



Beirut Office

United Nations
Educational, Scientific and
Cultural Organization

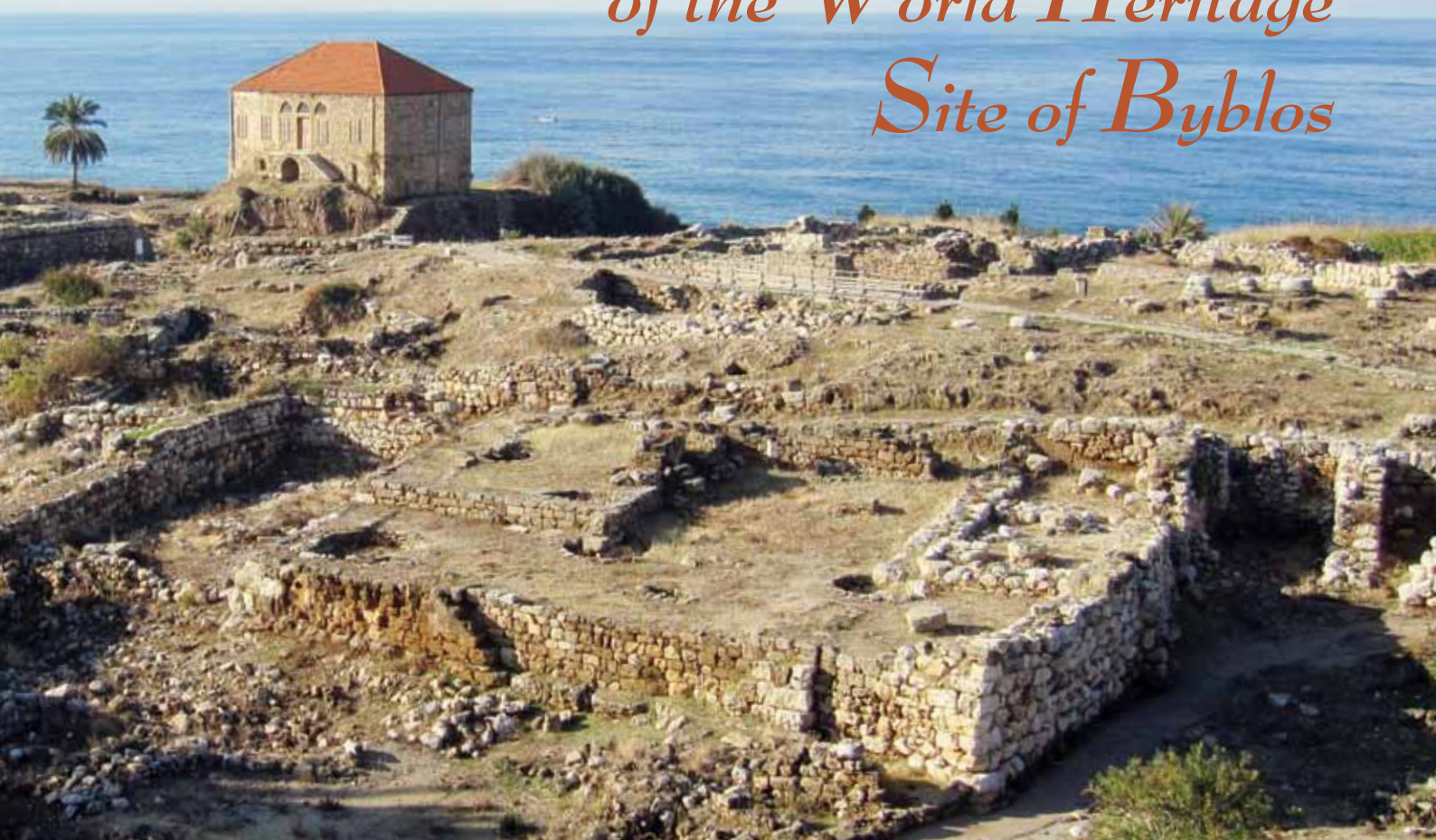
الجمهورية اللبنانية
République Libanaise



