Keeping artefacts *in situ* and preserving them once out of the water:
Daily questions for a conservator-restorer in marine excavations

Olivier Berger[1]

Abstract

Working on a shipwreck means analyzing its cargo, taking samples and when access is possible, studying the naval architecture. After publication, in many cases, closing and securing the site is possible.

Excavating a settlement or an underwater city calls first to understand the site with a non-intrusive survey. State of the art investigation equipment such as multi-beam sonar systems, sediment sounder, magnetometer with nuclear resonance allows us to start drawing the map of the establishment. Diving is necessary to check details, to make stratigraphic sections, or to understand structures. This brings up often thousands of artefacts.

Keeping most of the artefacts at the bottom of the sea and storing them in a special underwater storage place with an inventory number is a good solution, but it is also necessary to bring some objects in an atmospheric environment for study, as a reference or because they are too fragile, precious or unique to be left underwater. They will be then on display in a museum or will tour the world.

We are therefore regularly confronted with a sudden flow of artefacts literally inundating a laboratory but also drying out its budget.

Our experience through sunken cities excavations in Egypt has taught us ways to anticipate these waves of artefacts in needs of treatment and to adapt our policy of excavation and the techniques for underwater conservation-restoration.

Introduction

Working on a shipwreck means analyzing its cargo, taking some samples and when access is possible, studying the naval architecture. After publication of the site, it is often possible to close it still protected and monitored. Once the work is finished, in order to protect and preserve the site *in situ*, we cover the site with geotextiles. We proceed then to rebury the ship under sediment with the water dredge. To control the stability of the site, it is possible to measure the amount of oxygen. To control the stability of metal artefacts it is important to measure the oxydation-reduction potential. The procedure and the evaluation of some techniques concerning *in situ* preservation are described in details in Ms Vicki Richards' paper presented in this conference.

Site and cargo could be *in situ* protected. from scuba looters, by means of an iron cage, creating a giant underwater safe, has been made in Croatia, The heavy-duty cage is equipped with a large door that is always locked with occasional access only granted to divers under strict supervision.

But if it is relatively easy to preserve small sites *in situ*, it is more complicated to preserve a large settlement, not to mention an underwater city. Our main goal is to use the least intrusive approach to study the site. Our non-intrusive survey methods use the latest investigation equipment such as multi-beam sonar systems, sediment sounder, and a nuclear resonance magnetometer that allows us to undertake the mapping of the establishment. Diving is also necessary for checking details, maping stratigraphic sections, understanding the structures and bringing up artefacts that can often include an amount up to a few thousand.

The archaeological community agrees nowadays that it is important to preserve as much as possible *in situ* of our underwater cultural heritage. In our

[1] Basel, Switzerland

excavations we try to find a way in order to study the site while keeping most of the artefacts at the bottom of the sea, and then store and rebury them in a special underwater storage place. Despite these measures it is impossible to avoid having to deal with a large amount of artefacts coming up to the surface.

Thanks to our experience with the excavation of three sunken cities in Egypt we were able to anticipate these flows of artefacts in need of treatment and adapt our excavation policy accordingly.

Field practice and experience

The European Institute of Underwater Archaeology (Institut européen d'archéologie sous-marine, IEASM) lead by Franck Goddio (2008), has been excavating in Egypt for more than ten years. We are working in the Nile delta and more precisely in Alexandria and the Bay of Aboukir where we found, under the sea, the ancient sunken cities of Canopus and Heracleion. The excavations cover a very large surface. Our working area on the eastern harbour of Alexandria covers 3.5 km by 1.5 km or over 500 hectares.

Despite working in dirty water, which is polluted by the city sewage, we try as much as we can to preserve the material we discover *in situ*. Up to now, more than 15,000 artefacts have been found. We were able to keep most of them in situ, in the underwater site. Stonework was the main part of the abundant material. We also found objects made of organic materials, ceramics, glass and various kinds of metal. These sites are unusual because they have been abandoned following several natural cataclysms and have not been reoccupied. The corpus of artefacts includes mainly objects dating from the Ptolemaic Period till the end of the Byzantine Period. The archaeological excavations benefit from a conservation and restoration laboratory aboard a ship, thus enabling objects to be treated as soon as they emerge from water. The first stages of conservation are thus carried out on the ship, and the complementary treatments, which require heavier equipment, are carried out on land, at a laboratory in Alexandria.

The majority of the stones discovered on the three sites are linked to a structural environment like walls from buildings or docks, floor or pavement, *noria* - the Egyptian machine used for lifting water-, columns, and other elements of construction. These architectural stones have been preserved *in situ*. In some cases a reburial under sediment was necessary to avoid physical, chemical degradation and biological alteration. All these structures were studied, drawn, photographed, and precisely repositioned and left at the original place where they were found.

In the eastern harbour of Alexandria, where the royal quarters were, we found pavements and broken columns in situ. This is where our way to protect the site, and to keep artefacts underwater with a project of an underwater museum can be seen. The underwater museum is still a project with numerous technical questions such as stabilising a polluted marine environment, and minimising the deterioration of artefacts. It will be a technological prowess and the architect Jacques Rougerie will turn our dreams into a museum under the sea.

