

EASTERN PART OF THE BLACK SEA

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ABSTRACT

The article was written during the meteorology and oceanography classes conducted at the Polish Naval Academy in Gdynia as part of the term paper task, and during the ERASMUS+ program.

It is an intercontinental sea, located between southern Europe East and Asia Mi-nor. Through the Bosphorus straits system, the Marmara-Dardanelles communicate with the Mediterranean Sea and further with the planetary ocean, and through the Kerch Strait with Azov Sea, which is an annex of the Black Sea.

The Black Sea is poor in the islands, with a slightly laced shore. The most important islands are the Serpent Island and those formed by the Danube, beyond the spill, like the Great Sacalin Island. The most important peninsula is the Crimean Peninsula, "shared" with the Sea of Azov. The Black Sea bays are either wide, not suitable for stormy vessels (such as Burgas Bay, Varna Bay, Sinop Bay, Samsun Bay), either clogged at the exit by horizontal currents or turned into the river. The mediolateral floor of the Black Sea, including the wave breaking area (0–0.5 m deep), shelters in the rocky portions organisms, animals and vegetas, that strongly fix and can withstand some drying periods. Some major cities are located on the Black Sea, such as Burgas, Varna, Constanta, Odessa, Yalta, Sevastopol, Sochi, Suhumi and Trabzon. In Roman times the sea was called Pontus Euxinus.

Keywords:

Black Sea, bays, strait, peninsula, mediolateral floor.

INTRODUCTION

Let's begin with some history: The name of the sea was for the first-time mentioned by the Cimmerians and the Scythians who called it "Axaina", which means "dark blue". The Greeks who colonized the region named it "Pontos Euxeinus", or "welcoming sea", perhaps borrowing phonetically from the name "Axaina". Later on, the Romans transcribed the sea's name as "Pontus Euxinus", while also using the term "Mare Scythicum". During the Middle Ages, the sea was referred to as "Μεγάλη Θάλασσα" ("Megali thalassa"), meaning "The Great Sea" in Romanian and "Mare Maggiore" in Genoese Italian, and "Καικίας Θάλασσα" ("Chechias thalassa"), or "the sea of the northeast wind", which was translated into Bulgarian as "more Сесил" ("blind" or "closed sea"). Venetian maps and the chronicles of Wavrin and Villehardouin also contain these names.

The term "Black Sea" emerged in the 15th century when the Ottoman Empire expanded, and there are three possible explanations for its origin, although all three are disputed. The most widely accepted but unverified theory suggests that the sea was named Black due to its color during bad weather, although this applies to all seas. Another theory, popular among Anglo-Saxon sources, claims that "Black" is a translation of the Scythian word "axaina". The final hypothesis is that the name was given by the Seljuk Turks and later adopted by the Ottomans, who associated the color black with the north. They called the North Sea the Black Sea, and this term was subsequently translated into Russian, Romanian, and Bulgarian when these peoples regained access to the sea.

GEOGRAPHICAL CHARACTERISTICS

The Black Sea is an inland Sea located in Eurasia. It covers an area of 423,488 km². The deepest point is located at around 2,212 m below sea. Tides are generally of small amplitude (about 12 cm). The average salinity of the Black Sea is around 18 parts per thousand (ppt) or 1.8% salinity. However, it is important to note that salinity in the Black Sea can vary depending on factors such as location, depth, and time of year. The salinity in the Black Sea is relatively low compared to other seas and oceans, as it receives significant freshwater inflow from rivers, particularly the Danube and Dnieper rivers, which reduce its overall salinity. The Black Sea is, hydrologically speaking, a remnant of the Sarmatian Sea and presents a series of unique aspects in the world: brackish water (on average 16–18 grams of salt per liter compared to 34–37 in other seas and oceans), stratification between oxygenated surface waters and anoxic deep waters.

The map below underlines the Black Sea's geographical position and the neighbouring states: Bulgaria, Romania, Moldova which are delimiting it to the West, Ukraine to the North, Russia – northeastern part, Georgia to the east part and Turkey to the south – southeastern part. During this article we will focus to the East-ern part of the Black Sea, which is the area framed by Russia, Georgia, and Turkey.



