



# HERAS

Submarine Archaeological Heritage  
of the Western Black Sea Shelf

# HERAS BOOK



Common borders. Common solutions.

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of the Western Black Sea Shelf - HERAS  
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of the Western Black Sea Shelf

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# *Submarine Archaeological Heritage of the Western Black Sea Shelf - HERAS*

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## CHAPTER 1

### PROJECT "HERAS": INTRODUCTION

#### 1.1. Context. Necessity. Objectives

HERAS is the acronym of the project entitled "*Submarine Archaeological Heritage of the Western Black Sea Shelf*". The purpose of this project was to explore the western Black Sea continental shelf and identify underwater archaeological sites in order to promote them in the "Scuba Diving" adventure tourist circuit. This project brought together institutions from Romania and Bulgaria - under the Cross-border Cooperation Programme Romania - Bulgaria 2007-2013.

The adoption of the UNESCO Convention on 2 November 2001 as the international treaty to save the underwater cultural heritage facilitates joint exploration of the multimillenary history of the Black Sea western coast at Constanta and Kaliakra, as an important part of the European Union eastern border.

The HERAS project aimed at promoting Scuba Diving adventure tourism in the Constanța - Balchik area and increase the tourism potential of the western Black Sea, through the identification and promotion of common underwater archaeological heritage.

The main objective of the "HERAS" project - the identification of the common underwater archaeological heritage on the west coast of the Black Sea at Constanța and Kaliakra -, has not been explored so far.

Since the creation of the first ancient Greek colony Histria, the Constanța - Balchik area have witnessed the rise and fall of several empires, from the Romans to the Byzantines and Turks, and also passed through barbarian invasions, Genoese dominion, etc. Vestiges of this common history were studied onshore, where ancient cities and towns are known to archaeologists and transformed into tourism interest areas.

Historical sites, both on land and underwater in particular, became attractive to tourists around the world.

The HERAS project, classified in the Priority Axis 3 - Economic and Social Development of the Programme CBC Romania - Bulgaria aimed at:

- discovering, identifying and promoting common submarine archaeological heritage in the western part of the Black Sea, near Constanța - Kaliakra;
- promoting "Scuba Diving" adventure tourism through a media campaign meant to increase awareness.

#### 1.2 Partnership and project responsibilities



The HERAS project brought together partners specialized in identifying archaeological sites and ancient wrecks on the bottom of the Black Sea, in order to highlight their value and preserve them in the context of sustainable development.

By combining the expertise provided by 2 research institutes, 2 museums and 1 NGO specialized in Scuba-Diving adventure tourism, the joint scientific team provides the skills necessary to identify and analyse the underwater archaeological heritage.

**LEAD PARTNER: THE NATIONAL RESEARCH - DEVELOPMENT INSTITUTE OF MARINE GEOLOGY AND GEOECOLOGY - GEOECOMAR - ROMANIA**

NRDI GeoEcoMar represents the national pole of excellence in marine geology and fluvial and deltaic coastal sedimentology, in geophysics and geoecology.



GeoEcoMar has an extensive practical experience in harmonizing policies, procedures and methodologies on regional level, being involved in the development and implementation of all regional plans related to the Black Sea environment: the initiative GEF / UNEP, Black Sea, etc. The international cooperation began in 1991 with the Cousteau team and developed in many European funding programs. The specificity of these activities has always had a strong cross-border component, as geological processes cannot be restricted by political boundaries. GeoEcoMar conducted joint activities and joint missions together with Bulgarian researchers. The permanent cooperation with the Black Sea partners (mainly with the Institute of Oceanology in Varna and the Bulgarian Academy of Sciences) was constantly improved and continues to develop.

GeoEcoMar owns a sea and ocean research infrastructure, which includes specific marine equipment and laboratories. The GeoEcoMar researchers provided technical assistance to archaeologists in discovering and shaping of many ancient and prehistoric sites in Dobrogea.

Within the "HERAS" project, GeoEcoMar has the status of Lead Partner, participating and coordinating all project activities. The institute organized a Database by identifying and classifying underwater archaeological objectives based on existing information; it also organized joint Romanian-Bulgarian underwater research campaigns and held a training session for scuba diving instructors in the field of marine archaeology techniques. In addition, as Lead Partner, NRDI GeoEcoMar has promoted HERAS through media campaigns, workshops and conferences. GeoEcoMar is the organizer of the final Conference of the project.

**THE NATIONAL HISTORY AND ARCHAEOLOGY MUSEUM CONSTANȚA**

The National History and Archaeology Museum in Constanța has a collection of more than 430,000 objects, which presents the profile of Dobrogea settlements over the centuries, from prehistory to 1940, attested facts, events, portraits of important personalities in Constanța, representing a reference point for Romanian and foreign tourists.

In the specific sector of the HERAS project, the National Museum of History and Archaeology in Constanța had the research and identification expertise of underwater archaeological sites along the Romanian Black Sea shore. The museum is active in this area since 1879. Numerous objects of interest from the archaeological heritage recovered from the sea have been restored and integrated in the collections of this institution.



Within the "HERAS" project, the National History and Archaeology Museum in Constanța participated with expertise in underwater research expeditions, took part in joint Romanian-Bulgarian underwater research campaigns, attended training sessions for scuba diving instructors in the field of marine archaeology techniques and organized a permanent exhibition of underwater archaeological finds and artefacts.

#### THE INSTITUTE OF OCEANOLOGY (IO-BAS) VARNA, BULGARIA

The Institute of Oceanology Varna represents the Bulgarian Academy of Sciences as co-coordinator of all studies related to the Black Sea and the World Ocean according to the National Oceanographic Commission (NOC) and leads the research and international relations activities hosted by the Intergovernmental Oceanographic Commission of UNESCO.



IO-BAS performs comprehensive monitoring of the Bulgarian Black Sea continental shelf and prepares qualified specialists in marine sciences. The research activities of the Institute are in marine physics, chemistry, geology and archaeology, biology and ecology, coastal dynamics and ocean technologies. The entire Bulgarian Black Sea coast area is studied by the Oceanographic Institute in Varna, covering the geo - archaeology sector, thus representing the focal point of national expertise in the field. For the HERAS project the most important IO - BAS expertise sector was marine geology and archaeology.

IO - BAS organized underwater research campaigns of the Bulgarian coast, participated in Romanian-Bulgarian joint campaigns for Romanian seaside underwater research, attended the training session for scuba diving instructors in marine archaeology techniques and promoted the "Heras" project through media campaigns, workshops and conferences.



## THE KAVARNA CITY MUSEUM, BULGARIA

The Kavarna City Museum holds rich collections of prehistoric, ancient and medieval artefacts unique for this part of Europe. The museum specializes in: discovery, collection, recording and working with cultural monuments, preparation and implementation of new exhibitions and updating existing ones.



Within the "HERAS" project, the Kavarna City Museum participated with expertise in underwater research expeditions, took part in joint Romanian-Bulgarian underwater research campaigns, attended training sessions for scuba diving instructors in the field of marine archaeology techniques and is working on a permanent exhibition of underwater archaeological finds and artefacts.

## NGO "RESPIRO UNDERWATER RESEARCH SOCIETY", CONSTANTA, ROMANIA

The NGO "Respiro Underwater Research Society" is specialized both in professional training of Scuba Diving divers, as well as in diving expeditions and diving emergency procedures. All these qualifications are in accordance with the EU standards and legislation.



Within the "HERAS" project, the NGO "Respiro Underwater Research Society" will participate as organizer of diving campaigns to interest sites for the project objectives and will conduct training courses for diving instructors.

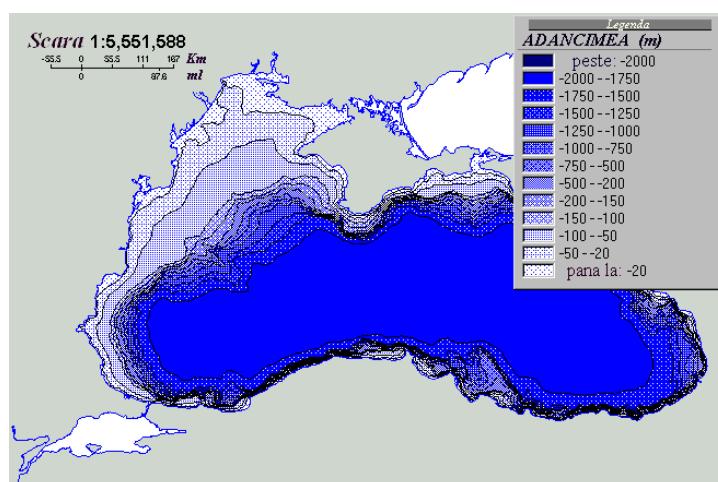
## CHAPTER 2

### NATURAL BACKGROUND OF THE WESTERN BLACK SEA

The Black Sea is one of the largest enclosed seas in the world, covering an area of  $4.2 \times 10^5$  km<sup>2</sup>, with a maximum depth of 2212 m. Its total water volume is 534,000 km<sup>3</sup>, but most of its water volume under the depth of 150 - 200 m (423,000 km<sup>3</sup>) is anoxic, contaminated with hydrogen sulphide (H<sub>2</sub>S).

The Bosphorus and Dardanelles Straits represent the sole connection of the Black Sea with the Mediterranean Sea. The Bosphorus Strait is narrow (0.76-3.6 km) and shallow, its threshold is 32-34 m. The strait limits the water exchange in both directions, between the Mediterranean very salty water (salinity of 38 - 39 ‰) and the more brackish water in the Black Sea (with a salinity of 17 ‰ at the surface and 22 ‰ at the bottom).

The Continental Shelf corresponding to Romania and Bulgaria is located in the western part of the Black Sea, as seen in the map below.



Bathymetric map of the Black Sea - processing after the Constanța DHM-1999 map

Here, the Continental Shelf widens dramatically, accounting for about 25% of the total area of the sea. In addition, two of the largest rivers in Europe have here their river mouths: The Danube, with a flow of about 200 km<sup>3</sup>/year and Dnieper, with a flow of 54 km<sup>3</sup>/year. Other smaller rivers like the Dniester (310 m<sup>3</sup>/sec) and the Southern Buh (82 m<sup>3</sup>/sec), are generating a total flow in the northwestern Black Sea, of about 255 km<sup>3</sup> / year.

#### 2.1 Geomorphological and geological characterization of the Romanian and Bulgarian Coast

*The Romanian Coast* of the Black Sea is located between the Chilia Secondary Delta, to the north, up to Vama Veche (border with Bulgaria) in the south, with a total length of 243 km. The coast can be divided into two sectors. From a geological, geomorphological and sedimentological point of view, the limit between these two sectors is conventionally established at Cape Midia. The evolution of the coast in both sectors is determined by the relationship between the amount of sediments available, transport, sorting, storage and hydrodynamic regime of the sea, in the form of waves and marine currents. The coastal current is oriented north-south, parallel to the shore.

The *Northern sector*, with a length of about 160 km, is located between the border with Ukraine and Cape Midia. This sector, including the beaches in front of the Danube Delta, has as main sediments source the material transported by the Danube and subsequently redistributed by coastal currents. The arenitic fraction of the coastal sediments consists of quartz, with some local heavy mineral admixtures. The amount of carbonates, represented by molluscs shells, increases from north to south, from a few percent at Sulina, to a percentage of over 90% at

Periboina, correlated with the increasing distance between the Danube mouths. The Northern sector of the coastline is included in the Danube Delta Biosphere Reserve.

The *Southern sector*, with a total length of approximately 80 km, encompasses the coast between Cape Midia and Vama Veche. This section consists of cliffs separated by a lower, sandy shore (Mamaia, Eforie, Costinești, Tatlageac, Mangalia). According to Shepard's genetic classification (1967), the Southern sector of the Romanian coastline belongs to the secondary shores type, with two main subtypes: erosional type (with cliffs) and depositional type (type of shore - barrier). The shore presents various sectors, which reflect local differences induced by the evolution of sedimentary processes, as well as the geological characteristics of the land.

The main characteristic of the southern coastline is the shore evolution with coastal cliffs as well as the gradual transition from the Danube terrigenous facies to an organogenic type. Hence, it is possible to separate two distinct sectors: the Cape Midia Sector - Cape Singol, with transitional features between the northern and southern unit and the presence of a complex barrier type beach ridges, which has evolved between the active cliffs; Cape Singol - Vama Veche Sector, characterized by the predominance of active cliff shores, separated by coastal sand barriers.

The active cliff shores are found in the following sectors: Eforie Nord - Belona, Cape Turcului - Cape Tuzla and Cape Tuzla - Vama Veche. The cliff is interrupted by beach ridges at Costinești, Tatlageacul Mare Lake, Mangalia Lake, Comorova swamp.

Headlands occur in areas with harder rocks: Cape Midia, Cape Ivan, Cape Turcului, Cape Tuzla, Cape Aurora. Some cliff sectors are now isolated from direct sea action following construction of hydrotechnical structures in the harbour.

Accumulative shores in the Cape Midia - Vama Veche sectors are of two types: barrier beaches (Techirghiol, Costinești, Tatlageac, Mangalia coastal bars) and complex barrier beaches (accumulative shores between Cape Midia and Cape Ivan, Cape Ivan and Cape Clisargic, and the coastal barrier extending between Cape Clisargic and Cape Singol).

In geological terms, the Romanian seaside covers the following structural areas: South Dobrogea, Central Dobrogea, North Dobrogea and the Pre-Dobrogea Depression. South Dobrogea is limited to the north by the Capidava-Ovidiu Fault. The crystalline basement of this unit is overlain by a cover of Paleozoic, Mesozoic and Cenozoic sediments, with frequent stratigraphic gaps.

Pre-Quaternary deposits occur in the coastal area southwards from Cape Midia up to Vama Veche and furthermore on Bulgarian territory. The Late Precambrian (Ediacaran) basement (Histria Formation, formerly described as "green schists" formation), accumulated 540-570 million years ago, is exposed at Cetatea Histria, near Vadu town and on the shores of Tașaul Lake at Cape Midia. The Upper Jurassic limestones (Oxfordian and Kimmeridgian) crop out at Cape Ivan and Cape Clisargic, on the shores of Tașaul Lake. The western shore of Siutghiol Lake exposes lower and upper Cretaceous deposits. The Sarmatian is best represented at the base of the Southern Dobrogea cliff, overlain by Quaternary loess deposits.

The erosional and weathering surfaces of the pre-Quaternary formations in Central and South Dobrogea are overlain by several levels of brown clay, followed by loess and paleosols. The South Dobrogea tectonic block, bounded by the Capidava-Ovidiu and Intramosian faults, is relatively stable geodynamically, suffering small uplift movements near the border with Bulgaria. The subsidence along the Dobrogean shore is estimated at 2 - 4 mm/year.

The *Continental Shelf* corresponding to the Romanian coast partly overlaps the main geological-structural units of Dobrogea.

The internal Black Sea shelf adjacent to Romania is well defined, with a width of 10-15 km in the north and 1-5 km south of Constanța. Current sediments are covering the local relict geomorphological structures. The eastern internal shelf boundary is marked by the 27-30 m isobath, beyond which the external shelf area is present, extended to a depth of about 120 m.

During the Late Quaternary, the Black Sea underwent significant changes due to global climate change.

*The Bulgarian coast*, with a length of 412 km, has a generally eastern exposure, includes erosion cliffs, sandy beaches, aeolian dune areas and lagoons. The shoreline configuration underlines the presence of two bays: Varna and Burgas, which penetrate deep into the land. The

cliffs represent 60% of the entire length of the coastline, the sandy beaches - about 30%, while the remaining 10% consists of shores protected by hydrotechnical structures.



The geological formations occurring along the shoreline are complex and varied. Erosional shores are common in the northern extremity between Cape Sivriburun and Cape Shabla, being represented by Sarmatian limestones in the base of the cliff (the Karvuna Formation), overlain by loess type deposits. At Cape Shabla the shore has an eastern exposure, favouring an increased withdrawal rate of 0.30 m/year. In the sector between Cape Krapetz and Cape Shabla, of alternating headlands with extensive beaches (Durankulak-North, Durankulak - Krapetz, Shabla) and firths supplied by karst sources, the erosion rate reaches 1.2-1.6 m/year. The beaches are composed of medium, organogenic sand, containing over 93% organogenic carbonate. Their heavy mineral content is low. In the Sivriburun - Shabla sector a wide system of aeolian dunes is developed, corresponding to the Durankulak beaches, north to Cape Krapetz and in the Shabla - Ezeretz sector. In some areas, the dunes behind the beach are about 2 m high, being fixed by specific vegetation. North to Cape Krapetz the dunes complex is developed up to 400 m from shore, their height reaching 10-15 m.

*The Black Sea coast of Romania during the Roman period, after N. Iorga, V. Pârvan, I. Bitoleanu, A. Rădulescu and C. Chera*

*Walachia, Servia, Bvlgaria, Romania Chart From the Atlas Theatrum orbis terrarium by Joan Blaeu, 1645*



North of Cape Kaliakra, a vast dune complex, 5000 m long, develops between Shabla and Ezeretz. By the Dobrogea camping site construction, much of the dune field was covered in concrete. The shore between Shabla and Kaliakra consists of yellowish Sarmatian limestone. Cape Kaliakra is the most prominent cape along the Bulgarian coast, protruding 2 km offshore. The adjacent shore is steep with vertical cliffs, 70 m high. Characteristic are karst processes, with numerous caves and deposits of carbonate minerals. Here the erosion rate is 0.05 m/year. To the south, between Kavarna town and Albena resort, the shore is composed of limestone and clay. Landslides develop over large areas in this sector. The beaches of the north Bulgarian shore are formed of organogenic gravels. In the central part of the Bulgarian coast, beach sediments



have also a mineral intake from the landslides and rivers. Beach sand is coarse, predominantly made of quartz, with a low-carbonate content.