We discovered more than one hundred stone anchors not linked to any shipwreck. We decided to keep them *in situ*. We asked an Egyptian student to study them and create a typology of the anchors, and then publish the results. These anchors are of many types and sizes. Most of them are made of limestone. The anchors represent a typical artefact, which is easy to study scientifically *in situ*.

In situ preservation is the best policy to adopt for these kind of objects. Anchors, cannons and even amphorae can quickly overfill a storage room. Too many

museums are crowded with the display of these kind of objects, which are heavy and bulky. It could be now time to move away from the usual methods of excavation and recovery towards a new way of preserving and presenting this type of underwater cultural heritage. Some other voluminous stone objects such as milestones, sarcophagus, worked on architectural blocs, naos are also kept *in situ* in their original position. For smaller objects we have a different approach.

In one area of the ancient city of Canopus we found a large number of black basalt fragments of sphinxes. The pieces did not fit together. It became quickly clear that they belonged to a workshop for cutting and reusing stone. For this kind of smaller stone objects or fragments a special technique is used. Each piece is precisely mapped on the bottom of the sea with a Global Positioning System (GPS). It receives a number and is lifted out of the water. It receives then a basic cleaning, is identified, described, measured, photographed and sometimes drawn. Once all the data are registered, the pieces are brought back to the site in a storage area.

Usually the storage places, also call “parking”, are deeper area where it will be easy to bury the artefacts under sediment without creating an underwater hill. When the area is full, it is covered with sediment. Another place with a new number and with its precise localisation is then chosen as the following “parking”. Not only stones are stored in these “parkings”, but also ceramics and metal artefacts. Storage areas are frequently reopened to allow the archaeologists to verify, check or pick up some objects. In doing so, a large quantity of sand has to be removed but the objects can be easily found since they are precisely documented. All the objects keep their number underwater with a system of plastic tags; they are packaged in a plastic net, and secured inside plastic boxes covered with sand. The precise situation of each artefact is noted in the database.

In order to find a way to study the inscribed artefacts and let them remain *in situ*, we developed an interesting method of underwater stamping. Our discoveries brought up some stone objects bearing inscriptions or decorations. Some of the inscriptions are in Greek but the majority of them are in hieroglyphics. Most of these artefacts are on very big blocks. This fact raises the question of how to study these inscriptions when the specialists are not all divers and live in different parts of the world? As a rule, this kind of large inscribed blocs of stone stay *in situ*. To allow the study of inscriptions we started using a new method enabling us to take a print underwater. Developed by Georges Brocot from France's Direction des recherches archéologiques subaquatiques et sous-marines (DRASSM) this technique makes it possible to have the exact stamping of the inscription.

The first step is to clean thoroughly the stone from any incrustation. A cloth coated with a pasty silicone is then laid on the surface of the stone to act as a stamp. The fabric is afterwards covered with a sheet of lead which is hammered in such a way that the silicone is in contact with every detail of the inscription. The polymerisation of this special silicone occurs in at least twenty hours. It is then possible to remove the fabric. The inscription appears printed in negative. This method allows also the stamping of other details such as tool traces or technological details. This silicone membrane, the faithful reproduction of the original, can be studied directly by the specialist epigraphist. Pictures in raking light reveal all the details, as the original would have done.

Conserving waterlogged organic material in situ is almost as difficult a challenge as to preserve it in an atmospheric environment. When we discover a small waterlogged organic artefact like basketry, rope, textile or a wooden object, it is very problematic to preserve it in situ because the stable state in which it was kept in the sediment is interrupted. Physical deterioration such as stream flow, sand

abrasion, biological alteration like *Teredo navalis*, bacterial and chemical destruction process of the cellulose will prevent keeping a small organic object after its discovery. Even so, we do not have the equipment to stabilise waterlogged wood, we have no budget to treat it and no place to store or exhibit the huge pieces of wood. In most cases we mainly have to keep the wood *in situ*, like a shipwreck or parts of building construction.

The scientific interest to have the artefacts out of the water is low because the study can be done under water. The main problem is to keep them under water without deterioration or minimise it. When possible, we leave the organic element partially covered with the original sediment and we avoid letting it float and move with the current. We simply rebury the wooden artefacts under a large quantity of sediment without any protection between the wood and the sediment. When it is possible, we put bags of gravel or sand to serve as weight on top of the sediment.

General lines and rules for underwater conservation-restoration

> Any project involving direct actions on cultural heritage requires a conservator
> (Ref. definition of the profession, ICOM-CC 1984).

