

I have followed this correspondence with interest. The series of pictures by JP, both of the slipways and of the “Quays” are of extreme value, and I am not aware of any other images that compare with these for clarity and accuracy. They are an important record.

Regarding the interpretation of the Quays, and the allegation that they are Warehouses, we must try to rely only on facts, measurements, and solid data. It may be that we do not have enough data or measurements to resolve the dispute, or not of sufficient accuracy, and therefore we recommend further measurements. The present situation is a verbal stalemate, based on inadequate data.

There are several comments on the present situation.

1. So far as I know, no map of Apollonia underwater covering the whole site, and mapping the city as a whole, with surveyed measurements of positions, has been made by any archaeologists since the survey made by the Cambridge University team in 1958 and 1959, and published by NCF in several versions in journals and books up to 1971.
2. Detailed archaeological drawings with measurements may have been made of individual buildings underwater since 1959, but I am not aware of those either. (apart from work by JP). (Carlo Beltrame may have made some accurate drawings?).
3. The 1958-59 Surveys used the best measurement techniques of the day, but modern laser surveys and differential GPS etc. could produce a much more accurate map. The slipways, the block-towers, the grid building, and the apsidal building were all drawn at large scale in 1958-59.
4. All the subsequent maps of the town plan, by all authors, so far as I can see, are based on simplified versions of the 1958-59 map! Each subsequent writer has taken the original version and adapted it, altered it, simplified it, straightened out lines which on the ground are not straight, omitted depth soundings, joined up broken walls which should not be connected, and so on. None of these maps add anything to the 1958-59 survey, and, in terms of information-theory, they lose data. Since presumably they have sometimes copied each other, the maps get worse and worse with time. It is pure chance if one of these maps happens to confirm or negate any particular model of the “Quays” or “Warehouses”.
5. Several factors from the 1958-59 survey show that the relative local sea level changed during the period of occupation of the city, and that the circumference of the inner harbour contracted. In particular, there are small masonry walls on top of the slipways, implying that they were no longer in use at a later date, and small buildings were constructed on top of them; and the sea level which adjusts exactly to the walkway round the piscine is not the same level that makes sense for the use of the slipways. In general, Piscinae are a late development, so that is consistent.
6. The measurements of sea water depth in 1958-59 were made only with a ranging pole, and to an accuracy of 10cm. But we were ignorant in those days of the magnitude of the Mediterranean tide, and of the seasonal variation in sea level. Thus these figures for depth should be regarded as approximate, probably with a margin of error of 20cm.
7. As JP has pointed out, the critical measurement regarding the function of the “Quays/Warehouses” is whether the northern end of the structures between the raised masonry was above or below sea level. If the sea came between the masonry structures, and flowed into the space between them, then the concept of a “warehouse” seems inappropriate, no matter whether the sea bottom is sand or rock.

8. I don't know of any super-precise calculations of the relative sea level change since our work in 1958-59. The essential facts are that, when in active use, the floor of the tunnel through the grotto reef should be dry; the slipways should be deep enough at the bottom, and with long enough dry length; the channel into the inner harbour should be deep enough for ships; the walk-way path round the piscine should be dry; and obvious "land buildings with thin walls" should be on dry land. These requirements immediately reveal anomalies, even with the rough measurements available.
9. The "Grid Building" seems to front onto a harbour perimeter, with a present depth of 2.8m in front of it. But there is another row of small buildings further towards the centre of the harbour, requiring a sea level change of at least 2.8m. That correlates OK with the piscine, but would leave the slipways completely dry. The presence of buildings on top of the slipways, suggests that there was indeed a change of level while the city was occupied. Very roughly, the most probable sequence based on present evidence, is that the relative sea level was around - 1.8 to -2.0m when the slipways were built. The land lifted a bit so that the relative sea level sank to - 2.8m for the period when the fishtank was built; and then much later the city sank 2.8m to the present position. (The alternative, as discussed in *Cities in the Sea*, is that the vertical displacement was different at different parts of the city).
10. My map shows the water depth 2.2m, 2.3m, and 2.4m, around the "Quays". Thus the ground between the "Quays" would appear to have been flooded at the time that the slipways were built. However, given errors of the order of 20cms, we have to be very careful with this conclusion.
11. Notes: JP, your drawing of the "Quays" as we discussed in Brussels, shows them very long and narrow in the group assembly drawing, and much shorter and wider for the single "Quay" drawing. Something has to be corrected. Also, if the "quay" has 5 courses of ashlar masonry each 18-20cms thick, the height is 90-100cms.

It seems to me only likely to cause offence, bad tempers, and confusion if we argue too strongly on this evidence. Once a conflict reaches a certain level of disagreement, evidence has to be overwhelming to reach a decision which no-one can dispute. There is no point in encouraging more argument with no conclusion.

On the qualitative side of the argument:

12. If the "Quays" are really "warehouses", where has the superstructure gone to? There are no signs of pillars, foundations, posts, roof tiles, walls, fallen blocks, or even the sockets for wooden pillars. Furthermore, why are not warehouses on a continuous masonry foundation? What are spaces for? Given that the inner basin is small, and can only be entered through the narrow fortified entrance channel, why would one handle large cargo vessels inside this small basin? Would the water close to the "Warehouses" have been deep enough for cargo ships? These arguments tend to refute the concept of "warehouses", cannot be settled just by discussion, unsupported by facts on the ground.

The requirements are fairly simple, since they all depend on accurate vertical depth measurements at a number of known places, and this could be done with a simple measuring pole, marked in cm. There is no need for scuba gear. The key measurements are the floor of the Grotto Reef tunnel; the foundations of the Grid building; the small buildings in front of the Grid; numerous measurements around the "Quays"; the bottom of the slipways, and the walkway and sluices of the piscine. The light-structured buildings in the areas on both sides of the "Quays" also need to be depth-checked for their foundations. They look like land-based buildings, so their foundations should have been dry. But they also look as if they were built at the time that the harbour basin had contracted to its "inner perimeter".

A very different approach, requiring more security and high tech gear, would be a complete site map using an AUV and optical stereo-depth mapping of the whole site. That would provide the data that would really solve the question for sure, with accuracy to +/- 5cm, or even better..

Making the known data available is a good step forward, but please let us be careful about conclusions. We need more facts.

Best regards,

Nic.

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