6 | Conservation of Underwater Cultural Heritage

6.1 STATE OF AFFAIRS

According to Article 2(5) and Rule 1 of the 2001 UNESCO Convention, *in situ* conservation of archaeological remains is considered a priority and therefore techniques such as reburying using burial mounds and covering by means of metallic structures must be used. However, heritage must sometimes be removed to prevent permanent loss or to facilitate scientific use. Specific conservation techniques must be applied in all cases and range from simple checks of the integrity of the buried object or its protective structure to more complex conservation interventions applied to organic elements.

Today, protection and conservation techniques are not uniform and depend on each Autonomous Community's degree of development in underwater archaeology. There are even substantial differences among those which have underwater archaeology centres in terms of necessary infrastructures, facilities, equipment and technical specialisation. This is more evident when it comes to equipment and specialists for the processing of especially delicate organic and inorganic elements such as iron and its alloys. The current state of affairs can be summarised in the following four points:

(a) There is a growing number of underwater elements which need proper protection and conservation.

(b) There are not enough laboratories equipped to undertake these treatments.

(c) Currently there are not enough technicians with the necessary training and specialisation to tackle this problem.

(d) Long-term processes are not guaranteed when undertaken by private enterprise due to future uncertainty.

Stabilizing ceramic material (CASC Archive).

6.2 SPECIFICITY OF UNDERWATER ARCHAEOLOGICAL OBJECTS

The conservation of Underwater Cultural Heritage raises specific problems arising from the extended period of time spent in wet environments or completely submerged. Once these objects are removed, they require a series of conservation techniques which are often specialised due to different deterioration factors.

As already mentioned, the 2001 UNESCO Convention emphasises *in situ* conservation as opposed to removal. Both options must be addressed with sufficient guarantees and the destination of shipwrecks and their context should be clearly defined beforehand in the Archaeological Intervention Project (Rules 10 and 24 of the Annex to the Convention). This means that when archaeologists approach a site by means of a suitable

Ceramic conservation and restoration (ARQUA Archive, 2008).

Wood laboratory (CASC Archive).

Wood laboratory. Freeze-dryer (ARQUA Archive, 2008).

project, they must have previously decided what conservation strategies to apply.

One of two alternatives is chosen depending on site characteristics, the type of archaeological intervention and the final destination of the objects to be removed and studied: *in situ* conservation or the removal of objects.

6.2.1 In situ conservation

This is the preferable option because it allows objects to remain in the same stable conditions in which they have been preserved over long periods of time.

This is the option selected if the site is not going to be altered or even destroyed by pillaging, maritime works (dredging, laying of underwater pipelines, port construction, regeneration of beaches, etc.) or any other circumstance. *In situ* conservation or transfer to an underwater location other than its original position (reburying) must consider certain fundamental aspects for the proper conservation of artefacts:

(a) In the case of *in situ* covering, the conditions existing prior to excavation must be maintained and to do this they must be analysed and reproduced as accurately as possible. A probe must also be used to monitor the conditions of the covering installed and allow for the extraction and analysis of samples.

(b) If metallic structures are chosen as cover elements, be these "boxes" or "cages", it is very important to prevent corrosion of the metal used in building the protective structure. Iron should not be used (paradoxically the most frequently used material to date) because rust could have a negative effect on the elements being protected. This is especially important in the case of organic elements which could suffer irreversible damage. These techniques should, therefore, completely isolate the objects from the protective structure either by means of burial mounds or some other technique. Contact with metallic mesh should likewise be avoided for the same reason. In any case, corrosion of the protective metallic structure can be prevented by installing systems such as sacrificial anodes

which have proven to be highly effective against iron corrosion.

This becomes even more important if the object is transferred because of conservation needs. Elements such as the type of sand used as cover, salinity and biological conditions need to be reproduced at the new site because any modification will produce unavoidable re-adaptation processes to the new environment with the ensuing deterioration of the objects. As in the case previously described, probes must be installed in order to continuously monitor the site and take samples.

Mechanic cleaning of a bronze figure (CAS Archive).

6.2.2 Removal of objects

Alterations in the state of conservation of objects in underwater locations are very specific and mostly due to their being in an environment causing different alterations depending upon the composition of the object and the conditions of the site (basically exposure to salt water and macro and microorganisms). In these cases, objects removed must undergo a long and costly conservation process in laboratories with adequate means to undertake the necessary conservation work, whose future is guaranteed and which are endowed with the necessary stable budgetary resources.

In general terms, when objects are subjected to underwater conditions they undergo an adaptation process following which they tend to reach a state of equilibrium with the surrounding environment. In addition to these irreparable transformations, further damage is produced by micro and macroorganisms which, depending on the composition of the object, are more or less severe. In all cases, regardless of whether the objects in question are inorganic or organic, they tend to reach a state of equilibrium with the different sorts of water-saturated environments depending on their nature.

Following underwater archaeological interventions it is often necessary to remove the object from its resting place. When this happens, the equilibrium established is interrupted causing the decomposition process to speed up subjecting the object to the risk of irreversible damage.