Fig. 1. Black Sea and its neighbouring states

THE GEOSTRATEGIC IMPORTANCE OF THE BLACK SEA

Geographically speaking, the Black Sea is a semi-enclosed bay. The Mediterranean Sea, connected to it by the Bosphorus straits (between the Black Sea and the Marmara Sea) and the Dardanelles (between the Marmara Sea and the Aegean, as part of the Mediterranean Sea). They are, legally, under the control of Turkey (established by the Treaty of Montreux, Switzerland, 1936). After all the in history the sea had been a Greek, Roman, Turkish lake, it was for a time and a Russian lake.

Thus, to the discontent of some great naval powers, Turkey may allow or prohibit the passage of ships through the straits, especially military ships, and access to large warships (aircraft carriers, liner ships, heavy cruisers, nuclear submarines, seas Troop carriers etc.) is prohibited in the Black Sea.

Anyway, it would be very dangerous for them to act in the Black Sea because they could be caught, trapped, and submerged. As a result, forces and means planes and missiles, intended for the operations of the

great powers in this area, they must be located in military bases in allied riparian countries.

Turkey plans to build an artificial canal for the country navigation between the Black Sea and the Aegean Sea, somewhat parallel to the route naturally existing, the role of which is not yet clear. Apparently, it is for decongestion of shipping and avoidance of repeated naval disasters in the Istanbul area, but it is also possible to lead to changes in maritime law passing or others. The Turks built over the Bosphorus three gigantic bridges, and they also plan to build a submarine tunnel to complete land connections between the two sides of Istanbul, respectively Europe and Asia.

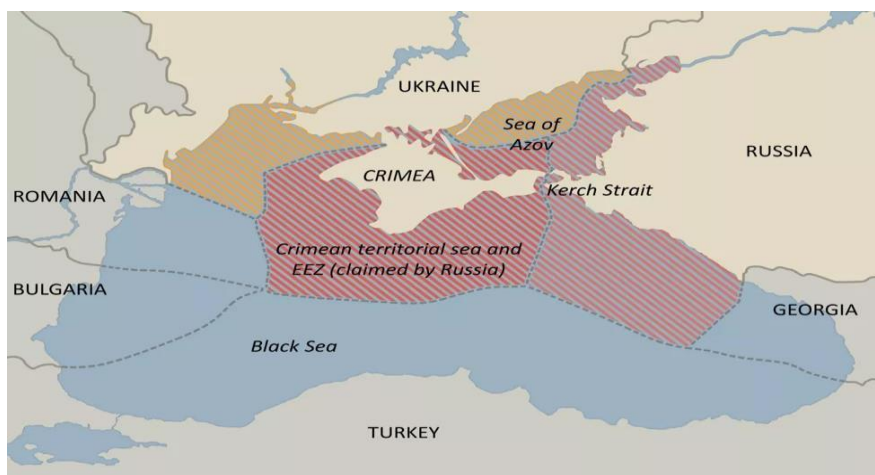


Fig. 2. Responsibility zone for each state bordering the Black Sea

CHEMICAL CHARACTERISTICS

The Black Sea has a special chemistry that distinguishes it from any other sea on the planet. What makes it special is that while other seas and oceans contain oxygen dissolved in their waters, in the Black Sea there is no oxygen below the depth of 100 m. Moreover, abiotic water (without oxygen) has a high concentration of hydrogen sulfide, a highly poisonous gas with the smell of rotten eggs. Except for highly adapted forms of life, plants and animals cannot survive under abiotic conditions. Hydrogen sulfide is also very fatal for humans. Surface waters of the sea have a lower density than abiotic deep layers because they are warmer and have a lower salinity. Fortunately for life in the Black Sea, this density difference prevents abiotic waters from reaching the surface of the sea.

