indicates that an official was sent to the "Mining land", a phrase which, at the time, referred specifically to the mining zone in Sinai.[6]

– an inscribed stela from Year 2 of Amenemhat II, towards the end of the 12th dynasty (ca 1850 BCE) lists the names of several officials on an expedition which took them through Ayn Soukhna.[7] One of them, Ity, son of Isis and "repeller of scorpions"—a rare enough title—is also mentioned on two inscriptions dating from the same year found at Wadi Maghara, the heart of the Sinai mining zone.[8]

3. The word *bjȝ* might be followed by *ḥsmn* (amethyst, bronze or natron) here but this is debatable since the signs that make up this second word could also be determinatives related to the first word.
4. Abd el-Raziq *et al.* 2002, fig. 10-11.
5. Abd el-Raziq *et al.* 2002, p. 42-43, fig. 12.
6. Abd el-Raziq *et al.* 2002, p. 57-58, fig. 28.
7. Abd el-Raziq *et al.* 2002, p. 44-47, fig. 13.
8. Gardiner, Peet, Černý 1955, pl. X, no. 23; pl. XI, no. 24.

From the start, the epigraphic data thus suggested that the newly discovered site was indeed a stopping-off point on the route to the other side of the Gulf of Suez. It did not however, at this stage, provide any evidence for a seafaring route, as the troops might also have made their way around the gulf to reach their destination.

2. The Storage Galleries

Excavations undertaken at the site gradually yielded some answers to this pending question. Ten galleries carved into the sandstone mountain were found at the foot of the engraved rock face. They are all roughly on the same level (14 m above sea level) and share many common features: they are rectilinear, about 2.5 m wide and 2 m high, with a length ranging from 15 to 20 m. Most of them were fitted out with a sturdy access ramp and originally had a door. The entrances to three of these galleries were enclosed in a well-built rectangular structure, measuring 13 m × 4 m [fig. 5]. The building was accessed through a door facing east, opening onto a large hallway; the roof was held up by wooden columns whose postholes in the ground are still visible nowadays. All this shows that the galleries were meant to be used both as living and storage quarters.

The collected archaeological data suggests that most of the galleries were used extensively throughout the Middle Kingdom. Abundant ceramic material dating to the 12th Dynasty has been found, with some still bearing hieratic inscriptions in ink. For example, a large grain storage jar found in the entrance to gallery G7 was labelled "the treasurer's assistant Iky, 6 measures *heqat* <of grain>" in characteristic late 12th dynasty palaeography. Metallic objects dating to the same period were also found, such as a gold pendant with a herringbone pattern embossed in gold, which has an exact counterpart in the Dahshur jewellery from the reign of Senusret III [fig. 6]. The most interesting finds for the interpretation of the site were made in galleries G2 and G9, right next to the east wall of the leaning building: two large limestone stone anchors, of a coarser shape than those at Wadi Gawasis, were unearthed in the entrance to gallery G9 [fig. 7]. When the two galleries were investigated, the charred remains of two Middle Kingdom ships were found, which had been carefully dismantled and stored in a very specific order [fig. 8]. Up to five layers of large cedar planks, some 10 cm thick and 30 cm wide, were stacked in three parallel rows. They all bear traces of a type of fastening that combines mortise-and-tenon joints with ligatures and is characteristic of Egyptian shipbuilding techniques [fig. 9]. The systematic use of double joints, which probably helped strengthen the overall structure, seems to have been a specific feature of seagoing vessels. In any case, the boat remains found at Ayn Soukhna share this characteristic with similar boat remains from Mersa Gawasis dating to the same period. The timbers were laid out on wooden poles, which may have been part of the rowing equipment. From the detailed analysis of the vestiges by Patrice Pomey,[9] which is still underway, it can be preliminary concluded that these were the remains of two distinct boats, both 14 to 15 m long.

9. See *infra* P. Pomey, "Ships remains at Ayn Soukhna", in this volume.

This finding corroborates the indications found in the epigraphic sources: the Egyptians were masters in the art of assembling and dismantling seafaring ships for intermittent use. The ships, which were initially built in the Nile valley, were carried across the desert as "ship kits" and reassembled on the coast for maritime navigation. Upon return, they would be taken apart again and stored close to the shore in boathouse type galleries, ready for the next expedition. Paradoxically, the ship remains at Ayn Soukhna have survived into the 21st century—they are probably the oldest attested seafaring ships to date—the heat from the fire caused the ceilings of the galleries to collapse onto the smouldering wood remains, which actually sealed them into place. At this stage in our interpretation, it would be tempting to see Ayn Soukhna and Mersa Gawasis as two contemporaneous interrelated facilities, one meant for long maritime expeditions further down the Red Sea, and the other for small-scale shuttle navigation to the other side of the Gulf of Suez requiring only one or two days in smaller crafts. However, the latest discoveries at Ayn Soukhna suggest that the navigating pattern was actually even more elaborate.