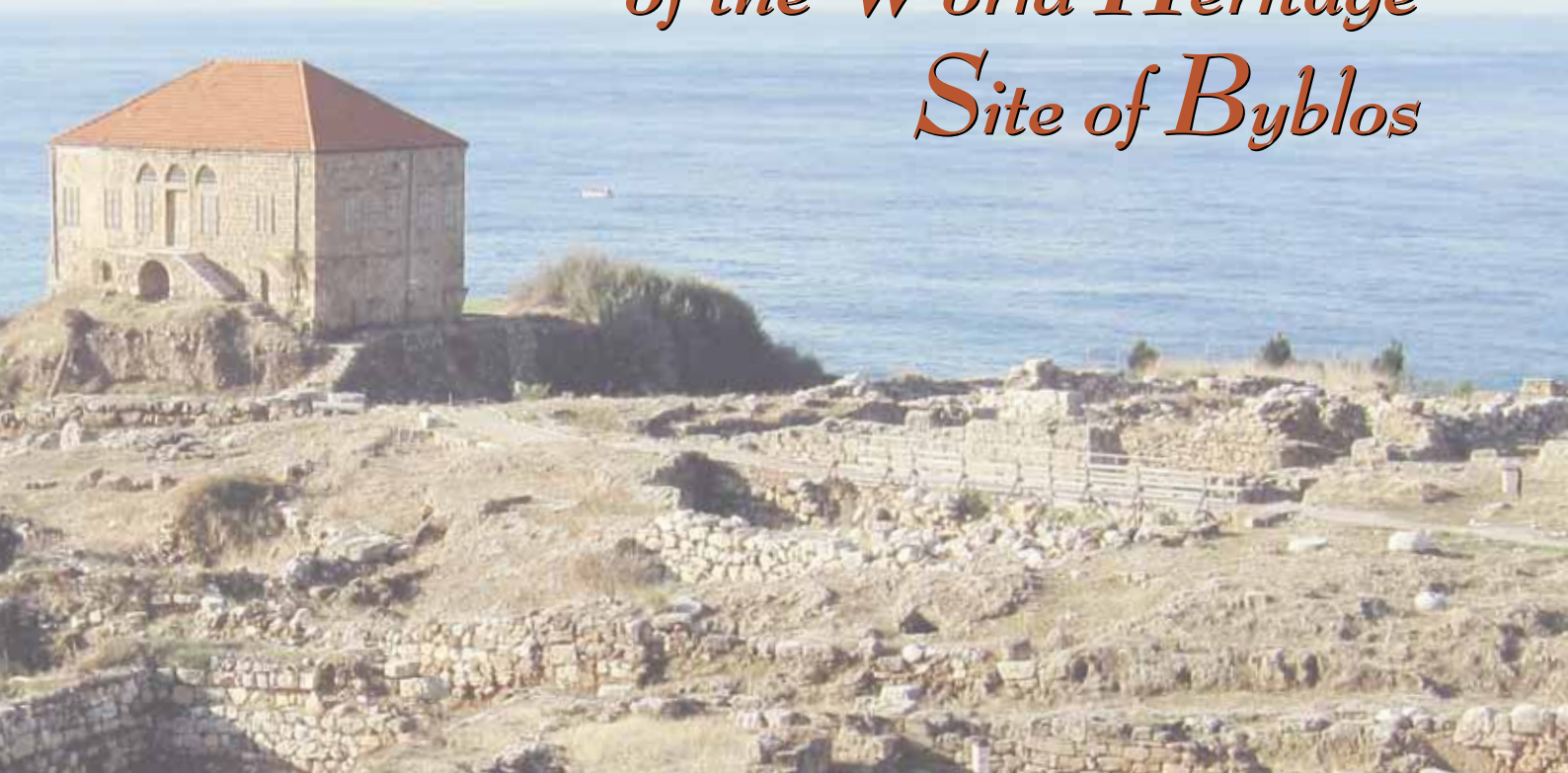
وزارة الثقافة
Ministère de la Culture
Direction Générale des Antiquités



Emergency Safeguarding of the World Heritage Site of Byblos



*Emergency Safeguarding
of the World Heritage
Site of Byblos*



Introduction

Located on the Eastern Mediterranean, 40 km north of Beirut (Lebanon), Byblos is one of the oldest continuously inhabited cities in the world, from 6000 B.C. to the present time. Standing on a natural sand stone cliff, Byblos was listed as a World Heritage Site in 1984 under criteria III, IV and VI.