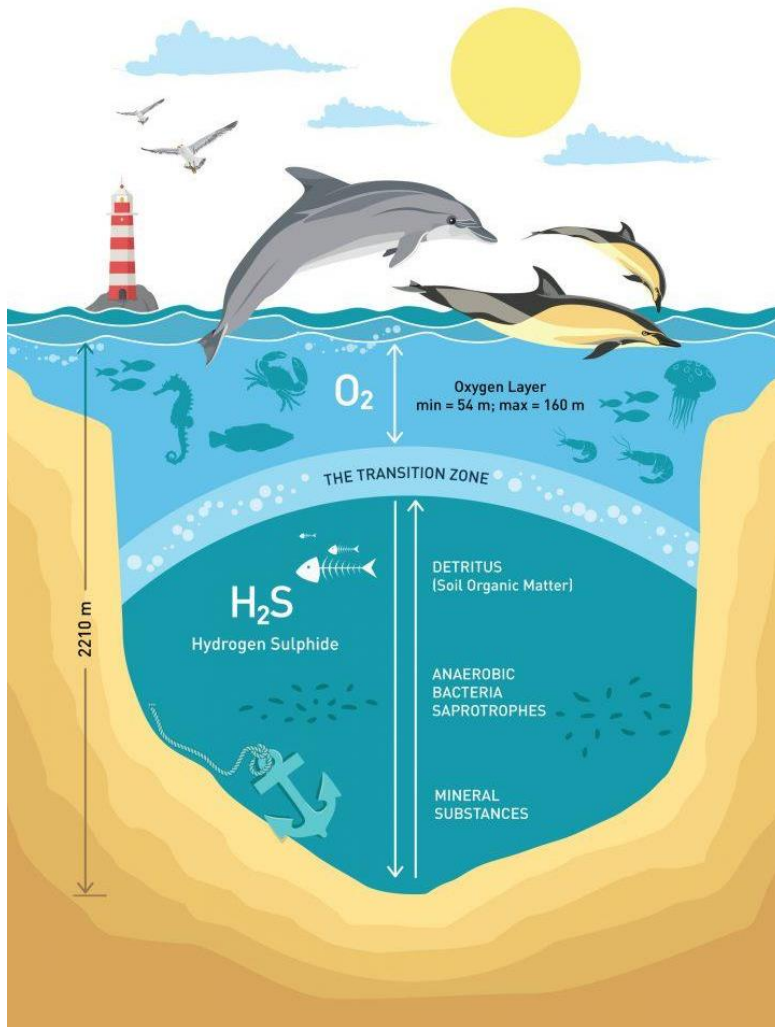


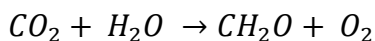
Fig. 3. Black Sea's Layers

The deep waters of the Black Sea are composed of water that comes from the Mediterranean Sea and passed through the Dardanelles and Bosphorus. The Bosphorus also has two layers, one of water surface coming out of the Black Sea and one of deep water from the Mediterranean Sea. The Bosphorus has a depth of only 50 m (even less in some places) and a width of 700 m, and the water entering the Mediterranean flows into the deepest part of the Black Sea, almost 2 km below. For the deep layer of the Black Sea – almost 95% of the volume of the sea – this incoming water is the only source of oxygen and new water can stay deep for 1,000 years before reaching the surface again and re-entering the circuit to the Mediterranean.

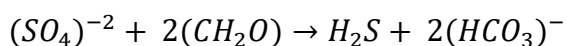
Plants use solar energy to convert carbon dioxide into organic matter and oxygen, a process known as photosynthesis. At night, the reverse process of breathing takes place, and some oxygen is consumed.

The same process occurs at the level of floating plants – phytoplankton – on the high seas or algae in the coastal area. The photosynthesis equation, without which there would be no oxygen in our atmosphere, is written as follows (living beings)

PHOTOSYNTHESIS



BREATHING



There are many fascinating processes going on in the depths of the Black Sea. The environment seems to resemble that of the early ocean before the presence of oxygen in the atmosphere, and therefore attracts the interest of researchers. Sediments at the bottom of the Black Sea, for example, contain rich deposits of frozen methane (methane hydrates) at low temperatures and high pressure at deep sea.

CHEMICAL POLLUTION

Pollution occurs when chemicals or energy (noise or heat), discharged into the environment, affect any form of life, or decrease the value of the environment for people (for landscaping or other destinations).

There is evidence that many rivers that flow into the Black Sea were heavily polluted in the decade between 1970 and 1980. Some of the sources of pollution, heavy industry, or agrochemical factories, such as pesticide-producing ones, are now closed due to the economic collapse that affected many countries after 1990.

Oil transport through the Black Sea has increased greatly and there is a constant risk of pollution from spills due to accidents and mishandling.