## 2.2 Hydro-meteorological factors in the western part of the Black Sea

### Winds regime

On the Romanian coast of the Black Sea, the relative wind speed is relatively high (4.2 - 6.95 m/s) due to connections between the Mediterranean area and the atmospheric circulation over the Black Sea. Multiannual average speed value (1961-2000) ranges between 4.2 m/s (Mangalia) and 6.95 m/s (Sulina). The prevailing wind direction is from west and north. The highest values are recorded during December to February (up to 40 m/s; with N-S and NE-SW directions), while the lowest values are recorded during April to September.

The climate of the Bulgarian Black Sea coast is determined by two factors: on one hand, the atmospheric circulation characteristic to the Balkan Peninsula (south), and on the other hand, the climate influence from the Black Sea (north). The influence of the Black Sea reaches about 30-40 km onshore from the coast. The maximum wind speed average is between 6.7 m/s in the north (Cape Kaliakra Station) and 2.7 m/s in the south (Nessebar, Sozopol and Tsarevo). Similar to the Romanian coast, the highest wind speed values are recorded in winter (average - approx. 8.5 m/s - Cape Kaliakra), while the lowest values were measured in July and August (below 2.0 m/s - Sozopol). The prevailing wind direction is N-S and NW-SE.

### Waves regime

Adjacent to the *Romanian coast*, waves were divided into three categories according to wind direction: N-ENE winds are generating the biggest waves around 102 days per year; SSE-WSW winds are generating average waves circa 91 days per year; and E-SE winds are generating small waves. Wind waves appear under the action of these winds, and surge waves occur following disappearance or reduction of the wind speed. The calm for the Romanian seaside is an average of about 1.9% per year, the remaining period is divided into about 50.7% wind waves, 20.1% surge waves and 27.3% waves combined (wind and surge). Storms from N, NE, E and SE determine the sea level rise by 1.2-1.5 m. The tide in the Black Sea has an average period of 12h 25min and amplitudes of only 7-11 cm.



Coastal erosion - Cape Tuzla

Because of the eastern exposure, adjacent to the *Bulgarian coast* the waves are generated primarily by winds from the N, NE, E, SE and S. In a proportion of about 75%, wave direction is dominant from NE. The average wave height varies between 0.12 m in summer time (Varna Bay) and 1.7 m in winter (Ahtopol). Maximum values were recorded in the south, at Ahtopol. The extreme wave values registered on the Bulgarian coast are over 10 m, with the average annual maximum of 10.17 m. The extreme wind waves are the main cause of flooding in low-lying coastal areas. These waves can cause coastal erosion activation and landslides along the coast, and coastal infrastructure damage.



## CHAPTER 3

### EVOLUTION OF THE HUMAN COMMUNITIES ON THE WESTERN COAST OF THE BLACK SEA, FROM PREHISTORY TO PRESENT

#### 3.1 The first human settlements on the West coast of the Black Sea

Since ancient times, the north-west coast of the Black Sea represented the ideal environment for human life and development of communities of people inhabiting this area. Dobrogea, the land between the Black Sea and the Danube, was an area of permanent cultural and ethnic interferences. The evolution of human communities here cannot be understood without taking into consideration the freshwater resources, which are essential for any kind of human habitation (seasonal or permanent).



The earliest evidence of habitation in Dobrogea is represented by rudimentary tools made of flint, dated as the **Early Palaeolithic**. Such tools, alongside a specific palaeo-fauna, were discovered in two caves from Central Dobrogea, "Adam" and "Bats Cave", located in an area that could ensure the necessary living conditions for the first human communities: shelters situated in caves and under the cliffs, drinking water from Casimcea river and its tributaries (Visterna, Ghelengic and Mireasa creeks), and a corridor of access to the Black Sea. Most of the Palaeolithic settlements around the Romanian seaside were concentrated in the areas of lagoons and marine coasts. Discoveries made during the Late

**Paleolithic** are fewer, following the general depopulation phenomena, also noticed on the eastern coast of the Black Sea.

An increase in number of settlements established in Dobrogea, at the expense of life in caves is explained by the climate improvement from the beginning of the Mesolithic era. The taste for small kills, specific to the steppe region, the emergence of more sophisticated tools, have influenced the industry of the lithic material: the trapezoidal and rectangular flint tools had been used for a long period of time (Hamangia culture).



A similar situation was noticed in the area of the Bulgarian seaside, where the only known archaeological site is Pobiti Kamani, west of Varna Lake. The absence of Mesolithic habitation is explained by Bulgarian scientists as due to flooding of palaeo-valleys: Paleoprovadiyska, Paleovoydnitya, Paleosredetska and Paleorezovska, the ancient Mesolithic settlements being covered by the sea. Marine transgressions could also explain the absence of the early Neolithic in Dobrogea (6<sup>th</sup> millennium BC), but the lack of systematic underwater research does not allow to formulate convincing answers regarding this issue.

Most of the **neo-enaolithic** settlements in Dobrogea of Hamangia (5200-4600/4500 BC) and Gumelnița type (4600/4500 - 4000 BC), were built next to the main rivers, especially close to areas where rivers discharge in the Black Sea, where they formed the current seaside lakes Mangalia, Tatlageac, Techirghiol, Agigea, Siutghiol, Tașaul, Gargalâc, Sinoe, Istria, Golovița, Babadag, Razim. This explains the concentration of Hamangia settlements in the area of the Romanian and Bulgarian seaside. Hamangia communities were situated around the main sources

of freshwater. Gumelnița - Varna communities were grouped mainly in the area of the large bays (currently lakes), close to the mouths of the main freshwater rivers. The biggest habitation concentration, with eight archaeological sites (Beloslav, Varna, Morflot, Ezerovo I and II, Arsenalna, Poveljanovo, Strachimirovo, Devnia), was found in the area of today's Varna-Beloslav lakes, which in the 5<sup>th</sup> millennium BC was a large marine bay at the mouths of Paleoproviadiyska Valley. Hamangia communities have intensively exploited the nearby marine resources (a group of individuals identified in the necropolis at Durankulak had a predominant fish-based diet), or the more distant resources. The lower habitation density within the seaside area is explained by a more diversified economy of Gulmenița communities which widely practiced agriculture. If fishing and cattle breeding represented the main occupations of Hamangia communities, thus explaining their periodic movement along the sea coast and the main rivers, Gumelnița communities have secured their food needs by more complex environment exploitation strategies and by barter, sometimes done at very long distances. After the great marine transgression which took place at the end of the Atlantic period (beginning of the 4<sup>th</sup> century BC) human settlements became rarer, the eastern communities just sporadically reaching the west-Pontic coast, as shown by the funerary discoveries made at Baia-Hamangia and Durankulak.

Durankulak is located in NE Bulgaria and has been investigated for decades by a team lead by H. Todorova. The excavations at Durankulak were conducted between the years 1974-1997, and as a result 1204 prehistoric tombs were carefully registered and 17 homes discovered. The settlement from Durankulak was populated between the years 5200 and 4200 BC, the first inhabitants belonging to Hamangia culture. The prehistoric village was made up of several homes, very well organized, of large dimensions and with several rooms. Around 4700/4600 BC, the stone architecture has been generalized, becoming a distinctive phenomenon in the final phase of Hamangia culture and highlighting the social differences inside the community. Durankulak is one of the few settlements preserved from the first farmers, which can provide information regarding their daily life.

In the northern part of Cape Kaliakra there is a small bay, with a harbour named Bolata. This is a narrow sea channel which crosses the seashore like a gully. Both sides are rocky, with caves carved inside. A short river with numerous tributaries discharges into Bolata. At the discharge place a lagoon is formed. In the small karstic caves a 40 cm thick layer (with fragments of Neolithic grey-blackish pottery) was found, similar to the „Nivata” archaeological site from Durankulak. In Kavarna area, the first details that made reference to human presence in the region date from the 6<sup>th</sup> millennium BC and mostly consist of lithic pieces and neo-enaolithic ceramics, discovered at the bottom of Cape Chirakman, in the caves from around the towns Bolata and Yailata. In the early days of the Bronze Age (3200 BC), based on a marine regression, we witness a revival of habitation, as the following discoveries show, especially in the southern part of the Bulgarian coast, discoveries dating from the second phase of the Early Bronze Age (2780-2504 BC) in the areas of Varna - Beloslav lakes. Just like in the case of enaolithic settlements, these had been flooded too and for this reason living in seaside areas was abandoned for a long time.

In Shabla Cape area there are traces of an ancient settlement called Caron Limen, which is



continued under water to a depth of 4 m and on a length of 400 m. Picturing the world from 3500 years ago, when the level of the Black Sea was about 3-5 m lower than the current one, it was discovered that the area of this reef was above the water and that it protected the old port. This explains the presence of a settlement and of a port in the area which today is improper for mooring. To the north of this reef five stone anchors were found at depths between 1.5 up to 3.5 m. These three-hole stone anchors place the life of the port in the old period of the Bronze Age (1500-1200/1100 BC).

At **Yailata**, a national archaeological reserve is located on an impressive drifting body of karstic Sarmatian limestone, 2 km long and 250 m wide, which was produced by a palaeo-seismic event. Landslides in three terraces are representative here. The orientation of the coast is NE - SW. The adjacent coast between Shabla Cape and Kaliakra Cape consists of detrital, biogenic and oolitic Sarmatian limestone. A small bay exists here and the east of it three stone anchors were found, all dating from the Bronze Age: two stone anchors with only one hole (Porozhanov 1989) and another with three holes.



**Kaliakra Cape** and the archaeological reservation on its territory are located 12 km south-east of Kavarna city. This is the largest promontory of the Bulgarian coast, advancing 2 km into the sea. The vertical cliff, with a height of 70 m, is made of highly karstic Sarmatian limestone. The commercial ships which stopped at ancient **Tirizis** used the deep bay west of Kaliakra Cape for docking, bay which provided natural protection against the northern and eastern winds. This bay was first used in the late Bronze Age.

The population of Dobrogea was part of the great Carpathian-Balkan ethnic entity, identified as **Thracians**, from the **First Iron Age - Hallstatt** (11<sup>th</sup>-5<sup>th</sup> centuries BC). The emergence and establishment of Greeks at Pontus Euxinus, or the Greek colonization, occurs beginning with the 8<sup>th</sup> century BC. The most important cities established here are Apollonia, Messembria, Odessos, Callatis, Tomis, Histria and Tyras.

At the end of the 2<sup>nd</sup> millennium BC, an increase in trading and crafting was registered in



Kavarna area, leading to an influx of population in the region. This attracted like a magnet the Nomadic tribes and the population began to fortify the settlement in the less accessible areas, such as Chiralman and Kaliakra Capes. Since those times, the Thracian tribes took into consideration a natural fortification of the Chirakman Cape and created here a settlement called **Bizone**. The Thracian settlement at **Topola**, with a rich amphorae material from the Hellenistic period, was identified on a high plateau, close to Topola village. Traces of Thracian habitation from the beginning of the Iron Age were discovered under a Thracian-Roman

sanctuary and under a paleo-Christian basilica, dating from the 4<sup>th</sup> century.

**Zaldapia** fortress was built by the Thracian Obulensi tribe in the 8<sup>th</sup> century BC. The old centre of the fortress was naturally protected on the east, north and north-east sides, being surrounded by a deep valley and having a short fortified line on the west and south-west sides. It was disposed on a territory 1200 m long and 500 m wide, in the southern part of the actual Abrit village. The old fortification from **Tauklimana Cape** is located in Rusalka resort. In the beginning, the location was populated by Thracians, who fortified the settlement with a port. The fortress was built at the beginning, or in the middle of the 6<sup>th</sup> century BC.

## The Roman-Greek period

With the beginning of the Greek colonization in the Black Sea - 7<sup>th</sup> century BC, large urban centres were developed in the western Black Sea coast area, known as *polis*, but also small villages known as *emporion*. When choosing the location for a future colony, Greeks took into consideration, first of all, the possibility for establishing a port, due to the supremacy of sea commerce. The relations between the newcomers and the natives will prove to be mutually beneficial: both Greeks and locals will influence each other, reflecting this in economy and culture.



Towards the second half of the 4<sup>th</sup> century BC, significant changes in the social-economic and political-cultural environment took place at the mouths of the Danube. At the beginning of La Tène period (5<sup>th</sup> - 4<sup>th</sup> centuries BC) the **Scythian** influence makes its presence felt in the local environment, this being highlighted by Scythian tools - *akinakes type* daggers, Scythian religious kettles. Pushed by the Sarmatians, the Scythian tribes entered the province by south, especially through the seaside area, occupying new territories under the leadership of King Ateas.

The **Macedonian** authority north of the Danube will assert starting with Phillip II and will advance during the time of Alexander the Great, whose campaign in 336-335 BC against the Tribals resulted in a strengthening of the previously occupied positions. The contact of Scythians with the Getae is increasing starting with 4<sup>th</sup> - 3<sup>rd</sup> century BC. Due to permanent contact with the locals, in Dobrogea, the Scythians ended up by being assimilated, being lost in the large number of Getae. In the Dacian kingdom of **Burebista**, beginning with the middle of the 1<sup>st</sup> century BC, Scythia Minor experiences a considerable development from social, economic and political point of view. The organized presence of the Getae - Dacians in Dobrogea, even after the death of Burebista in the year 44 BC, was obvious. After the death of Burebista, the Dacian state crushes down. The three Getae authorities in Dobrogea, Rolex, Dapix and Ziraxes enable the Romans to rule Scythia Minor. This region falls under the Roman domination (from 29-28 BC) and it remains so for almost seven centuries.



**Histria.** The oldest Greek colony in Dobrogea was Histria, a Milesian fortress on Sinoe Lake, dating from the 7<sup>th</sup> century BC (657/656 BC - according to the information from Eusebius). Being founded on a large marine bay promontory - which today is Sinoe Lake - Histria benefited from a highly strategic position, located between the Getae world, the Scythian world and the newcomers. Among the oldest

archaeological findings from Histria we mention: Asia Minor archaic ceramics (second half of the 7<sup>th</sup> century BC), Asia Minor vessels decorated in *Fikellura* and *Clazomene* styles (the second half of the 7<sup>th</sup> century BC - 6<sup>th</sup> century BC), luxury ceramics painted with *varnish* in *black figures style* (550 - 525 BC) and *red figures style* (525 - 490 BC). Histria trading with the local population was simplified in this period, due to the appearance of the coin „with wheel” and the legend ΙΣΤΡΙΑ - the name of the fortress, derived from the name of the Danube. Beginning with the 6<sup>th</sup> century BC, Histria becomes the most important *polis* on the west and north-west coasts of Pontus Euxinus, with extensive commercial exchanges, having relations with other commercial centres from Asia Minor, but also with the natives. The *chora* of Histria (the rural area controlled by the *polis*) reached north up to the Danube Delta (about 22 km from the fortress) and south down to Casimcea Valley. Fortifications such as Vadu, Sinoe, Dolojman Cape existed in the seaside area.

**Tomis (Constanța).** For ancient Tomis, sources mention several names, out of which the best known are *Tomis* or *Tomi*. Alongside Histria, Tomis emerges during the Greek colonization on the Left Pontus, in the 7<sup>th</sup> - 6<sup>th</sup> centuries BC. Tomis promontory was an imminent stop for sailors. The name of the settlement varies, in Greek it is *Tomis* or *Tomeos* and in Latin it is *Tomi* or *Tomis*. The Milesian origin of the colony is stated by Demetrios from Callatis, taken over by Pseudo-Skymnos - "*Tomis city was a Milesian colony*" - and reaffirmed by Ovid (*Tristia*, I and II).



After 260 BC, as a consequence of the conflicts between Bizantion and Callatis, Tomis took advantage of the decay of the other west-Pontic colonies and experienced economic development, as it is shown by the first bronze coin issuing of the city. From 29/28 BC (after the campaign of Crassus) the Pontic cities Histria,

Tomis and Callatis passed directly under the administration of Macedonia; this lasted until 46 AD, when the Province Moesia was organized.



The city of Tomis enjoyed a privileged status, being the centre of the Greek Association of West-Pontic Cities (*Pentapolis* later becomes *Hexapolis*) during the 1<sup>st</sup> - 2<sup>nd</sup> centuries AD. Under the leadership of Antonins and Severs, the city reached its heyday of prosperity (2<sup>nd</sup> - 3<sup>rd</sup> century AD), when several public buildings and also the new inner wall of the city were built.

After repeated barbaric attacks, at the beginning of the fourth century AD (especially under the rule of Constantine the Great), a period of economic prosperity follows for the metropolis of Tomis, when

many public buildings are built (such as the Mosaic Edifice) or restored (such as the inner wall), actions which are difficult to analyse due to the overlapping of the ancient city by the current modern port and by contemporary buildings.



*Callatis* (Mangalia) is a Dorian creation of Heraclea Pontica, which was founded by Megara. The foundation date is unknown; the only indications regarding its beginnings are archaeological. The excavations showed an early habitation, dating no earlier than the 4<sup>th</sup> century BC. Plinius the Elder states that the city was originally named *Cerbatia* (*Acervetis*) and it was assumed that this Thracian toponym was taken from an indigenous settlement that existed in the area and that the nearby river which discharged into the sea was called Cerbes / Cerbos (the present Limanu Valley).



Geographer Pseudo-Scymnos noted in the 1<sup>st</sup> century BC that Callatis fortress was founded by „the inhabitants from Heraclea Pontica, upon the order of an oracle (probably Delphi), in the times when Amyntas conquered the Macedonians.“ If this refers to Amyntas I, who ruled between 540 - 498 BC, we can conclude that the founding date of the colony would have been at the end of the 6<sup>th</sup> century BC. Considering that the oldest findings date from the 4<sup>th</sup> century BC, most people consider that the above mentioned reference is actually related to Amyntas III (390 - 373 BC). The mythical founder of the fortress was considered to be

Heracles. As long as the Odrysian kingdom "levied tribute from all the cities they possessed", Callatis was also forced to recognize their authority and after their defeat by Philip II (341 BC) it became part of the Macedonian Kingdom. In 313 BC the city fought off the Macedonian garrison, triggering a rebellion among the west-Pontic colonies (Histria, Odessos). But the king of Thrace, Lysimachos, succeeded to immediately subdue Histria and Odessos, and to defeat the allies of the Greeks - Scythians and Thracians. Callatis city was the only one that withstood a long siege, probably in 311 BC. Finally, it was taken over by Macedonians, the latest in 302 BC. After the death of Lysimachos (281 BC), Callatis managed to release itself.

