

A project for the creation of an underwater archaeological park at Apollonia, Libya

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Abstract

In 2008 and 2009 the Archeotema society (Venice, Italy) was contracted by the Libyan government to outline a project for the management of the underwater archaeological sites of Libya as places for underwater tourism. The project was part of a general remit of Evaluation and Conservation of the Cultural Libyan Heritage.

A selected site was Apollonia in Cyrenaica. The ancient harbour with all its structures allowed for the visualisation of a real park with an itinerary for divers and a glass-bottom boat for people to see from the surface.

Keywords: underwater, archaeology, Apollonia, park

1. Introduction

An 'underwater archaeological park' is a submerged archaeological area open to the public and accessible through prearranged itineraries. Such type of park can be visited by both divers and visitors on-board glass-bottom boats.

To become a public park, an underwater archaeological area must first be investigated. In addition, it should not present any potential risk for conservation *in situ* of monumental architectural remains or objects. Seaside ancient urban settlements, villas, harbours, fisheries and other ancient maritime infrastructure, now submerged as a result of bradyseismic or eustatic events, can be enhanced by the establishment of a park. Shipwrecks may be opened to public access if their contents comprise material that is not easily removable, such as marble blocks and columns, iron cannons and concreted pottery.

An underwater archaeological park should be especially useful for the protection and enhancement of the archaeological heritage, as requested by the United Nations Educational, Scientific and Cultural Organization (UNESCO) Convention on the Protection of the Underwater Cultural Heritage (UNESCO, 2012). Furthermore, such a park usually creates new employment in towns and cities located close to the area. In fact, wherever parks

have been established and have worked efficiently, hotels and restaurants have sprung up. Also, a number of small private business establishments that deal with everyday and extraordinary maintenance of the park, surveillance and guided tours have also come to those areas. In short, a new frontier for organised tourism has been created.

In addition, there is the potential in such areas of setting up research projects in the field of maritime archaeology, marine biology and conservation, thereby creating new professional opportunities. Ultimately, the main goals in the creation of underwater archaeological parks should be to preserve both the natural and cultural resources of the site and to attract visitors enjoying the cultural features of the site (Davidde, 2002).

2. Examples of underwater archaeological parks and museums

2.1. Italy

2.1.1. Baia

The volcanic region of the Phlegraean Fields extends to the west of Naples and overlooks the waters of the Gulf of Pozzuoli. It is well known both for its numerous archaeological sites from the Roman period and for the bradyseismic phenomena that have radically altered the original structure of the coastline over the centuries. Ancient Baia was a bathing resort for Roman aristocracy but, because of bradyseism, began to sink into the water around the 3rd c. AD. The ancient city, which is now almost submerged, was famous for its luxurious seaside villas, public offices, baths, shops and coastal installations.

The zone of underwater Baia covers a 13 000m² area of well-preserved ancient buildings where it is still possible to see not only the wall structures, but also some beautiful decorations such as paintings, stuccos, mosaics and marble wall-cladding. The whole park is divided into seven main underwater sites, which are positioned at a depth ranging between 3m and 24m under water. The local diving club guides underwater tourists to the submerged

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city and they can read information about the ancient remains on descriptive panels fixed close to the structures. However, some of the sites can also be visited simply by snorkelling. Visitors not able to dive can admire the ancient underwater ruins from a special boat with a transparent hull.

2.1.2. Ustica

The natural marine reserve of the island of Ustica in Sicily offers to visitors an underwater archaeological itinerary in the area of Punta Gavazzi. The itinerary ranges from a minimum depth of 10m to a maximum of 24m. Signs giving directions using different coloured lines underwater make it easy to find all the archaeological remains. These include lead anchors, amphorae and other kinds of pottery. Special panels describe the function, date and provenance of each find; general information on navigation in antiquity; the different types of anchors and amphorae used and produced at that time; and maps of the itinerary and the rules with which visitors must comply. Photography is permitted and visitors can also see the remains on board a boat with a transparent bottom.

2.2. Croatia

Over 500 archaeological sites are located in the Croatian waters of the Adriatic Sea. The ancient shipwrecks are protected by a metal cage that is the less expensive and more secure way of preserving them. Divers who have obtained a Croatian National dive licence can visit the sites, but they cannot touch shipwrecks or their artefacts (Mesic, 2008).