The archaeological site was extensively excavated for over 60 years, between 1921 and 1983. Structures dating to the different periods can still be distinguished where the evolution of the city is seen in its different elements throughout the ages. The authentic landscape (Medieval houses, city wall, souks, harbor and the archaeological site) gives a definite architectural value to the city. Furthermore, the strategic coastal location has been at commercial crossroads, mainly during the Bronze Age period. However, the most significant value attributed to Byblos lies in the discovery of the earliest Phoenician alphabet engraved on the Ahiiram sarcophagus dating back to the 11th century B.C. which later became the basis of the actual western alphabet.

As a result of the recent war against Lebanon (July-August 2006), the Lebanese coast was partially affected by the oil spill from the fuel tanks of the Jiyeh power plant. The cleaning works were first conducted by the Ministry of Environment. An expert mission led by Mr. Mounir Bouchenaki, Director-General of the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), was sent to Lebanon by UNESCO (10 - 15 September 2006) to assess the condition of the affected cultural heritage sites after the war. Urgent measures were undertaken to clean up the oil spill from the World Heritage edifices along the Byblos shoreline. In addition, the mission found two structures with no direct relation to the war damages requiring critical attention to safeguard.



The northern Medieval tower presented serious underwater structural damages at the southeastern corner foundation emphasizing the need to reinforce the structural stability.

The foundation of the Bronze Age temple tower exhibited hazardous erosions at the vertical section of the soil beneath the temple walls. Critically located above the existing level of the archaeological site, it endangered the stability of the structure as a whole. Consolidation works were urgent to prevent further deterioration and destruction of the temple.

The Japanese government financed the cleaning and rehabilitation operation through UNESCO Beirut Office as the executing agency. The Ministry of Culture - The General Directorate of Antiquities directly supervised all the works.





Cleaning of the Oil Spill from Byblos Sea Shore

The cleaning of the oil spill on the archaeological structures comprised:

1. *The western protective wall with its reused granite Roman columns.*
2. *The foundation and the structures of the two Medieval towers at the entrance of the ancient port.*
3. *The Hellenistic fish-tank at the sea shore below the archaeological tell.*

Collection of all polluted waste and debris was manually executed, placed in heavy duty bags and transported to the disposal area. Oil absorbent booms, pads and snares were used at all times in a fence-like manner in order to retain the oil and prevent it from seeping throughout the







sea water. The clean-up operation also used nylon bristle brushes and low hot water pressure jet washing machines in order to minimize the damages on the archaeological structures. These pressure jets operated using fresh water supply free from any solvent or chemical material. The water pressure ranged between 75 bars and 150 bars.



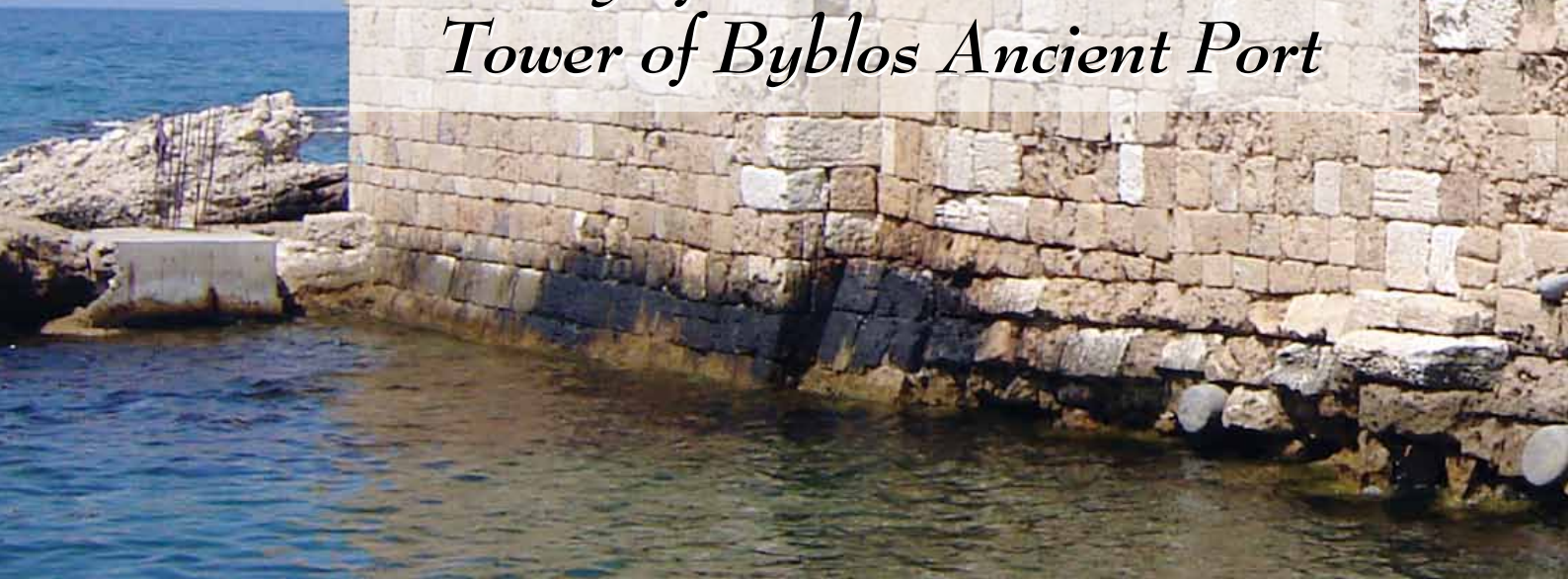
The cleaning operation was carried out in accordance with standards and procedures approved by the Ministry of Environment.