Towards the end of the 3<sup>rd</sup> century BC, Callatis becomes part of Scythia, among „other Greek cities which are under the protection of king Rhemaxos“, to whom Histria also paid annual tribute (*phoros*), in exchange for political and military protection (the Greek colonies were threatened by the attacks of Thracians led by Zoltes). The strong political instability



which occurred during the wars between Mithridates VI and the Romans, led to a gradual decline of the city (1<sup>st</sup> century BC). During Augustus, Callatis becomes *civitas foederata*, maintaining its internal independence, its rural land possessions, and it was exonerated to host a Roman garrison and to pay tribute. This political success was the symbolic equivalent to a new reestablishment of the city. Ariston, the one who negotiated for the people of Callatis, was rewarded with the honorary title of „the re-founder of the city“.



Other Greek and Roman settlements, identified in the seaside area of Histria - Callatis are: **Istria-village, Nuntași, Săcele, Vadu** - identified as the ancient *vicus Celeris*, **Corbu de Sus, Pietra, Sibioara, Năvodari, Midia, Anadalchioi** - *vicus Turris Muca*, **Lazu** - a *castellum* fortification type, **Agigea** - traces of early Roman habitation, **Techirghiol, Tuzla Cape** - *Stratonis Turris*. **Costinești - Schitu** would correspond to ancient *Parthenopolis*, mentioned by Plinius the Elder and Eutropius. *Parthenopolis* city is mentioned among other seven cities which were considered by Eutropius as belonging to the region occupied by the *Scythae arroeteres* (Scythian farmers); this actually corresponds to the area in Dobrogea where coins of the Scythian kings were found. The same ancient writer emphasises the importance of *Parthenopolis*, by mentioning it among the main Hellenistic cities on the west-Pontic coast, conquered by Romans in the year 72/71 BC, during the campaign conducted by the Governor of Macedonia, M. Licinius Varro Lucullus, placing this settlement between Callatis and Tomis.

**Bizone (Kavarna)** was founded by Dorian settlers in the 4<sup>th</sup> century BC. At the end of the 5<sup>th</sup> century BC, settlers from Mesambria established in Bizone, where they formed one of the last colonies on the west coast of the Black Sea. The city develops and, if we were to judge by the number of anchors found on the bottom of the sea, it becomes one of the most important commercial centres of the time.

**Timum.** Pieces of Hellenistic and Roman ceramics, Hellenistic amphora seals, baked clay figurines and coins minted at Dionysopolis dating from the 3<sup>rd</sup> - 2<sup>nd</sup> century BC, were all discovered under a habitation level corresponding to the early Byzantine period.

**Dionysopolis (Balchik).** According to the ancient literary information regarding the topography of Dionysopolis, this settlement seems to be overlapping with the current modern city of Balchik. The toponym was mentioned by Pseudo-Scymnos, Annonimus Periplus Pontus Euxini, Plinius the Elder and Strabon. In spring 2006, a team of archaeologists discovered the foundation of a Hellenistic temple dedicated to goddess Cybele.

At **Balik** a Roman settlement was discovered, dating from the 1<sup>st</sup> to the 4<sup>th</sup> century BC. The late Roman and medieval fortification **Adina** is located at approximately 2.25 km north-east from the centre of Balik village. The Imperial Roman road Durostorum - Marcianopolis went through this fortress, strongly fortified and protected with a double inner wall.

The ceramics found at Caron Limen dates from the 5<sup>th</sup> century BC and the 6<sup>th</sup> century BC. The origin of the oldest amphorae is Chios and it is dated as being from the last quarter of the 5<sup>th</sup> century BC. Three bronze anchors were found in the eastern area with stone anchors at a depth of 10 - 11 m. The lack of ceramics after the 6<sup>th</sup> century AD suggests that Limen Caron harbour was located south of this reef.

**Bulgarevo.** Between Kavarna and Timum, in the area of the actual Bulgarevo village, a settlement with habitation levels from the Roman and Roman-Byzantine periods (1<sup>st</sup> to the 4<sup>th</sup> century AD) was discovered. Traces of Hellenistic, Roman and Byzantine habitation were also found close to the village.

## The Roman-Byzantine period. Scythia Minor

Information regarding the military organization of province Scythia Minor were written down in *Notitia Dignitatum* (4<sup>th</sup> century), dating from the times of **Constantius the Second** (337-361), to which the information provided by *Itinerarium Antonini* are added, compiled and based

upon a model from the reign of Diocletian. Being a good organizer, Diocletian visited the Danubian provinces (294-303) and with this occasion he rebuilt the fortifications along the Danubian *limes*.

From administrative point of view, Diocletian reorganized the Empire, establishing dioceses and increasing the number of provinces and their dimensions. According to this new system, the province of Scythia Minor was part of the Thracian diocese, together with Europe, Thrace, Haemimontus, Rhodope and Moesia Secunda. The capital of the province was established at Tomis, where the residence of the military commander (*dux*) was also located.

Under Diocletian, Tomis became the residency of Scythia Minor. Later on, new buildings were built, among which we mention the *Roman Edifice with Mosaic*, which has been repaired several times and finally abandoned at the end of the 6<sup>th</sup> century - beginning of the 7<sup>th</sup> century.

Due to his reconstruction initiatives, the offensive military missions, the large number of troops stationed in the area, we can say that **Constantine the Great** was the creator of the



Scythian *limes* system. After 318-319, when Constantine the Great took on the titles of *Gothicus Maximus* and *Carpicus Maximus*, and after the treaty with the Goths was concluded in the year 332, a period of peace and economic prosperity followed for Scythia Minor. The presence of Goths in Scythia Minor is also archaeologically attested by the cemeteries in Histria, Tomis, Callatis, Beroe, Capidava and Dinogetia. Later on, during the reign of **Anastasius** (491-518), a policy of reconstructing the fortifications in most cities of the province was initiated, initiative attested at Dinogetia,

Histria, Altinum, Ulmetum, Tropaeum Traiani, Callatis, Tomis. This initiative was determined by the appearance of the **Slavic tribes** in the region. In the 6<sup>th</sup> and 7<sup>th</sup> centuries, the Byzantine Empire had to face incursions of Slavs and Bulgars, mixed with bands of Huns in Scythia Minor region.

The presence of Slavs in Scythia Minor was felt after the year 533 and especially after 540, when they settled here. Towards the end of Justinian's reign, another nomad population appeared at the Lower Danube, related to Huns-Bulgars, named **Avars**; the Emperor gave them a federate status and placed them on the Danube border. In order to face these repeated conflicts, Justinian gave order to build in the Balkan Peninsula and upon the Lower Danube hundreds of fortifications disposed in several defence lines. In Scythia Minor, the policy begun by Anastasius to fortify the *limes* system was continued. Procopius of Caesarea mentions that construction works were conducted for over 40 settlements. On this occasion many cities or castles were rebuilt or built from scratches, both on the Danube line and in the interior, but even on the seaside of the Black Sea. The construction works undertaken by Emperor Justinian the First in Moesia Secunda and Scythia Minor, finds its reflection in the different ways by which the inhabitants of the two provinces wanted to show their gratitude to the Emperor. This includes the inscriptions from Messembria and Callatis by which the Emperor is complimented with the attribute of "buildings lover".

Tomis city was rebuilt under Justinian, a fact recorded both archaeologically through the adherence of a tower named "the butchers'" to the northern side of the defence wall, built by butchers by means of mandatory work. Other parts of the inner wall were also built by mandatory contributions. Later on, from the beginning of the 6<sup>th</sup> century, Tomis led a precarious existence, as the entire Scythia Minor province did. It became more and more difficult for the inhabitants to face the repeated attacks of Slavs, Bulgars and the Avars. Around the year 680 Tomis finally fell under the attacks of the Avars and Slavs.

## The Medieval period

The last migrations in this area are those of **Pechenegs**, **Cumans**, **Tatars** and **Uzis**. During this entire period Dobrogea is under Byzantine domination. Evidence of the efforts made by the

Empire in order to protect the province are the three cross-Dobrogea walls from the 10<sup>th</sup> century and the fortresses on the Danube limes (Transmarisca-Tutrakan, Durostorum-Silistra, Păcuiul lui Soare-Vicina(?). The Byzantine fleet naval bases on the Danube (Axiopolis-Cernavodă, Capidava, Carsium-Hârşova, Noviodunum, Aegyssus-Tulcea, etc.) were meant to defend *Thema Paristrion* from the repeated invasions of the tribes which came from the north. From the 13<sup>th</sup> century at the mouth of the Danube and not only, sailors and Genovese traders are emerging, who began to draw maps of the west coast of the Black Sea, mentioning the cities and the names of the



most important ports and settlements.

Callatis harbour continued to function without interruption since its establishment and until the end of the Roman-Byzantine domination. In the medieval period, it was mentioned by Evlia Celebi. The configuration of the actual seashore has changed drastically, as most of the ancient port facilities were covered by the sea. At the end of the 19<sup>th</sup> century, P. Polonic drew up a map of the ancient city and port, indicating a large harbour, delimited by the northern defence wall of the city which advanced all the way into the water and also by a large breakwater, that reached to the entrance of Mangalia Lake. Underwater researches conducted by Constantin Scarlat, between 1963 - 1967, led to the conclusion that in ancient times a large bay measuring 2 x 2 x 1 marine miles existed, while the harbour was closed with three breakwaters built on natural cliffs and two more dams located as an extension of the northern and southern defence walls of the Callatis city. Under the sea, stone paving slabs, building foundations, mooring places and two wrecks just near the piers, were discovered. Near the current seafront villas, under Hotel President, buildings foundations from the early Roman and Roman-Byzantine period were discovered.

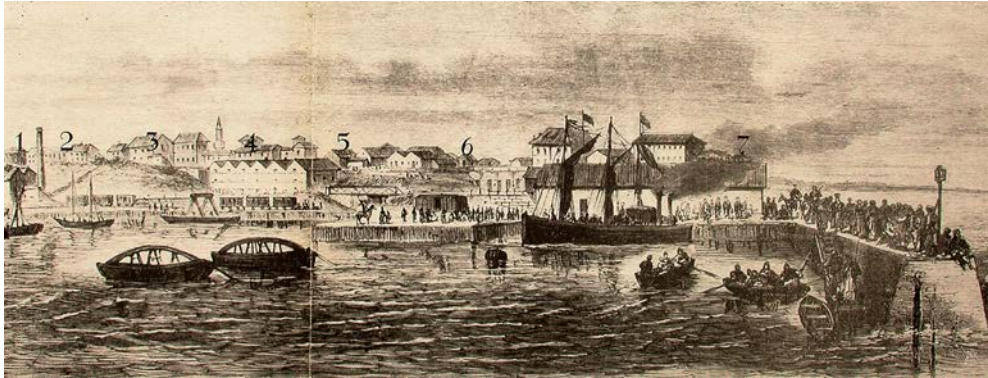


Later on, Dobrogea faces a long period of Ottoman ruling, both on social-economic level, as well as culturally and spiritually, as the territory was part of the Ottoman Empire until Romania gained its state independence at the Berlin Congress in 1878.

In the 16<sup>th</sup> century, a period of continuous wars between Russia and the Ottoman Empire began, lasting until the liberation of Bulgaria. During these wars, Kavarna and the surrounding areas were repeatedly burned, and the population exterminated, so that the city did not succeed to develop into a powerful economic centre. Kavarna and its surroundings remained under Ottoman domination, until the Russian-Turkish war which took place in 1877 - 1878. Agriculture remained the basic occupation, with modernization trends and a bloom of capitalism. After the highway to the port was finished in 1909, the quantity of imported and exported goods suddenly increased. Mainly grains and livestock products are exported, while they import goods such as coal, agricultural and industrial equipment and consumer good products. During the modern era, ethnic consciousness and the pride of being part of a



civilization with ancient traditions inoculated the Romanians from Dobrogea with the vitality and the spirit of conservation, thus finding its fulfilment in the fast development at all levels, while being part of the Romanian state. The measures taken by the Royal House and by the Romanian state led to the evolution of the province towards modernism; an important role in this process was played by the construction of the bridge Fetești-Cernavodă and Constanța, constructions made by engineer Anghel Saligny. Constanța becomes the most important maritime port of Romania, a key determinant for developing economic relations.

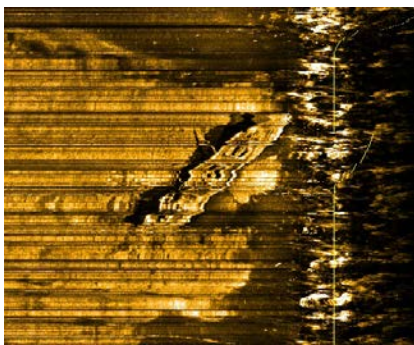


*Picture from the National Museum of History and Archeology Constanța, Romania*

This positive evolution tendency was maintained during the following decades. Dobrogea evolves rapidly during the inter-war period towards a full integration in the modern state of Romania; the economic and cultural life found its expression in the continuous development of the land and harbour infrastructure and also of the public institutions system.

The two World Wars partially affected the province between the Danube and the sea, due to the military operations which took place in the region. Various shipwrecks of transportation and military ships date from this period.

The last decades brought to Dobrogea a change in the political system and in the economic priorities, but also a positive evolution in the development of the land and urban infrastructure, this being a consequence of Romania and Bulgaria integrating into European Community structures.



## CHAPTER 4

### BRIEF HISTORY OF THE EVOLUTION OF NAVIGATION AND GOODS SHIPPED BY SEA

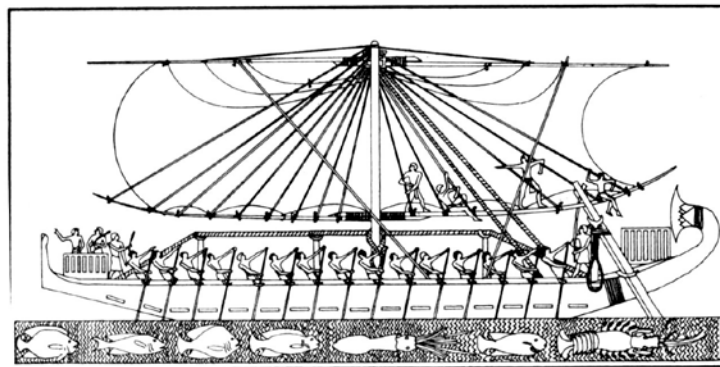
#### 4.1 The beginnings of navigation and sea trade

The history of transportation on water begins with the use of the tree log in order to randomly travel from one place to another, shifting afterwards to the carved log which became the log-canoe navigated with rudimentary oars and then to travelling by raft (made up of several adjacent tree logs), used for one or more „passengers” and their luggage.

With these means and vessels, the prehistoric man achieved breath-taking performances in the art of navigation and succeeded to attain impressively long distances and to reach faraway lands, which were only to be „discovered” by the modern man after a very long time and with the use of superior ships. The evolution of human society required the development of navigation and of the sea transport, differentiating vessels in several categories, small and fast ships, war ships and heavier, trade and transportation ships with bigger storage capacities propelled with oars and sails.

The **ship**, in its current understanding, has its beginnings as a combination between a raft and a log-canoe, in a way that allows it to benefit of the advantages from both vessels.

In the campaign conducted by Egyptians for the exploration of the Red Sea, they used very curved, light vessels with a flat bottom, with no keel and rudder, and propelled by oars and sails, while after a 1000 years the Egyptians used evolved vessels with a crew of 50 men.



*Egyptian ship - bas-relief photograph, courtesy of the Navy Museum, Constanța*

The ancient history of navigation records the activity of Phoenicians - a nation of sailors who founded in the 3rd millennium BC various citadels, having their harbour located on the east coast of the Mediterranean Sea. From here they colonized the entire Mediterranean basin, reaching the Baltic Sea, the Red Sea and the western coast of the Black Sea. The Phoenicians were very good ship builders and highly skilled sailors. They knew how to guide themselves after stars (the Pole Star was named the Phoenicians' Star), and they used the wind for moving even when sailing against it.

*Phoenician ship photograph, courtesy of the Navy Museum, Constanța*



Another nation of sailors - the Greeks, contributed to writing the ancient history of navigation and sea trade. The ancient Greeks colonized the shores of the Mediterranean Sea and those of the Black Sea, building up citadels - powerful harbours, some of which evolving until nowadays; they were also the



creators of war and trade ships.

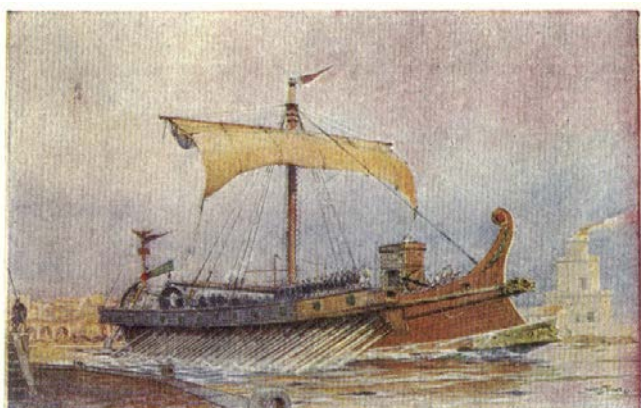
In those times a certain vessel stands out. It was called „trireme” and was not only a war and expedition ship, but also a trade ship.



*Ancient Greek ship*

*Photo courtesy of the Navy Museum, Constanța*

From the ancient period the Carthaginians must also be mentioned, for they were skilled navigators and traders whom reached with their merchandise all the way to the northern Europe and Black Sea, and even travelled around Africa through the Red Sea.



