UNIVERSITÀ DEGLI STUDI DI NAPOLI "L'ORIENTALE"
Dipartimento di Studi e Ricerche su Africa e Paesi Arabi
Laboratorio di Archeologia

Harbor of the Pharaohs to the Land of Punt

Archaeological Investigations at Mersa/Wadi Gawasis Egypt, 2001-2005

Kathryn A. Bard and Rodolfo Fattovich Editors

NAPOLI 2007

KATHRYN A. BARD AND RODOLFO FATTOVICH
Editors

HARBOR OF THE PHARAOHS TO THE LAND OF PUNT

Archaeological Investigations
at Mersa/Wadi Gawasis, Egypt, 2001-2005

NAPOLI 2007

Chapter 5
Finds: Ship evidence

CHERYL WARD AND CHIARA ZAZZARO

5.1 Ship timbers: description and preliminary analysis

C. Ward

Excavations at Mersa/Wadi Gawasis in 2005-06 continued to recover the world's oldest remains of seafaring ships. In addition to the presence of hull timbers at an archaeological site once located on the fringes of a lagoon probably linked to the sea, extensive damage to planks and fastenings by the shipworm, or marine borer, provides irrefutable evidence of seafaring.

Twenty-two other ancient Egyptian watercraft built for use on the Nile date from about 3000 to about 500 BC (Ward 2006). Because Egyptian construction techniques used to build these riverine vessels differ significantly from those of later Mediterranean seagoing craft, many scholars assumed that Egyptian ships would more closely reflect Mediterranean-type construction. Discoveries at Mersa/Wadi Gawasis prove that Egyptian design and construction techniques were successful both on the Nile and at sea. This report provides a preliminary review of the timbers excavated in 2004-06 and offers comparisons to other Egyptian watercraft.

Most timbers found at Mersa/Wadi Gawasis in 2004-05 and those excavated in 2005-06 were in contexts that indicate either discard or reuse and recycling in ramps, entrances, and walkways. Many planks were significantly reduced in size or reworked. In addition to 53 individually documented ship components, archaeologists also recovered at least a thousand wood debris fragments related to the dismantling of ships in concert with an aggressive hull cleaning and rot-removal process. Much of the wood debitage shows damage from shipworm infestation (Figure 56).

In 2004-05, Chiara Zazzaro excavated and described, with the assistance of Cinzia Perlingieri, wood objects recovered in WG 24, Cave 2 and WG 28, Cave 1 (see Fattovich and Bard 2005: 21-23). Zazzaro's study of the steering oar/rudder blades (T1, T2) follows in 5.2. Planks available for study in 2005-06 were intensively documented and assigned numbers in a sequential series that incorporated all finds through January 2006. Planks, plank fragments, and other wood finds with features identifying them as hull components or maritime equipment were assigned numbers T1-T60, not inclusive. Wood debris collected from excavation squares by archaeologists received brief scrutiny and recording. Lot numbers (W1-W166, not inclusive) represent associated fragments from a particular area brought to the laboratory on a given day. Wood debris was recorded according to the Stratigraphic Unit (SU) and square. While each lot was photographed, only a few examples could be thoroughly evaluated in the time available, so it is likely that much additional information about ship-breaking activities could be acquired by a thorough study of wood debris and its distribution.

On site, as archaeologists encountered substantial planks or timbers during excavation, the extent of the plank was defined and then cleaned as quickly as possible for mapping into the site plan while reducing exposure to sun and wind. When possible, the plank was then moved to a sheltered location (such as a cave) where it was measured, drawn and recorded in detail, and recorded with digital photographs. The condition of some planks required *in situ* recording, and moving these planks resulted in disarticulation. Most planks are stored on site, but representative examples (plank T34, steering oar/rudder blades T1 and T2, and plank T12, among others) were packed into wooden crates and transferred to Supreme Council of Antiquities storage facilities at Qift.