In fact, all the evidence available clearly indicates that the site at Ayn Soukhna was developed and used extensively during the Old Kingdom, contrary to what was initially inferred from the analysis of the rock inscriptions overlooking the site. The "lean-to building" and gallery complex are obviously part of a coherent design dating to the Old Kingdom, as shown by the ceramics found in the area, which point to an already significant occupation of the site over the second part of the 4th dynasty. A collection of cylinder-seal imprints, which were found in the entrances to the galleries, feature the Horus name of Khafre, the 4th king of the 4th dynasty (ca 2570 BCE) as well as those of Niuserre, Djedkare and Unas, respectively the 6th, 8th and 9th sovereigns of the 5th dynasty (ca 2450-2350 BCE). In gallery G5, most of the ceramic found on the ground comes from dozens of large broken storage jars dating to the Old Kingdom. Some still bear engraved hieroglyphic inscriptions allowing for their owners to be identified—the "inspector of the auxiliaries Ankh" (*sḫḏ nfrw(w) ꜥnḫ*) is thus known to have stayed at the site, probably during the 5th dynasty. In much the same way a hieratic ostracon found in gallery G2 under the layer of boat remains bears testimony to the existence of "the director of the shena-workshop Nefer-khu-wy" (*jmy-r pr šnꜥ Nfr-ḫw-wj*), an Old Kingdom official. Finally, the excavations have yielded at least five official inscriptions dating to the end of the Old Kingdom. One, in the entrance to gallery G9, makes use of the toponym "Terraces of turquoise" (*Ḫtjw mfkꜣt*), which refers to the South Sinai, thus probably disclosing the destination of the mission. This is followed by a list of the officials who took part in the expedition, namely different categories of military (especially several "inspectors of recruits") and one "inspector of carpenters" (*sḫḏ mḏḥw*).[10]

All this evidence seems to indicate that the site was used in the Old Kingdom in much the same way as in the Middle Kingdom and that boats such as have been found in the storage galleries were assembled and launched to sea at Ayn Soukhna probably from the earliest periods of pharaonic history.

10. For detailed epigraphic results, see *infra* P. Tallet, "New Inscriptions from Ayn Soukhna 2002-2009", in this volume.

3. The Metal Workshops

One of the major finds at Ayn Soukhna consists of numerous copper workshops, all clearly dating to the Middle Kingdom. They were excavated both in the lower area of the site, along the modern road that connects Ayn Soukhna to Suez, and in a small wadi in the upper area, right next to the storage gallery complex we have already mentioned (wadi 2) [fig. 10]. Five of these workshops have been studied to date and it is now possible, from the evidence, to model the smelting process used in the reduction of copper ore (malachite).[11] Each workshop was equipped with several naturally ventilated furnaces [fig. 11-12] that could be heated to temperatures exceeding 1200°C to reduce the malachite. The redox operation resulted in slag cakes in which minute copper prills were imprisoned. The slag was then crushed and pounded to pieces on tables set into the ground and the metallic elements carefully sifted from the gangue. Finally, the metal was melted into small ingots in crucibles heated in horseshoe-shaped furnaces [fig. 13-14]. Those were ventilated using cane blowpipes tipped with ceramic heads. Between 2004 and 2009, an experimental platform was set up on the site, with replicas of ancient furnaces built to archaeological specifications, to allow for full reconstruction of these processes. The recorded archaeological and technological observations are to be published at IFAO.[12]

Malachite reduction furnaces had already been found in the eastern desert, on copper mining sites dating back to the Early Dynastic times[13]. More recently, several thousands of such ore reduction units, dating mostly to the Old Kingdom, were found in the Sinai peninsula.[14] The smelting sets found at Ayn Soukhna in a well dated Middle Kingdom context fill a gap in our documentation, since they consist of a very different type of furnace. The ventilating systems and the inner dimensions of the hearths are consistent with earlier models. The heating chambers, on the other hand, grow to a spectacular 1.20 m in some of the best preserved furnaces, which probably allowed for improved heat conservation and for the processing of greater quantities of ore. Another characteristic lies in the way the furnaces were built in sets of four, with an apparent ratio of several sets for one melting furnace. Such a design suggests an extremely standardised workflow, with the multiplication of identical working units giving the site a "pre-industrial" appearance.

The concentration of metal workshops at Ayn Soukhna is striking, considering the number of furnaces discovered to date. Few variations can be observed here and there in the layout of this or that workshop—mostly due to the fact that some rows of furnaces were rebuilt after collapsing—the available data suggests a phenomenon that was both on large scale and short-lived. Although Ayn Soukhna was used by the Egyptians probably from the very beginning of the Old Kingdom, and was probably still in use in the New Kingdom, metallurgy and metalworking seem to have been limited to the Middle Kingdom. This raises two questions: first, where did the metal ore used in the many workshops come from? Of course, one cannot

11. This study was conducted in collaboration with the CNRS UMR 5060 team, "Métallurgie et cultures", directed by Philippe Fluzin.
12. Abd el-Raziq *et al.* 2011.
13. Castel, Pouit 1997; Castel *et al.* 1999.
14. Castel, Tallet, Fluzin 2008.

totally rule out the possible existence in the region of a large deposit still to be discovered. But research conducted *in situ* rather seems to suggest that the ore was imported from the Sinai Peninsula, with which Ayn Soukhna had established contacts, even though this may not be the most obvious of solutions.[15] The second question concerns the fuel required for the reduction and smelting operations. Should we infer, from the hot water spring nearby that a large quantity of trees grew next to the archaeological zone at that time? Was it also necessary to draw on the resources of nearby wadis for wood?[16] Analysis of charcoals found in the workshops, pointing to the presence of acacia and tamarisk wood—both familiar species in the Egyptian desert—is not in fact conclusive.[17] From what we know at present, it seems likely that the metal workshops were closely connected to the presence of a coastal harbour on the site and also, at some point during the Middle Kingdom, to a conjunction point between ore and fuel.

