

## ***Byblos & the Sea* - an HFF funded Research Project**

### **Summary report: Complementary Sea Survey in El-Yasmine and Medieval Harbor areas / Mission 7b - Sept. 2017**

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*Byblos & the Sea* is a multidisciplinary research project on the coastal and maritime area of Byblos co-directed by Martine Francis-Allouche (affiliated researcher at Collège de France) and Nicolas Grimal (Prof. at Collège de France), in collaboration with the Directorate General of Antiquities of Lebanon. It is a continuation of a long term research program on coastal and maritime Byblos, started by Honor Frost in the 1960ies and resumed after the Lebanese civil war, since 1998.

Since 2011, the research program *Byblos and the Sea* has conducted a series of multi-disciplinary field investigations in collaboration with local and foreign specialists. The main objectives of this research program were to understand the maritime approaches to Byblos and locate the much attested Bronze Age harbor of the city which was responsible for its economic growth during Antiquity.

In September 2016, marine investigation resumed (mission no. 7) in the Bay of Jouret Osman, the outer basin area which remains submerged to this day around the Island of El-Yasmine (Fig. 1). The specific aim of this mission was to carry out a survey to deliver a detailed bathymetric and paleobathymetric map from the area. Due to equipment failure towards the end of the mission, the span of work could not be entirely covered and therefore a survey extension had to be undertaken (mission 7b) in September 2017, under the direction of George Papatheodorou (Patras University) and also entirely funded by the Honor Frost Foundation.



**Figure 1. Aerial view of the southern maritime approaches to Byblos, marked with areas of interest**

This complementary remote sensing survey (Mission 7b) completed the following objectives:

### Objective 1 (Fig. 1 – Area 1)

A detailed bathymetric survey was conducted in the area using a new surveying system to fine-tune results: a shallow water Multibeam Echosounder (Bathyswath). This Bathyswath system provided very accurate and dense bathymetric data, along with high quality backscatter data (similar to side scan sonar data). The objective was to couple results of this new surveying system with results obtained by the Chirp Subbottom profiling data used in previous missions (2014, mission 4 & 2016, mission 7). The final aim was to understand and draw the global geomorphology of the marine approaches to the antique harbor of Byblos which was located (2013, mission 2) in the southern vicinity of the Acropolis.

Preliminary scientific results are published in the Bulletin d'Archéologie et d'Architecture Libanaises (Francis-Allouche, M. and Grimal, N. *et al.* 2017. "Byblos maritime : une installation portuaire au piémont sud de la ville antique", BAAL 17, p. 133-196).

### Objective 2 (Fig. 1 - Area 2)

At the request of the Directorate General of Antiquities, the second objective of our remote sensing survey (mission 7B), was to produce a Wave Progradation Model through additional bathymetric data, obtained by a new and upgraded surveying system: the Multibeam Echosounder. The aim was to deliver a Mathematical Model necessary to produce a Physical Model for the conception of a wave-breaker. The medieval structures of the harbor and the archeology of coastal Byblos needed protection from predominant sea currents and winds. Therefore, we upgraded the June 2014 remote sensing survey (mission 4), with more detailed charts of marine area outside the Medieval Harbor (fig.1 - Area 2), delivering an exact profile of the seabed (Figs. 2 and 3) in preparation of the installment of the wave-breaker.