2.3. Israel

2.3.1. Cesarea

Divers are able to tour the sign-posted remains of the magnificent harbour built by King Herod to honour his Roman patron, Caesar Augustus. It was the largest and most impressive port during the Roman Empire and has been widely excavated over three decades. There is no other ancient port in the world that is accessible to ordinary divers.

In fact, after only a half-hour's instruction, divers can dive with a guide to the ancient submerged harbour, where 36 points of interest are marked along 4 trails in the sunken port, covering an area of 95 000m². They even receive a waterproof map that describes in detail each of the numbered sites along the way.

One trail is accessible to simple snorkelling. The others, ranging from 2m to 9m below the surface and close to the beach, are appropriate for any inexperienced diver. In addition, divers can see ancient anchors, a ruined lighthouse, an ancient breakwater and the remnants of the original foun-

dations that made this harbour one of the wonders of the Roman Empire.

2.4. USA and Canada

Across the United States and Canada, numerous underwater protection systems and parks have been established since the 1980s and are managed by federal, state, local, private non-profit or local dive shop entities. Some of these protection systems involve complex circumstances, such as crossing international boundaries, or involving multi-state bottomlands, and are located on the bottomlands of oceans, rivers or bays. Some systems include only one site, while others comprise dozens of shipwreck sites and geological features over vast areas.

The National Oceanographic and Atmospheric Administration (NOAA) also created three national marine sanctuaries that are dedicated specifically to the preservation of historic shipwrecks in North American waters (Cohn and Dennis, 2011).

2.5. Australia and Europe

Since 1981 five shipwreck trail systems have been established and two additional ones are currently being established. Each trail system is administered by an individual state and, in most cases, the state maritime museum or maritime heritage unit oversees the trail system (Cohn and Dennis, 2011).

Other underwater parks and preserves exist in Portugal (Alves, 2006), Finland (National Board of Antiquities, 2012), Scotland (Robertson, 2003) and the Caribbean (Scott-Ireton, 2005).

2.6. Egypt

The submerged royal quarters of Cleopatra, once located on an island that sunk in the 4th c. AD, were discovered in the 1990s within the eastern harbour of Alexandria. Scattered remains of the Pharos of Alexandria lighthouse, one of the Seven Wonders of the Ancient World, were also located nearby surrounding the 15th c. AD Fort Qaitbey.

The Ministry of Culture of Egypt has partnered with UNESCO to form an international scientific committee that will assist in a feasibility study on the establishment of a partial underwater museum in Alexandria featuring these internationally important sites *in situ*. A museum of this type involves considerable technical challenges with regard to architecture, but the bay itself is man-made and only 5–6m deep.

2.7. China

The Baiheliang Underwater Museum was created as a mediation project to protect China's rare cultural resources that were to become submerged as a

result of the construction of the Three Gorges Dam on the Yangtze River. The site is an ancient ridge with hydrological inscriptions that record the changes in the Yangtze River over the past 1200 years. In addition, stone carvings along the banks of the river are part of the exhibited sites. Construction began in 2002 and the museum opened in 2010. The facilities allow visitors to view the inscriptions and carvings from within submerged tunnels that are 30m below the new water surface (Cohn and Dennis, 2011).

3. Apollonia and its underwater and marine sites

The site of Apollonia is located along the coast about 20km from ancient Cyrene in the region of Cyrenaica. In origin this site was a Greek colony founded in BC 631 by the citizens of the island of Thera. During the Greek period, it was exclusively used as a harbour for Cyrene but then, during the 1st c. BC, it became a city with the name of Apollonia (Laronde, 1985, 1986, 1990). Regarding the architectural remains, the theatre is the only monument of the Greek period still visible on land, while there is great evidence of Roman and especially Byzantine buildings.

Apollonia is also the largest underwater city of the classical Greek period. The harbour comprises two basins. The western basin is protected by two isles to the north and by the so-called Grotto Reef to the west. This reef has recently collapsed and, in the past, has perhaps closed this side of the port. Scholars suppose that this natural structure could allow researchers to reach the ship sheds located along the south side of the main island.