4. The "Kom 14" Sector

In the lower part of the archaeological site [fig. 15], the area nearest to the coastline and the most threatened by modern development, a zone which was used intensively as early on as the Old Kingdom, is under rescue excavation since 2006. Remains in the sector lie respectively at the top and the bottom of a thick calcareous stratum which delineates an ancient coastline. The succession of installations found there is extremely stratified and identical to that found in the upper part of the site. Two or three successive phases correspond to an occupation of the site during the Old Kingdom.[18] After a fairly long hiatus, materialized by a thick deposit of eolian sand devoid of any archaeological artefact, three phases clearly dating back to the Middle Kingdom have been identified.

The first phase is characterised exclusively by hearths and makeshift installations, a vast temporary camp established on the very surface of the eolian deposit. The artefacts found here point to an early Middle Kingdom occupation, with ceramics belonging to the very end of the 11th dynasty and the first half of the 12th.[19] The third and last phase is characterised by a workshop for copper reduction, and by re-occupation of the Old Kingdom facilities, where many traces of copper processing have been found. The artefacts here show forms belonging to the second half, or even to the end of the 12th dynasty,[20] while both the upper stratigraphic

15. Throughout pharaonic history, both in the Eastern desert and in the Sinai Peninsula, metal ores seem to have been processed near the place of extraction, as shown by the numerous workshops at wadi Dara, wadi Kharig and Bir Nasb (Castel, Tallet, Fluzin 2008).
16. From our own experience in furnace reconstitution, 75 kg of charcoal would have been needed to maintain combustion for 8 hours in one single unit. If we allow for at least one hundred units on the site, each having been used 4 or 5 times, a total of 35 tons of charcoal would have been needed.
17. Report by Aurélie Salavert, palaeobotanist (Paris-I University), February 2007.
18. Several fragments of stoneware crockery, characteristic of the 1st, 2nd and 3rd dynasties, point to nearby early settlements from the Thinite period, not yet discovered.
19. The ceramic artefacts presents morphological and technical characteristics related to the productions of the end of Old Kingdom and the First Intermediary Period.
20. Circa the reign of Amenemhat III, a king regularly mentioned in many official inscriptions both at the site of Ayn Soukhna and in Sinai.

position and the chronology of the different levels emphasize the fact that metallurgical activity at Ayn Soukhna was both late and short-lived in the site's history.

While Middle Kingdom phases are relatively small-scale, the Old Kingdom strata bear witness to a much more extensive and functionally diversified occupation. A large storage building was found on the upper level of sector 14. It is so far the largest building discovered in Ayn Soukhna. It has been preserved over 220 m² (14 by 16 m) and is made of rough blocks mortared with clay, or mud brick in parts. The structure reveals fifteen small rooms arranged around an original 6.20 × 6.20 m building with specific baking and butchering facilities as well as kitchens and, probably, habitation function. In addition to ceramic deposits typical of the late 4th and 5th dynasties, the imprint of a cylinder seal bearing the name of Horus Unas,[21] *Wꜣḏ tꜣwy* (ca. 2375-2350), confirms the synchronous occupation of this lower zone and the upper storage gallery complex.

The most remarkable element in sector 14, however, is a long pit, oriented east-west lying below the breaking line of the calcareous stratum, 200 m from the present-day coastline, in a sandy zone which may well have been the upper part of a beach [fig. 16]. The pit was carved out into the soft sandstone; measuring 17.50 m long and 1.90 to 2.20 m wide, with a 2.30 m maximum depth. With its roughly symmetrical layout and curving sides, it has a definite boat-like shape. At the eastern end, the pit slopes down sharply and narrows to 75-85 cm. The opposite side along the same longitudinal axis also narrows down significantly, to 70-80 cm. This shallow, flat-bottomed western end also features two low transverse walls built with blocks extracted while the pit was being dug out. The walls probably served as vertical support in association with several postholes dug into the sandstone outside the pit. At the bottom, which has a roughly concave shape, several rectangular cavities were found along the same longitudinal axis as the two extremities. Finally, the southern side shows some twenty holes carved deep into the sandstone [fig. 17]. These all follow a curving line corresponding to the sloping bottom of the pit; they seem to have been used in pairs, one with a flat base above another with a slanting base, and they may well have served as kind of postholes to accommodate slanting or horizontal wooden beams.

Excavation east of the pit revealed a row of twelve rectangular pillars, each about 1.00 m long, laid out along parallel lines, 70 cm to 1.00 m apart. All were built at right angles against a long low wall running east to west almost 17.00 m. Some of the pillars have kept their original height, around one metre. Horizontal holes dug into the sandstone opposite have been found to the south of almost each pillar. Obviously, the pillars and the slots opposite were meant to work in association to support an upper wooden structure made of transverse horizontal beams.

The whole structure, comprising the boat pit and the parallel pillars is 6.50 m wide and 28.50 m long. All the elements above obviously belonged to one same construction programme and were used over a short period of time. The study of ceramics discovered *in situ* in the oldest strata provides a *terminus post quem* for the late 4th dynasty, or possibly the early Vth dynasty.