Table 1. Pollution

CATEGORY OF POLLUTANTS	SOURCE	SITUATION IN THE BLACK SEA
<ul style="list-style-type: none"> • Pesticides; • Solvents; • Dioxin (from burning plastic); • Polyaromatic hydrocarbons (PAHS) 	<p>Agriculture</p> <p>Pesticides are sometimes used in large quantities to kill harmful insects or to destroy weeds and mushroom facias</p> <ul style="list-style-type: none"> • Industry <p>The industrial process uses and produces thousands of different chemicals.</p>	<p>It is very difficult and expensive to measure the concentration of organic chemicals that can cause pollution.</p> <p>We know little about their concentration and distribution in the Black Sea</p>
<ul style="list-style-type: none"> • The presence of garbage in the sea is a major problem because it threatens the living creatures and their habitat 	<p>Storage of urban and ship-generated garbage</p> <p>Garbage comes mainly from discarded packaging from households or industry</p>	<p>Many of the beaches around the Black Sea are full of garbage, they come from improper arrangements for storing urban garbage, garbage from ships or because of the negligence of citizens</p>
<ul style="list-style-type: none"> • Crude oil contains thousands of hydrocarbons. These are compounds of carbon and hydrogen that can be saturated, unsaturated or aromatic 	<ul style="list-style-type: none"> • Shipping <p>Most of the crude oil on ships does not come from large spills but from small, more frequent spills due to ballast water discharge, washing tanks and bilge</p> <ul style="list-style-type: none"> • Production and refining <p>Oil-based lubricants are also used in oil or gas drilling machines. It has a major local impact</p>	<p>Many provide mite discharges from shipping (emptying ballast tanks seems to be a major problem).</p> <p>Urban sewerage and industrial waste thrown into rivers and seas. Large quantities of crude oil enter the sea with the waters of the rivers that flow here, but the same phenomenon occurs in coastal cities as well</p>

PORTS

The main ports in eastern part of the Black Sea are:

- **GEORGIA:**
 - **Poti Port**



Fig. 4. Poti Port

- **Batumi Port**



Fig. 5. Batumi Port

- **RUSSIA**

- **Novorossiysk Port**



Fig. 6. Novorossiysk Port

- **Sochi Port**



Fig. 7. Sochi Port

- **TURKEY**

- **Trabzon Port**



Fig. 8. Trabzon Port

- **Samsun Port**



Fig. 9. Samsun Port

RIVERS

GEORGIA - There are several rivers in Georgia that flow into the Black Sea. The two main rivers are the *Rioni River* and the *Enguri River*.

Rioni River: The Rioni River is the longest river in Georgia, with a length of about 333 km. It originates in the Greater Caucasus Mountains and flows westward through western Georgia, passing through the cities of Kutaisi and Poti, before finally emptying into the Black Sea near the town of Zugdidi.



Fig. 10. Rioni River

Enguri River: The Enguri River is another significant river in Georgia that flows into the Black Sea. It originates in the Greater Caucasus Mountains and forms part of the border between Georgia and Abkhazia, a breakaway region of Georgia.



Fig. 11. Enguri River

TURKEY - There are several rivers in Turkey that flow into the Black Sea. Some of the major rivers that originate in Turkey and empty into the Black Sea are:

Kizilirmak River: Also known as the "Red River," Kizilirmak is the longest river entirely within Turkey and flows about 1,355 km before reaching the Black Sea.



Fig. 12. Kizilirmak River

Yesilirmak River: Also known as the "Green River," Yesilirmak is another major river in Turkey that flows into the Black Sea. It originates in northern Turkey, near the city of Sivas, and flows about 519 km before reaching the Black Sea.



Fig. 13. Yesilirmak River

Sakarya River: Sakarya River is the third longest river in Turkey and flows into the Black Sea. It originates in central Turkey, near the city of Eskisehir, and flows about 824 km before reaching the Black Sea.



Fig. 14. Sakarya River

RUSSIA - There are several rivers in Russia that flow into the Black Sea. Some of the major rivers that originate in Russia and empty into the Black Sea are:

Dniester River: The Dniester River is a major river in Eastern Europe and flows through Ukraine and Moldova before forming part of the border between Ukraine and Romania, and ultimately emptying into the Black Sea. A small portion of the Dniester River also forms part of the border between Russia and Ukraine before it reaches the Black Sea.



Fig. 15. Dniester River

Kuban River: The Kuban River is a river in Russia that flows into the Black Sea, originating in the Caucasus Mountains. It flows through the regions of Karachay-Cherkessia, Kabardino-Balkaria, and Krasnodar Krai, and passes through the city of Krasnodar before emptying into the Black Sea near the city of Temryuk.