Between the two basins, the western basin was protected from the eastern winds by a pier and was accessible through a channel. At the beginning of the channel there were two towers. The eastern harbour was protected just by an island to the north, hosting a lighthouse. Only poor remains of the lighthouse are still visible. Along the south side of the basin, many buildings are present (Flemming, 1971; Laronde, 1985, 1986, 1990).

The external basin to the east could have hosted cargo vessels. This hypothesis could be supported by a pair of wrecks with amphorae, dated to the later Republican period, which have been found here (Laronde, 1990). Along the rocky coast of this harbour there is a big fishery of the Roman age, directly quarried in the rock. Inside this fishery, a marble statue was found during the 1950s (Flemming, 1971). Probably owing to both a phenomenon of subsidence, which has occurred along all the coast of Cyrenaica, and to the sea level rise, the harbour

of Apollonia now lies about 2.5–3m underwater. This phenomenon started perhaps in the Late Antiquity (Flemming, 1971). As a consequence the coast, where the city has been established, is now engaged by a phenomenon of erosion that is destroying the ancient buildings and the archaeological deposits.

4. Previous research

In 1957, the sea-bottom of the ancient city of Apollonia was explored for the first time by Captain D Forrow (Goodchild et al., 1976). In the following years of 1958 and 1959, two campaigns of documentation were conducted by the Cambridge Expedition under the direction of Nicholas Flemming. The team of divers made a preliminary plan of the submerged site, which is still the only one available. Using simple tools, they were able to position all of the structures visible underwater and could then propose a first interpretation of them. In particular, they concentrated their attention on the fishery and the slipways, directly quarried in the rock on the southern part of the main island. A general plan of these latter structures, which were used as ship sheds for Greek military vessels, was made by the English team (Flemming, 1959, 1961, 1965, 1971).

In September 1959, they surveyed the eastern part of the city; checked the position of the sea walls; established the existence of two harbours and defined the true entrance to them; discovered the foundations of a lighthouse; drew a schematic plan of the *piscina loculata*; discovered a ruined island to the west of Apollonia; and established the probable cause of subsidence – all within ten days. This experience was one of the very first of its kind in underwater archaeology. It has the great merit of having made the first, and still only, plan of the site and made public one of the most important underwater sites of the world with one of the most interesting ancient harbours of the Mediterranean.

In 1986 and 1987, further exploration of the site was conducted by a French mission directed by André Laronde. A team from the Department for Underwater Archaeological Research (DRASSM) of Marseille took part in the mission. The French group discovered two Roman wrecks and excavated one of them, which dated to the 2nd c. BC. A trench was also made by the team between the two towers at the entrance of the western harbour. The excavation uncovered that, between the 6th–7th c. AD the entrance had been closed quickly by reused building material (Laronde, 1990; Laronde and Sintès, 1998).

More recent research carried out by the French team has allowed researchers to analyse the ship sheds (Sintes, 2010).

5. Project plan of an underwater archaeological park in Apollonia

The project plan for the creation of an underwater archaeological park in Apollonia was included in a wide project planned for a Scottish company by two experts in international planning. The funding came directly from the Libyan government in 2009. The project, entitled 'Conservation and Restoration of the Cultural Heritage in the Great Jamahiriya', included all the most important archaeological sites of Libya: Leptis Magna; Sabratha; Tripoli; Villa Selin; Cyrene; Ptolemais; and Apollonia. Archeotema, which specialises in underwater works and projects, was in charge of the planning of an underwater archaeological park in Leptis Magna, Apollonia and Ptolemais.

Considering the previous research made on the site, Archeotema organised a mission to survey all the underwater archaeological evidence previously mapped both by English and French teams. During the survey 29 points of interest were identified and between those, the following paragraphs discuss the specially selected sites (Fig 1).

N. 2 – the so called Cleopatra's swimming pool: A quarry in the rock completely flooded. It is a sort of L-shaped dockyard, and is 13m long and 6m wide. It represents a perfect context for diving courses. It is accessible only by boat or can be reached by building a small staircase on the rocks.