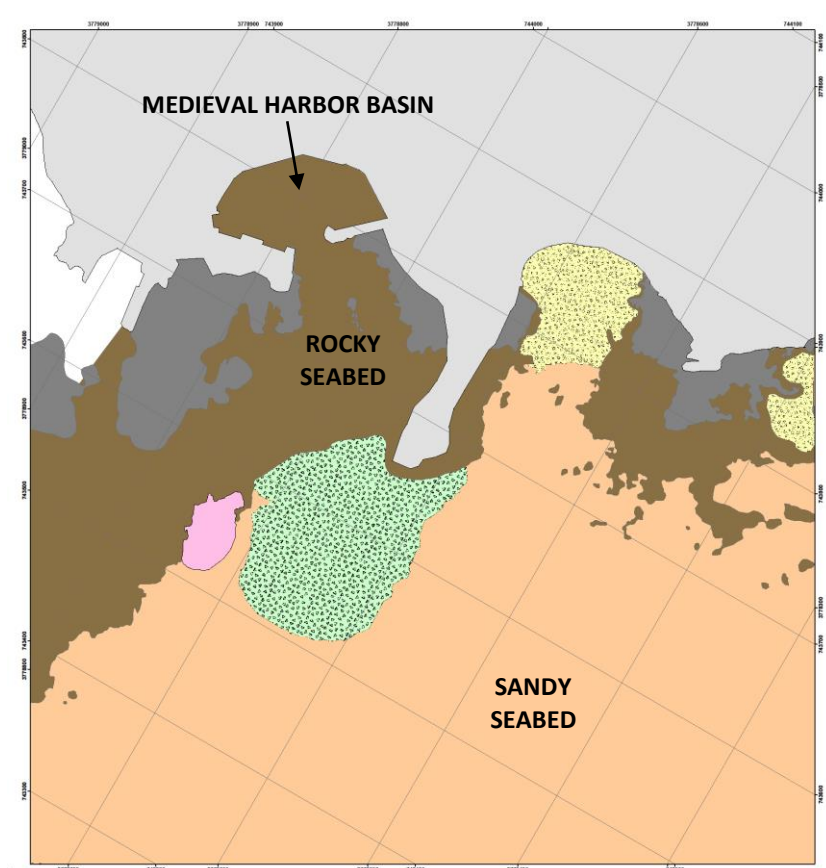


Figure 2. Seabed composition in the medieval harbor area of Byblos, showing in brown the large and shallow rocky seabed : even today the maritime approaches are rather difficult for bigger boats (@Byblos & the Sea, 2016, G. Papatheodorou).

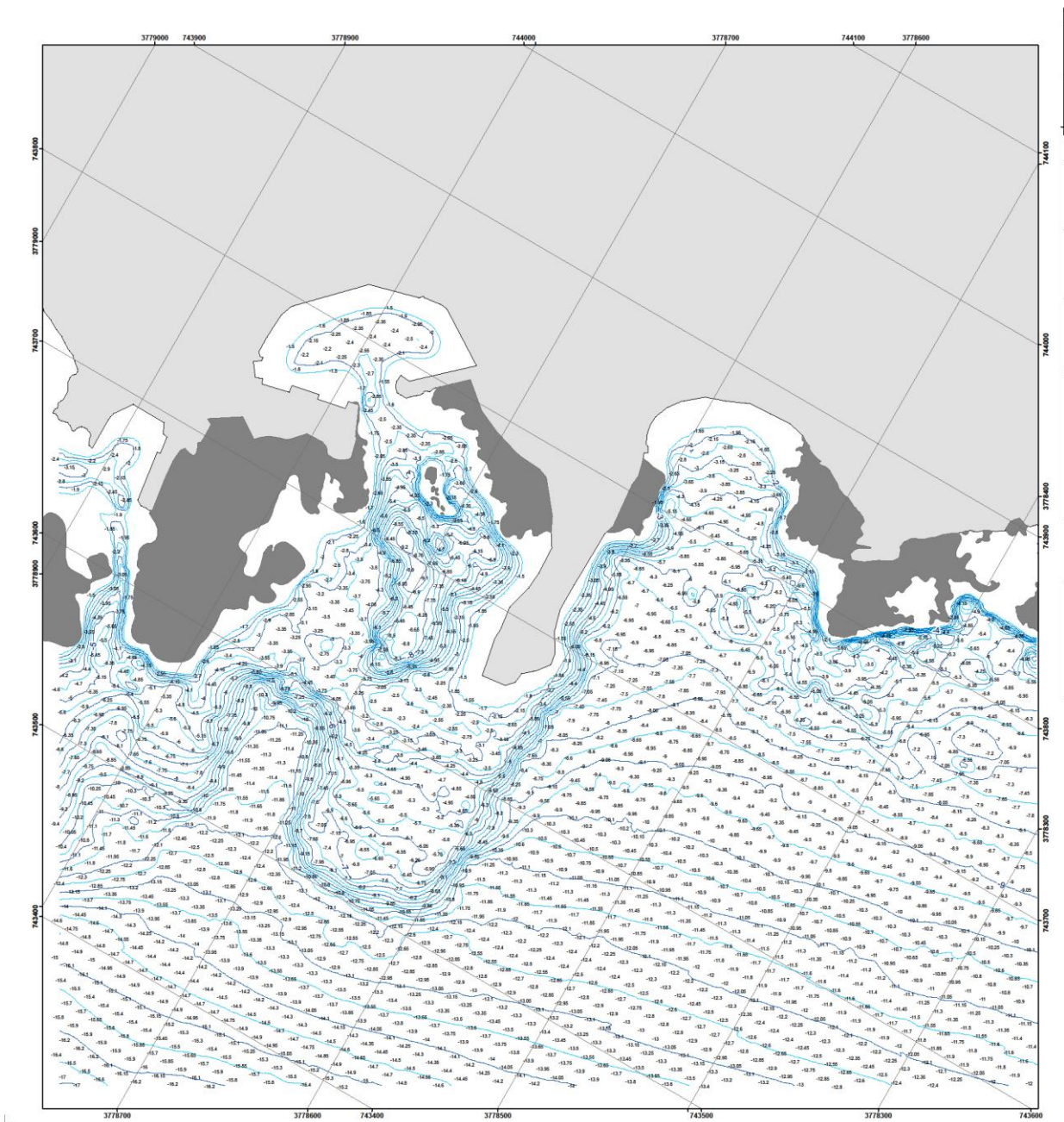


Figure 3. Bathymetric survey of the medieval harbor area, showing shallow and narrow seaward approaches, in spite of the 1968 harbor enlargement (©Byblos & the Sea, 2016, G. Papatheodorou).