Fig. 16. Kuban River

STRAITS

The Kerch Strait is a narrow waterway that connects the Black Sea and the Sea of Azov, separating the Crimean Peninsula from Russia's Taman Peninsula. The strait is named after the nearby city of Kerch, which is located on the eastern coast of the Crimean Peninsula.

The Kerch Strait is an important shipping route for both Russia and Ukraine, as it provides access to the Sea of Azov and its ports. In recent years, the strait has been the site of political tensions between Russia and Ukraine, as Russia annexed the Crimean Peninsula in 2014 and has since increased its military presence in the region. In addition to its geopolitical importance, the Kerch Strait is also known for its natural beauty and historical significance.

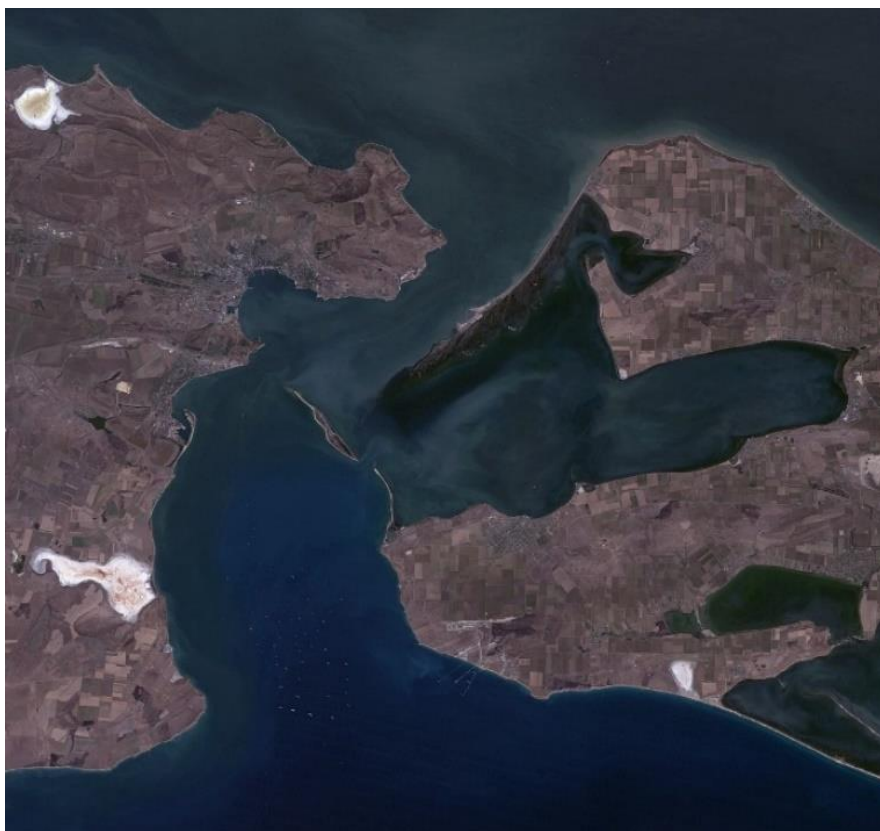


Fig. 17. Kerch Strait

FAUNA

The fauna of the Black Sea was formed during the evolution of the basin, from the Sarmatic Sea to this day. This is why the present fauna contains Sarmatic relics, Mediterranean species, Atlantic species, Indo-Pacific species and sweet species.



Fig. 18. The common dolphin (*Delphinus delphis ponticus*)

It populates mostly the waters of continental shelves. The maximum frequency is recorded in the waters of Crimea, Bulgaria and Turkey.

It has a length between 1.5–1.8 m and a weight of up to 55 kg, in exceptional cases, reaching 100 kg. The life span of the species is 22 years (males) and 20 years (females). It lives along the coast, at a small depth.



Fig. 19. Actinia

Is a genus of sea anemones in the family Actiniidae. Actinia display a rare form of heteromorphosis in which a cut inflicted on a specimen can develop into a second mouth.



Fig. 20. Sea horseman (*Hippocampus guttulatus*)

It is 8–18 cm marine fish of the Syngnathidae family. It lives near the ribs, at small depths, among algae bushes or sea grass.