Archaeologists noted that wood objects tended to be either soft, powdery and weak, or strong and resilient. Preliminary wood identification of ship timbers by Rainer Gerisch (see 6.2.b) suggests that the softer timbers are mostly Nile acacia (*Acacia nilotica)* type

and the much better preserved timbers are cedar, *Cedrus l* obtained from sources beyond Egypt's borders, or sycomore, a found in the Nile Valley (*Ficus sycomorus*). Whatever wood sp was used, the quality was high, typically with fine grain. For exa the Mersa/Wadi Gawasis examples have far fewer knots tha tamarisk Lisht timbers from the pyramid of Senusret I (Ward Ha 1992), and are comparable in quality to cedar used in the ceren cedar boats excavated outside the pyramid of Senusret III at Dahs

Analysis of the hull components revealed strong similarit Middle Kingdom boat construction technology as illustrated i Dahshur boats and the recycled working boat planks from Lish new or slightly different patterns and priorities are visible i Mersa/Wadi Gawasis timbers. In addition, thinner, less r fastened planks with waterproofed seams permit speculation deck-level structures designed to protect precious cargo and from the wind and waves of the Red Sea. As expected from an of all other ancient Egyptian watercraft, Egyptian shipwrights mortise-and-tenon fastenings without locking them in place with like later Mediterranean Bronze Age and Classical shipbuilders.

5.1.a Timber types and fastenings

After documentation, excavated wood finds were classified int types that reflect original function. Planks and wood fragmer unidentified function are classified as "other." Identifiable compone other artifacts such as boxes or furniture included in wood debris excavation units were considered small finds and are not discussed l

Distribution of timber types

Transverse timbers (Type 1)	1
Hull planks (Type 2)	16, possibly 17
Deck planks, chamfered (Type 3)	7, possibly 9
Planks with ligatures (Type 4)	5
Auxiliary equipment	6
Other planks, undetermined	12
Fastenings and debitage	T38, T40 and lots W1-V

A single transverse structural member (Type 1) has been found. Beam T32 is a complete deck-level beam (Figure 57) discovered with its rounded surface uppermost, parallel to the wall of the fossil coral terrace between the entrances to Caves 2 and 3. Its position probably reflects its re-use as an architectural element to stabilize sediments around the cave entrances. Rounded on its lower surface, the beam has ledges to receive deck planking on its upper face to either side of a central pedestal. Its ends, adzed into precise shapes that reflect hull curvature, could be fastened to other planks through square holes in each end.

A plank shape similar to plank shapes from other Egyptian watercraft, comparable dimensions, and damage from marine mollusks, determined whether a timber was classified as a hull plank (Type 2). Sixteen planks are assigned to this category, and all sampled Type 2 planks are cedar. The most straightforward identification in this category is T34 from WG 32, a knife-shaped plank (293 cm long, 46 cm wide, 15 cm thick) like some in the Dahshur and Lisht assemblages (see Figure 26). Other timbers are identified as hull planks on the basis of their size (6.5 cm thick or thicker) in combination with fastening size and pattern (deep mortise-and-tenon joints), and evidence of shipworm damage, usually on one wide face and adjacent edges.

The third timber type consists of short lengths of planking (75 to 90 cm) with chamfered ends on one wide face, widths up to 35 cm, and thickness of less than 5 cm (Figure 58). Type 3 planks are identified as deck planks because of their similarity in proportion and shape to deck planks from the Dahshur boats. Mersa/Wadi Gawasis deck planks are better finished, slightly larger in scale than most Dahshur deck planks (52-68 cm long, up to 29 cm wide and 3.5 cm thick), and at 10 cm the angled portion of the lower face is longer than most chamfered ends of the Dahshur deck planks (4-9 cm).

Most Type 3 examples that were identified are cedar; some are sycomore. Many of these planks have traces of white plaster on at least one wide face; several showed signs of marine borer infestation.

Numerous and deep adze marks and red paint over the damaged ar suggest these areas had been marked out for rot removal but tur out to be more damaged than expected and the planks were recyc as walkway components or wedged beneath larger planks on entra walls to compensate for plank curvature. One example (T13, sycomore) has a series of incised marks in the center of its lower fa another (T25) was originally a hull plank (Type 2) and was resha with chamfered ends before being recycled in a ramp leading to C 3's entrance.

Each Type 4 plank was reused in ramps leading into the entran to Cave 3 and Cave 4. These planks (2.5-3.5 cm thick) are thin than planks in the hull of any pharaonic watercraft. They are joinec one another with both mortise-and-tenon fastenings and ligatu (Figure 59). Mortises are about 7 cm deep with a maximum ter length of 14 cm. Ligatures consist of 1-1.5 cm-diameter holes t pass through the plank's wide faces and are associated with shall grooves about 4-5 cm long and 4 mm deep that extend to the pl edge on the inner surface only. No lashing was visible in any of grooves or holes. In addition, excavators found twisted copper strip cm wide in association with the outer face of several planks of t type (Figure 60). No evidence for marine mollusks is recorded for a Type 4 plank although at least three have a black coating along pl edges that probably represents a waterproofing agent on the in face. All identified members of this class are of Egyptian wood ty (acacia and sycomore) and are in good to incoherent condition.

