

HARBOUR OF PHARAOHS TO THE LAND OF PUNT (MARSA/WADI GAWASIS REPORT 2007-2008)

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with contributions by

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The project and the site

In 2001 the University of Naples “L’Orientale” (UNO), Naples (Italy), and the Italian Institute for Africa and Orient (IsIAO), Rome, in collaboration with Boston University (BU), Boston (USA), began investigations at the site of Marsa/Wadi Gawasis on the Red Sea coast, Egypt, under the direction of Rodolfo Fattovich (UNO/IsIAO) and Kathryn Bard (BU).¹ The site of Marsa/Wadi Gawasis is located 23 km to the south of the modern port of Safaga, on the top and along the slopes of a fossil coral terrace, which delimits the lower Wadi Gawasis to the north.

The archaeological investigations at Marsa/Wadi Gawasis are part of long-term program, in progress at UNO since the early 1980s, regarding the development of long-distance trade between the Mediterranean Sea and the Indian Ocean, from late prehistoric to early historical times, and the possible impact of this trade on the origins of hierarchical societies and states in the northern Horn of Africa (see Fattovich 1991, 1995, 1996a, 1996b, 1997a, 1997b, 1997c, 1999; Manzo 1999). Actually, Marsa/Wadi Gawasis was already identified in the mid-1970s by Abdel Moneim Sayed (University of Alexandria, Egypt) as the Egyptian port from where seafaring expeditions were sent to the land of Punt in the southern Red Sea in the first part of the 12th Dynasty (Sayed 1977).

After seven seasons conducted by the Italian-American Expedition, our knowledge of Marsa/Wadi Gawasis was considerably enlarged.² New inscriptions and a detailed chronology of the site based on the study of ceramics showed that the site was used for the whole Middle Kingdom as well as in the late Old Kingdom and in the late Second Intermediate Period-early New Kingdom. Moreover, it was also shown that the site was very intensively used at the end of the 12th Dynasty (reigns of Amenemhat III, Amenemhat IV, and possibly Senusret III). The archaeological investigations showed that both the top and the base of the coral terrace were occupied in ancient times. The following structures have been identified at Mersa Gawasis: temporary shelters, ceremonial monuments, rock-cut structures, ovens and kilns for bread making and pottery production, workshops for the manufacture of limestone anchors and lithic tools.

The Italian-American team also implemented an intra-site GIS, and conducted systematic researches aimed at the palaeo-environmental reconstruction of the area as well as detailed mapping of the site and survey of its structures by means of TLS and laserscan 3d in the framework of a MIUR-FIRB project coordinated by R. Fattovich (UNO) aimed at the reconstruction of the ancient landscape in the area.

¹ Granting institutions: University of Naples “L’Orientale”, Italian Institute for Africa and Orient, Italian Ministry of Foreign Affairs. The participation of the American component was made possible by private donors: Mr. Wallace Sellars and the Glen Dash Charity Foundation. The Expedition thanks for its collaboration and support the Supreme Council for Antiquities, Egypt, the Italian Embassy and the Italian Cultural Institute (Archaeological Section) in Egypt.

² Reports of the field seasons were published on-line, see www.archaeogate.org. A report of the first five seasons at Marsa/Wadi Gawasis was published, see Bard and Fattovich 2007.

The 2007-2008 Field Season

In December 2007-January 2008 the Italian-American Expedition conducted the seventh field season. The team in the field included Italian, American, Egyptian, British, German, Austrian, and Dutch personnel with different specializations (archaeology, nautical archaeology, epigraphy, geo-archaeology, geology, palaeo-ethno-botany, malacology, topography).³ Mr. Ayman Hendy Amin represented the Supreme Council in the field, and greatly supported the work.

In 2007-2008 investigations were conducted only in the western sector of the site (Wadi Gawasis), and focused particularly on the western slope of the coral terrace and the so-called "harbour area" between the wadi and the southeastern slope of the terrace.

Ten samples of charcoal, wood and shells were collected to be submitted to the IFAO Radiocarbon Laboratory, Cairo, for a radiometric dating, which is in progress.

Geology

Geological investigations were conducted in order to assess the structural stability of the caves and demonstrate that the coral terrace exhibit a complex system of fractures which will have to be carefully monitored for a proper preservation of the site.