21. This epigraphic element, the only one discovered in the sector, was found within a door latch that was filled in when the built-up complex was abandoned for good.

The stratigraphy inside the boat pit also suggests that its use was very limited in time, as it was gradually filled in with ash over a rather short period.[22]

In the current state of research, interpretation of these findings is difficult for lack of any known parallels out of royal funerary complexes. The site seems to have had a functional, technical use: in the context of Old Kingdom expeditions, one of the most likely explanations would be that the pit was meant as a ditch for assembling and dismantling seafaring ships. Such work would have been facilitated by means of large timbers fitted into the various holes and postholes and onto the vertical supports alongside or inside the pit. The facility may have been necessary for the accommodation of particularly large ships or for assembling/dismantling operations that were difficult to carry out in a desert environment

Thus, in addition to the extensive occupation and major logistic role evinced in Sector 14, it looks as though these findings provide clear archaeological confirmation of the use of Ayn Soukhna as an embarkation/disembarkation point during the Old Kingdom.

5. Conclusions and Prospects

Since archaeological excavation began at the site of Ayn Soukhna in 2001, our understanding of how the place was occupied and used in pharaonic times has made considerable progress. Extensive excavation—now nearing completion—of a gallery complex and storage spaces in the upper part of the site has in particular brought to light the maritime role of the site, notably with the dismantled Middle Kingdom ships found in two of the galleries. The chronology of occupation has also been refined. While the rock inscriptions overlooking the site date mostly to the Middle Kingdom, there is no doubt that the largest installations found were set up during the Old Kingdom, at least five centuries earlier, with a view to using the site in a similar way as a strategic stopping point on route to Sinai. Now is the time to concentrate most of the archaeological work on the lower area of the site, alongside the modern road to Hurghada because of the risk of rapid destruction. This area, which is close to the coastline has been greatly disrupted on the surface; it has nonetheless been possible to unearth stratified sequences of occupation, with a significant complex of copper workshops, a large building dating to the Old Kingdom, and a boat pit without any archaeological comparison which may have played a part in the shipbuilding activity. Because of the great variety of remains so far excavated in this area, we may well surmise that systematic excavation will provide many more discoveries.

22. Besides having apparently been in use for only a short amount of time, the structure was permanently abandoned while the upper building remained in use for a longer period, with the cooking and bakery activity producing the ashes that filled in the pit.