The auxiliary group (Type 5) is comprised of maritime equipm that was not part of a ship's hull, that is, a single blade from each of t steering oars/rudders recovered in 2004-05 (T1 and T2), a 1.89-met long crutch or stanchion (*Acacia nilotica*) (Figure 61), and some sm pieces including three from projecting knobs that may be oarlocks pins. Half-round and round-sectioned fragments were also recorded a may represent the remains of oar looms, poles, spars, or battens.

Wood debris and discarded fastenings were separated from bits branches, twigs, charcoal, boxes, and furniture remains. While ma

fragments were so eroded that features were indistinguishable, others retained tool marks, fasteners, and properties that provide at least an outline of their use history. For example, a 4-cm-thick acacia plank fragment with a faceted dowel (T50) and faceted dowel W67 (14.2 x 1.2 cm) were not part of the hull itself, but illustrate the use of common carpentry techniques to join wood. Similarly, pegs in fragments of thin planks and wooden boxes resemble loose pegs found in association with ship debitage, but are not seen in the remains of hull planks. Fastenings incorporate useful information about construction techniques, even without an entire vessel to study. In the case of the Mersa/Wadi Gawasis planks, this category includes free tenons of several sizes in planks and in upper levels of sediments both inside and outside caves; mortises and holes cut into planks for wood-to-wood fastenings; holes drilled for ligatures and lashing channels; pegs and dowels; and copper strips.

Type 2 and Type 4 planks were joined by mortise-and-tenon fastenings in standard sizes and patterns. All identified tenons are *Acacia nilotica*. Mortises (8-9.5 cm wide and 1.5-1.8 cm thick) were cut with chisels into plank edges, extending about 12-15 cm into each plank. Some tenons (Size I) found in archaeological sediments are 22-28 cm long, 4-6 cm wide and 1.2-2 cm thick, but those still in the planks were sawn and chiseled at their midpoints so as to break planks away from neighboring planks along plank seams. Most tenons filled the entire width of the mortise; some occupied only half the mortise when excavated. No pegged (locked) mortise-and-tenon joints are present today, but two loose tenon fragments and one mortise on plank T18 have drilled holes 1.2 cm in diameter, probably for fixing a loose tenon in place as seen on isolated joints in other Egyptian craft. As seen in the Lisht timbers, some mortise-and-tenon fastenings were 'stacked' one above the other, providing strong internal framing for the hull. In most planks, fastening spacing is between 40 and 60 cm.

Mortise-and-tenon fastenings in Type 4 planks were spaced more widely than those in Type 2 planks (60-75 cm), half the depth, and only 5.5-6 cm wide and 1-1.3 cm thick. Tenons (size II) measured 14-

15 cm in length, 3.5-5.5 cm at maximum width, and 1-1.2 cm t They do not occur in pairs, but about half of those recorded on planks are directly associated with a ligature fastening. On Egy river craft, lashing channels and ligatures have an ancient pedigre Mersa/Wadi Gawasis, on the inner face of a Type 4 plank, usual either side of the tenon, a shallow (4 mm) groove leads from the edge to a 1.2-cm-diameter hole through the plank. The holes are and one of the channels is usually slightly curved. No trace o cordage or lashing that passed through these ligatures was found a Type 3 deck plank, has two sets of opposing ligatures in the pattern, but lacks mortise-and-tenon fastenings. Two size III te (11 cm x 3.5-4 cm x 1 cm) were recovered from sediments, but of comparable size was documented in place.

Another form of fastening is visible in Type 2 plank T18 and 1 beam T32. About 17 cm from each end and 100 cm apart, diag holes pass from one edge of the plank to the inner face. Similar passing from beams through the sheer strake were recorde Reisner (1913: 84) for one of the Dahshur boats in the Cairo Egy Museum (4925) and are present on the Dahshur boats at the Museum of Natural History and the Carnegie Museum of Na History in the U.S. The hole on T18 is 5 cm x 3 cm on its outb edge and 3 cm x 2.5 cm where it exits the plank on the outer Holes in each end of beam T32 probably fit over sheer strake like these. Lashing may also have helped secure beams to plan two of the beams from the Carnegie Dahshur boat had cru cordage between the bottom of the beam and the notch cut int sheer strake.