*Roman ship, photo courtesy of the Navy Museum Constanța*

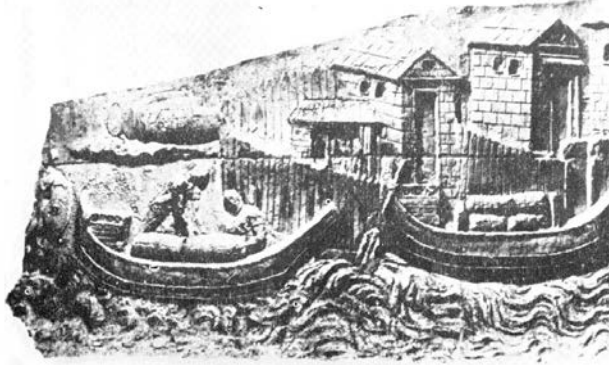
Ancient Rome meant a blooming period for navigation and sea trade. During this time the construction of vessels powerfully developed creating remarkable ships, renowned for their qualities: the roman trireme with sails, the liburna, a ship with battler towers.

The study of the commercial routes used by the ancient vessels on the Black Sea represent an important part of the entire study regarding the development of the Black Sea basin and of the Eastern Mediterranean hinterland area. By tracking the economic connections of the tribes and nations that have lived on these lands, a reconstruction of the cultural connections between them could be possible, as well as a reconstruction of the type of connections they had with the farther geographical areas of the Mediterranean. Current historical and archaeological research shows the existence of a Thracian maritime tradition on the western shore of the Black Sea, long before the Greek colonization. Naval transportation on the Black Sea in the Bronze Age is one of the moments least reported from the social-economic development of the Ancient Thrace and of the Southeast Europe. This is due to the insufficient volume of archaeological material currently held. The data we possess come, mainly, from literary works of Ancient Greek authors, created on the basis of mythological sources, and of several archaeological discoveries. Such discoveries are multiple stone anchors, fluted and with holes, as well as copper ingots shaped as large wolf/buffalo skins, and also round ingots. These monuments are widespread in the Eastern Mediterranean area, monuments which are classified by modern science as originating from the late Bronze Age. Here we should mention the Achaean presence in the Black Sea, according to the available written sources. It should be noted that these sources were written centuries apart after the end of the Bronze Age. The most renowned legend is about the trip of the Argonauts in their quest for the golden wool, described by Apollonius of Rhodes in his paper called „Argonautica” (*Ap. Rh. Argon*). Details about the relations between the Eastern Mediterranean nations and the people from the Black Sea coast are also mentioned in other ancient Greek legends. Among these we find the story about the stay of Ulysses in the country of Cumerians (*Homer Od X, XI, XII* - supposedly the action takes place in the Black Sea); the legend about Achilles stay on Levka island (known today as the Island of Snakes) in the Danube Delta, legend mentioned by Arktin of Miletus in his paper "Aethiopsis" (*Arktin of Miletus Aeth.*) and detailed by

Flavius Arrian (*Arr. PPE 32 34*); myths about the stay of Agamemnon's daughter, Iphigenia in Taurida (*Euripides IT*); the myth about Prometheus being chained by the coast of the Caucasus Mountains, myth related by Aeschylus.

The Greek colonization of the shore of Pontus Euxinus began in the 7th century BC, establishing Callatis, Tomis, Histria, Tirizis, Dionisopolis, Odessa, and Apollonia Pontica as ports on the western shore.

*Geto-Dacian vessels on Trajan's Column  
Photo Cr. Crăciunoiu, 1979*



In the 1st century BC, the Roman Empire reaches the Danube, conquering the Greek port-citadels and annexing the Dobrogea region to the Roman Province of Moesia; during the Dacian wars, water conflicts occur with the Dacians when Romans use ships for transportation and debarking troops. Conquering Dacia ensures Rome the possibility to transform the Danube and the Black Sea in main routes for the transportation of goods for

the empire, routes defended by a powerful fleet which disposed of castra and strong matching harbours.

During Roman times the development of navigation and of trade on the Danube imposed the development of the river fleet (*Classis Flavia Moesia*), of the maritime fleet (*Classis Flavia Pontica*), the organization of the maritime prefecture at Tomis (*Orae Maritime Prefecture*), the development of ship-owners associations, named colleges (for example: *Colegium Nautarium* from Dierna - Orșova), the occurrence of marine education (*Nauti Universitae Danubi* from Axiopolis - Cernavodă).

The time between the 3rd and the 6th century AD, known as the migration period, was the age that lead to significant political-social and economic changes in these regions. The Roman domination declined, the navigation on the Danube and Black Sea facing the same destiny; in the year 248 AD Histria citadel is destroyed, while the other harbours on the Danube and those from Pontus Euxinus were destroyed in 267 AD.

#### 4.2. Navigation and water trade in the Middle Ages

The beginning of the European middle ages meets the appearance of new nations with nautical skills:

- the Vikings, who undertake conquering campaigns on today's territories of England and France, up to Sicily, the Danube and Constantinople. The Viking specific ship was the „drakkar”, a curved ship with a solid body made up of oak ribs and lined with copper, with a viper shapes stern and the sternpost shaped as a fish-tail, propelled by sails;



- the Byzantines, with their characteristic ship named „dromone” - a massive galley, well-armed and carrying a terrible weapon at the prow called the „Greek fire”, weapon which torched enemy ships. Trade takes momentum and amplifies greatly connecting by sea the Central and Western Europe to the Byzantine world, a commerce activity in which the Romanian land was also included, along with the Danube and western Pontic harbours, developed from citadels - Roman and Greek harbours;

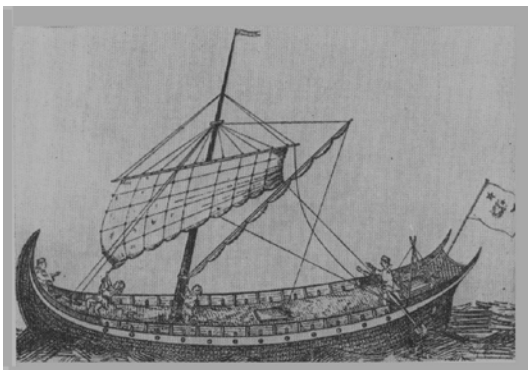
*Black Sea Medieval map  
Photo from V. Ciorbea, 1996*

- the Muslims, who were in a dispute with the Byzantines for the control over navigation and trade in the Eastern Mediterranean;
- the Crusaders used Flemish, Norma, Genovese and Venetian ships, heavy war galleys, light vedette boats and attack ships, ships for transporting goods, horses and people, the most commonly used route being Marseille - Beirut;

- the Venetians and the Genovese, rivals and allies, who monopolized the commerce in the eastern Mediterranean, have also penetrated in the Black Sea basin reviving a series of cities - ancient harbours; their typical ship was the „Venetian galley“;

In the 14th century, Turks come into Europe, conquer Constantinople and begin their expansion towards the centre of Europe. After the last quarter of the 15th century, they transformed the Black Sea into a „Turkish lake“ and maintained it so for a long time, while also carrying out tough battles with the Europeans for the control over the Mediterranean trade.

During the 14th-15th century navigation and water trade develop, vessels and vernacular ships are built, while the maritime harbours are facing a new blooming period. During the 13th and the 14th centuries, the Bulgarian rulers already held quite powerful commercial and military fleets. The commercial agreements concluded with the Italian republics, agreements which regulated the maritime trade and navigation in the western part of the Black Sea, remained as testimony in history. The despots from Dobrogea possessed vessels used to exert control over the maritime traffic that took place in the Black Sea.



*Moldavian caique  
Photo from Cr. Crăciunoiu, 1979*

The Moldavian caiques (sailing ships about 17 m long, 4 m wide, and weighing around 60 tons) are made famous in the entire area of the Black Sea and even in the Mediterranean. The fall of the Moldavian citadels in the hands of the Turks in the year 1484, marks the moment when Moldova ceases to be a maritime state, moment that lead to the establishment of full Ottoman domination over the Black Sea which becomes a „Turkish lake“ for more than 200 years.

The reigns of Vlad the Impaler and Michael the Brave bring back to light the successful role of navigation, of ships and harbours in the battles against Ottoman domination. The prosperity of the Balkan states of this glorious period enabled the development of the Romanian war and commercial navy.

The Ottoman domination period was a very difficult time for the Romanian navigation, which was subordinated to serve the interest of the High Porte. The Danubian harbours Galați and Brăila and the maritime harbours Constanța and Mangalia were developed to meet the Turkish trading interests. In the 18th century, various types of ships were built by craftsmen: „dubase“ (long wherries), „kayaks“ called rafters, shipping ships called trammels and „mrăjeri“, as well as big war ships, Turkish galleons, frigates, gunboats and even bombardiers. The wars carried on the Romanian territories and the battles conducted on the Danube and the sea had negative implications for the political-economic situation of the Romanian states, for navigation and water trade.



In 1815, through the final act of the Congress of Vienna, the freedom of river navigation was given for all rivers except the Danube, for neither Russia, nor Austria, desired the presence of other European powers in this area. The goods trading on the Sulina canal increases, situation which demands for maintenance works of the fairway and also a lighthouse is built (in 1818).

*Old lighthouse in Sulina, Romania*



The Romanian countries stand out in the regional politics in the year 1856, after the Peace Conference in Paris, when the „European Danube Commission” takes form. This commission will become the „International Danube Commission”, transformed after the first world war in the „Danube Commission”, with headquarters in Budapest. By the Independence War in 1878, the the modern Romanian navy is established.

In 1834, the first ship under the flag of the Romanian Countries called “Marița” was built at Giurgiu, and in the same year the ships “Rucsandra”, “Sf. Dimitrie”, and others, received the right to navigate on the Danube and on the sea under the flag of Moldavia. In 1837, the first foreign steam ship arrives in Brăila coming from Constantinople.

Between 1833 - 1839, more ships under the Romanian flag come into operation: the galleys “Elena”, “Xenocrat”, “Atena”, the brigs “Elisabeta”, “Zimnicea”, “Dunărea”, “Sf. Nicolae” and schooners “Dochia” and “Speranța”. In 1839, the merchant marine of the two Romanian principalities consisted of 20 ships. In 1850 the Moldavian navy possesses 76 ships. In 1861 the “First navigation regulation for the commercial navy of the United Principalities” appears, which standardizes the necessary documents for a ship, the leaves, the role of the crew, the inventory of the ship.

The period of Ottoman oppression over the Bulgarian territories was a period during which maritime traffic has not completely faded. Many of the medieval Bulgarian harbours over the entire west coast continued to operate, although at a different intensity. Moreover, a privileged brotherhood existed among the Bulgarian population, the one associated to sailors.

Besides these, there were various crafts associated to seamanship, such as seamen. The shipbuilding centers were placed at the inflow of rivers Kamchia, Irakli, Sozopol, Vasiliko (current Tsarevo), Ahtopol. Among the most important Bulgarian harbors of this period we could mention Varna, Nessebar, Pomorie, Sozopol on the Black Sea coast, Salonic on the Aegean Sea coast and Ruse on the Danube. Ruse was the seat of a Turkish pasha - kapudan on the Danube (Admiral). According to some sources, Bulgarian ethnics filled in admiral functions in the sultan’s fleet. Navigation was also practiced in the Renaissance period on Marița river and has continued until the 19th century, when navigation was stopped due to the clogging of the inflow of river Enos. During the seasons where the riverbed was full, it was possible to reach even Plovdiv and Pazardzhik. In 1867 the „Association of ships on the Danube” was founded at Svishtvov, which started its activity with three barges and the steam ship called „Nachalo” (The Beginning). The creation of the commercial maritime transportation society known as “Providența”, which functioned at Constantinople between the years 1862-1865, was considered to be among the most impressive maritime initiatives. At the end of 1863 the first Bulgarian ship “Azis” was purchased, named so in honor of sultan Abdul Azis. That particular ship was used for the transportation of goods and passengers, with a load of 560 tons, having three masts and reaching an average speed of 10 knots. The ship was equipped with 32 cabins for passengers and mainly navigated between Danubian harbours, but would also reach to Odessa, Varna and Burgas.

#### 4.3 Evolution of Romanian navigation and water trade in the modern and contemporary times

After gaining state independence, Romania has developed socially, politically and economically, development which also imposed the evolution of maritime and river navigation.



The need to establish a national navigation society, a Romanian commercial navy, became obvious. In 1890 „The Romanian Inland Navigation Service” (N.F.R.) is established, followed in 1895 by „The Romanian Maritime Service” (S.M.R.). In 1896 regular passenger and cargo courses are organized between Brăila, Constanța and Constantinople with vessels named „Princess Mary” and „King Carol”, and also a western cargo line is organized with the ships called „Dobrogea”, „Iași”, „Turnu-Severin” and „Constanța”. Three more ships - „România”, „Dacia” and „Trajan Emperor” - carry out regular passenger courses to Egypt and Palestine.

*Ship “România”, photo V. Ciorbea, 1996*



In 1907 the „Law for organizing the commercial navy” is issued. In the interwar period, the development of the Romanian civil navy fleet is influenced by the evolution of Romania’s foreign trade. The Romanian Maritime Service becomes the main factor for increasing the transit of goods through the Romanian harbours. At the beginning of the Second World War, the Romanian Maritime Service had 16 trading ships. The end of the war finds Romania with only one trading ship “Transilvania” and the cargo „Ardealul”; basically a Romanian commercial maritime fleet did not exist anymore. After this period we could speak of a rapid growth of the Romanian maritime fleet and also about a powerful development of maritime and river transportation of goods. In 1955 the Fluvial and Maritime Navigation Enterprise - „Navrom” was established. During 1960-1965, NAVROM receives 27 vessels and between 1966-1970 another 18 new ships are added, including ore ships and tank vessels. During 1971-1975, the number of Romanian vessels increased by another 45 ships. At the end of 1979, the trading fleet owned 153 ships. On December 31, 1989, the Romanian trading fleet had 311 vessels in its possession.

#### 4.4 Romanian and Bulgarian harbours and navigation conditions in the Black Sea

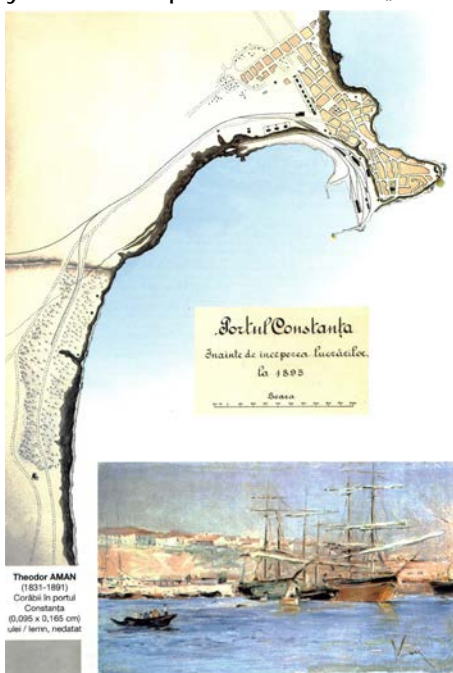
Starting from the times of the Thracians and of Geto-Dacians and continuing with the Greek, Roman, Byzantine periods and the Ottoman domination period, until obtaining the state independence, Dobrogea and its harbours knew periods of blooming but also decline.

#### CONSTANȚA HARBOUR

Constanța harbour formed on the ruins of the ancient Tomis citadel, a settlement which was founded by the Greek colonists from Miletus, in the 7th-6th centuries BC. By the mid-third century BC, Tomis experiences a high level of growth and becomes a free harbour. In 73 - 72 BC, the harbour citadels from the west shore of the Black Sea are included in Rome’s alliance, which demonstrates the strategic interest of Romans for the area. In the 2nd century BC Tomis becomes the biggest and most important harbour on the west shore of Pontus Euxinus. In this era various types of vessels were used for navigation and sea trade, with different dimensions: „corbita”, „ponto” maritime and fluvial ship, „great lapidoria”, „tesseraria” a light and fast vessel, „scapha” for establishing communication between the ships within the harbour, „vegeia”, „placida”, „musculus” and „natis” light ships used for short distance transports.

In the Roman Tomis, a roman college of seamen - called „naukleroi” - used to function, along with an association of the ship-owners, both established by the local aristocracy. The Byzantine Empire brought Dobrogea back to her role as a hub for trade in Eastern Europe, which led to reviving the maritime life of Tomis under his name of Constantia or Constantiana; Byzantine ships such as the „Dromonul”, „Pamfila” and „Acaccia” were docking here. In the

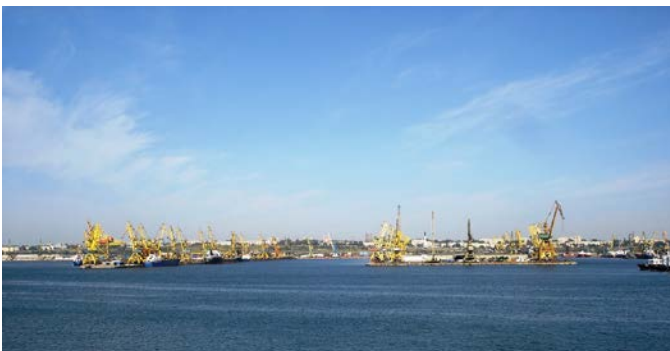
medieval time the Romanian civilization bloomed, which enabled the integration of Dobrogea in the Romanian Countries during the reign of Mircea the Elder (1366 - 1418). After this glorious period, Dobrogea enters a time of over 450 years of Ottoman domination. During the Ottoman domination the transport of goods from Constanța to the Turkish harbours was done with Ottoman sailing ships like „Dombaza” and „Nesaci”. Under the Ottoman domination, Constanța harbour continued to exist as the main connection gate between the Romanian territories and the South-Eastern Europe and the Orient. The achievement of Romania’s full independence represents the beginning of modern evolution for the city and port of Constanța. On September 27, 1909, the modern harbour of Constanța is officially inaugurated. By 1916 Constanța becomes the main route of export for Romania.