N. 3 – submerged tower: This tower is made by squared blocks, at the north side of the entrance of the harbour. To the south the door is closed by another tower. The entrance was the termination of a type of harbour channel. It has been excavated by A Laronde, who concluded that it had been quickly closed by reused elements during the 6th–7th c. AD.

N. 4 – big island where a certain number of open air quarries are visible: There are also caves which can be visited. Flemming documented the collapse of the central part of the northern limit of the island. Here it is possible to view the slipways from the top. There is a natural access for the boat, but it is necessary to equip it.

N. 5 – big quarry: This quarry is located in the rock and has circular silos connected to the sea. The big tank is connected to the sea with a tunnel, which allows a diver to visit it coming from the sea.

N. 6 – a submerged pier: This pier is made by squared stone blocks connecting the eastern

extremity of the slipways to a tower at the entrance of the harbour.

N. 7 – southern submerged tower of the harbour channel made by squared stone blocks: It is so well preserved that it is still visible from the surface. It is also a danger for navigation.

N. 8 – big submerged pier: This pier is made of squared stone blocks connecting the beach to the southern tower. It is about 90m long (Fig 2).

N. 12 – partially submerged ship sheds (*neosoikoi*): These ship sheds have ten slipways, 38.5m long and 6m wide, which were already documented by the Cambridge expedition in 1958 (Flemming, 1959, 1961, 1965, 1971) and recently by a French team (Sintes, 2010). The building is a type of hangar for the recovery in dry conditions of military oared ships of ancient Greece.

N. 13 – submerged fish pool (*piscina or vivarium*): This pool comprises a main big tank 44m long and three small square tanks quarried in the rock. These structures are normally dated to the Roman period. This submerged fish pool is currently positioned at a minimum depth of 1.9m and at a maximum depth of 3.8m (Fig 3).

N. 15 – submerged quays disposed in parallel: They are formed by parallelepiped carved blocks on the sides and by round stones inside the quays. The square blocks were the wall foundation, filled with simple small stones. The longest quay is about 35m long and the entire structure is about 40m wide.

N. 16 – submerged quarry: The quarry occupies an area of about 1000m² and consists of several regular cuts into the rock, made in order to give a preliminary rectangular shape to the blocks. The site has been previously interpreted by Flemming as a possible shipyard, but there is no evidence to support this suggestion.

N. 23 – submerged building: This building has parallel walls dividing it into five long rooms: The rooms are 5.5m wide and are closed both to the north and to the south. The whole structure is about 45m long and 30m wide. Because of its shape, it seems rather logical that a building with such long rooms closed on all sides is interpreted as a dock (or a warehouse).

N. 24 – submerged wall: This wall is about 60m long, enclosing to the north part of the docks. Apparently it is contemporary with the docks.

N. 25 – submerged quarry on the rock: It is composed by four socles of rock – 20m long – divided by three lanes where the rock has been excavated. The structure occupies an area of 20 × 16m. A double L-shaped wall was uncovered on the carved rocks. It is made of three rows of stone blocks, having a maximum width of 4.5m. It is obvious that this building was built after the quarry. The site is