We still lack some methods and technology to treat a few specific types of artefacts. It is therefore greatly safer to keep them *in situ*. Current technique does not allow without risk the treatment of several artefacts such as graphitised cast iron, wrought iron loosing his original surface, peeling or sugaring silver objects, mineralised lead, some composite artefacts, organic material like basketry and even wood, peeling like an onion potassium glass, cracking frit or faience, disappearing colours on faience, etc. In some cases we are not equipped to treat a certain type of material. Or the time spent working on one object would be scandalously high and indefensible in a budget. Thus, instead of trying to stabilise an object out of seawater, it is sometimes better to keep it in the environment of its discovery and to monitor its conservation *in situ*. It is necessary to think carefully before lifting an object out of water. Is it possible to stabilise it? Will there be an adequate budget? What will happen to the object after it has been treated? And is there a definite purpose to take it out of water?

Beside a scientific purpose or from an aesthetic point of view, conservation reasons can lead to the decision to take away an object from salty water. It is sometimes impossible to keep artefacts *in situ* underwater because the artefact itself or the information carried by the object would otherwise be lost. A rope, a basket or a textile will not resist for a long time when the excavations are in the Nile delta with a fast moving stream and strong erosion. One area will be covered with a huge sand dune while a few months later the archaeological floor level will be visible.

Fishermen with their nets are frequently moving big blocs weighing several tons over hundreds of meters. Their anchors could also simply plough an archaeological layer or destroy a wall. Regularly, our working area with its iron tubes, meters, positioning lines and its system of water dredge is destroyed for the same reasons.

The pollution can be extreme. We are working in the Bay of Aboukir in front of a chemical fertiliser factory and in the eastern harbour of Alexandria the sewage system of a city of more than 3 million inhabitants is pouring directly over us. Our air tanks are corroding so quickly in this aggressive environment that we can expect the same phenomenon to attack the nearby archaeological metal items.

Objects found under the sea are generally covered by concretions of sediment associated with marine organisms. In Alexandria, the water is so murky that marine organisms are covering everything in just a few days. In a few months the thickness of the concrete deposited makes the objects unrecognizable, no detail, not even the form of the objects can be distinguished, just a smooth relief. Even on artefacts usually known to be biocide such as lead and copper alloy concretion can grow very fast.

Even if the general policy is to protect and preserve sites *in situ*, when work starts, archaeological material appears. Various reasons make it necessary to bring some objects in an atmospheric environment: study, need of reference or samples, extreme fragility, preciousness or uniqueness. It is important that these objects do not stay underwater. They will be then on display in a museum or will tour the world on exhibitions. Sudden flows of artefacts thus happen regularly, flooding the laboratory with water buckets, crowding a storage room which is not big enough and absorbing a budget too small to cover the cost of restoration and long term conservation.

It is a utopia to think of being able to study a site without having artefacts on the surface. A conservation program is therefore absolutely necessary before starting to work on a site. Patrice Pomey (1981:26) said, “no underwater excavation should be undertaken without the certainty that the objects it exhumes can be treated, lest they deteriorate and disappear.” Colin Pearson (1984:81) said, “Today, underwater excavation without conservation, it’s purely vandalism.” This fundamental idea is not yet a trend, and unfortunately nowadays we can still observe too many underwater excavations without a real appropriated program of conservation.

The times when the divers were in charge of the artefacts, taking care themselves to clean the objects with their diving knife and putting them in fresh water for a long time is not so faraway. Unfortunately, it still exists in many excavations. The role of the professional conservator is essential to the smooth running of an underwater excavation. The conservator should be part of the team because the benefits resulting from the collaboration are invaluable. It is no longer a luxury - if it ever was - to have a conservation specialist at the site but rather a necessity.

Conservation and restoration of underwater heritage must start as soon as a site is discovered. Conservation is not the mere application of techniques and treatment processes but is a vital stage within the excavation. In an archaeological excavation, it is incumbent upon the conservator to register all the information that the objects convey. This documentation, sometimes supported by analyses, is not the ultimate goal concerning the objects. They must also be stabilized to ensure their survival, and sometimes, aesthetically improved for museum purposes. The conservator specialist of underwater heritage plays an important role, although the least visible, but the most important task is the long-term stabilization of the objects. An essential motto is: do not settle for make-up on items, but take the time to perform lengthy in-depth stabilizing treatment and especially for long-term preservation of underwater heritage.

Conclusion

The objects coming from the port of Alexandria and the bay of Aboukir represent in the conservation laboratory only a tiny fraction of what we really discovered. We slowly changed our traditional way of excavating for a new way that emphasizes the *in situ* study of the artefacts and the site itself. We manage to preserve as much as we can the objects in situ and the integrity of the site. But it is a utopia to think it is possible to study a site without having artefact coming onto the surface. Therefore, a

program of conservation is an absolute necessity before to start the work itself on a site. The professional conservator specialized in conservation and restoration of underwater heritage is not only working in a laboratory, but also has to be involved on the site, even before the archaeological work starts. This is an entire member of the scientific team.

This successful collaboration is clearly visible in the results the IEASM obtained in Egypt. Respect and protection of the integrity of the objects are parts of the ethics of our profession. Our goal is to succeed in making the objects visible to the general public, accessible to researchers, and stabilized to be passed on to future generations.

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