Inorganic non-metallic objects present the fewest problems because their decomposition is slow if the moisture conditions of their resting place remain stable and they are not attacked by biological agents. Specific problems arise, for example, from processes such as recovery of a portion of the water lost during the heating process of ceramics fired at low temperature. In the case of glazed ceramics, glaze loss caused by dissolved salts (sulphates and calcium carbonates) is the main problem.

Corrosion is the main problem associated with metals. Most metals are not in their natural state because they have undergone a transformation process necessary for use by man converting raw minerals into metal. Corrosion is the inverse process causing the destruction of the object whereby metals return to their most stable state (mineral) as they exist in nature. Iron from underwater environments is the metal most difficult to conserve.

Bone and ivory suffer ossein loss due to hydrolysis leaving only the calcareous substance. They may even fossilise once organic content is lost resulting in the crystallisation of the calcareous substance in the form of quartz.

Organic material was the most commonly chosen until the 19th century for the construction of ships and gear. Once deposited, chemical and biological processes cause the complete disappearance of the objects whose mass is fully returned to the environment. However, in extremely moist environments these decomposition processes are extremely slow due to the absence of oxygen. This allows objects to reach a stable equilibrium with their surroundings and they are conserved in their original resting place. In contrast with metallic or ceramic materials, the conservation of organic objects found underwater is the most difficult and complex due to their peculiar chemical and structural makeup. They have altered structures, are not homogeneous and in many cases show varying degrees of deterioration even within the same object. If they are not quickly covered following their deposit thus depriving them of oxygen, they will be attacked by macro and microorganisms which will destroy them.

In light of this information, it is easy to see why conservation needs to be carried out by specialists in the conservation of materials found under water. Within this field, specific specialisation in certain materials is called for

(mostly wood and some metals) which require more specific treatments.

6.3 MANAGING CONSERVATION

Many Autonomous Communities lack specific Underwater Cultural Heritage conservation programmes (not to mention the facilities and experts required for the treatment of objects from underwater environments), which is why collaboration between different institutions is sometimes encouraged.

However, it is common for each Administration to take responsibility for objects recovered in their territory by means of authorised interventions either requiring excavators to treat them or treating the objects themselves.

In the case of intervention by private companies (not recommended for the reasons already cited), the company awarded the contract should take charge of the conservation treatment and related costs for the latter's duration. This is not overly attractive to companies which engage in processes which are too short, incomplete or ineffective in preventing the continued deterioration of the objects. Moreover, as mentioned above, it is not unusual for underwater archaeology companies to be short-lived due to market fluctuations which further complicates the conservation treatments required by objects recovered through excavations temporarily under their care until works are completed.

Two different situations are detected when the competent government administrations take responsibility for post-removal conservation treatments: those with underwater archaeology centres which are more or less well endowed in terms of specialised resources and staff able to guarantee quality conservation and those lacking such centres. The latter tend to use the services of restorers which are not specialised nor are even familiar with the conservation processes required for objects removed from their underwater resting place meaning that, barring treatment of some

Store-rooms (ARQUA Archive, 2008).

types of materials such as ceramic, stone or simple metals, they lack the necessary training to provide a guarantee of proper conservation treatment.

6.4 PRIORITY ACTIONS

The following priority actions are proposed based on the foregoing:

1. In order to guarantee the conservation of Underwater Cultural Heritage, archaeological intervention projects have no choice but to resort to professionals in the areas of conservation (restorers, chemists, physicists), divers and specialists in the removal and treatment of organic and inorganic archaeological remains and the application of basic treatment protocols and a description of available equipment. Project budgets should include a specific item showing the estimated cost of conservation treatment.

2. Improvisation should be avoided in the conservation of Underwater Cultural Heritage and the necessary economic resources should be procured to guarantee the integrity of the objects after the excavation process.

3. Conservation treatments should be preferentially carried out in public facilities which means improving infrastructure and specialised equipment and staff at already existing laboratories and boosting the role of laboratories entrusted with the treatment of organic and inorganic materials. The National Museum of Underwater Archaeology (ARQUA) can collaborate with interested Autonomous Communities and other scientific institutions in the treatment and conservation of these materials. These typically long-term treatments can therefore be guaranteed since they would not be at the mercy of private companies which are very vulnerable to market fluctuations.

4. Archaeologists need to be trained in *in situ* protection techniques including the necessary precautions concerning materials, analyses and indispensable monitoring protocols to guarantee site conservation providing these professionals with basic conservation knowledge allowing for the effective management of archaeological intervention. These professionals may also be specialists in treating different sorts of objects as, for example, at the wood laboratory of the National Museum of Underwater Archaeology, who could then provide specific treatments in their areas of expertise to other institutions.

5. It is vital to train specialists in restoration and conservation of objects taken from underwater environments in order to address the specific problems posed by each different type of material.

6. Each underwater archaeology centre should be endowed with specific conservation and restoration laboratories.

7. Owing to the complexity and duration of conservation and restoration processes of archaeological materials taken from underwater environments and the risk posed by interrupting these processes, sufficient guarantees must be required of private conservation and restoration laboratories concerning their infrastructures and their long-term commitment to persevere in their activities until processes are complete. Government administrations must see to it that these guarantees are upheld. •