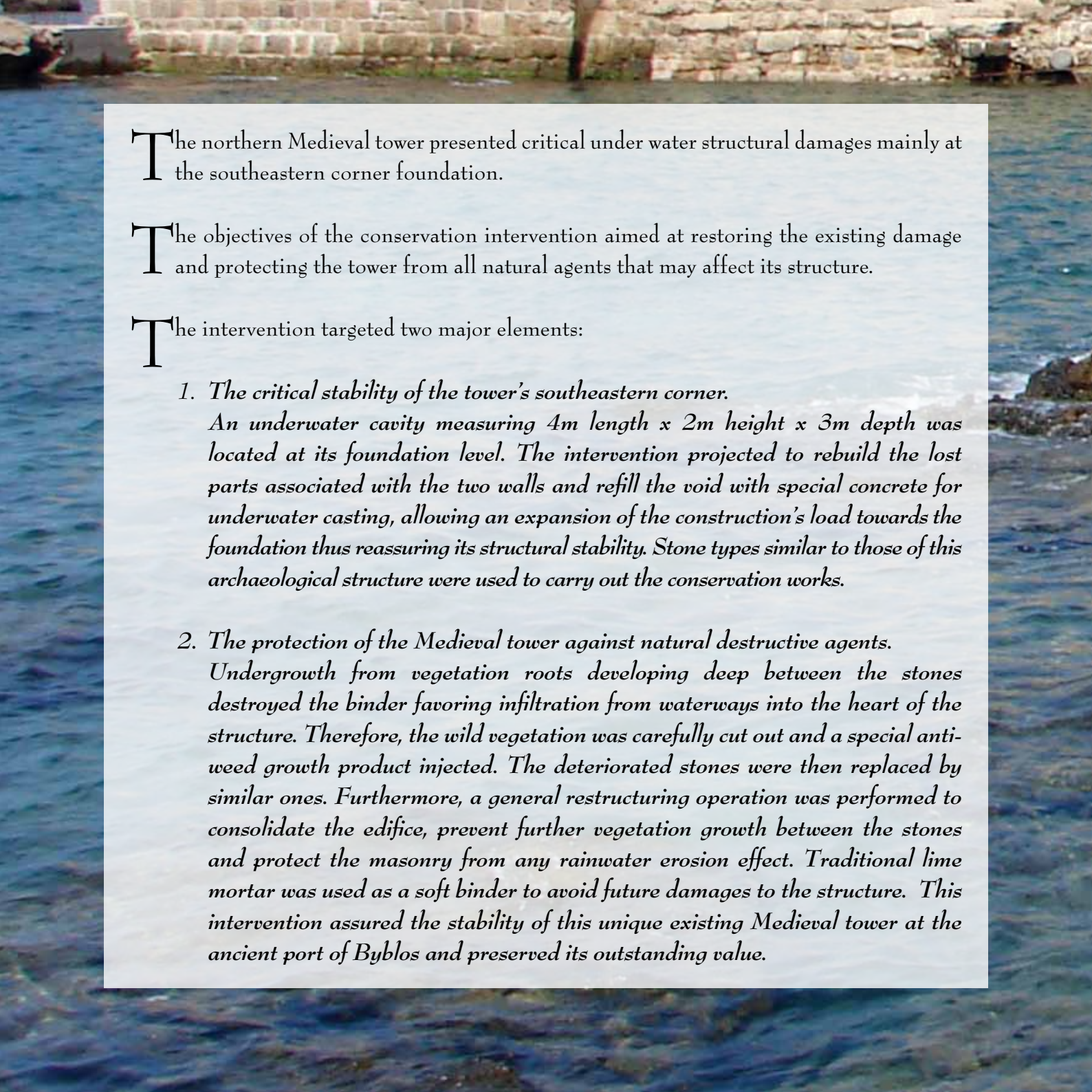




*Reinforcement of the Structural
Stability of the Northern Medieval
Tower of Byblos Ancient Port*





The background of the page is a photograph of a stone wall, likely part of the tower mentioned in the text, situated near a body of water. The wall is constructed from large, irregular stones and shows signs of weathering and structural damage. The water in the foreground is dark blue and slightly rippled.