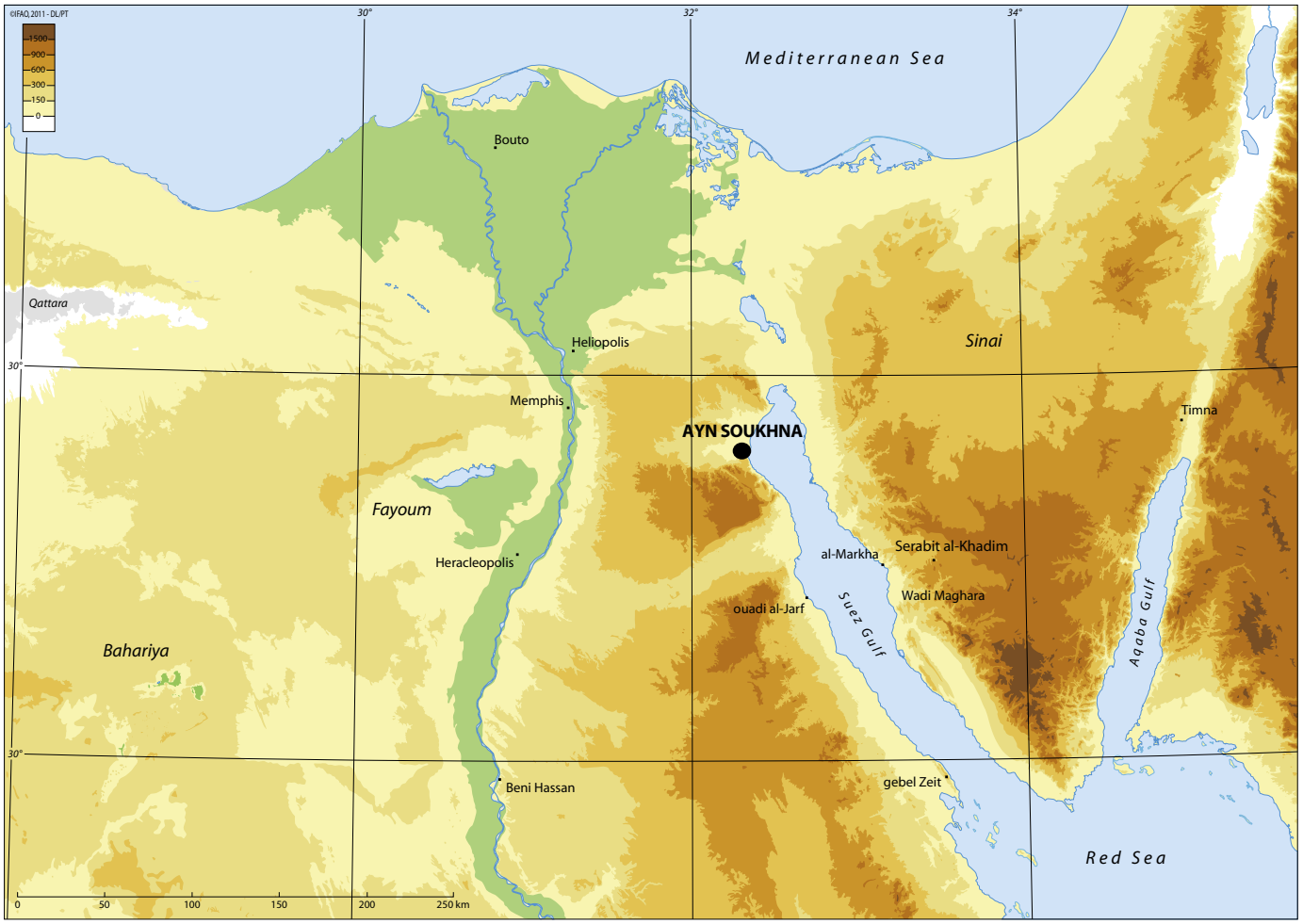

Fig. 1. Location of Ayn Soukhna.

Fig. 2. General view of the Ayn Soukhna area.

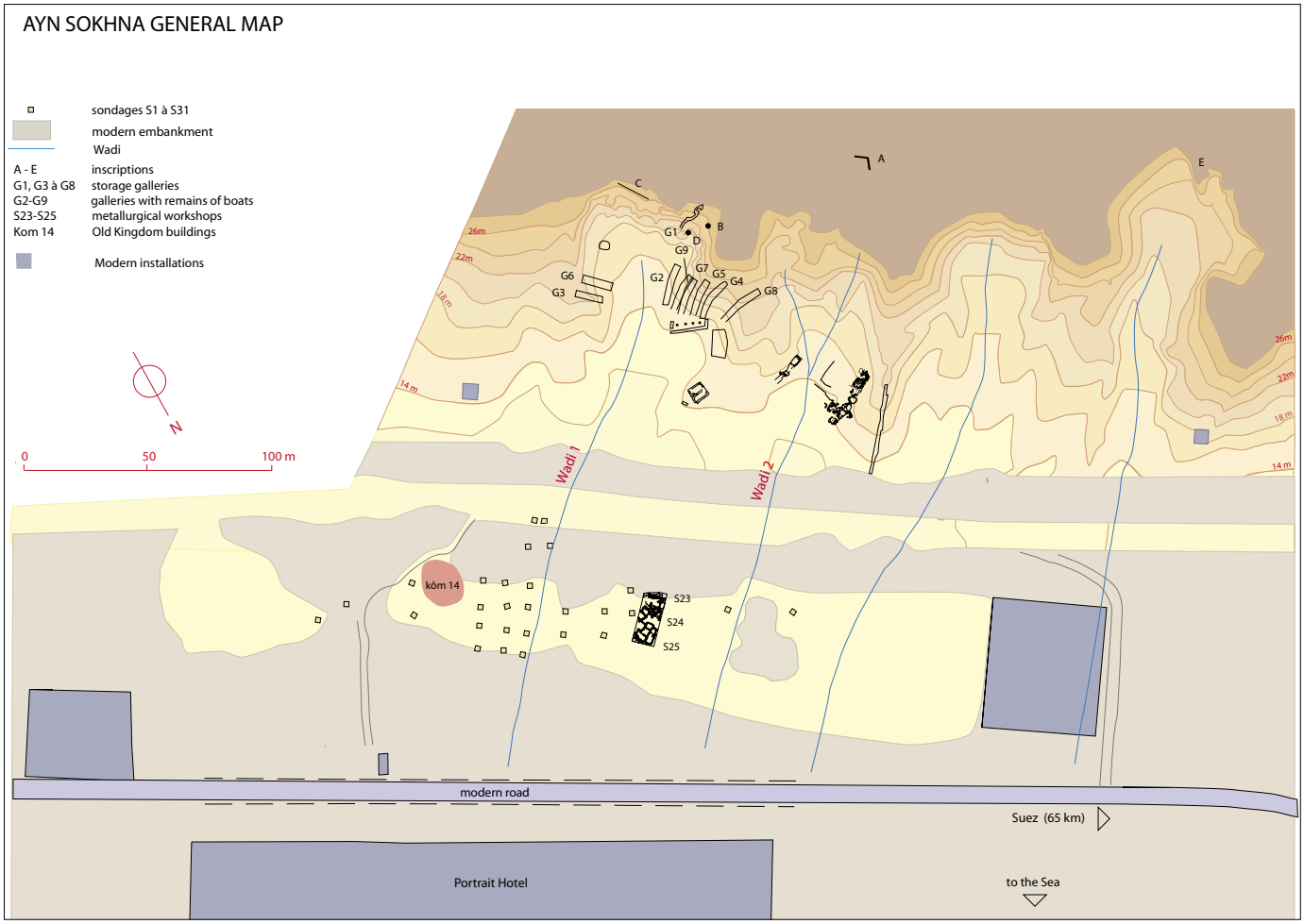

Fig. 3. Ayn Soukhna, map of the archaeological area.

Fig. 4. New Kingdom rock stela with the later addition of Coptic inscriptions.