Copper is rare on extant vessels, but present in limited quantiti the superstructure of the Khufu ships. At Mersa/Wadi Gaw twisted and bent remnants of copper strips of a constant widtl relatively common (see 7.3). A twisted copper strip fragment (3. x 1.8 cm) was found with a potsherd beneath ligature holes at E on T13. It resembles a fragment from WG 24, Cave 2, Room 1 SU53 that is 4 cm x 2 cm; an individual strip (10 cm x 2 cm) tha

associated with a thin dovetail-ended plank T60 (10 cm x 2 cm); and, most definitively, four strips (ca. 15 cm x 2 cm) threaded through a single mortise in hull plank T34. The strips are wedged into a mortise through the plank and exit in an 8.5-cm-wide recess on the plank's outer face. Copper strips overlapped one another slightly, but were not fastened to each other; they originally linked T34 to the plank below it much like ligatures visible low on the hull of the Khufu ship (Ward 2000: 49-50). Although there are indications that the other copper strip finds were used as fastenings, no other *in situ* examples were recovered in 2005-06.

Archaeologists also recovered a number of dovetail tenons, all cut in half at their narrowest point, but originally 20 to 34 cm long, 3.5 to 3.8 cm thick, and about 6.5-7 cm at their widest point, narrowing to 3-3.5 cm. Such fasteners were commonly used to secure seams between stone architectural elements in ancient Egypt. Late 19th-century reconstructors of the Dahshur boats cut dovetail fastenings into its planks to replace decayed lashing mortises (Ward 2004), but their use is not otherwise recorded on ancient Egyptian ships or boats. Although some dovetail tenons were present in the general shell and wood debris from plank cleaning activities in Cave 3, no planks or plank fragments excavated in 2004-06 retained any trace of mortises to hold these tenons; only stone anchors or blanks had dovetail mortises. As a result, their function is unknown although pry marks made by chisels suggest that wherever they were used, they fit tightly.

5.1.b Tools, surface treatments, and incised marks

In addition to recording dimensions, wood characteristics and fastening patterns for each timber, all wood fragments were also examined for tool marks and other features to try to understand patterns of activity at the site. Evaluation of tool marks showed that the expected saws, adzes, chisels, and probably polishers were in use both during the construction and recycling process. A few drilled holes imply use of the bow drill, and axes may have been used in a few cases to reduce plank length (T33).

Two categories of tool marks were readily identified associated with original shaping or reworking of planks (Figure The original shaping of timbers included careful finishing of examples so that few tool marks are preserved. A few score m shallow dubbing marks of an adze with a blade only a few centim wide or even smaller, and crushing caused by a chisel handle or edge of mortises, and, only on Type 4 planks, abundant saw marl wide faces fall into this category.

Tool marks associated with reworking of planks include saw n at plank ends, deep and wide gouges made by adzes, chisel mark: pry marks. Another tool of the shipwright stands out, and that i presence of red paint on finished surfaces that also bear eviden shipworms. Red paint is present on many of the timbers evaluat 2005-06, and also on perhaps 5% of the wood debitage. I believe the paint was used to mark areas that needed to be removed, per in accordance with the Old Kingdom word *šd-(m-)dšr*, translate John Darnell (1984) as "remove the red." Red paint is present on areas of extensive re-working or damage.

Some Mersa/Wadi Gawasis planks also bear incised marks probably relate to hull construction methodology (Figure 63). hull planks (T18, T34) and at least one Type 3 deck plank (possibly T11) bear panels of chiseled marks that include at leas multi-dimensional sign and what seem to be notational marks, son which extend to the plank's edge and suggest they might have matched with marks on an adjacent plank. Such a system is logic considering how ships built at a Nile shipyard could be e reassembled on the Red Sea shore, and has a precedent in the mai system on Khufu hull planks and battens (Nour *et al.* 1960: 8).

5.1.c Preliminary analysis of ship timbers

Ship timbers at Mersa/Wadi Gawasis provide the most an direct evidence for seafaring in complex watercraft anywhere i world. Although the vessels associated with Khufu's Giza pyr (ca. 2589-2566 BC) and those to the east of Khasekhemy's fun

enclosure at Abydos (end of the 2nd Dynasty, ca. 2700 BC) are substantially older, they were designed and built for use on the Nile like the Middle Kingdom craft buried at Dahshur and Lisht (ca. 1870-1831 and 1956-1911 BC, respectively) (Ward 2004, 2000). Abdel Moneim Sayed's (1978, 1980, 1983) initial discovery of stone anchors and a few plank fragments revealed hints at what might be preserved at the site, but underwater archaeological survey there was unproductive (Ward 1996).