Constanța harbour in 1895, photo V. Ciorbea, 1996

In 1936, the peak year for Romanian interwar export and also of harbour traffic - the port of Constanța was the largest port in Romania and one of the most modern and important harbours on the Black Sea. The years of the Second World War lead to a restriction of the commercial activities in the port of Constanța. Starting with the year 1948, the port of Constanța faces a new development, in order to keep up with the needs of the national economy. During 1976 - 1984 the Danube - Black Sea Canal and Poarta Albă - Midia Canal were built. Constanta harbour enjoys a convenient geographical position, being situated on the routes of 3 pan-European transport corridors - the 4th Corridor, the 9th Corridor and the 7th Corridor (the Danube) - which connect the North Sea to the Black Sea via the Rhine - Main - Danube corridor. The port of Constanta plays a major role in the European inter-modal transportation network, being favourably located at the intersection of the commercial routes which link the markets of the landlocked countries from the Central and Eastern Europe to the Transcaucasia region, Central Asia and the Far East.

Significant amounts of merchandise are being transported between the port of Constanța and the countries of the Central and Eastern Europe: Moldavia, Bulgaria, Serbia, Austria, Slovakia and Germany.



Close to the port of Constanța the two satellite harbours Midia and Mangalia are located, which are part of the Romanian maritime harbour complex.

#### MANGALIA PORT

Mangalia port is located on the western shore of the Black Sea, near the southern border with Bulgaria. The Callatis port-city was founded around the year 507 BC by the Greeks from Heraclea (according to other sources from the 8th century BC). The citadel was destroyed in the late 6th century by Avars, but the city is reborn to become in the Middle Ages, under the domination of Genovese, one of the most important ports from the western shore of the Black Sea. The Turkish domination has not managed to restore the importance of the Mangalia port. The First World War brought to Mangalia destruction and ruins; the interwar period provides a time of peacefulness without anything notable for Mangalia. After the Second World War, Mangalia becomes a closed military port; the city and the port develop, and in the recent years, prior to 1989, a shipyard is built. Today, Mangalia harbour knows a developing period.



## MIDIA PORT

Midia port is located on the Black Sea coast, at approximately 13.5 km north of Constanța. The port is positioned between Lake Tașaul and the sea, close to Năvodari city, where the exit Poarta Albă - Midia Canal enters the sea.



## SULINA PORT

Sulina port is located on the Sulina Canal, between miles 2 and 0. In 1780 Sulina was a good port for wintering ships; in 1807 the city was occupied by the Russians; in 1853 Sulina had a population between 1000 - 12000 inhabitants, mostly Greeks and Maltese who were employed with corn transshipping with barges at Sulina port. During the Crimean war, the city was destroyed and the inflow of the Danube blocked. After the war, Sulina knows a truly modern development under Austrian administration, becoming a cosmopolitan city which in 1818, after the Independence War, returns to Romanian administration.



The current Sulina port is divided between the free zone of Sulina, located in the basin of mile zero and the commercial port of Sulina, located alongside the city. Due to its favourable geographical position and in the order to develop the region, the free port regime was established since 1978 in the Sulina port and the Sulina Free Port Administration was founded.

## BULGARIAN BLACK SEA PORTS

### VARNA PORT

According to statements of ancient writers (Ps. Scymnos 748-750; Ann. PPE 79-80), Odessa was established in the 6th century BC. During that time, the port was located in the north bay of Cape Varna, which no longer exists today. The earliest pottery found in the port waters dates from the middle of the 6th century BC. Supposedly until the beginning of the construction of the



current Varna port at the end of the 19<sup>th</sup> century, the old port was located on the exact same place since the establishment of the ancient city Odessa in the 6th century BC. The studies made through archaeological excavations indicate that it might have been situated in the area of the current Central Station in Varna. The modern port of Varna was completed before 1906. The Balkan wars diminished the increase of the trade turnover of goods in the area.



The port of Varna is the main trading port of Bulgaria and is located in the bay of Varna. The current port of Varna represents a complex made up of several terminals: West-Varna, East-Varna and the maritime Station (the terminal for passengers).

The East-Varna port terminal, together with the maritime Station are part of the public transportation network of national importance, being also designated for general cargo transportation, bulk or liquid goods, RO-RO goods and container transportation, passenger services, docking and communication services, electricity supply services for ships, etc.

The West-Varna port terminal is part of the public transportation network of national importance, also being intended for general cargo transportation, bulk or liquid goods, RO-RO goods and container transportation.

## BURGAS PORT

The Burgas port is one of the most important ports on the Black Sea, being located on the inner side of the Burgas bay, in the region of Burgas. On May 18 1903, the port of Burgas was inaugurated in the presence of King Ferdinand I of Romania.



The port holds a total number of 19 berths with a maximum draft of 12,3 m. The port of Burgas is part of the Burgas harbour region, which stretches between Cape Emine and the river Rezovska, including a total of 8 port operators (state-owned or private): Burgas port, Rosenets-Lukoil Neftochim port, Maritime Bulgarian Fleet - Burgas port, Naval Repairs Plant - Burgas Port,

Transstroy, Liberty Port, Nesebar Terminal. In 2011 the Burgas port processed 3,5 million tons of goods, compared to 9,15 million tons of goods processed by the Varna port in 2011.

#### BALCHIK PORT

The Balchik port existed since Antiquity. Nowadays it is a port of national importance, being used for public transportation, as well as for processing general cargo, bulk or of vegetable origin (especially wheat and sunflower). Considering the turnover of goods, the Balchik port occupies the third position after the ports of Varna and Burgas.



#### NESEBAR PORT

According to Herodotus' writings (IV, 93), the city and the port already existed at the end of the 6th century BC. It was located in the southern bay formed by the Nesebar isle. The terminal of the port is designated for passenger services, docking and anchoring ships; it is also intended for waste takeover and processing, and to supply the vessels with water, electricity and telephone connection.





## CHAPTER 5

### EVOLUTION OF KNOWLEDGE AND USE OF THE UNDERWATER REALM

#### 5.1. Brief history of diving

Learning about the depth of the seas has been a continuous concern of man over time, in his quest to master nature and overcome his own limits.

At first, man would go in freely, without any gear, to collect shells and sponges or to recover lost objects. Conches and mother-of-pearl objects discovered in tombs attest to the fact that the practice of apnoea (holding one's breath) was mastered since prehistoric times in eastern regions. First mentions of diving activity date back long before the Christian era.

A certain Scyllios of Sion, with his daughter Cyana, cut the ships mooring ropes of King Xerxes of Persia, letting the ships be carried away to the sea by the storm. Cyana is the first woman to be remembered in the history of this activity, considered a manly one par excellence.

Along the coasts of Japan or Korea, collecting pearl-bearing shells, from depths sometimes exceeding 30 meters, was the task of women - the famous „Ama“. In the gulfs of the Mediterranean, with its clear and warm waters, Greek inhabitants, a nation of sailors, have tried to extend their activity under the sea. Aristotle described the life of sponge fishers, trained divers who were seeking to broaden their area of activity and the time they could spend underwater.

The first attempts of breathing underwater were made by a breathing tube, an accessory suggested by enlightened minds of the ancient world, such as Aristotle, Pliny the Elder or later, during the Renaissance, by Leonardo da Vinci. The penetration depth is very low due to the high hydrostatic pressure faced by the thorax, against the atmospheric pressure of the air inhaled and because of the large volume of air that needs to circulate (the inert volume in the tube).

The transmission of this method down generations is noted by illustrious people, such as Homer, Hippocrates, Herodotus or Thucydides, who make references in their writings to their contemporary Greek and Persian divers.

The oldest tales of the man's diving into the sea with especially-designed tools for this purpose are to be found in the episode from Alexander the Great's Epic, according to which he had dived for some time underwater in a wooden diving-bell called Colympha (in certain translations, it says "barrel"), with crystal portholes by which he had observed the sea life. These bells were built three centuries before our era for docking works. Since ancient times, the use of the bell as a means of breathing underwater was also noted. Aristotle describes divers who, in order to extend their stay underwater, would breathe from time to time from a bowl full of air, sunk bottom side up, ballasted (with weights) and tied to a vessel on the surface. This technique is forgotten by the end of the Roman Empire and is taken up again only in the 16th century, through the attempts of using an inverted barrel to protect the upper part of the diver's body.



In the Roman Empire, there was the guild of urinatores - professional divers specialised in recovering the loads of wrecks sunken less than 10 meters deep. In the Byzantine Empire, then in the Great Britain and in Holland, the first diving suits appear alongside diving-bells, ever since the Middle Ages. Man's terrestrial condition prevented him from evolving in the water unprotected. Apnoea diving offered time-limited (1-2 minutes) and space-

limited (30-40 meters deep) possibilities to act, and the lack of protective means limits visibility and conditions the immersion by the water temperature. It was therefore necessary for man to breathe underwater, to be protected in this improper environment for his way of life. If at first this challenge was tackled with by precarious means, in time the diving technique has widened.



It is only in the 19th century that swimming goggles, used by naked sponge or pearl oyster fishermen, in warm waters, and heavy diver suits, made of rubber, with lead boots and helmets, appear.

In 1818 the German Siebe reduces the bell to a spherical helmet protecting the head. In 1836, Siebe attaches his helmet to a waterproof suit, heavily ballasted, and fashions an eviction valve, triggered by the movement of the head. We have thus our first heavy diver, a dress that in its time was a great breakthrough, allowing the extension of the time spent underwater and carrying out an efficient activity.

The crucial moment marking the modern age of professional diving is the design and creation of the diving regulator by Jacques Yves Cousteau and Emile Gagnan. The technical progress in the field of diving gear was sustained by the development of hyperbaric medicine. After 1935, autonomous civilian professional diving also takes off, with pioneers such as Hans Hass in Germany, Philippe Tailliez and Jacques Yves Cousteau in France. During World War II, autonomous military professional diving sees a fast development, and after 1945, in the US and in Western Europe, Scuba Diving becomes a sport and an entertainment.

Philippe Tailliez and Jacques Yves Cousteau create in 1942, at Toulon, the second underwater film (black and white) and invent, alongside engineer Émile Gagnan, the first diving regulator adapted for scuba divers' tanks. The French Jacques Yves Cousteau has an enormous contribution to this development, popularizing scuba diving, both in its professional and its amateur form, through his dozens of movies made for television on-board his ship Calypso.

### Important moments in the history of diving

**4<sup>th</sup> Century B.C.:** Writings of Aristotle, Aeschylus and Pliny include references to the life and work of sea sponge fishers.

**3<sup>rd</sup> Century B.C.:** Greek mathematician Archimedes (287-212 B.C.) states the principle of buoyancy of solids.

**6<sup>th</sup> Century A.D.:** First notes on the „Ama“, women pearl fishers in Japan and South Korea.

**1250:** In his work „Opus Major“, Roger Bacon describes some air tanks meant for divers.

**1430:** Manuscripts in the National Library of Munich show a diver recovering goods from a shipwreck, wearing a suit and a leather helmet, extended by a tube to the surface of the water.

**1500:** Leonardo da Vinci designs one of the first autonomous underwater breathing machines.

**1511:** Work of Vegetius „De Re Militari“ is republished, showing engravings of underwater breathing devices.

**1680:** Italian physicist Giovanni Borelli describes in his work “De motu animalium” a device invented by himself, considered to be the ancestor of the autonomous device.

**1714:** Valentini describes in his work “Musei Musearum” a diver endowed with a waxed-cloth bonnet and a mask.

**1771:** Freminet invents his „machine hydrostatergatique“. With this device, Freminet spent over an hour at a depth of 15 meters on the bottom of river Seine.

**1775:** La Chapelle writes „Trait du scaphandre“, where the term „scaphandre“ (diver) first appears.

**1808:** Briz-Fradin designs an autonomous device for breathing underwater, also considered to be one of the ancestors of modern autonomous devices.

**1828:** Lemaire d'Augerville patents the „pneumatonautique“ machine, allowing people to stay underwater for half an hour.

**1867:** French engineer Triger, the inventor of the open caisson, notices the accidents of caisson workers, called decompression sickness or caisson disease.

**1869:** Jules Verne popularizes the concept of autonomous underwater breathing device in his book “20 000 Leagues Under the Sea”. The device was worn by the book's characters when going hunting in the submarine forests.

**1893:** Louis Boutan builds the first underwater photographic camera.

**1936:** Le Prieur starts teaching practical diving and initiates the first diving club, called "Club des plongeurs et de vie sous-marine".

**1930:** Louis Le Corlieu creates the swim fins.

**1937:** Alex Kramarenko patents in Nice the single-plate visor (mask).

1938: Guy Gilpatrick writes the book "The Complete Goggler", acknowledged as the first manual of sportive diving.

1939: Hans Haas makes the first film while apnoea diving, called "Stalking Underwater".

1942: Hans Haas - first dives into the Red Sea and Australia's Great Barrier Reef.

1942: Jacques-Yves Cousteau and Frederic Dumas create their first movie 18 meters underwater, focused on apnoea diving and underwater hunting.

1942: Jacques-Yves Cousteau alongside Emile Gagnan, design a diving regulator, inspired by a pressure regulator built for the gas intake of automobile engines.

1946: Jacques-Yves Cousteau finishes work on his constant volume dry suit.

1948: The first Cousteau-Gagnan aqualungs are imported in the USA.

1951: The "Skin Diver Magazine" is set up in Los Angeles. At the moment, this is considered the best magazine in the field.

1952: Jacques-Yves Cousteau, Frederic Dumas and James Dugan publish "The Silent World", where they describe the invention of the aqua-lung, as well as stories related to the numerous dives made by the authors using this device.

1953: The first diving club in the USA is set up, "The Sea Sabres SCUBA Club".

1956: The University of California designs the first diving wetsuit.

1958: "Sherwood Manufacturing" of USA produces the first piston diving regulator, after the original Cousteau-Gagnan model.

1959: The "World Underwater Federation" (CMAS) is born. Founding members are the specialised national federations in Belgium, Brazil, Switzerland, France, Germany (FRG), Greece, Italy, Yugoslavia, Monaco, Great Britain, the Netherlands, Portugal, Spain and the USA.

1960: The "National Association of Underwater Instructors" (N.A.U.I.) is created. NAUI sees continuous development, becoming the first international organization of sportive divers.

1962: Hanness Keller performs a dive to a depth of 303 m.

1964: The first book on Underwater Sports is issued in Romania.

1964: The Marilsa ship is launched in Mexico, especially designed and equipped for sportive diving. The bases of underwater tourism are thus set.

1966: John Cronin and Ralph Erickson created "Professional Association of Diving" or PADI.

1969: "Sea and Sea Travel" is set up in San Francisco, the first tourism agency exclusively destined for divers.

1970: The "Scuba Schools International" (S.S.I.) organization is created.

1983: Introduction of "Orca Edge", the first diving computer.

1983: Jaques Mayol sets a new record for free diving, 105 m.

1996: The depth of 110 m is reached in free diving by Umberto Pelizzari.

## 5.2 The beginnings of professional diving in Romania

The beginnings of professional diving in Romania cannot be established with precision, as they belong approximately to the middle of the 19<sup>th</sup> Century. The first documented mention is the High Decree no.376/1867, creating *The Flotilla Corps*, as a separate body of the Romanian army.

Another page noting the Romanians' efforts to conquer the depths is represented by the first underwater research, conducted by Emil Racoviță at the end of the 19<sup>th</sup> century. In 1891, Emil Racoviță makes the first dive at a depth of 10 meters, from aboard the "Roland" ship. Over time, divers have fixed hundreds of rudders and propellers, have brought to the surface dozens of shipwrecks, mines and projectiles, clearing navigation routes. Technical divers have participated in large hydro-technical constructions, such as those at the Cernavoda Bridge and the Constanța Harbour, carried out at the end of the 19<sup>th</sup> century and the beginning of the 20<sup>th</sup> century, plus the ones in the contemporary era: the port of Mangalia, the dry docks belonging to the dockyards of Constanța and Mangalia. The Cernavoda Bridge (1895) and the Constanța Harbour (1909) were works where divers have definitely had their input.

Up to 1910, due to the beginnings of the diving activity, Romania sought the help of foreign specialists (Italian, Greek, maybe even English). After this year, there certainly were local divers as well, for at the beginning of 1911 the Military Navy published a "Professional Diver's Manual", containing rules of using and maintenance of the equipment, as well as working or diving norms.

The manual is the first regulation of the diving activity in our country. Due to the development of works performed via divers and caisson workers, in 1956 their activity is regulated on a civil scale, with the introduction of the first decompression tables, as well.

After 1956, divers' clubs start emerging.

Crossbow divers could be met both in mountain lakes, in the Danube Delta or at the seaside, fact showing that underwater hunting has seen a fast increase and that autonomous diving itself was regarded rather as a sport than as a job.



Starting from the idea that the world's seas and oceans were an important reservoir of raw materials, in the second half of the sixties, a special interest was shown in Romania for the beginning of exploration and exploitation of the biological and mineral resources of the Planetary Ocean and especially those of the Romanian continental shelf at the Black Sea. The establishment of the marine technology laboratory within the Romanian Institute for Marine Research - Constanța in 1972 represents an important

moment in approaching the issues on man's submersion and work underwater.

As a sign of recognition of Romanian interests in the field of underwater research, there was also the visit that the famous Commander Jaques-Yves Cousteau paid to the Romanian Institute for Marine Research - Constanța, on the occasion of the Calypso ship's expedition to the Black Sea.

### Important moments in the history of diving in Romania

**1891:** Emil Racoviță performs a series of dives at the depth of 10 m, using a Siebe-Gorman heavy standard diving suit to study underwater life.

**1895:** The Bridge of Cernavodă is completed, whose pillar foundations required the intervention of Romanian divers.

**1904:** The construction works of the Port of Constanța were completed, with an important input from divers.

**1911:** The *Manual of the Professional Diver* is published in Romania.

**1970:** An underwater habitat LS-1 [2] is launched in Romania, in lake Bicaz. A team of divers from the Research Station of Pângărați, Neamț, managed a 30 days stay at a depth of 10 m.