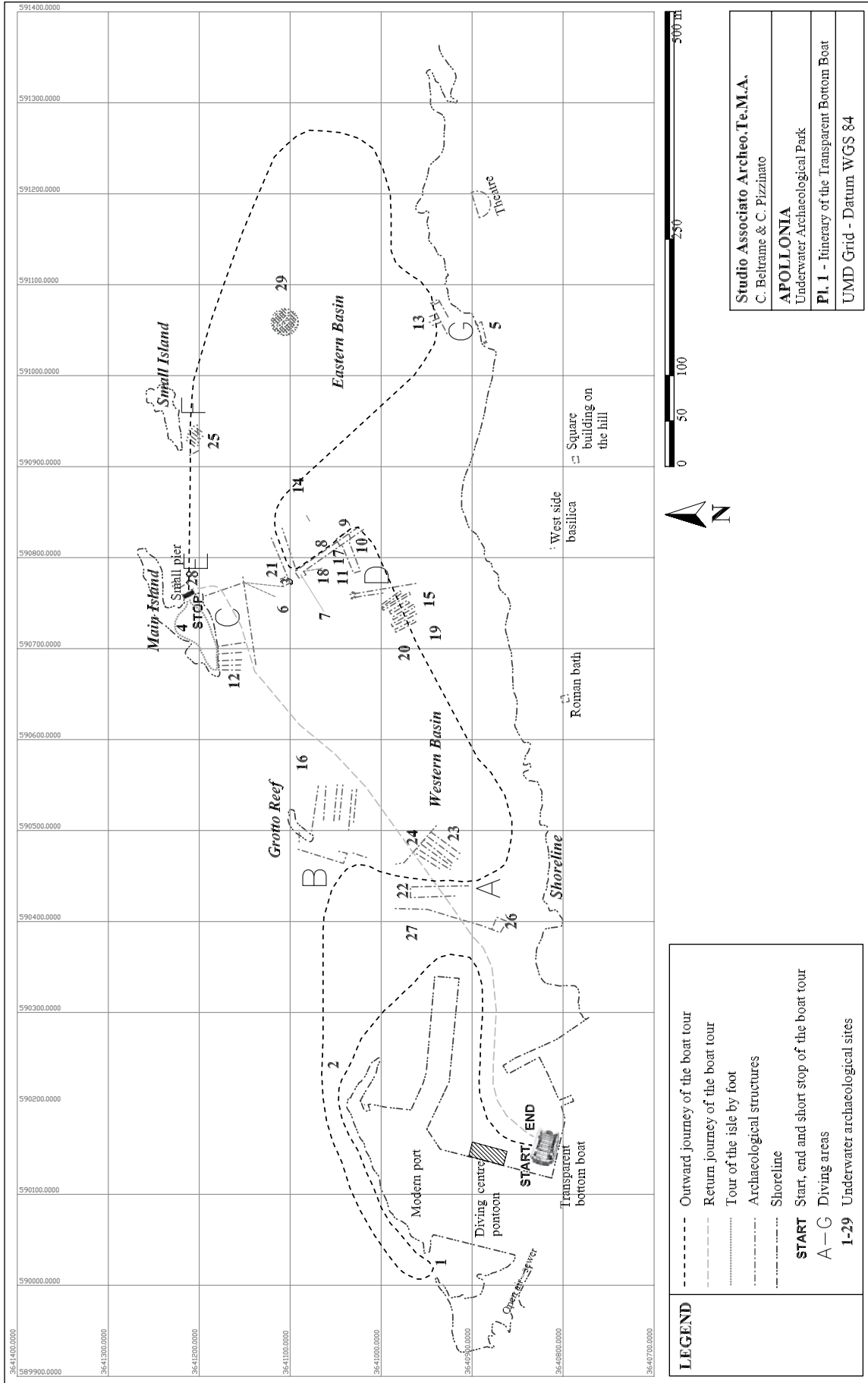


Fig 1: Map of the underwater archaeological sites of Apollonia



Fig 2: Submerged pier

positioned at a minimum depth of -1.5m and at a maximum depth of -3m .

6. Diving points

The following paragraphs outline some points of interest which could be visited by divers and tourists aboard transparent-bottom boats. Some sites that are similar to each other have been grouped together as the intention is to create a thematic tour, and also because some sites are situated close to one another. The following list contains some sites that were not discussed previously, as the present paper discusses only the most significant sites.

Pool: site N. 2

The so-called Cleopatra's swimming pool could be a perfect natural swimming pool to train the new divers. It is possible to reach it aboard a zodiac boat carrying the equipment and the students. A fixed panel advising that the passage of motor boats is forbidden and that it is a training site will be placed at the entrance. An additional panel will indicate the number and the ID of the site with a short description of it.

A: sites N. 22, 23, 24, 26, 27

This archaeological area is only a pair of metres in depth and it can be reached by the coast. It is possible to visit a submerged square building (N. 26) along the remains of a pier or a city wall (N. 27).

Along a submerged wall (N. 22) is present between this wall and another submerged building (N. 23) with parallel walls dividing five long rooms, interpreted as a dock (or warehouse). The depth range of this area is from 1m to 3m underwater.

B: site N. 16

The diver will be able to visit a submerged quarry. The depth is 3m underwater.