It is no exaggeration to state no one imagined the abandonment of complete timbers outside the cave system or the coils of rope in Cave 5 at Mersa/Wadi Gawasis, and so the results of this expedition's work are truly groundbreaking. Marine encrustations, destruction by shipworms, ship timbers recycled as architectural elements, and debris left by ship-breaking activity are common both inside and outside the caves on the western slope of the coral terrace. Documentation of wood remains shows that the technology and dimensions of hull components are consistent with what might be expected of seagoing ships in the Middle Kingdom. They are similar to, but sturdier than, Dahshur and Lisht planks, and bear marked similarities to boatbuilding techniques seen in those river craft.

For example, T32 resembles beams from the Dahshur boats, but at 3.29 m long and 0.28 m wide is more massive in scale. The midships beam in the Carnegie Museum of Natural History, for example, was 2.22 m long and was a maximum of 0.18 m wide, with ledges 0.035 m wide and 0.025 m deep. Deck planks are similar in shape and proportion, but about 15 percent larger at Mersa/Wadi Gawasis than on the Dahshur hulls.

Hull planks up to 22 cm thick provide ample evidence of a characteristic Egyptian construction practice, overbuilding. In this case, because shipworm damage extends up to 5 cm into the plank edge, overbuilding does not seem to be an appropriate term. Some plank fragments resembled sponges with a thin layer of finished surface; it is difficult to imagine how they provided any protection from the sea. No exterior coating was recorded for any Type 2 plans,

suggesting that the resinous nature of cedar acted as a moc effective repellent. Type 4 planks probably functioned in dec structures as they are not robust, have small mortise-and-tenon and have no damage from shipworm.

Auxiliary components and maritime equipment such as the steering oar/rudder blades, and possible oar pins help to el aspects of actual voyaging and also provide insight into the di and disposal of wood elements. Cordage recovered in Cave stored in coils in Cave 5 (see 7.2) also contribute to underst more about standing and running rigging for seagoing ships.

The primary activity that may be documented outside Cav and 4 at Wadi Gawasis is ship breaking. In the entrance areas o 2 and 3, work areas identifiable by extensive deposits of chipp shipworm-infested wood fragments, and fastenings cut and brok tools, testify to the trimming and reworking of planks. Examin wood debitage indicates large-scale removal of damaged woo ships built of planks like those recorded in 2005-06.

It is likely that once ships returned from their voyage, ship inspected the hulls, perhaps marking unsatisfactory timbers w paint. Workers then began to remove planks from the hulls by seams apart and sawing or chiseling through the tenons, and most likely followed behind them and pulled the planks off t from the outside. Once timbers were broken off the ships outs caves, men carried them into the cave. They walked over reinforced with mud-bricks and planks and across walkways n short and cut-up planks about 80-100 cm long from the e across the lower levels of Cave 2, Room 1 into the 19 m working space. There, workers cleaned and prepared ind planks, some of which may have been returned to shipyards Nile, while others were recycled in architectural features on t Some planks were stored or discarded in the cave rooms, an were even used as fuel, as charcoal samples identified by Gerisch as non-native species *Cedrus libani, Pinus* sp., *Querc* and even ebony, indicate.

Like other unique artifacts discovered by archaeologists working at Mersa/Wadi Gawasis, the ship timbers and remains contribute to a broader understanding not only of the role of shipbuilding technology and achievement, but also of the vast administrative and bureaucratic nature of ancient Egyptian contacts with the world beyond Egypt's borders.

5.1.d Partial catalog of timbers[1]

T32: Type 1 beam, *Cedrus libani*
WG 30/WG 16, between Caves 3 and 4, SU50
MaxL: 329 cm MaxW: 28 cm MaxTh: 18 cm

In very good condition, beam T32 was excavated with its lower, rounded face uppermost. Mud plaster and salt, mixed with wood and broken ceramics, covered the sides of the beam. Heartwood is central in the beam, and a few knots are visible. On the upper face, carved ledges define a central pedestal. On one edge, the ledge is about 8 cm wide and 4 cm deep; the opposite ledge is only 6 cm wide. A similar pattern is present on Carnegie Museum Dahshur boat beams. The central pedestal (12-14 cm wide) is almost entirely worn away in the middle third of the beam and has major concentrations of hatch and chopping marks 70-100 cm from each end. A 4 cm x 5 cm hole extends 7 cm into the beam from the upper surface, and a 4 cm x 4 cm hole is present at each end of the beam. The 4 cm x 4 cm hole is nearly vertical, and central in the thinned and shaped ends that fit into notches cut into the sheer strake. Shallow grooves connect the holes to the beam ends on the lower surface.