**1972:** The Laboratory of Marine Technology is set up within the Romanian Institute for Marine Research in Constanța.

**1973:** The first section of underwater research was opened for the public at the Museum of Romanian Navy in Constanța.

**1974:** A simulated dive was performed as a national premiere at the Laboratory of Marine Technology, in a diving chamber, for a depth of 80 m.



**1976:** The Constanța Divers' Centre is set up, to continue the research activity in the hyperbaric field.

**1976:** Jacques-Yves Cousteau visits the „Grigore Antipa” National Institute for Marine Research in Constanța on the occasion of the expedition of the Calypso ship to the Black Sea.

**1978:** The depth of 100 m is exceeded during a real dive into the Black Sea, in August.

**1981:** The first saturation diving in Romania is performed, at a depth of 300 m.

**1984:** A saturation dive is made within the Hyperbaric Laboratory of the Divers' Centre, at a depth of 500 m.

**1891:** Emil Racoviță performs a series of dives at the depth of 10 m, using a Siebe-Gorman heavy standard diving suit to study underwater life.

**1895:** The Bridge of Cernavodă is completed and its pillar



foundations required the intervention of Romanian divers.

1904: The construction works of the Port of Constanța were completed, with an important input from divers.

1911: The *Manual of the Professional Diver* is published in Romania.

1970: An underwater habitat LS-1 [2] is launched in Romania, in lake Bicăz. A team of divers from the Research Station of Pângărați, Neamț, managed a 30 days stay at a depth of 10 m.

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### 5.3. The beginnings of diving in Bulgaria

The beginning of the diving activity in Bulgaria dates back to sometimes in the 19<sup>th</sup> century, but one cannot exactly say when, and the date of its appearance will most likely never be known. The beginnings of the diving activity in Bulgaria is related to the military activities during the Russian-Turkish War of 1877-1878, when several groups of divers acted on the Danube, some of them endowed with ventilation equipment serviced by a divers' boat, and others equipped with “Bayton” rubber suits. After the Bulgarian Liberation of 1878, diving activities were performed, related to clearing the ships sunken in the Danube.

During 1893-1906, divers from the French company “Batignolles” worked alongside Bulgarian divers for the construction of the ports of Burgas and Varna. At the beginning of the post-Liberation period, divers worked according to the 1899 Russian Maritime Status. In 1906, the Bulgarian Maritime Status was issued, describing the functions and obligations of the diver officer. In 1914, the first civilian “Rules for the diving activity” were issued, as well as a manual of the diving activity. The first proof of a qualified diver that we hold was issued to the Officer of the Military Marine Fleet Nikola Furnadzhiev, who during 1905-1906 had studied and promoted with excellent grades from the officers' class of the diving school at *Kronstadt* and was awarded two high orders by the Russian emperor - “St. Anna” and “St. Stanislav”.

During the period before and after World War II, Bulgarian divers, mainly equipped with ventilation equipment, performed numerous operations of raising ships, clearing territorial waters of mines and military equipment and ammunition, as well as in the building of hydro-technical structures.

After 1947, an ISA-M autonomous diving equipment, using oxygen for breathing, entered the armament of the Military Maritime Fleet. In 1955, a rescue team for emergencies was created within the Military Maritime Fleet, based on a rescue ship and two diving boats.

During the second half of the last century (after 1950), elements of autonomous diving equipment started being imported and used, based on the air autonomous device invented by Cousteau-Gagnan. In 1958, the section of underwater sports is created attached to the Central Committee of the Volunteer Organization in Support of Defence (DOSO). In 1959, the Republican Division of Underwater Sports (RSPS) was created, renamed in 1972 as the Bulgarian Federation for Underwater Sports (BFPS). At the end of 1959, only two months after the creation of the CMAS, Bulgaria became a member of this organization, through the Republican Division for Underwater Sports.

In 1965, Anton Bedzhev founded the first group of professional diving with autonomous equipment. Later on, groups of professional diving were created alongside various institutions

and enterprises, such as the Fleet for Constructions and Technique, the Bulgarian Maritime Fleet, the "Kozlodui" nuclear plant and others. In 1969-1971, over 30 Bulgarian divers participated in the building of an underwater pipe in the Persian Gulf - Kuwait. From 1967 to 1974, in Bulgaria a series of experiments with underwater laboratories took place, where research teams would live and work for several days and nights underwater, at a depth of 10-22 meters. A large volume of the research program was carried out, undertaking the study of man's possibilities of living underwater for long periods of time, and in-situ observations on the underwater flora and fauna. In 1969, the "Laboratory of Underwater Research" (LPI) was created at the Institute of Scientific Research and Oceanography, aiming to create new and improved methods and equipment for an efficient and safe functioning underwater. In 1973, the Laboratory of Underwater Research becomes a component of the newly-established Institute of Oceanology (IO-BAS) of the Bulgarian Academy of Sciences (BAN). The underwater research laboratory designs the "Shelf" underwater laboratory, organizes all the experiments with the "Shelf"-1970 and "Chernomor"-1973, 1974 underwater laboratories.

From 1975 to 1995, the Underwater Research Laboratory sets up a long-term program ordered by the Bulgarian government, to create "Technical methods and systems for the activity of diving up to depths of 200 meters", regarding further activities of exploration and extraction of oil and gas in the area of the Bulgarian continental shelf. Within this program, two marine diving systems are designed and created - with an open diving bell for a depth of up to 100 meters and with a closed bell for saturation dives up to depths of 200 meters. A series of experimental dives with psycho-physiological studies were performed, showing a high level of safety and effectiveness of the diving technology created.

### **Important moments in the history of diving in Bulgaria**

**1877-1878:** The first information regarding the Danube diving operations during the Russian-Turkish war.

**1906 :** The Bulgarian Maritime Status of the Maritime Military Fleet, with a section for diving officers.

**1914:** The "Rules for the Diving Activity" and the "Manual of the Diving Activity" were published in Bulgaria.

**1958:** A section of underwater sports is created attached to the Central Committee of the Volunteer Organization in Support of Defence (DOSO).

**1959:** The Republican Division of Underwater Sport (RSPS) is created in Bulgaria. Bulgaria becomes a CMAS member.

**1960:** The first manual for autonomous divers is edited - the "Bases of Underwater Sports" - authors Bourdin, Dorosiev, Hristov.

**1963:** The first "Regulations Regarding the Activity of Light Dives" is edited.

**1965:** The first group of professional dives with autonomous diving equipment is created - "The Underwater Group of Engineers".

**1967:** The first experiment with an underwater laboratory was carried out in the Gulf of Varna - depth of 10 meters.

**1969:** The first research group for diving, the "laboratory of Underwater Research", is created in the city of Varna.

**1969 - 1971:** The Bulgarian state company "Transstroy" performed major underwater building operations in Kuwait, with the participation of over 30 divers.

**1970:** An experiment was carried out with the "Shelf" underwater laboratory at Cape Maslen - a depth of 20 meters.

**1973-1974:** Two experiments with international participation were performed with the "Chernomor" Soviet underwater laboratory at Cape Maslen - depth of 22 meters.

**1973:** The first professional diving training with autonomous equipment was held in the city of Varna.

**1975:** Start of implementation of the long-term program "Technology and technical systems for underwater work of people for depths of up to 200 meters".

**1979:** First dives at a depth of 100 meters by using a mix of gases for breathing, with an "open diving bell".

**1980:** The system of diving with closed diving bell was entirely manufactured and tested in Bulgaria.

**1982:** Participation in the Soviet-Bulgarian expedition on the "Vityaz" scientific research vessel, searching for the submerged continent "Atlantis". Saturation dives were performed up to a depth of 200 meters.

**1988:** Experimental dives in saturation state in the pressure room under the pressure of 20 bars.

**1990-1991:** Following the invitation of the Ministry of Defence of the Republic of Cuba, an expedition took place in the coastal Cuban waters to look for sunken Spanish galleons, by means of a lateral sonar, the underwater research boat of the Institute of Oceanology and an open diving bell. A series of dives up to the depth of 100 meters were performed.

**1996-1998:** Work on the project of the Ministry of Defence of the Republic of Bulgaria "Technology for Rescuing Crews of Damaged Submarines".

**1999:** The Bulgarian National Association of Underwater Activity (BNAPD) is created.

**2013:** The Bulgarian record for depth diving with technical equipment is attained. A depth of 147 meters was reached by Rosen Zhelyazkov.

**2014:** The first training was carried out, and certificates were issued for "scientific research", in compliance with the CMAS Program.

#### 5.4 Romanian underwater archaeology

Submarine archaeology represents, after submarine biology, geography and geology, the fourth new scientific branch resulted from the research of the submarine environment. It was born in Romania first as an amateur pursuit (sailors), then took shape starting with 1966 through systematic studies within the Navy Museum, where a division of underwater and archaeological research was created.

The diver researcher Constantin Scarlat has brought an important contribution to the interdisciplinary exploration of the Black Sea continental shelf, with many discoveries linked to his name. Constantin Scarlat has initiated the Cousteau-type autonomous diving; he set the ground for the first diving unit in the Military Navy (1967) and for a research sector in this field in 1969. He created the first map of the underwater relief and resources of the Black Sea continental shelf.

#### The ancient Port of Tomis and the ancient Port of Callatis

At Tomis, port on the western shore of the Black Sea, Romanian underwater archaeological research highlighted the existence of a large submarine store of monumental remains (marble architectonic fragments, Roman sarcophagi, etc.), spreading over an area of approximately 10000 square meters. Objects discovered following underwater research yielded evidence of an ancient sailing tradition, of the maritime trading relations between the local population of Dobrogea and the Greeks coming here to trade. Greek navigators were drawn by the riches in the Left Pontus, in Dobrogea, but encountering high seas, they called it „Pontus Axeinos” - Inhospitable Sea. And yet, this name has changed in time to "Pontus Euxeinos" - Hospitable Sea.

At Callatis, the main element of submarine archaeological research is represented by the discovery and topographic delimitation of the configuration of the ancient port of Callatis. The fact that the port and a large part of the city of Callatis were above sea level in ancient times is proved by ruins discovered underwater, by objects found (paving, bricks, sewage, amphora, column heads, sarcophagi, shingles, various constructions, etc.).

In 1967, underwater archaeological research in Romania acquired an organized character, with the investigations carried out in the supposed site of the ancient port of Callatis (nowadays Mangalia) by the group of divers-archaeologists led by Constantin Scarlat.

It was then that two anchors were discovered at a depth of approximately 20 meters, one made of lead, the other of iron. The lead anchor dates back to the period of 3<sup>rd</sup>-1<sup>st</sup> centuries B.C. and has unusual weight and dimensions, being in fact one of a kind for its time. It belonged to a high tonnage Hellenistic ship, with a capacity of over 3000 amphorae. The study of both objects has allowed the formulation of some extremely interesting conclusions regarding the navigation in the Left Pontus. It was still at Callatis where, alongside a large number of Greek



amphorae, some of them stamped, manufactured in Rhodes, Thasos, Lesbos, etc., alongside Greek or Roman shingles, milling stones and a few objects and vessels from the Middle Ages, the wreck of a 4<sup>th</sup>-3<sup>rd</sup> century ship was found, made entirely of wood. From on-board this wreck, 12 perfectly preserved amphorae were extracted.

## 5.5 Bulgarian underwater Archaeology

Underwater archaeological research in Bulgaria is placed in 1959. There was first an expedition around Cape Kaliakra, and a few months later around Cape Maslen. Among the pioneers of underwater archaeology in Bulgaria we must name Ivan Kazakov, Ivan Galabov, Velizar Velkov, Goranka Toncheva, Mihayl Lazarov, Lyuba Ognenova-Marinova, Ivan Karayotov and many others.

The idea of creating a scientific centre for underwater archaeology has been supported from the very beginnings of this field in Bulgaria. At first, the idea appeared in the Military Maritime Museum of Varna. It was only materialised in 1978, when the Central Base for Maritime Research was created at Sozopol, base renamed in 1984 as the Centre for Maritime History and Archaeology. Currently it is called the Centre for Underwater Archaeology. In 1999, the division „Marine Geology and Archaeology“ was created at the Institute of Oceanology. It is this very Institute of Oceanology that is pioneering in Bulgaria, researching the great depths of the Black Sea in search for its historical past.

Among the main tasks of the Bulgarian underwater archaeology is the study of submerged settlements, of parts of harbour installations and neighbourhoods of ancient cities, as well as the most attractive part of marine archaeology, searching for ancient shipwrecks.

Among the study objectives along the years we remind the territorial waters of Cape Shabla, Yailata, Cape Kaliakra, Kavarna, Balchik, the Gulf of Varna and the Varna-Beloslav Lake, Cape Cherni, Cape St. Atanas, Nesebar Peninsula, Pomorie, Cape Akin, Sozopol, the estuary of the Ropotamo river, Cape Maslen, Primorsko, Kiten, the Gulf of Arapyra, Ahtopol.

From the Bulgarian coast of the Black Sea, all the types of monuments that can be found under water are known. These are submerged prehistoric settlements, discovered along the northern and southern shores of the Varna-Beloslav Lake and on the Strandzha Coast, from the Eneolithic and the early Bronze Age, submerged parts of ancient cities, such as Bizone (currently Kavarna), Mesambria (currently Nessebar), dams in the town of Karantina and Cape Galata in the Gulf of Varna and Apollonia Pontica (currently Sozopol), ships, their loads and ship anchors.

The oldest traces of maritime transportation recorded in underwater archaeological expeditions are those from the late Bronze Age. These consist of numerous stone anchors with channels and holes, copper ingots shaped as a stretched bull/buffalo skin, round copper ingots and a sole polymetallic ingot, discovered in 1973 in the Western gulf of Cape Kaliakra. There are numerous findings from the times of the Great Greek Colonization, from the period of Roman dominance in the Black Sea basin, Late Antiquity and Middle Ages, especially from the period of the 13<sup>th</sup> -14<sup>th</sup> centuries. Besides amphorae, from these periods are known numerous iron anchors, ships loaded with construction materials and others.

## 5.6 Scuba Diving in Romania

Due to the past social and economic conditions, the diving activity in Romania is less rich in events. Nowadays sportive autonomous diving continues to develop especially during activities such as photography, filming and underwater tourism. Numerous books and specialized magazines are edited, and the diving equipment is widely diversified. Continuous improvement is seen not only in comfort, endurance and efficiency of the diving equipment, but also as in the processes of formation, education, training, diving safety and protection of the underwater environment.

**1956:** several clubs of divers, mostly equipped with their own-built equipment, start appearing within some branches of AVSAP (the Voluntary Association for Supporting Homeland Defence).

**1962:** First Romanian movie filmed underwater „Shells have never talked“.

**1967-1969:** Observations over the submerged part of the citadel of Tomis were performed, a result of the exceptional work by the group of divers-archaeologists led by Constantin Scarlat,

1973: The first section of underwater research was opened for the public at the Navy Museum in Constanța.



## 5.7 Scuba Diving in Bulgaria

After 1989, conditions were created to develop the diving tourism. Over 30 tourist diving centres were created and are successfully functioning. These centres are authorised by international diving agencies, such as CMAS, PADI, NAUI, SSI and others, and they function according to the standards and requirements of these agencies. On the Bulgarian coast, there are yearly over 7000 sportive and tourist dives, and over 400 training courses for the qualification in diving are held. The main objectives for underwater tourism are sunken shipwrecks, numerous on the Bulgarian coast. At the beginning of the 21<sup>st</sup> century, the so-called technical dives started to be practised and developed, so that objectives sunken at a depth of 80-100 meters have become accessible for amateur divers. In 1999, the Bulgarian National Association of Underwater Activity (BNAPD) was created, member of CMAS and carrying on the traditions of the Bulgarian Federation of Underwater Sports, which had been interrupted in 1989.

*The Bulgarian National Association of Underwater Activity* is a non-governmental, non-commercial association, uniting the efforts made by the Bulgarian citizens and organizations to develop and improve the methods and instruments for underwater activities that are safe and efficient for people and for protection of underwater archaeological heritage and for the environment. In 2014, the first training of “scientific dives” according to CMAS requirements and standards took place, and the 10 successful graduates were issued CMAS certificates.

## CHAPTER 6

### LEGISLATION IN THE FIELD OF UNDERWATER ARCHAEOLOGICAL HERITAGE

#### 6.1 European Legislation on Underwater Heritage

The UNESCO Convention on protecting underwater cultural heritage, adopted on 2nd November 2001, is the international treaty targeting the safeguarding of underwater cultural heritage. Contact: UNESCO - Section of Museums and Cultural Objects Division of Cultural Objects and Intangible Heritage 1, Rue Miollis - 75732 Paris cedex 15 - France Tel. + 33 (0) 145684406-Fax+33(0)145685596 Email [u.koschtial@unesco.org](mailto:u.koschtial@unesco.org); [www.unesco.org/culture/en/underwater](http://www.unesco.org/culture/en/underwater).

Underwater cultural heritage means all traces of human existence having a cultural, historical or archaeological character which have been partially or totally under water, periodically or continuously, for at least 100 years, such as: sites, structures, buildings, artefacts and human remains, together with their archaeological and natural context; vessels, aircraft, other vehicles or any part thereof, their cargo or other contents, together with their archaeological and natural context; and objects of prehistoric character.



**The objectives and general principles of the UNESCO Convention are:** to provide and improve the protection of the underwater cultural heritage, to cooperate for the protection of the underwater cultural heritage and to preserve the underwater cultural heritage for the benefit of humanity.

The convention encourages in situ responsible and harmless access of the public to underwater cultural heritage, in order to observe and study, in order to encrease public awareness, appreciation and protection of this heritage. Each State Party shall use the best practicable means at its disposal to prevent or mitigate any adverse effects that might arise from activities under its jurisdiction incidentally affecting underwater cultural heritage. States Parties are encouraged to enter into bilateral, regional or other multilateral agreements or develop existing agreements, for the preservation of underwater cultural heritage. Each State Party shall take all practicable measures to raise public awareness regarding the value and significance of underwater cultural heritage and the importance of protecting it under this Convention States Parties shall cooperate in the provision of training in underwater archaeology, in techniques for the conservation of underwater cultural heritage and, on agreed terms, in the transfer of technology relating to underwater cultural heritage.