Fig 3: A tank of the vivarium

C: sites N. 3, 6, 12, 21

Dive can begin on the site N. 12, which is a partially submerged ship sheds (*neosoikoi*) with ten slipways quarried in the rocky bottom and divided by walls of unquarried stone. Visitors can start the tour from the west and move to the east, where a long submerged structure in stone blocks (N. 6) and a submerged pier are present. The pier is made of squared blocks (N. 21) and connects the eastern extremity of the slipways to a tower at the entrance of the harbour.

The submerged tower (N. 3), made by squared blocks, is located at the northern side of the entrance to the harbour. The depth range of the area is from 2m to 4m .

D: sites N. 7, 8, 9, 10, 11, 15, 17, 18, 19, 20

A diver can easily start from site N. 7, which corresponds to the southern tower of the entrance. The diver can continue the dive along a massive pier of squared blocks (N. 8), which runs toward the beach. Along the route the diver will see other stone foundations of difficult interpretation (N. 17, 18).

The pier is connected to a big plateau of squared blocks (N. 9). Here the diver can turn toward the west to follow a new possible pier (N. 10) that is east/west oriented, which ends near a submerged structure, made of stone blocks with circular shape (N. 11).

Moving further west the diver will see a big structure composed by presumed submerged quays disposed in parallel. Other stone structures are present along the western side of the quays (N. 19, 20). The depth range of the area is from 2m to 4m .

E: site N. 28

This dive is very short. It is possible to see a submerged quarry with unfinished stone blocks aligned. The depth of this area is 3m .

F: site N. 25

This short dive will encounter a submerged quarry on the rock comprising four socles of rock divided

by three lanes, where the rock has been excavated. Over it there is a double L-shaped wall of three rows of blocks. The depth range is 1.5m to 3m.

G: sites N. 5, 13

The dive can start from a big submerged fish pool (*piscina* or *vivarium*) (N. 13) comprising a main tank and three small square tanks quarried in the rock. On the west side of the pool, moving toward the coast, it is possible to dive under a tunnel which connects a big quarry and circular silos, engraved in the rock, to the sea (N. 5). Divers will have to exit from the quarry and return to the sea to finish their dive. The depth range of this area is 1m to 4m.

7. Critical aspects

According to Flemming (pers. comm.), who has extensive knowledge of the problems of the submerged ruins of Apollonia, the main wave damage at Apollonia appears to be related to the Grotto reef (N. 16) and to the 'west island' (site N. 4). For a thousand years or more, the northwest side of the town was protected from storms by the Grotto Reef, as well as by artificial rubble breakwaters between the reef and west island. Gradually that breakwater was broken down and flattened, and the waves now break into the city area. In 1959 a large part of this overhang had collapsed. Thus the whole tunnel feature, and the flat, straight arch outside it, were being destroyed by the waves. Currently the waves also attack the mainland shore, but are not very dangerous because the island creates a partial 'tombolo' effect.

Flemming proposes the building of a breakwater over the site of the Grotto Reef to prevent further damage. On stormy days, a new breakwater, or even a submerged or discontinuous type, would maintain much calmer water over the city, and thus would make it much more attractive to tourists. Since there was obviously a rubble breakwater in this sector in ancient times, it is even justifiable on the basis of 'restoration'.

Two other problems, according to Flemming (pers. comm.), are the pollution of sewage, which started in 2003, and the Al Manara Hotel, which is too close to the archaeological site and discharges liquids on the west of the modern harbour.

8. Conclusion

The establishment of an archaeological park could help conserve ancient submerged monuments and acquire funds for cleaning and restoring them. An integrated system of archaeological parks could enhance the country towards a new economy based on cultural tourism.

In order to create an underwater archaeological park at Apollonia, it will be necessary to follow a series of actions that could be summarised in the following steps:

1. solve the critical aspects relating the archaeological risk (sewage and erosion);
2. clean the sites;
3. carefully document the sites;
4. carry out trench excavations for studying purposes;
5. delimit and equip the park;
6. build a diving centre;
7. build or buy ships (with flat transparent bottom or simple zodiacs); and
8. train local dive-guides, park guardians and restorers.

These actions, if adequately carried out, may lead to important economic, social and cultural developments, starting a dialogue between 'memory culture' and 'present culture'.

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