[1] Abbreviations used here are as follows: OF Outer Face, exterior planking surface; IF Inner Face, interior planking surface; MaxL Maximum Length; MaxW Maximum Width; MaxTh Maximum Thickness; rem Remaining. Timbers have two edges, two ends, and outer and inner faces. All wood identifications to species level were made by Rainer Gerisch. Where wood type is described as having gross morphological characteristics similar to a particular species, this indicates a similarity of color, grain pattern, density, and general evaluation of pore presence and distribution rather than a scientific identification to species level.

T34: Type 2 plank, *Cedrus libani*
MaxL: 293 cm MaxW: 43 cm MaxTh: 15 cm
WG 32, SU9

In very good condition, knife-shaped hull plank T34 has wood rot and insect damage on its wide end. Several large knot: 15 cm) are present on the IF and Edge A, but grain runs parallel long Edge B. The OF is wider than the IF, and the IF is sl concave. Plank T34 was fastened to other timbers by deep mc and-tenon joints (8-9.5 cm wide, 1.2-1.5 cm thick, and 13 cm and secured by a band of copper composed of four strips thr through a mortise near the tip of the plank's wide faces. Wood t were originally about 21-26 cm long. All remaining tenons are half that length today because they were sawn and chiseled to this plank away from its neighboring planks along the former seam. No pegged (locked) mortise-and-tenon joints are presen lashing channels are present; 22 of 25 fastenings are paired mc and-tenon joints, much like those in the Lisht timbers. Two ser incised marks are present on the plank's inner face.

T18: Type 2 plank
MaxL: 134 cm MaxW: 16 cm MaxTh: 11 cm
WG 24, Cave 2, entrance corridor, SU32 [2004-05]

In poor condition due to its relatively exposed position high i sand outside the cave and heavy salt encrustation, little ori surface remains on this plank. Light insect damage is present for 50 cm along the IB edge/OF margin near End 1. T18 is cracked Edge A; near End 1 is a partial mortise (8.5 cm wide, 1.2 cm and 5.5 cm deep). Heavy salt encrustation obscures about half c IF and End 1 on the inboard edge, but 13 mortise-and-tenon j one with a 1.2 cm peg hole to the OF, are present on the outl edge (Edge A). The remains of two diagonal holes are visible o OF (3.5 cm x 3.5 cm) and outboard Edge A (5 cm x 5 cm). tenons remain in mortises; no fastenings are visible on th Mortise-and-tenon fastenings are extremely close-set and

separated by only a millimeter or two, if that, in some cases. The wood shares gross morphological characteristics with cedar type wood.

T25: Type 2 plank fragment converted to a Type 3 plank, *Cedrus libani*
MaxL rem: 77 cm MaxW rem: 15 cm MaxTh: 7 cm
WG 30, D5 (north), SU62

Despite extensive shipworm infestation on both edges and OF, T25 is in overall good condition. Shipworm channels, with shells, run along grain lines on OF and extends up to 4.5 cm into thickness of plank. Wood grain runs parallel to plank edges and only one small knot (3 cm diameter) was recorded. The remains of three mortises (7.5, 8.5 and 9.5 cm wide and 1.2 cm thick) are visible on IF and the edges. Heavy dubbing with an adze blade 4.3 cm long with bites up to 1.5 cm deep and lines of red paint centrally located and near End 2 cover much of the IF. Chisel marks are visible in mortise 2.

This plank fragment originally was a Type 2 hull plank, but has been reworked as a Type 3 chamfered deck plank, as the plank ends each show a ca. 10-cm-long angle on the original OF.

T13: Type 4 plank, *Acacia nilotica*
MaxL rem: 122 cm MaxW: 19 cm MaxTh: 3.4 cm

T14: Type 4 plank, *Acacia nilotica*
MaxL: 203 cm MaxW: 25 cm MaxTh: 3.8 cm
WG 30, C4/C5, SU62

In good condition when exposed, but soft and entirely disaggregated when removed, T13 and T14 were still joined by two mortise-and-tenon fastenings when uncovered outside Cave 4. The seam was open by 0.7-3.5 cm when first exposed. The IF was uppermost, and the OF was not observed closely, but seems heavily eroded. No damage from marine borers was identified, but some insect damage was visible on the IF of both pieces. Neither timber was complete, but End 1 of T13 and End 2 of T14 are original. A black

coating up to 3.3 cm wide is present on the IF along the origi of both planks. Edge B of T14 was bright red and very worked when exposed.