Romania and Bulgaria have joined the UNESCO Convention on protecting underwater cultural heritage. This makes Romania and Bulgaria face a great challenge, that of answering the requirements imposed by the Convention and of combining their efforts and expertise to create a new common model for the Black Sea regarding the protection of common underwater cultural heritage.

In Romania, the UNESCO Convention on protecting underwater cultural heritage was adopted through Law no. 99/2007. According to the provisions of this law, activities directed at underwater cultural heritage must use non-destructive techniques and survey methods in preference to recovery of objects.

Also, activities directed at underwater cultural heritage sites shall avoid the unnecessary disturbance of human remains or venerated sites.

Public access to in situ underwater cultural heritage shall be promoted, except where such access is incompatible with protection and management.

**The Convention encourages international cooperation in the conduct of activities directed at underwater cultural heritage, in order to further the effective exchange or use of archaeologists and other relevant professionals.**





## 6.2 National Legislation on Underwater Heritage

### Romanian legislation on underwater heritage

The need for a precise legal regulation of the continental shelf was raised in the years 1945-1947 and was discussed at several UN conferences. During these discussions, concluded by the Conventions on the continental shelf of 1958 and on the Law of the Sea of 1982, the idea crystallised was that the continental shelf of a coastal state includes the seabed and subsoil of the submarine areas extending outside the area of the territorial sea, along the entire natural extension of the terrestrial territory of the state, until the external limit of the continental edge, or up to a distance of 200 nautical miles, or 350 nautical miles from the baselines from where the width of the territorial sea is measured. The 1979 Conference of Geneva has set up some delimiting criteria for the width of the continental shelf. During the debates, the need arose that the delimitation should be made based on agreements between coastal states, according to the norms and principles of international legislation.

On 25<sup>th</sup> April 1986, through Decree no. 142, Romania has set up its exclusive economic area in the Black Sea. Through Law no. 36 of 16<sup>th</sup> January 2002 on the statutory regime of inland maritime waters, of the territorial sea and of the contiguous area of Romania, the Romanian legislation in this field was updated. Thus, according to Art. 1 to this law, Romania's territorial sea includes the stretch of water adjacent to the coast, or, as case, to inland maritime waters, with a width of 12 nautical miles (22 224 m), measured from the baselines.

The baselines are the lines of the highest tide along the shore or, as case, the straight lines uniting the most advanced points of the shore, including the seaward shore of islands, of landing sites, of water facilities and of other permanent waterside installations. Coordonatele geografice ale punctelor între care sunt trasate liniile de bază drepte de la care este măsurată lăţimea spaţiilor maritime ale României. The geographical coordinates of the end points of the straight lines from which the width of Romania's maritime spaces is measured. Inland sea waters, the territorial sea, their soil and subsoil, as well as the airspace above them are part of the Romanian territory.

In these spaces, Romania exercises its sovereignty according to its internal legislation, to the provisions of international conventions it is part of, and considering the principles and norms of international law. According to the provisions of art. 6 and 7, Romania's contiguous area is the stretch of sea adjacent to the territorial sea, stretching seawards up to 24 nautical miles, measured from the baselines set up in art. 1. In its contiguous area, Romania exercises the control to prevent and repress infringements, on its territory, of its laws and regulations in the customs, tax and health domains, as well as regarding the crossing of state borders.

Also, Romania's exclusive economic area is set up in the marine space of the Romanian Black Sea Coast, situated beyond the limit of its territorial waters and adjacent to them, where Romania exercises sovereign rights and jurisdiction over the natural resources of the seabed, its underground and the column of water above, as well as regarding the various activities related to its exploration, exploitation, protection, environmental protection and management.

In terms of the organization and development of scientific research activities, the law provisions that the scientific research activity carried out in Romania's territorial sea is performed by specialized Romanian institutions, based on approved programs and projects, and endorsed by competent Romanian organs; foreign individuals or companies may take part in scientific research activities in Romania's territorial sea only by express approval from Romanian organs, according to the legislation in force and specific conditions. Besides the natural resources of the Black Sea continental shelf, the underwater underground of the western part of the Black Sea also contains ancient archaeological sites, which were the subject of scientific research through the HERAS Project.

Law no. 182/2000 regarding the protection of the movable national heritage institutes the statutory regime of goods pertaining to the movable national heritage, as part of the national cultural heritage, and regulates the specific activities for its protection. The movable national heritage consists of goods having a historical, archaeological, documentary, ethnographical, artistic, scientific and technical, literary, cinematographic, numismatic, philatelic, heraldic, bibliophile, cartographic and epigraphic value, representing material proof

of the evolution of the natural environment and man's relation thereto, of the human creative potential and of the contributions by Romanians, as well as by the national minorities, to the universal civilization. The goods included in the movable national heritage are: archaeological and historical-documentary goods, such as: land and underwater archaeological discoveries, tools, pottery, inscriptions, coins, seals, jewellery, clothing and harness elements, weapons, funeral inscriptions, except for samples of building materials, materials from sites, which are archaeological samples for specialized analyses. Goods pertaining to the movable national cultural heritage are part, function of their importance or historical, archaeological, documentary, ethnographical, scientific and technical significance, of their age, uniqueness or rarity, of the treasury of movable national cultural heritage. The fund of the movable national cultural heritage consists of cultural goods having a special value for Romania.

### **Bulgarian legislation on underwater heritage**

The first law on Bulgaria's underwater areas was adopted within the fifth session of the Ninth Popular Congress of 08.07.1987 (OJ, no. 55/1987). On 28.01.2000, the Bulgarian Parliament adopts the Law on marine areas, internal waterways and ports of Bulgaria (OJ, no. 12/2000). According to the Law, internal maritime waters include the area from the shore to the exit lines connecting Capes Caliacra, Tuzlata and Ekrene; from the Gulf of Varna - between Cape St. Constantine and Cape Ilangik; from the Gulf of Burgas - between Cape Emine and Cape Maslen and between Cape Maslen and Cape Rohi.

Bulgaria's marine territorial waters stretch for 12 nautical miles, with a total area of 9000 km<sup>2</sup> over which Bulgaria exercises its sovereignty. The adjacent area stretches for 24 nautical miles from the exit lines, and represents the area where Bulgaria exercises control when customs, tax, border or health procedures are infringed.

An area of major economic interest for Bulgaria is, according to Order No. 77/07.01.1987 of the State Council, the area stretching over a distance of 200 nautical miles from the exit lines.

In 1997 an Agreement was concluded with Turkey, with a similar agreement pending with Romania. It is expected that, following a joint agreement concluded in optimal conditions, Bulgaria's economic area of major interest in the Black Sea should have a total area of approximately 35000 km<sup>2</sup>, and the area of the underwater territory should represent approximately 44000 km<sup>2</sup>. With regards to performing scientific research, Bulgarian legislation provisions that any scientific studies carried out in the abovementioned territories shall be performed by responsible Bulgarian institutions, based on programs and projects having prior approval from competent Bulgarian authorities. The means of protecting cultural heritage are provisioned in the national legislation (laws and government decisions), as well as by the international conventions ratified by Bulgaria.

The most important law on the cultural heritage of the Republic of Bulgaria is the Law on Cultural Heritage (Published in OJ no. 19 of 13th March 2009, republished with changes in OJ no. 66 of 23rd July 2013). In this law, the protection and conservation of cultural heritage, including non-material, industrial, underwater and cultural landscape, is provisioned in detail. The Law on Cultural Heritage provisions detailed measures of protecting the archaeological heritage on the territory of the Republic of Bulgaria. Through Ordinance No N-00-0001 of 14.02.2011 regarding the performance of on-site archaeological studies, issued by the Minister of Culture, published in the OJ no. 18 of 1st March 2011, with the latest changes and completions published in OJ No. 30 of 17th April 2012, there are established all the activities that can be performed on-site within the archaeological studies realised. Ordinance no. N-2 of 6th April 2011 stipulates the creation, maintenance and provision of information within the automated informational system „Archaeological Map of Bulgaria”, issued by the Minister of Culture and published in the OJ no. 32 of 19.04.2011.

The Centre for Underwater Archaeology operates in Bulgaria. This is a state cultural institute to protect the underwater archaeological heritage of the Republic of Bulgaria. Its activity is set up through the Law on Cultural Heritage. The Centre for Underwater Archaeology coordinates the activities related to the management and study of underwater archaeological heritage, having a Register of underwater cultural heritage.

## CHAPTER 7

### RESULTS OF THE HERAS PROJECT

#### 7.1 Equipment purchased

In order to meet the objectives of project HERAS, within the approved budget, the following equipment was purchased: a RIB boat type (photo 1); complete diving, photographic and filming equipment; scientific research equipment as magnetometer - gradiometer (photo 2), side scanning sonar, and gyroscopic compass.



*Photo 1. RIB boat type*



*Photo 2. Magnetometer - gyroscopic compass*

#### 7.2 Research methods and results of HERAS project

The methods of scientific research used in HERAS project were adequate for the activities performed, such as:

a. observation, orientation, measurement; photographing and filming objectives and artefacts of interest (photos 3 and 4);



*Photo 3. 2 Mai barrow viewed from the sea - HERAS 2014*



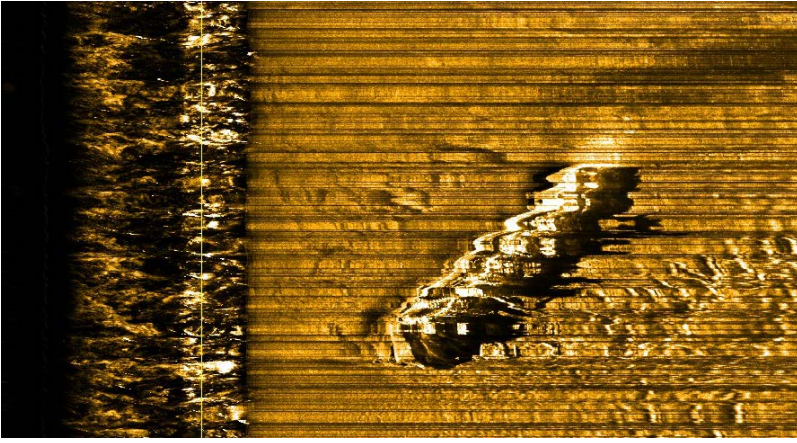
*Photo 4: Phragment of an ancient ship's keel discovered on the Vadu beach - HERAS 2014*

b. scanning the submerged objects (photo 5);

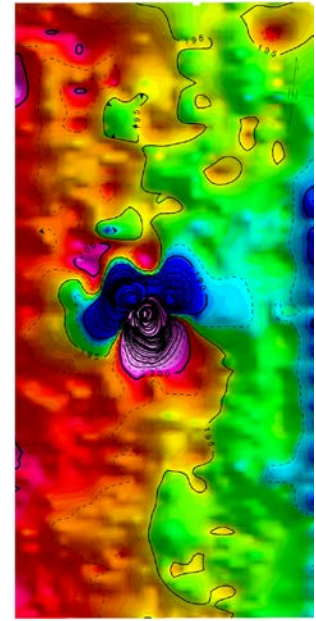
c. magnetometric investigation of the area where an object is located, an scanning it in the same time (photo 6, 12);

d. visual research made by divers, photographing and filming the objectives and the artefacts discovered (photo 7, 8,9,10,11);





*Photo 5. A scan image of Moskva ship - HERAS 2015*



*Photo 6. A magnetic map of the Moskva ship and adjacent area - HERAS 2015*

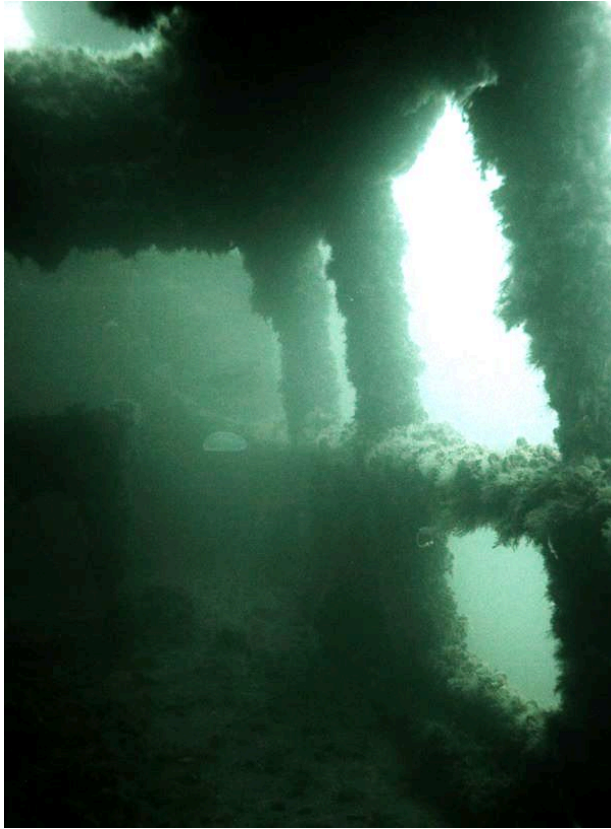


*Photo 7. The Moskva shipwreck - HERAS 2015*

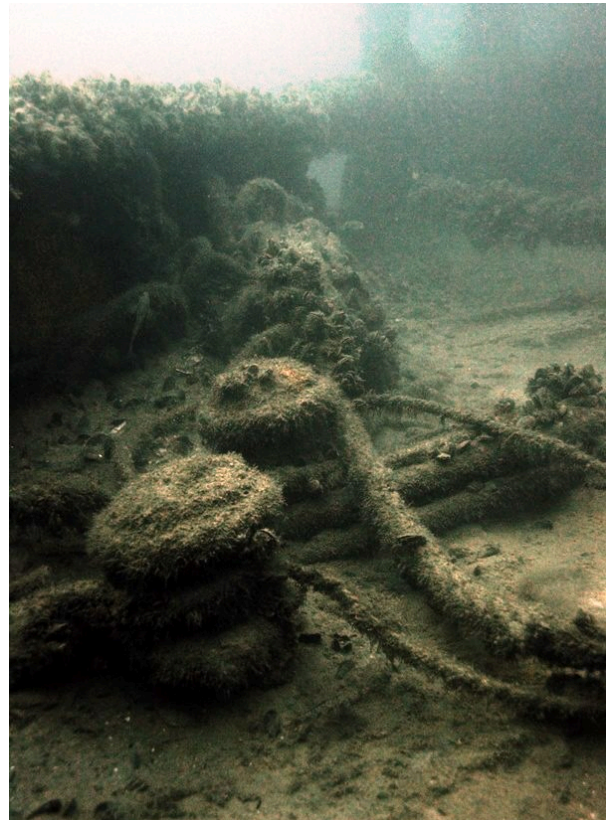


*Photo 8. The Moskva ship - HERAS 2015*





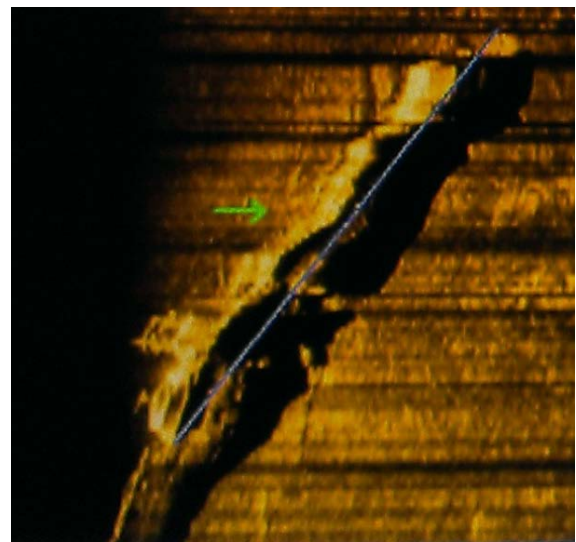
*Photo 9. Arkadia ship - HERAS 2015*



*Photo 10. Arkadia ship - HERAS 2015*



*Photo 11. Submarine - HERAS 2015*



*Photo 12: submarine sonar scan image - HERAS 2015*

The remarkable results obtained in the HERAS project matched the ambitious objectives that were initially set. The main results are as follows:

- the land campaign deployed on the shore of Dobrogea between Constanța-Kaliakra (historical archaeological sites), investigating several archaeological sites:
  - a. the barrow in 2 Mai resort, severed by the active abrasion in the area;

- b. Callatis Citadel: the Callatis Museum, the relics preserved in the basement of Hotel President in Mangalia, the traces of the northern and southern ancient wall, which are still visible in the cliff of the Callatis Citadel;
- c. Tomis Citadel: the Roman Mosaic Edifice, the Archaeological and National History Museum in Constanta; the location of the ancient harbour; remains of ancient ships and goods carried by sea;
- d. the Roman Aqueduct in Corbu, very well preserved on the left flank of Corbu valley; Histria Citadel: the Museum of Histria Citadel, the ruins of the citadel;
- e. The prehistoric archaeological site from Durankulak;
- f. The Yailata Citadel, the ruins of the citadel, the natural Yailata reservation;
- g. Cape Şabla, the ruins of Caron Limen, the Roman citadel;
- h. Temple of Goddess Cybele in Balchik;
- i. The Museum of the city of Kavarna: these sites provided information regarding habitation in the area in ancient times, about fishing and sea trade activities.

During this campaign, a great number of ancient archaeological sites were recognised and identified, as well as the locations of several citadels, harbours and possible ancient harbours locations in areas of southern Romanian seashore and northern Bulgarian seashore. Representative films and photographs of artefacts from these places were taken.

- two sea campaigns, lasting for 16 days and covering over 1000 miles, were conducted using the research vessel "MARE NIGRUM" of GeoEcoMar; during these campaigns, 17 objectives (out of which seven were new ones) of the Romanian submerged archaeological heritage were analysed.