Coastal geological investigations were conducted along the wadi bed and the base of the southern and western slopes of the terrace. These investigations are supporting the hypothesis that the mouth of Wadi Gawasis was originally a lagoon.

Geoarchaeological investigation in the harbour area provided evidence of a sequence of sea beaches which were occupied during the Middle Kingdom.

Structural Geology⁴

Structural geological investigation demonstrated that the area of study are extremely associated with fault / fracture system as a result of the Red Sea rift. They have two major directions; NNW-SSE to NW-SE and NE-SW. Caves 2, 3, 4 and 5 are structurally investigated. They are extremely dissected by five major fractures during late Pleistocene/early Holocene, associated with about four minor fractures as well. The predominant trending is NW-SE. They are characterized by several bifurcating at different levels and angles between 85° and 10° for the same fracture, causing gravity collapse for some masses or blocks. In some parts, These fractures intersects the sub horizontal bedding of sediments splitting some masses, ready to collapse. A fracture of NNE-SSW trending is less dominant type in the site. Along the fault/fracture plane, slight movements were observed forming narrow space between the fractured blocks which are up to 25 cm.

Coastal Geology⁵

Preliminary analyses suggest that during the time of occupation the wadi was a shallow, semi-enclosed bay (~1.5 km²) with an open connection to the Red Sea.

The base of the present cliffs consists of a narrow coral-beach rock platform. Archaeological excavations during the 2006-2008 field seasons found a number of occupation sites within one

³ Expedition members in 2007-2008 were: Prof. Kathryn Bard, archaeologist; Prof. Rodolfo Fattovich, archaeologist; Mr. Mohamed Badr, geologist; Dr. Claire Calcagno, maritime archaeologist; Dr. Alfredo Carannante, malacologist and *geo-archaeologist*; Prof. Otto Cichocki, *dendro-chronologist*; Dr. Andrea D'Andrea, computer specialist; Carlos de La Fuente, photographer; Prof. Duncan FitzGerald, geologist; Mr. Rainer Gerisch, *paleo-botanist*; Mr. Christopher Hein, geologist; Mr. Giancarlo Iannone, computer specialist; Ms. Ilaria Incordino, *Egyptologist*; Giulio Lucarini, lithic analyst; Dr. Elsayed Mahfouz, epigrapher; Mr. Pasquale Musella, conservator; Ms. Tracy Spurrier, archaeologist; Mr. Stefano Tilia, surface surveyor; Dr. André J. Veldmeijer, rope analyst; Dr. Sally Wallace-Jones, ceramic analyst; Mr. John Wallace-Jones, ceramic illustrator; Dr. Chiara Zazzaro, archaeologist.

⁴ The investigation was conducted by Mohammed Badr.

⁵ The investigation was conducted by Duncan FitzGerald and Christopher Hein.

meter above this beach rock surface. From the cliffs toward the wadi of the coral-beach platform a medium-fine gray sand is found at depth in all auger cores. The gray color likely results from anoxic conditions of previous water table levels resulting in iron oxide coatings. The occurrence of this sediment below the thin beach rock layer found in WG-T7A3 indicates a ubiquitous distribution of this sediment at depth throughout the study area. Based on the sedimentology and relative abundances of mollusk and foram species, this sediment is interpreted to have been deposited in a tidal lagoon. Shell and foraminifera distributions indicate that much of palaeo-bay was protected and a low energy environment. Wadi processes have since in-filled the bay.

The depth of the bay is unknown and will be determined through dating methods and infilling rates of the bay during the past four thousand years. Dating of shell samples will provide minimum dates for which the embayment existed. Additionally, deposition rates can be determined from a series of dates taken from shells vertically stacked within a single core. From the radiocarbon dates infilling rates and depth of the bay can be roughly determined. Shell samples collected over the two years of field studies at Wadi Gawasis have been sent to the French Institute for Oriental Archaeology (IFAO) in Cairo for radiocarbon dating.

Palaeo-ecology⁶

In 2007-2008 palaeo-ecological investigation was conducted in a close relation with the coastal geology in order to reconstructing a) the palaeo-environment at the time of use of the site, and b) the ecological evolution of the site through time. Both sediment samples from the different excavation units and shells from auger holes were examined.