On T14, four mortise-and-tenon fastenings (6 cm wide, 1 and 5-6 cm deep) retained tenons 5 cm wide at the plank Edge B, and traces of a pair of ligatures remain on Edge A ne but this part of the plank had crumbled before it could be co recorded. Edge B of T13 had a single pair of ligature holes 12-cm-long tenon preserved in a mortise 6 x 1 x 5 cm. A sir (1.2 cm diameter) was centrally located between the two ligature holes and grooves at End 1 of T13. A twisted cop fragment was found under the ligature holes near End 1 w was removed.

An attempt to consolidate the timbers using Paralloid B-72 removal was unsuccessful.

T1: Type 5, steering oar/rudder blade, *Acacia nilotica*
WG 24, Cave 2 entrance, SU26 [2004-05]
Steering oar/rudder blades are described in 5.2.

T2: Type 5, steering oar/rudder blade in 2 pieces, *Acacia nilot Faldherbia albida*
WG 24, Cave 2 entrance, SU26 [2004-05]
Steering oar/rudder blades are described in 5.2.

T44: Type 5, crutch, *Acacia nilotica*
MaxL rem: 189 cm MaxW: 18 cm MaxTh: 6.9 c
Cave 4, leaning against north wall

Bowed, with a friable and dry surface that is cracked and c this crutch is nearly complete. Carved from a branch with a bi end, T44 has few small knots, is fine grained, and has c located heartwood. The crutch opening (13 cm x 8.5 cm x 7 c cm) is flattened along its narrowest surface and slightly concav sides.

T45: Type 5 fragment, carved pin or peg, *Ficus sycomorus*
MaxL rem: 9.5 cm MaxH rem: 10.2 cm MaxTh: 6 cm Max peg circumference 19 cm
WG 24, Cave 2, Room 1 just north of T16

A peg carved from compass timber rises from a flat base with one original rounded edge and two roughly hacked edges remaining. T45 was found with the peg oriented vertically with its flat lower face uppermost in a position that "squared off" the re-shaped tip of T16. It is in very good condition and has no damage from insects or marine life.

W147: wedge-shaped fragment that resembles the base of T45
MaxL rem: 13.5 cm MaxW rem: 10.5 cm MaxTh: 2.5 cm
WG 24, Cave 2, Room 1, E5, SU43

W63: from a peg fragment of similar proportions to W147
MaxH rem: 6.8 cm MaxW: 5.5 cm
WG 24, Cave 2, Room 1, C2, SU53

All three pegs/peg fragments (T45, W147, W63) share gross morphological characteristics of the same wood type, but only T45 was identified.

5.2 Ship blades
C. Zazzaro

During the 2004-05 field season, two steering oar/rudder blades were found covered by windblown sand, in the upper level of the Cave 2 entrance corridor, WG 24 (Figure 64). Associated with them were branches, algae and leaves, some rope fragments, and potsherds dating to the early New Kingdom (see 4.1.h). Found on top of a deposit of windblown sand, the two blades represent the remains of the last seafaring expedition at Mersa/Wadi Gawasis.

Blade 1 / T1 (Figure 65a)
MaxL: 200 cm MaxW: 40 cm, MinW: 15 cm MaxTh: 12 cm

T1 consists of two parts joined by a scarf junction. It is tria in shape, with a rounded corner and an indented cut near the to upper part is of *Acacia Nilotica* (see 6.2.b): it has a consistency, with insect damage on the surface. The lower, preserved part is of *Faidherbia albida* (see 6.2.b), which grows Nile Valley as well as in sub-Saharan regions. Its surface is encrusted with salt and shows insect damage, which occurre abandonment at the site.

On T1 the fastening consists of five mortises with four pa preserved tenons still *in situ* (tenon dimensions: MaxL: 2 MaxW: 9 cm, MaxTh: 2.4 cm). Mortises 3, 4 and 5 are fixe perpendicular pegs 1.5 cm in diameter. Mortises 4 and 5 are bro two trapezoidal cuts containing copper remains. A hole, 6 diameter, through which rope would have passed, is carved ir upper part of the blade.