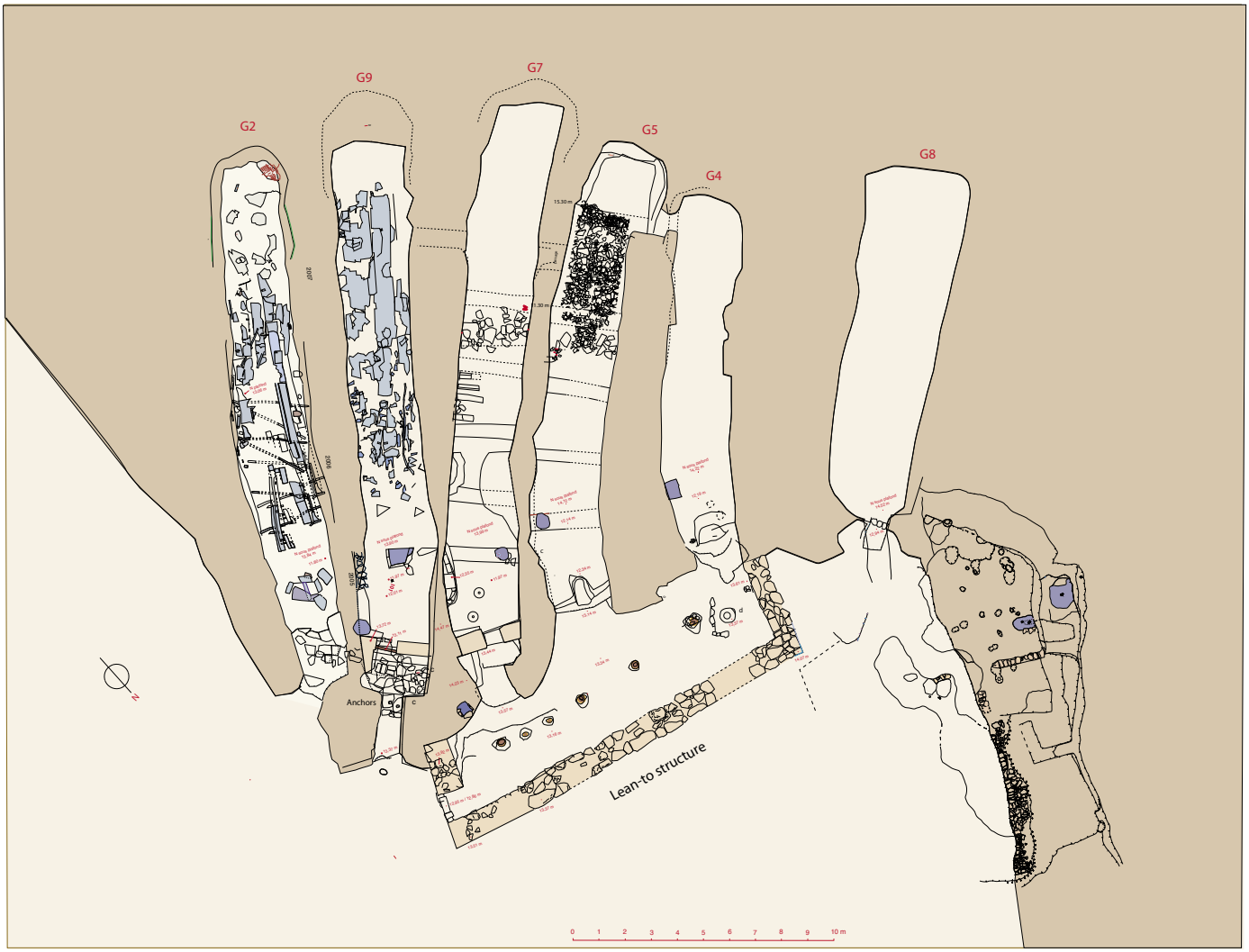

Fig. 5. Map of the rectangular structure built against the gallery complex.

Fig. 6. Gold pendant from the Middle Kingdom (gallery G7).

Fig. 7. Anchors found at the entrance to gallery G9.

Fig. 8. Remains of a burnt boat found inside gallery G9.