The shell evidence from stratigraphic sequence in the so-called "harbour area" (WG 49, WG 46, WG 57, WG 54), where evidence of an occupation with several hearths, potsherds and food remains was found, points to a shallow sub-tidal environment in an open embayment with sea-grass covering the coral-reef at the base of the sequence, predating the human use of the area. This stratum is covered with finer sands suggesting a shallow sub-tidal environment possibly evolving to a submerged beach with evidence a mangrove zone.

The upper strata corresponding to the phases of human occupation of the area consist of fine sands with large foraminifers typical of a shallow sub tidal (tidal flat) environment covered with sea-grass, suggesting a more restrict embayment than the previous one. The occurrence of hearths suggests that this was a backshore with elements from the a sub-tidal zone close to the occupation area.

At the top the sequence consists of layers of colluvial sediments (coarse sand and fine conglomerates), with evidence of a channel-like erosion pointing to flooding episodes in a wind-dominated setting. Several hearths and potsherds with a lot of food remains (mainly fish bones and shells) have been found just at the bottom of this interval.

Archaeology

In 2007-2008 the western and southern slope of the coral terrace continued to be investigated (Fig. 1). Samples of cedar were also examined to provide evidence for a dendro-chronological dating of the site.

Western Slope

In 2007-2008 excavations were conducted on the top of the slope of the terrace, in front of the entry to Cave 6 (WG 32) where some large pieces of timber from seafaring ships were found

⁶ The investigation was conducted by Alfredo Carranante.

and carefully studied *in situ*, because their removal may badly damage the wood⁷. These timbers provided nautical archaeologists with a very important information about the construction technique of ancient Pharaonic ships. The excavations outside Cave 6 provided more fragments of clay sealings with the imprint of seals dating to the late 12th Dynasty were also collected in this area.

Excavations were also resumed to the north of entry to Cave 3 (WG 33) where the remains of a mud brick structure, hearths, inscribed stelae and exotic ceramic were found. A votive stela dating to the 21st or 31st year of reign of Amenemhat the III, was found.

Two new excavation units were opened on the top of the slope, to the south of the entry of Cave 6 (WG 55 and WG 56). In this area the opening to an other cave (Cave 7) was found and partially excavated. A large quantity of wood debris from ship timbers and lithic artefacts were found in front of this entry (WG 55) suggesting the occurrence of an area of intense activity of this spot. A stela with an offering inscription to Wsir Wedj-wer (Osiris of the sea) was found.

To the south of the entrance to Cave 7, the opening to a rock cut cavity was found, but not completely excavated for security reason (WG 56) (Fig. 2). A quadrangular arrangement of three conglomerate slabs and a rock cut wall in the colluvial horizon of the coral terrace, was found in front of this entry and might indicate a ceremonial use of this area.

Southern Slope

In 2007-2008 excavation in the so-called “harbour area” provided a firm evidence of the use of this area in the Middle Kingdom.⁸

The following Excavation Units were delimited and partially excavated between the coral terrace and the present bed of the wadi in the southwestern sector of Wadi Gawasis (the so-called “Harbor Area”) in December 2007 – January 2008: WG 45/46/47/48/49/50; WG 51; WG 52; WG 54; WG 57.

Two main phases of use of the area in the Twelve Dynasty were identified. In the earlier phase, part of the area was used as storage for large jars. In the later phase most of the area was used as camp with clear evidence of large hearths and a lot of fish remains (Fig. 3).

Mapping

In 2007/2008 the topographic work⁹ focussed on supporting the laser scanning of the caves in order to make the location of the markers for the scanner consistent with the reference system (WGS84 UTM) at the site, mapping the new excavation units, and positioning the geological test pits across the wadi bed. The goal of these pits was the determination of eventual ancient coast lines running deeper into the Wadi and thus closer to the archaeological area. In fact, a series of trenches excavated just south-east of the main terrace had brought to light evidence of a possible beach environment. In this case it was important to assess the altimetry of this particular area also in relation to the test pit’s geological stratigraphy. The positioning of these pits was carried out by taking their elevation (relative to sea level) into account. The final phase of the topographical field season was the acquisition of elevation points in the coastal area characterized by the presence of the *tumuli*, along the northern bank of Mersa Gawasis.

Technology Application

In 2007-2008 *laser-scanning* technology was applied with the support of the *Centro Interdipartimentale di Servizi di Archeologia* (CISA), UNO, Naples, to generate a detailed 3-D

⁷ The excavation was conducted under the supervision of Kathryn A. Bard, Claire Calcagno, Elsayed Mahfuz, Tracy Spurrier and Chiara Zazzaro.