Blade 2 / T2 (Figure 65b)
MaxL: 175 cm MaxW: 35 cm MaxTh: 12 cm

T2 is identified as *Acacia Nilotica* (see 6.2.b); it is preserved, and the lower part is damaged by shipworms, demonstrates that the blade was used in the sea. Small rema copper are seen in the damaged lower part. The blade is triangu shape with a rounded corner and a groove on the top.

On T2 the fastening consists of four fragmentary mortises wi partially preserved tenons (tenon dimensions: MaxL 22.5 cm Ma cm). A hole, 7.5 cm in diameter, through which rope would passed, is carved into the upper part of the blade.

The two blades are probably part of the same steering oar/r in spite of differences in length and top shape. They seem to been modified and/or re-adapted. The lower part of T1, which i different species of wood, might have been a later addition, as th

is much better preserved than the upper part. Mortises and tenons alternate on the two blades, and they originally connected each blade to a central loom, which is missing.[2] After the last use, the original steering oar/rudder was most likely dismantled cutting the tenons connecting the blades to the loom. Where and how the original steering oar/rudder was positioned on the stern, and if it was employed as steering oar or as quarter rudder, cannot be determined.

The original fastening also included the use of copper strips, since copper traces are still visible in the two cuts along the edge of T1 and in the lower part of T2. The copper strips may have been used to protect or reinforce the mortise-and-tenon junctions and to fasten the blades to each other and to the loom. The strips were probably removed with part of the timber during the dismantling of the ship (see the two trapezoidal cuts on Blade 1 in Figure 65a). In representations of ancient Egyptian ships, Reisner and Boureaux have interpreted dark bands on steering oars and quarter rudders as evidence of metal bands (see Boureaux 1925: 341-45; Reisner 1913: Plates 12-13, 4801, 4820, 4825, 4844), and the Mersa/Wadi Gawasis evidence is the first of copper used in the fastening of an ancient Egyptian boat.

The two circular holes are carved almost in the same place on each blade. These functional holes provided a channel for rope to secure the blades to the hull, as with the steering oars from the Dahshur boats (Ward, 2000: 96) and in several representations of ancient Egyptian ships and boats (see also Faulkner, 1940: 7).

The triangular shape of the Mersa/Wadi Gawasis steering oar/rudder is similar to those in ship representations of the Second Intermediate Period to early New Kingdom, which also have a triangularly-shaped steering oar and quarter rudder.[3] The

[2] A similar fastening is also attested in the steering oars from the Dahshur boats (Creasman 2005:109, Figure 51; Ward 2000: 96).

[3] See, for example, the triangular quarter rudders of the gold model boat from the Theban tomb of Ahhotep now in the Cairo Museum (JE 4681, JE 4669), in model boats from Tutankhamen's tomb (see Jones 1990), and in reliefs at Ramses III's Medinet Habu temple illustrating the naval battle with the Sea Peoples.

representational evidence thus fits well with the pottery with the Mersa/Wadi Gawasis steering oar/rudder blades, been dated to the early New Kingdom (see 4.1.h).

The length of the two Mersa/Wadi Gawasis blades al data for estimating the dimensions of the original representations of ancient Egyptian ships, and in the Dah the proportion between the quarter rudder and the hull is 1:8 to 1:10. Therefore, the dimensions of the Mersa/Wa blades suggest a ship 14.4-20 m long, which seem appro seafaring vessel in the Red Sea. The expedition flee included ships of different sizes, as is attested by the Hatshepsut's expedition to Punt (Naville 1907-1913, Pl and by the Papyrus Harris, which records Ramses III's ex Punt (Bongrani 1997: 46).

The Hatshepsut expedition is the only known one tha with the probable date of the Mersa/Wadi Gawasis blades. have been other seafaring expeditions to Punt in the Kingdom, however, that are unknown because no recor have survived.

5.3 Stone anchors and pierced stones[4]

C. Zazzaro

To date, twenty-six whole or fragmentary stone anchors found at Mersa/Wadi Gawasis, which are the main evide study of the ancient Egyptian stone anchors. Six anc recorded by Sayed in the mid-1970s (Sayed 1980: 154-15 Frost 1979; Nibbi 1975, 1984, 1992, 1993). Twenty an three pierced stones of uncertain function) were record UNO/BU expedition.

[4] Mohamed Mustafa Abdel Maguid helped record anchors in 2005-06