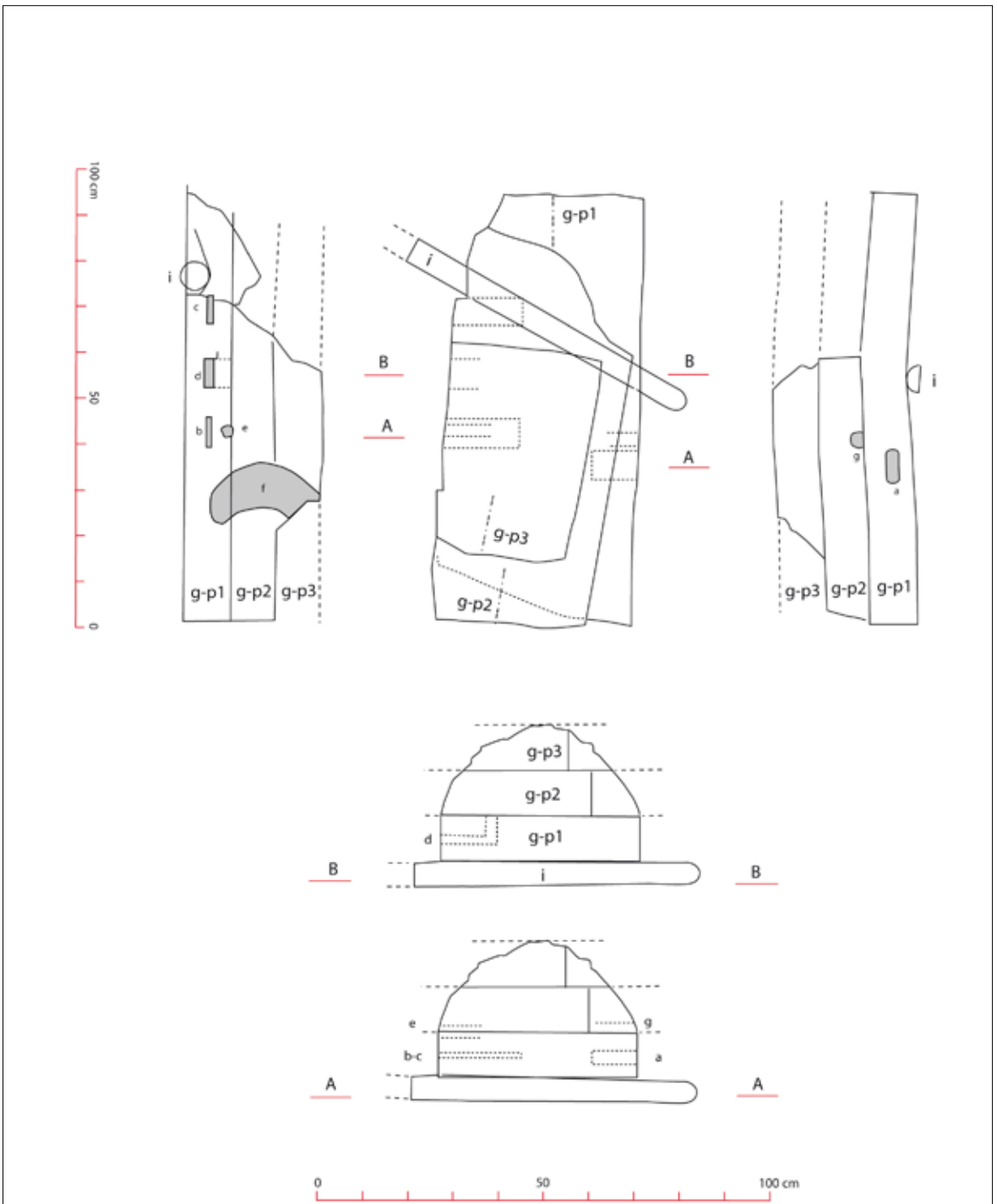

Fig. 9. Drawing of boat pieces showing the jointing system with mortises and tenons.

Fig. 10. Topographical map of Wadi 2.

Fig. 11. General view of copper workshop 1.