⁸ The excavation was conducted under the supervision of Kathryn A. Bard, Rodolfo Fattovich, Ilaria Incordino and Tracy Spurrier.

⁹ Mapping was conducted by Stefano Tilia.

model of the western wall terrace, where caves 2-5 were cut, and the inside of caves 2 and 3, and to provide a proper reconstruction and map of these caves, as well as more precise assessment of the preservation and stability of these features for a future consolidation project.¹⁰

A relevant result was the elaboration of simulated horizontal and vertical cross plans, which can provide useful information for future intervention in the caves (Fig. 4).

Dendro-chronology

In 2008 the measurement of wooden parts from the former seasons continued in order to get more evidence for outlining a dendrochronological sequence of Egypt.¹¹ Six samples (T16, T20, T21, T32, T64, T65) with a number of rings ranging between 324 and 41 were examined (Fig. 5).

The results will be incorporated in project 7 of SCIEM 2000 “The Synchronization of Civilizations in the Eastern Mediterranean in the Second Millennium BC”. Within this project we collect data sets to construct a standard for absolute dating reaching back from modern times back to the second millennium B.C. The data sets from Wadi Gawasis will be important modules to reach this goal.

Epigraphy

Nine stelae, six ostraca and four inscribed fragments of papyrus and tissue were found in 2007-2008.¹²

In particular, the stelae include: 1) A funerary stele, dated to the 23rd year of reign of Amemenhat III (ca. 1831-1786 BC). 2) A badly preserved stele recording the 41st year of reign of Amenemhat III. 3) A badly preserved stela with a representation of Min and the words “perfect god.” 4) A stela with the name of Punt. 5) A stela recording an offering to Osiris of wadj-wr and Horus the Great. All stelae can be surely dated to the 12th Dynasty.

Nine clay seals and seal impressions, dating to the 12th-13th Dynasties were found as well.

Finds

Ship Timbers

During the course of the 2007-2008 season, a total of five ship timbers were identified; two were fully excavated while three were initially recorded and left in situ.¹³

Two ship timbers were found in WG 55 lying across the entrance of Cave 7, perhaps to facilitate access to the cave. Unfortunately, excavation was interrupted in this area due to safety concerns, and the two timbers were only partially recorded. One (T57; ca. 14 cm thick) appears to be a large plank, covered by a thick layer of salt encrustation. The other plank (T74) was found on the floor, lying horizontally across the entrance to Cave 7, ca. 150 cm below the top of the cave. It is 4.5 cm in thickness and features a small notch on the exposed face. No further apparent diagnostic features were visible after superficial examination. A dismantled and reworked hull plank (T75) was found in the same context. The plank shows features suggesting it was originally a larger hull plank that was subsequently reworked and reduced in thickness (Fig. 6).

The plank features a shallow rectangular channel (9 cm x 7.5 cm x 1.2 cm) between the plank edge and a through-mortise, with trace impressions of five copper strips (1.5 cm in width) originally held in place within the channel by a rectangular wooden stopper (8.5 cm x c. 1 cm) inside the mortise. Chisel marks are distinctly visible within the channel. On the same original outer

¹⁰ This application was made by Andrea. D’Andrea with the assistance of Giancarlo Iannone.

¹¹ The dendrochronological investigation was conducted by Otto Cichoeki.

¹² The epigraphic work was conducted by El-Sayed Mahfouz.

¹³ The timbers were excavated and examined by Claire Calcagno and Chiara Zazzaro.

face not far from the channel, another through-mortise was started and not completed; the unfinished recess measures 8.4 cm in width, while the actual perforation is only 4.3 cm wide. A peg (diam. 1.1 cm) located between two lashing holes (see below) is also attributable to the plank's first phase of use. This plank is comparable to other planks previously found at the site which have been identified as possibly belonging to small boats.

In WG 32, an assemblage of large ship timbers was found outside Cave 6 aligned towards the cave entrance and covered with a thick encrustation of salt, which covers an area of ca. 2.30 m x 1 m. The outlines of at least three long timbers could be discerned moulded beneath this salt deposit, which has permeated the surface of the wood. One timber (T72) was identified as the upper part of a steering oar blade (Fig. 7).

Fragile conditions precluded full excavation of these timbers until further assessments can be completed, so they were left *in situ* and covered with sand.