The northern Medieval tower presented critical under water structural damages mainly at the southeastern corner foundation.

The objectives of the conservation intervention aimed at restoring the existing damage and protecting the tower from all natural agents that may affect its structure.

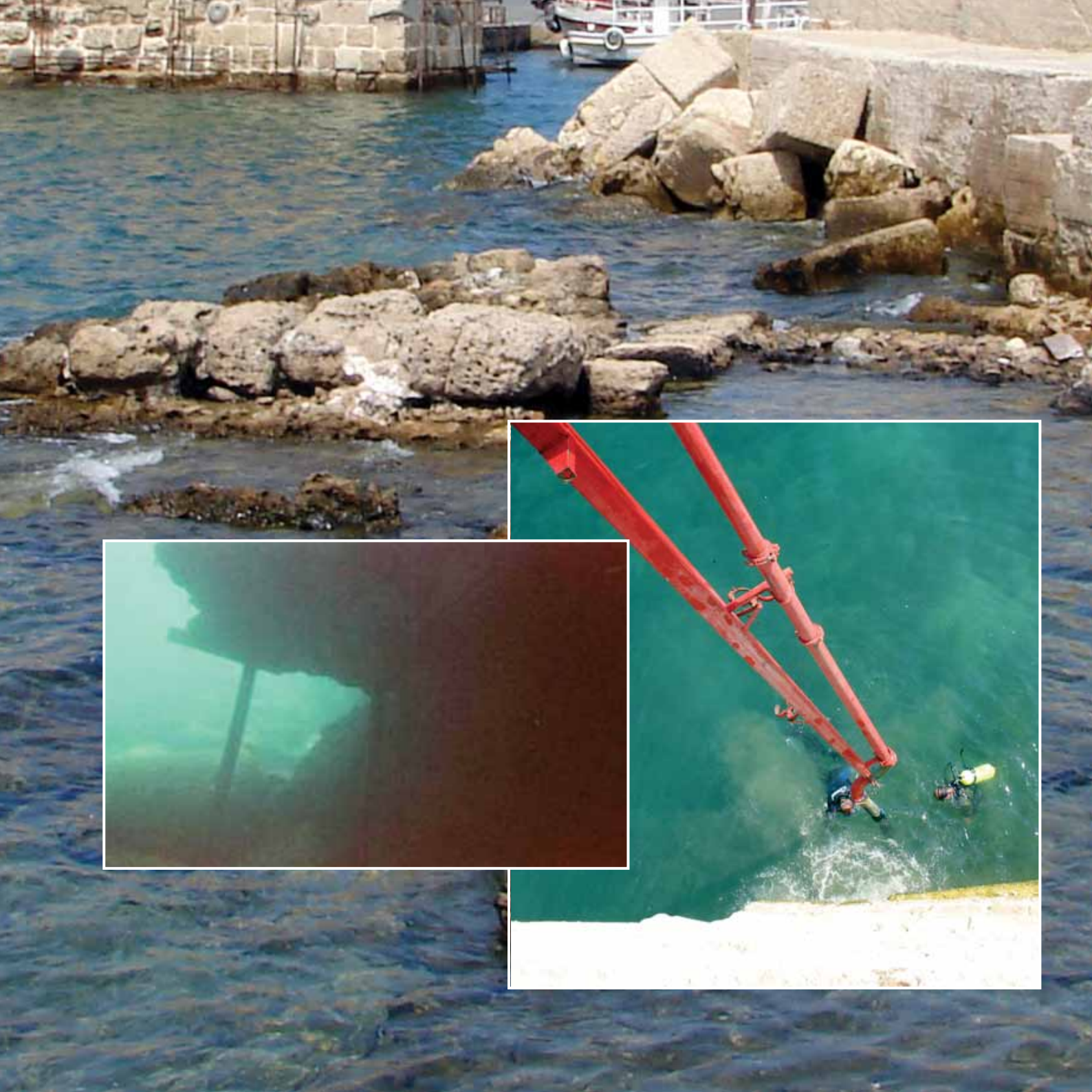
The intervention targeted two major elements:

1. *The critical stability of the tower's southeastern corner.*

An underwater cavity measuring 4m length x 2m height x 3m depth was located at its foundation level. The intervention projected to rebuild the lost parts associated with the two walls and refill the void with special concrete for underwater casting, allowing an expansion of the construction's load towards the foundation thus reassuring its structural stability. Stone types similar to those of this archaeological structure were used to carry out the conservation works.

2. *The protection of the Medieval tower against natural destructive agents.*

Undergrowth from vegetation roots developing deep between the stones destroyed the binder favoring infiltration from waterways into the heart of the structure. Therefore, the wild vegetation was carefully cut out and a special anti-weed growth product injected. The deteriorated stones were then replaced by similar ones. Furthermore, a general restructuring operation was performed to consolidate the edifice, prevent further vegetation growth between the stones and protect the masonry from any rainwater erosion effect. Traditional lime mortar was used as a soft binder to avoid future damages to the structure. This intervention assured the stability of this unique existing Medieval tower at the ancient port of Byblos and preserved its outstanding value.



The Consolidation of the Temple Tower

The foundation of the Bronze Age temple tower exhibited hazardous erosions at the vertical section of the soil beneath the temple walls. Critically located (three meters) above the existing level of the archaeological site, it endangered the stability of the structure as a whole.

The objective of the intervention aimed at covering the soil in order to limit the erosion phenomena caused by the affecting agents.

The peculiarity of the temple as an archaeological structure necessitated a comprehensive documentation of the entire building prior to and after any intervention.

The consolidation process was managed as follows:

- 1. The vertical erosion area under the temple structure was brought under control by backfilling earth all around it to protect its foundation.*

A geotextile separation layer was spread between the archaeological soil and the new backfill material. A backfill gravel “tout-venant” was applied all around the temple, extending to the first foundation level and covering all vertical denuded sections.

“Gabion” cubes were installed in single, double or even three rows to limit and retain the gravel backfill. In addition, a 10 cm layer of earth was spread on the top of the backfilling material and the Gabion area.





- 2. At the southern side of the Great Residence, also dating to the Bronze Age period, an old reconstructed stone wall had partially collapsed due to the feeble retaining wall. The latter wall was rebuilt according to the traditional method.*
- 3. Joints were re-pointed on the top of the masonry walls of the temple using lime mortar to protect the masonry from hydro-thermal exchanges, limit the aggressive action of the atmospheric agents and prevent rainwater penetration into the archaeological walls.*
- 4. A slope was created securing an access to the original level of the temple.*

As a result, the consolidation works sustained the structure, made the temple tower accessible to the visitors and were naturally integrated within the archaeological site.







United Nations
Educational, Scientific and
Cultural Organization

- UNESCO Regional Bureau
- for Education in the Arab States - Beirut
- Sports City Avenue, Bir Hassan
- P. O. Box 11-5244
- Beirut - Lebanon
- Tel: 961 1 850013/4/5
- Fax: 961 1 824854
- E-mail: beirut@unesco.org
- Website: www.unesco.org/beirut

Coordination and Follow-up:
Joseph Kreidi

Technical Supervision:
Tania Zaven, Assaad Seif, Khaled Rifai, Oussama Kallab

Cleaning of the Oil Spill:
Promar Marine Contracting and Environment Services

**Reinforcement of the Structural Stability of the Northern
Medieval Tower of Byblos Ancient Port:**
Michel Daoud

The Consolidation of the Temple Tower:
Michel Daoud

Editing:
Tania Zaven

Photos:
Tania Zaven, Martine Francis and Michel Daoud

© UNESCO Beirut, 2010



Photo: Tania Zaven