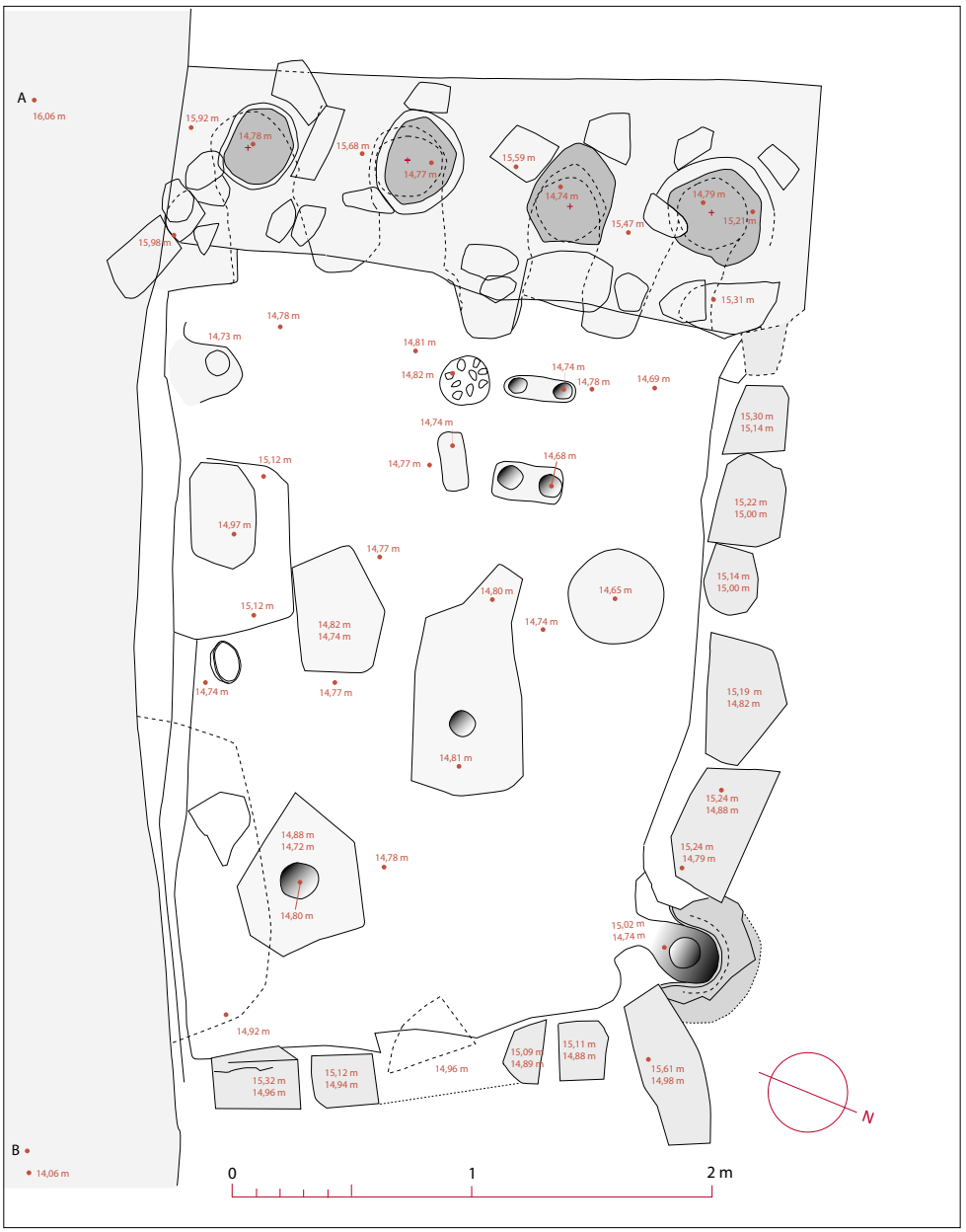

Fig. 12. Archaeological map of copper workshop 1.

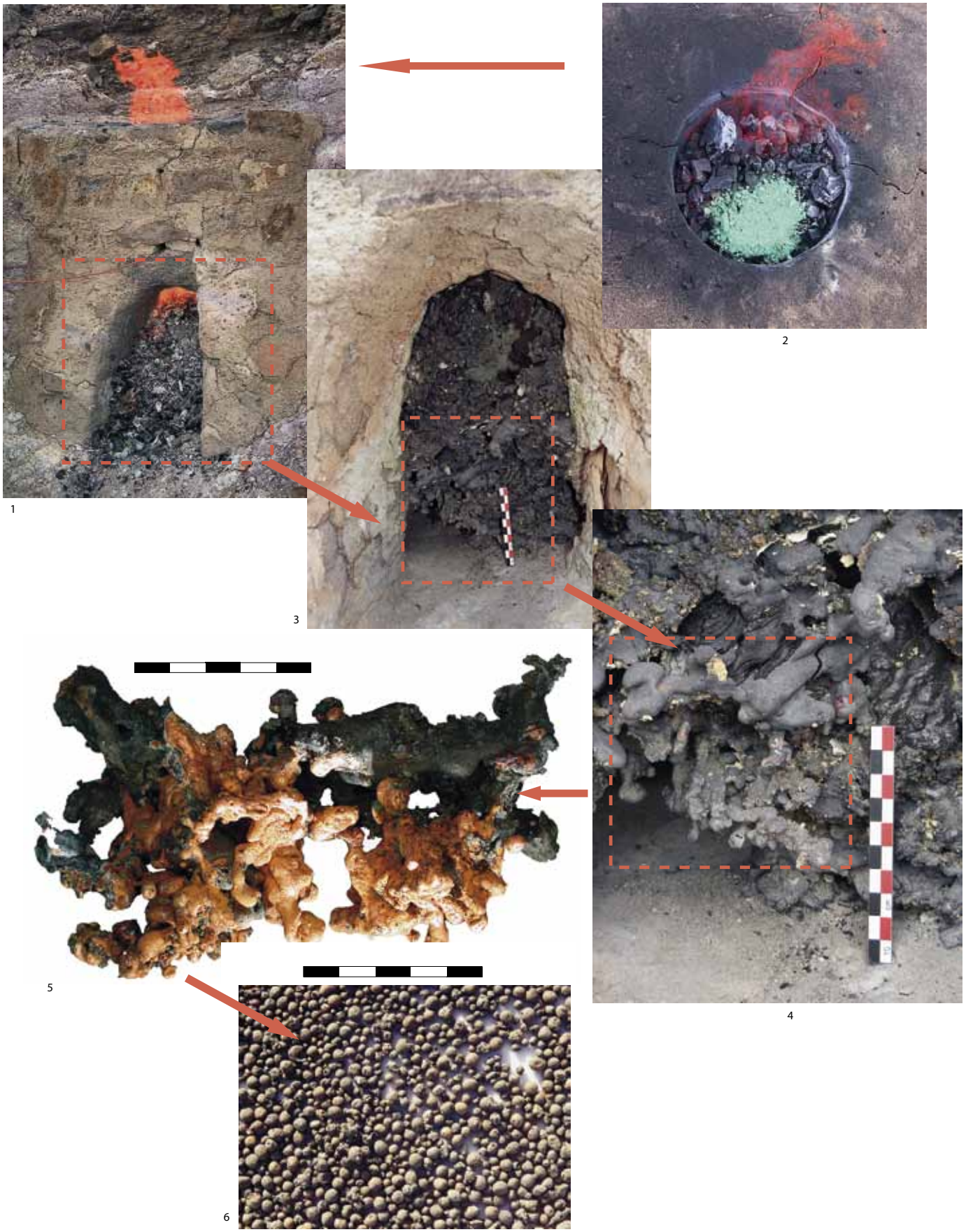

Fig. 13. The successive steps of the copper smelting process.

14a.

14b.

Fig. 14a-b.
Melting the copper in crucibles.

Fig. 15. General view of "Kom 14".

Fig. 16. General view of the boat pit.

Fig. 17. Photograph of the boat pit, showing the holes carved in the sandstone.