A plank (T73, 69.2 cm x 23.4 cm x 4.8 cm) was found in WG 33 in a layer of windblown sand deposit close to terrace wall. Its dimensions and shape are comparable to other timbers identified as deck planks found at the site during previous field seasons. This plank was possibly reworked since the remains of two lashing channels are visible at one end.

Cordage

Forty-five lots of rope fragments were inventoried this field season. Cordage was found in the slope area, in trenches WG 33, WG 52, WG 32, WG 54, WG 55 and WG 56.¹⁴ Most of rope fragments found during this field season has an average diameter of 3-7 mm with two strands zS plied, the 90.3% was found in WG 55-WG 56 and the rest is coming from the other trenches. Among these fragments, they were identified a rope fragment knotted in a reef knot found in WG 53 (Fig. 8); nine simple knots and two reef knots found in WG 55; one ending knot found in WG 56, and two simple knots and one ending knot in WG 56.

Worthy to note are two small coils of strip found on the surface at the entrance to Cave 7 and four more found in WG 54 and in WG 55. They may point to storing and reusing fragments of strip still in good condition.

Ropes from Cave 5

In 2007-2008, the study of the contents of Cave 5, the so-called 'Rope Cave', has been finished. Focus of attention was the completion of the description of the find.¹⁵ Moreover, attention has been given to the condition of the cordage, viz. the possible insect activity. The installation of devices to check the cave's environment will give insight as to its condition and the conservation of its contents.

Pottery

All of the ceramic material from the site, including both body sherds and diagnostics, was examined and as this represents a considerable corpus of material certain typical areas of the site have been selected for detailed analysis.¹⁶

The overall chronological profile of the site is clear and uniform, dating to the 12th dynasty with occasional indications of the early 13th especially in the development of ceramic technology. Many jars show a typical Middle Kingdom combination of turned upper sections with a hand or coil made base scraped on the outer surface.

¹⁴ The cordage was examined by Chiara Zazzaro.

¹⁵ The ropes were examined by André J. Veldmeijer

¹⁶ The ceramics were examined by Sally Wallace-Jones.

The profile of cups is generally rather shallow suggesting an earlier rather than later Middle Kingdom date whilst the technology used for bases shows evidence that wheel turning was becoming important. A number of cups have bases which were cut to shape on the exterior surface, one in particular from WG 47 showed clear internal riling lines whilst the exterior was rather clumsily cut to shape. There are also several round bases from small jars which show clear internal evidence of turning having a spiral in centre interior, these along with small plates also have evidence of scraping on the exterior. Of the ring bases at the site at least one in Marl A variant three is clearly wheel made and applied to the vessel and one in Nile B1 appears to have used some hand modelling. All of which supports a date of 12th to early 13th dynasty with the emphasis more on a 12th dynasty date. The cupped rim usually found in Marl C fabric and very typical of Wadi Gawasis is not well known at other sites in Egypt however it can be dated with confidence to the period between the mid 12th and early 13th dynasties because it is always found in combination with a few other rim types and in particular Bader type 46 corrugated rims and Bader zir rims of types 2 and 3.

The difference between WG 49 and areas such as WG 32 and 51 form an interesting comparison since WG 32 and 51 reflect one trend at the site, and WG 49 another. WG 32 and 51 illustrate areas where a wide range of forms and fabrics is present, representing an eclectic mix of vessels, technology and functions, whilst WG 49 represents areas containing only large storage vessels in limited numbers of shapes and mainly in Marl C and its variants. WG 51 may be compared to areas such as WG 32 and 33 and also WG 55 around the mouth of the caves, whilst WG 49 forms a parallel with WG 45, 46 and 47. This in turn would suggest that the area around WG 49 identified as the harbour area had a clearly defined storage function whilst the areas defined by WG 32, 51 etc have a much more complex and wide ranging set of functions.

Exotic ceramics included Middle Nubian types, potsherds from the southern Red Sea regions, fragments of Canaanite ceramics, and one Minoan potsherd.

The imports from the southern Red Sea confirm that the Yemeni coast and possibly Eritrea were involved in the Egyptian-Punt trade network. Noteworthy, all the sherds of vessels imported from the southern Red Sea which were collected in this field season can be ascribed to closed bottles/jars, suggesting that they were used as container for storage-conservation.

