

CONFLICTING EVIDENCE FOR DEFINING THE ORIGIN OF THE MA'AGAN MIKHAEL SHIPWRECK

This paper will deal with the Ma'agan Mikhael ship which was introduced in the 3rd symposium, by Dr. Elisha Linder and Mr. Jay Rosloff¹. This was after the second season of excavation. Following the third and last season, all the hull components, cargo and small finds were retrieved from the site. The wood is in a laboratory in holding pools, installed with heating and mixing systems, for the long process of impregnation with polyethylene glycol (P.E.G.). The following are the preliminary results of the analyses of the finds.

Ma'agan Mikhael is located on the coast, 35km. south of Haifa, Israel. The ship was found in a depth of 1.5 meters, under a layer of sand 1 meter deep, 75 meters from the shore. It has been dated to approximately, 400 B.C.

Stones and rocks.

The ship carried about 13 tons of stones and rocks. Depending upon the method of classification used, between 5 to 7 different lithic types were identified. The largest amount, making up about 60%, is of the Blueschist type. Our geology consultant, Dr. Arie Shimron, concluded his analysis by attributing the majority of this group of rocks to the Tyrrhenian Sea - in Calabria or, preferably, Corsica. However, a portion of the remainder is most probably from the south coast of Cyprus. As far as we know all these types of rocks had no economic or commercial value, or any particular use.

Food stuffs.

Some remnants of food were found, including olive pits Fig seeds and one burnt acorn. Most of them are normally found all over the Mediterranean. But the burnt acorn has been identified by Prof. Mordechai Kislev as having had its origin in southwest Turkey or the Aegean Islands nearby.

Ceramics.

The 70 items retrieved include a pithos, basket handle jars, mortiers, a cooking pot, jugs, juglets and bowls and were analyzed by Dr. Michal Artzi and Mr. Jerry Lyon, who suggested that most can be attributed to Cyprus, although some were identified as having its originated in Greece.

Pollen.

The pollen has been identified by Dr. Mina Evron as local and summer-blooming, giving us a hint that the ship may have sunk in summer.

Ropes.

A large amount of ropes was found on the site, some knotted. Five different thicknesses were found, ranging from 2 to 40 mm. in diameter. Their characteristics and origin have yet to be identified.

Wood.

The hull was built from allepo pine as were the frames, the mast-step and the keel. The keel was removed in one complete piece, 8 meters in length. The false keel and the tenons were made of oak. The one-armed wooden anchor² and the carpenter's tools were also of the same material. One of the tools was made of eastern plane (*Platanus Orientalis*). There were some decorative boxes made of olive wood. The rocks were found resting on a layer of dunnage which was of pistachio- (*Pistacia Palaestina*) - pine and oak. These five types of wood are found along the Israeli coast of today, or the Phoenician coast of that period. We are checking with our consultant Dr. Ella Werker, whether it is possible that all these types of wood could be found in any other region of the Mediterranean.

Construction.

The ship was a shell-first construction with mortise-and-tenon joints secured by wooden treenails. In her bow and stern structure the knees were lashed to the planks, the stem, the stern post and the keel. The frames were held in place by iron nails. The parallels of ships fastened by being partially sewn and iron-nailed that have been found in the Mediterranean although very few in number, were discovered in the central and the western part of the Mediterranean; such as Giglio, Bon-porté, Gela and Marsala.

Hydrostatics.

A preliminary analysis of her hydrostatic characteristics, which were done according to her extrapolated body-lines, appears in the table below:

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<i>DRAFT (M.)</i>	<i>DISPLACEMENT (M3)</i>	<i>FREE BOARD (M.)</i>
<i>0.90</i>	<i>9.85</i>	<i>0.96</i>
<i>0.95</i>	<i>11.01</i>	<i>0.91</i>
<i>1.00</i>	<i>12.19</i>	<i>0.86</i>
<i>1.05</i>	<i>13.41</i>	<i>0.81</i>
<i>1.10</i>	<i>14.60</i>	<i>0.76</i>
<i>1.15</i>	<i>15.92</i>	<i>0.71</i>
<i>1.20</i>	<i>17.21</i>	<i>0.66</i>
<i>1.25</i>	<i>18.53</i>	<i>0.61</i>
<i>1.30</i>	<i>19.87</i>	<i>0.56</i>

By finding her wale we could estimate her draft, which did not exceed 1.1 meters. But we must take into our calculations the limitations due to her freeboard. Assuming too big a draft will minimize the size of the narrow freeboard. We reached the figure of less than 15 cubic meters displacement, and freeboard of 75 cm. as having been the ship's original design. Her total weight reached 18 tons. This included her own weight, rigging, crew, equipment, food, water and the rocks. This figure gives us a freeboard of 60 cm. I hesitate to be convinced that she crossed the Mediterranean in summer on these conditions, knowing what a normal Meltemi is. Nevertheless the ship sailed and beached under control, perpendicular to the shore. Another factor to be considered is the fact that the ship was practically new. One could still find bark on the frames. No traces of barnacles or teredo were discovered nor any sign of friction on the keel, wale or anchor. What we did find are shavings and brand new wood, as well.

More tests.

The evidence at this stage appears to be conflicting. Therefore we shall be conducting more tests of pollen samples which appeared under some coating on the keel, and await the results of the Neutron Activation Analysis for the ceramics and ratio isotopes testing of the lead. Resins and fibers of the ropes are also being analyzed.

Conclusions.

How was it that a ship with artifacts indicating different ports of call, which carried such a large amount of rocks from the Western Mediterranean, reached the coast of what is today Kibbutz Ma'agan Mikhael in Israel, in perfect condition, as if it was built yesterday in a nearby shipyard? At this stage of our investigation, it is still an enigma.

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NOTES

1. See *Tropis III*, Athens, 1995.
2. Rosloff, J.P., *IJNA* 20.3: 223-226.