Fig. 21. The little Gobus

The Gobus species lives in deep waters, so that it can hide from coastal vegetation, shrimp and cliffs. There are ten species of gobies in the Black Sea that differ from each other. The main characteristic of this fish type

is that it quickly adapts to various changes and can alter its color. Changing the color helps them disguise the area they are in at the time.



Fig. 22. Sturgeon

They are found only in the Northern Hemisphere, being present especially in the Black Sea and Caspian Sea, much rarer in the waters of Western Europe (especially the stream), from where they migrate to the corresponding rivers.

Sturgeons are fished for meat, black eggs and their glue: Overexploitation of natural stocks has ditched them, and more species are now grown in fish farming enterprise.

FLORA

The Black Sea vegetation consists of associations of plants, algae of different sizes and colors and sea grass the only plant with flowers in sea waters on the seaside sands appears the seaside vegetation.



Fig. 23. Algae

Sea grass is a diverse group of the kingdom of Protista, the kingdom of Plantae, and some organisms of the kingdom of Monera.

SOME TRADITIONS IN EASTERN BLACK SEA REGION



Fig. 24. Location map of the Eastern Black Sea Region

People of the Eastern Black Sea region, especially those living in rural areas, have to work very hard to make a living. Therefore, they have a very active and vibrant lifestyle. This lifestyle of the people has also made impact on the local music and dance. For instance, the music

played with “Tulum” and “Kemençe”, two local instruments of the area, is very active and alive.



Fig. 25. Tulum instrument

Tulum is a musical instrument like Scottish bagpipe, which is made up of goat skin. A blowing pipe called “lülük” is attached to one of the two fore legs of animal skin to blow the Tulum. In the same way, the instrument like reed pipe called as “nav” which produces twofold whistle, is attached to one of the back legs of animal skin. The top of Tulum is covered with beautiful and embroidered fabrics to make it nice-looking.

Folk dances of the Eastern Black Sea Region are most active and live as compared to local dances of other regions in Turkey. This extremely lively dance, on the music of Tulum and Kemençe, is called “Horon” in local language.

The most important feature is that everyone participates in this dance including young and old, men and women, holding hands together in a circle while an experienced person in the group directs the dance.

Everyone who participates in the dance sings songs accompanied with melody of the music.



Fig. 26. Kemence instrument

DID YOU KNOW THAT

- The Black Sea consists of two superimposed seas. This is an amazing phenomenon and very rare! The first 200 meters of its depth, totaling 10% of the total volume of the Black Sea, represent waters containing life. From 200 meters below, begins a dead, lifeless sea, very rich in hydrogen sulfide. Only the upper layer of the sea (up to 150–200 m deep) supports life in the Black Sea.
- due to the fact that oxygen does not reach the bottom of our sea, all the wrecks that have sunk here are in a perfect state of conservation?
- the Black Sea receives water from the Mediterranean Sea through an underground river that brings very salty water and many sediments from the Mediterranean basin. This underwater river is the

first discovered of its kind in Europe. If it had flowed on land, it would have been the sixth river in the world. It has a flow rate 350 times that of the Thames and flows through a bed that has a maximum depth of 35 m and a width of 800 m in places.

- in the old days, seals lived in our sea, but they disappeared due to excessive hunting.
- in the Black Sea there are also sharks, it is a small species, called the sea dog?
- the fauna of the Black Sea was once much richer.
- Hundreds of species have disappeared, and another 160 species of plants and small coastal creatures are now on the verge of extinction.
- dolphins once had prosperous colonies of millions of members in the Black Sea sea? In 2006, it had reached tens of thousands of copies. After the measures to protect the species of dolphins, their number increased, but not enough to populate the sea as before.
- huge waves can also form in the Black Sea?
- In the early 1990s, due to an earthquake of 7.2 on the Richter scale, waves over 5 m high formed to the shore.

SUMMARY

In conclusion, the Black Sea is a unique water basin in the world, with a great history and lots of mysteries. The waters of the Black Sea have all the characteristics of brackish waters, they have a large variability of total salinity in correlation with the surface, depth, and season. It also has an enormous importance for the countries which are bordering it, and even for the rest of the world because of the communication with Mediterranean Sea. Nowadays, when the peace of the world is put to a hard test, we must entrust in the Black Sea and its potential to be a vital region for world well-being.

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