Lithics

The 2007-2008 lithics, mostly from WG55, showed a very high percentage of debit-age, mainly with waste products resulting from the knapping activities, and a few cores suggesting that WG 55 was an area where stone artifacts were manufactured.¹⁷

The retouched tools kit, very poor in quantity, does not show any particular standardization of the products and the very few retouched elements are not characterized by clear typological traits. Denticulate, notches, and side-scrapers are the majority of the retouched tools.

On the whole, the Mersa/Wadi Gawasis chipped stone tradition shows quite primitive and opportunistic technological features, even if the rare standardized cores, debitage elements, and very well manufactured and bifacially retouched tools from the previous field seasons suggest that more evolved technologies were also well known.

The high presence at WG 55 of a great quantity of wood debris, mainly associated with the majority of the lithics supports the hypothesis that these more “primitive” tools were quickly and roughly knapped at that spot to be immediately used to scrap and clean the timber. The few well manufactured long blades and bifacial tools might be used in other more specific activities, such as, e.g., exploitation of plants in the harbor area.

¹⁷ The lithics were examined by Giulio Lucarini.

Copper

Thirty-one copper pieces were found during this field season, they are usually flat and fragmentary. Conditions of the copper are very corroded and the original dimensions of the different pieces are altered due to the oxidization of the copper.¹⁸

Twenty-one fragmentary pieces coming from different context (WG 32, WG 49, WG 51, WG 53, WG 54, WG 55 and WG 56) were identified as strips or bands, which were possibly related to the ship. A knife or saw blade, 8.7 cm x 2.05 cm in size and 0.25 cm thick, with a rounded tip and broken to the other end, was recorded in WG 32 A5 SU 25 (Fig. 9).

A stick, 2.2 cm in length and 0.2 cm in diameter was also found in WG 32. A thin pointed rod or pin approximately 9 cm long and 25 mm in diameter was found in WG 55 E3 SU4. Finally, a possible fragment of a copper slag was found in WG 54.

Textiles

Twenty-seven textile fragments were collected in 2007-2008, mainly WG 55 and WG 56. All textiles seem to be made of flax/linen.¹⁹ The woven textiles have a loose weave with an equal number of single threads (S-spun) in both warp and weft directions. They were made by passing alternatively one weft over and under alternating warp threads, as it was usual common in Pharaonic time. Very few fragments were made alternating two wefts over and under one warp, or alternating two wefts over and under two warps. One fragment from WG 55 shows a seam all along the middle part of the textile, and it is possibly a repair.

A strip of painted linen (ca. 20 cm x 4 cm) with a red mark and hieratic script was found in WG 55-56, close to the “ceremonial” structure and its study is in progress by El-Sayed Mahfouz.

Small Finds

Twenty-nine objects were inventoried as small finds in 2007-2008, including wood and pottery objects, fragments of mat and leather.

Wood objects included five discs with a groove. Three specimens with a strip in the groove, ranging from 10 to 12 cm in diameter and 1.1 cm thick, were from WG 32 (Fig. 10).

A smaller one was ca. 4.5 cm in diameter and 1.1 cm thick. Another one from WG 33 with a rope still in the groove is ca. 3 cm in diameter.

A similar pottery disc from the surface to the west of WG 48 is ca. 3 cm in diameter. Two more pottery discs without a groove ca. 7 cm in diameter and shallow domed were found in WG 54 and on the surface close to WG 19/2005, respectively. Sally Wallace-Jones interpreted these objects as jar stoppers stating that their diameters fit very well with some jar and bottle rims.

Four complete or fragmentary conical objects were found in WG55. They were ca. 3.5 cm in length and 2.2-3.2 cm in diameter and were interpreted as knobs, perhaps from boxes. A whole one, 3.5 cm in length and 3.2 cm in diameter, shows a dowelled end for insertion (Fig. 11).

A bracket, 11.5 cm x 16.5 cm in size with has three pegs and one hole for a peg, was found in WG 55. A complete wood peg, ca. 15 cm in length and ca. 1 cm in diameter, a faïence bead 0.2 cm in diameter and a leather fragment, 3 cm x 1.2 cm in size and 0.25 cm thick, were also found in WG 55. A fragment of mat with only 5 knots still preserved, ca. 9 cm x 5 cm in size, and a cylindrical wood object, 3.5 cm long and 1.7 cm in diameter, were collected in WG 55, as well.