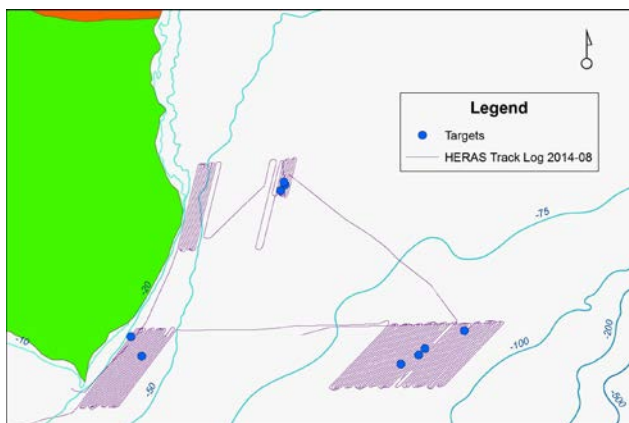


Map showing the research campaign route of R/V Mare Nigrum in January 2015



Mare Nigrum at sea - HERAS, January 2015

- two sea campaigns conducted using the research ship „Akademik” of the Oceanology Institute in Varna, lasting for 16 days and covering over 1200 miles, during which nine objectives belonging to the Bulgarian archaeological submerged heritage were identified, objectives with a good potential for underwater tourism;



Map of the research campaign of ship Akademik, August 2014

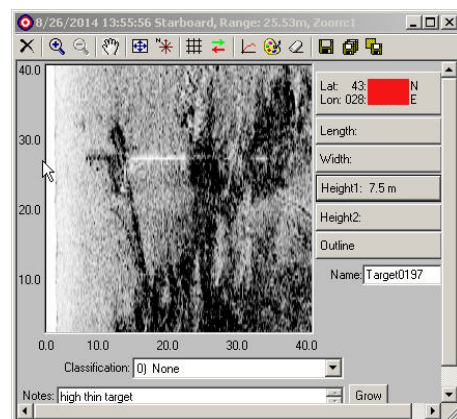
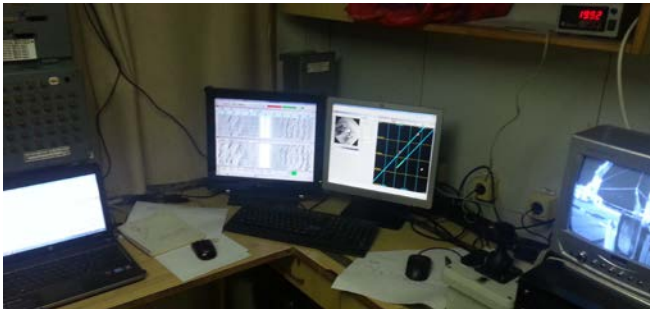


Image from the side scanning sonar ship Akademik, HERAS August 2014





*A panoramic picture showing a wooden ship sunken to a depth of 60 m in front of Cape Şabla, taken with a camera installed on board the research submarine, Akademik - 2014 December campaign*



- two specific professional training courses for recreational diving, made up of a theoretical session and a practical one, with exercises in open water, dedicated to recreational diving in areas with submerged archaeological sites; the theoretical session included also presentations of the UNESCO Convention, of methods and equipment used in order to define archaeological sites, of investigation techniques, of compass research navigation patterns, of the research scale and communications; 55 persons attended the course, obtaining



at the end of it a Participation Diploma; the second diving training course - PADI - Open Water Diver - was attended by 10 persons, representatives of the project partners; all the students received an internationally recognised PADI certificate;

- nine workshops were organised, as follows: three by the lead partner GEOECOMAR, four by partner 3 IO-BAS, one by the Constanța Museum and one by the Museum of Kavarna; during these activities, the project progress was presented and recreational diving activities were promoted;



*Pictures taken at meetings and workshops organized within the HERAS project*

- C14 dating of artefact samples;
- two exhibitions were organized by the National Museum of Archaeology and History Constanța and by the Museum of Kavarna;
- two media campaigns organized by the lead partner and IO-BAS, presenting the objectives of HERAS project and disseminating its results;
- a scientific conference of the HERAS Project, with international participation, entitled "Interdisciplinary research of the submerged archaeological heritage in the western part of the Black Sea", during which the scientific results of the project were presented (12 scientific communication topics) and the cross-border Management Plan of the Black Sea underwater archaeological tourism;



- the HERAS OPEN DOORS action; for this activity, the Lead Partner GeoEcoMar, together with Partner 5 GO Respiro Underwater Society organized the Scuba Diving Open Doors event during the Tomis Yacht & Car Exhibition in Constanța;
- the database of the HERAS project, organized following the UNESCO model and containing information about objectives belonging to the submerged archaeological heritage, which are the object of the Scuba Diving activities;
- the cross-border Management Plan/Guide for underwater archaeological tourism in the Black Sea;

- the HERAS book;
- the website of HERAS project: [herasprojectcbc.eu](http://herasprojectcbc.eu)

## REFERENCES

- Antipa, Gr.*, (1941), *Marea Neagră*, Ed. Univers, București
- Bârdeanu, N., Nicolaescu, D.*, (1979), *Contribuții la istoria marinei române*, vol. I, Ed. Științifică și enciclopedică, București
- Bejan, A.*, (1994), *Războiul naval de-a lungul veacurilor*, vol. I, Ed. Tehnoproduct, București
- Bhattacharya, J.P., Giosan, L.*, (2003), *Wave-influenced deltas: geomorphological implications for facies reconstructions*, *Sedimentology*, vol 50, pp 187-210
- Boev, R.* (1966), *Expedition for underwater archaeological investigation in the area of Cape Kaliakra. - Korabostroene i koraboplavane* Vol. 1, 27-30 (in Bulgarian)
- Bondar C., Panin N.*, (2001), *The Danube Delta hydrologic data base and modelling*. *Geo-Eco-Marina*, 5-6, Bucharest - Constanța, Romania, p. 5 - 52
- Bondar, C.* (1989), *Trends in the evolution of the mean Black Sea level*, *Meteorology and Hydrology*, vol 19, no 2, pp 23-28
- Bondar, C., Roventza V., State I.* (1973), *La Mer Noire dans la zone du littoral roumain* Monographie hydrologique, Bucharest, Romania
- Boșneagu, R.*, (2004), *Influența condițiilor geografice asupra rutelor de transport în bazinul Mării Negre-sectorul vestic*, (2004), Ed. Cartea universitară, București
- Brătianu, Gh.*, (1988), *Marea Neagră*, vol. I - II, Ed. Meridiane, București
- Caraivan, Gl.*, (2010), *Sedimentological study of the beach and inner Romanian shelf deposits between Portita and Tuzla*, Ex. Ponto Printing house, Constanta, Romania (in Romanian)
- Caraivan, Gl., Fulga, C., Opreanu, P.*, (2012), *Upper Quaternary evolution of the Mamaia lake area (Romanian Black sea Shore)*, *Quaternary International* vol 261, pp 14-20
- Ciorbea, V.*, (1996), *Portul Constanța 1896-1996*, (1996) Editura Fundației Andrei Șaguna, Constanța
- Ciorbea, V.*, (1996), *Portul Constanța de la antichitate la mileniul III*, Ed. Europolis, Constanța



- Ciorbea, V., Atanasiu, C.*, (1995), Flota maritimă comercială română. Un secol de istorie modernă 1895-1990, Ed. Fundației "Andrei Șaguna", Constanța
- Constantinescu, N., Tambrea, D., Matresu, J., Sampetean, E., Pușcasu, N.*, (1998), Tectonic and structural framework and geological evolution of the Istria Depression during the Paleogene and Neogene. 3rd International Conference on the Petroleum Geology and Hydrocarbon Potential of the Black and Caspian Sea Area, Supplement to Geo-Eco-Marina, No 3 (78 pp.)
- Constantinescu, St.* (2005), Analiza geomorfologică a țărmului cu faleză între Capul Midia și Vama Veche pe baza modelelor numerice altitudinale, Unpublished PhD thesis, Faculty of Geography, University of Bucharest (in Romanian)
- Crăciunoiu, Cr.*, (1979), Navomodele, vechi nave românești, Ed. Sport-Turism, București
- Dachev, V.Z., Trifonova, E.V. and Stancheva, M. K.* (2005), Monitoring of the Bulgarian Black Sea Beaches., (In) Guedes Soares, Garbatov & Fonseca (eds.), Maritime Transportation and Exploitation of Ocean and Coastal Resources Taylor & Francis Group/ Balkema, 1411 - 1416
- Dan S., Stive M.J.F., Walstra D.J., Panin N.*, (2009), Wave climate, coastal sediment budget and shoreline changes for the Danube Delta. Marine Geology, 262, issues 1-4, p. 39 - 49
- Dan, S., Stive, M., van der Westhuysen, A.*, (2007), Alongshore sediment transport capacity computation on the coastal zone in front of the Danube Delta using a simulated wave climate, Geo-Eco-Marina, vol 13, pp 21-30
- Dimitriu, R., G.*, Geodynamic and hydro-geological constraints regarding the extension of the prospective archaeo-cultural area within the Northern Romanian coastal zone, Quaternary International vol 261, pp 32-42
- Drăghicescu, M.*, (1943), Istoricul principalelor puncte pe Dunăre de la gura Tisei până la mare și pe coastele mării de la Varna la Odessa, București
- Georgiev, G., Dabovski, C., Stanisheva-Vassileva, G.*, (2001), East Srednogorie-Balkan rift zone. In: Ziegler, P.A., Cavazza, W., Robertson, A.H.F., Crasquin-Soleau, S. (Eds.), Peri-Tethys Memoir 6: Peri-Tethyan Rift/Wrench Basins and Passive Margins. Memoires du Museum Nationale d'Histoire Naturelle, pp. 259-293
- Giosan L., Bokuniewicz H., Panin N., Postolache I.* (1999), Longshore Sediment Transport Pattern along the Romanian Danube Delta Coast. Journal of Coastal Research, 15 (4), p. 859 - 871
- Keremedchiev, S. and Stancheva, M.*, (2006), Assessment of geo-morphodynamical coastal activity of the Bulgarian Black Sea part, Compt. Rend. Acad. Bulg. Sci., vol. 59, no 2, 181-190
- Kuzmanov, G., Salkin. A.*, (1992), Antique amphorae from the aquatory of the Black Sea coast of Southern Dobrudzha. - Bulletin de Musee Natioanal de Varna 28(43), 27-61 (in Bulgarian)
- Kuroki K., Goda Y., Panin N., Stănică A., Diaconeasa D., Babu Gh.* (2007), Beach erosion and its countermeasures along the Southern Romanian Black Sea shore, "Coastal Engineering 2006" (Proceedings of the 30th International Conference, San Diego, California, USA, 3-8 September 2006), vol 4, pp. 3788-3799
- Lazarov, M.*, (1988), The mysterious Carian port. - FAR'88. Varna, 33-42 (in Bulgarian)
- Manoliu, I.* (1984), Nave și navigație, Ed. Științifică și enciclopedică, București
- Marin, I., Gh., Boșneagu, R., Marin, M., Dumitrache, L.*, (2010), Procese actuale de eroziune costieră în zona Capului Tuzla, Bul.D.H.M. 2/2010, Constanța, p. 76 -78 (în română)
- Panin N.*, (2005), The Black Sea coastal zone - an overview. European Seas: Coastal Zones and Rivers - Sea System - Geo-Eco-Marina, 11, p. 21 - 40
- Panin N., Jipa D.* (2002), Danube River Sediment Input and its interaction with the North-western Black Sea. Estuarine, Coastal and Shelf Science, 54, p. 551 - 562
- Panin, N.* (1996), Impact of global changes on geo-environmental and coastal zone state of the Black Sea, Geo-Eco-Marina, vol 1, pp 7-23
- Panin, N.*, (1998), Danube Delta: Geology, Sedimentology, Evolution, Association des edimentologistes Francais, Paris, p. 65
- Panin, N.*, (1999), Global changes, sea level rise and the Danube Delta: risks and responses, Geo-Eco-Marina vol 4, pp 19-29.
- Peychev, V.*, (2004), Morphodynamical and lithodynamical processes in coastal zone, Publishing house "Slavena", Varna, 231 pp. (In Bulgarian)
- Peychev V., Stancheva, M.*, (2009), Changes of Sediment Balance at the Bulgarian Black Sea Coastal Zone Influenced by Anthropogenic Impacts, Compt. Rend. Acad. Bulg. Sci, vol. 62, no 2, 277-285
- Popescu, I., Lericolais, G., Panin, N., Wong, H.K., Droz, L.*, (2000), Late Quaternary channel avulsions on the Danube deep-sea fan, Black Sea. Mar. Geol. 179 (1-2), 25-37
- Popov, V., Mishev, K.*, (1974) Geomorphology of the Bulgarian Black Sea coast and shelf, Publishing house of the Bulgarian Academy of Sciences, 267pp. (In Bulgarian)

- Porozhanov, K.**, (1989), Dating of the stone anchors with holes from the Bulgarian Black Sea coast. Achievement and problems. – *Archaeology* № 1, 6-15 (in Bulgarian)
- Salkin, A.**, (1991), Underwater archaeological expedition “Kaliakra-90” – *Archaeological Discoveries and Excavations 1990*. Lovech, 76 (in Bulgarian)
- Scarlat, C.**, (1984), Călătorie în adâncuri, Editura Militară, București
- Scarlat, C.**, (1988), Itinerare subacvatice la Istru și Pontul Euxin, Editura Sport-Turism, București
- Sotirov, A.**, (2003), Division of the Bulgarian Black Sea coast according the type of the beach sands and their supplying provinces, *Review of the Bulgarian Geological Society*, vol. 64, part 1-3, 39-43
- Spătaru A.**, (1984), “Research programme for coastal protection works”, *Hydraulics research*, vol XXX, pp 159-214
- Stanchev, H.**, (2009), Studying coastline length through GIS techniques approach: a case of the Bulgarian Black Sea coast, *Compt. Rend. Acad. Bulg. Sci.*, vol. 62, no 4, 507-514
- Stancheva, M.**, (2009), Indicative GIS-based segmentation of the Bulgarian Black Sea coastline for risk assessment, *Compt. Rend. Acad. Bulg. Sci.*, vol. 62, no 10, 1311-1318
- Stancheva, M.**, (2010), Sand Dunes along the Bulgarian Black Sea Coast, *Compt. Rend. Acad. Bulg. Sci.*, vol. 63, no 7, 1037-1048
- Stancheva, M.** (2010), Bulgaria. In: *Coastal Erosion and Protection in Europe, A Comprehensive Overview* – Eds, E. Pranzini, A.T. Williams; ISBN-13: 9781849713399 (ISBN-10: 1849713391), 496 pp, Rutledge Taylor & Francis Group
- Stancheva M., Ungureanu V.G., Stănică A., Caraivan G., Palazov A., Stanchev H., Peychev V.** State of the art of geomorphic coastline classifications: global studies and regional researches along the Bulgarian – Romanian Black Sea coast (submitted to *Problems of Geography*)
- Stănică A., Dan S., Ungureanu G.** (2007), Coastal changes at the Sulina mouth of the Danube River as a result of human activities. *Marine Pollution Bulletin*, 55, p. 555 - 563
- Stănică A., Panin N.**, (2009), Present evolution and future predictions for the deltaic coastal zone between the Sulina and Sf. Gheorghe Danube river mouths (Romania). *Geomorphology*, 107, p. 41 - 46.
- Stănică, A.** (2003), Evolutia geodinamică a litoralului românesc în sectorul Sulina-Sf. Gheorghe și posibilitati de predictie, unpublished PhD. Thesis, Biblioteca Universității București, Facultatea de Geologie și Geofizică, Bucharest p. 120, (in Romanian)
- Toncheva, G.** (1964), Sunken harbours. Varna (in Bulgarian)
- Toncheva, G.** (1973), New data about the trade along the Black Sea coast during XVI-XIV c. BC - Vekove. Vol. 3, 17-24 (in Bulgarian)
- Trayanov, T.** (1969), Anchorages from Bulgarian Black Sea. *Korabostroene i koraboplavane* Vol. 6, 29-31 (in Bulgarian)
- Ungureanu, Gh., Stănică, A.** (2000), Impact of human activities on the evolution of the Romanian Black Sea beaches, *Lakes & Reservoirs: Research and Management* vol 5, pp 111-115
- Velkov, V.** (1984), Dobrudzha during the Late Antiquity (IV-VI c.). In: *History of Dobrudzha*. Vol. 1, 156-173 (in Bulgarian)
- \*\*\* (2006), *Cartea pilot a Mării Negre*, Direcția Hidrografică Maritimă, Constanța
- \*\*\* (2013), [http://ro.wikipedia.org/wiki/Litoralul\\_romanesc](http://ro.wikipedia.org/wiki/Litoralul_romanesc)
- \*\*\* (2006), <http://www.geo-spatial.org/articole/ii-litoralul-romanesc-in-documente-cartografice-perioada-mediievala-ii>. *Litoralul românesc în documente cartografice*. Ștefan Constantinescu. Publicat la 07 Feb 2006 | Secțiunea: [Articole](#). Categoria: [Cartografie](#)/
- \*\*\*[http://www.balkanolidays.co.uk/holiday\\_destinations/summer\\_holidays/bulgaria/bourgas\\_area/nesebar/index.html?aport=BFS](http://www.balkanolidays.co.uk/holiday_destinations/summer_holidays/bulgaria/bourgas_area/nesebar/index.html?aport=BFS)
- \*\*\*<http://www.unesco.org/new/en/culture/themes/underwater-cultural-heritage/2001-convention/>
- \*\*\*[http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CLT/UNDERWATER/pdf/Infokit\\_en\\_Final.pdf](http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CLT/UNDERWATER/pdf/Infokit_en_Final.pdf)
- \*\*\*<http://www.unesco.org/new/en/culture/themes/underwater-cultural-heritage/>
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