¹⁸ The metal remains were examined by Chiara Zazzaro.

¹⁹ The textiles were examined by Chiara Zazzaro.

Wood and charcoal

In 2007-2008, further studies revealed the occurrence of a second mangrove species beside the commonly found grey mangrove, *Avicennia marina*, which provided an important wood fuel along the Egyptian Red Sea coast.²⁰ It belongs to the Rhizophoraceae family and can be ascribed to either *Rhizophora* or the *Bruguiera* genus. The red mangrove, *Rhizophora mucronata*, is distributed over the whole tropical Asia, Australia, East Africa and Madagascar. In comparison with *A. marina*, the red mangrove is less tolerant to high soil salinity and requires more humid conditions; it is an evergreen, in the tropics up to 25 m high tree, in Egypt 3-6 m.

Charcoal from another species of mangrove, *Rhizophora/Bruguiera*, was collected in WG 47 (2007-08) and WG32 (2006-07), as well as WG 53-WG 55 representing the first substantial reference for ancient Egypt. It can be assumed that the wood was either cut and carried with from mangrove woodlands in the South on the return way of expeditions, as this tree occur along the eastern coast of Africa, or there were natural stands along the Egyptian shoreline during pharaonic times, further to the North than the recent distribution, and later disappeared by human exploitation.

Charcoal material, comprising 33 samples with 1,760 pieces, from the 2007-2008 excavations was analyzed, and the following species were identified: *Acacia nilotica*: 847 pcs (1,132.7 ml), *A. sp.*: 1pc (1.2 ml), *Avicennia marina*: 372 pcs (241.5 ml), *Calotropis procera*: 1 pc (2.5 ml), *Cedrus libani*: 250 pcs (331.2 ml), *Diospyros sp.*: 8 pcs (5 ml), *Faidherbia albida*: 40 pcs (68.3 ml), *Ficus sycomorus*: 14 pcs (9.7 ml), *Leptadenia pyrotechnica*: 16 pcs (9.1 ml), *Pinus sp.*, pinoid pits; 5 pcs (9.7 ml), *Quercus sp.*, evergreen: 3 pcs (3.8 ml), *Rhizophora/Bruguiera*: 62 pcs (44 ml), *Salix sp.*: 22 pcs (21.2 ml), *Suaeda sp.*: 87 pcs (111 ml), *Tamarix sp.*: 28 pcs (33.4 ml), *Vitis vinifera*: 1 pc (5 ml). Newly found taxa are *Calotropis procera* and *Vitis vinifera* (*V. vinifera*, however, was a surface refill). Some fragments of ebony (*Diospyros sp.*) were again identified in the charcoal remains from WG32, SU25 and WG55 as well as WG 16/2006-2007 and WG32/2006-2007, showing that the majority of the ebony charcoal was so far recovered in front of the coral terrace with the caves.

Samples from further ship timbers were collected from Cave 2 (T51), exterior Cave 2 (T58), Cave 3 (T56, T57, T61, T64-T70, wooden block), WG32, Cave 6, SU33 (T22), WG33, SU2 (T71) and the types of wood determined. The planks and beams are made of cedar wood, only plank T56 of sycamore, two finds of poles, T68 and T70, of Nile acacia. Examined from the running excavation were small wood pieces of a newly discovered deck beam (T73) and a badly preserved steering oar blade (T72) which was left in the ground. The sample of the blade, taken by the excavator, was identified as *Faidherbia albida* showing similarities to steering oar blade T2 discovered in 2004-05 where the upper portion was of the same wood type. A few tenons (W378, W379, W380 and one from T72) were made of Nile acacia wood like all previous tenons and dovetails.

Thirty samples (741 pcs) from the great quantity of wood debris that was excavated during this season were investigated. Most of the debris pieces are the by-product of ship repair work, some are parts from the boxes. The following species were identified: *Cedrus libani*, *Acacia nilotica* and *Ficus sycomorus*. A few branches from *Avicennia marina* were also found in WG 52.

Conservation

The condition of excavated ship components has been systematically checked by direct observation during past field seasons.²¹ Wood planks stored on site in Cave 3 are in good condition and appear to have stabilized in storage, with only minor changes on the surface such as small

²⁰ Wood and charcoal were examined by Rainer Gerisch.

²¹ The conservation was conducted by Pasquale Musella.

cracks and occasional pale areas of salt. In some cases planks stored in Cave 1 exhibit light powdery salt crystals on the surface. They are found on some surface areas of the wood and have not structurally damaged the wood.

At the end of the 2007-2008 field season five data loggers to monitor temperature and relative humidity were placed in three caves (Caves 1, 2 and 3) and one data logger was placed in one of the storage boxes containing ship timbers in the Supreme Council of Antiquities (SCA) storeroom at Qift, to monitor the environment in which materials were stored.²²

²² The devices were procured by Harold Wellmann, who advised K.A. Bard and R. Fattovich to place them in the caves.

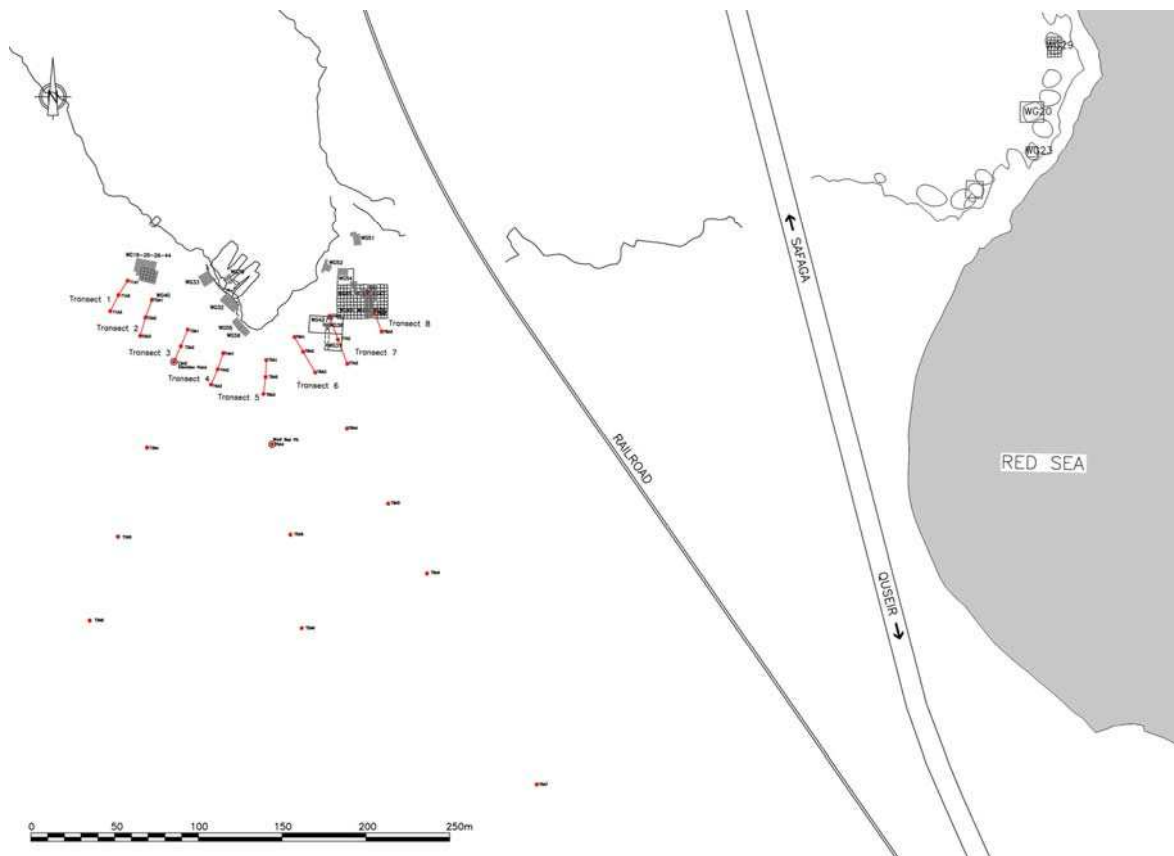


Fig. 1 General Map of the site



Fig. 2 General view of WG 56



Fig. 3 General view of the "harbour area"



Fig. 4 Laser scanning application



Fig. 5, Wood sample for dendrochronological analysis



Fig. 6 Timber T75



Fig. 7 Timber T72



Fig. 8 Rope fragment knotted in a reef knot from WG 53



Fig. 9 Knife or saw blade from WG 32



Fig. 10 Wood disc from WG 33



Fig. 11 Conical object from WG55