

THE BLACK SEA IN ROMANIAN OCEANOGRAPHIC RESEARCH

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Abstract. Romania, as a maritime state, after being separated from the Black Sea coast for 400 years, until the War of Independence in 1877, has a tradition in the marine sciences for over 100 years. The illustrious ancestors of Romanian oceanography, especially biological oceanography, are Emil Racoviță, Grigore Antipa and Ioan Borcea. From an oceanographic point of view, E. Racovitza distinguished himself as a biologist of the famous Antarctic multinational expedition, under the command of Captain Adrien de Gerlache, from Belgium, aboard the vessel *Belgica*, between 1907 and 1909. G. Antipa is the founder of the Bio-Oceanographic Institute in Constanța (1932) and of the Biological Research Station in Caliacra (currently in Bulgaria) and in this context he held the positions of organizer, general administrator and director general of the State Fisheries, as the second national delegate of Romania at the International Commission for the Scientific Exploration of the Mediterranean Sea (CIESM), and as rapporteur for the Black Sea, Marmara and the Eastern Mediterranean, as well as organizer of the first Congress and General Assembly of CIESM in Romania in Bucharest in 1935. I. Borcea's main scientific achievement is the creation of the Marine Zoological Station in Agigea, in 1926, which bears his name to this day, with the maintenance of close collaborative relations in the field of marine biology, especially with France and Italy. The main marine research institutions, namely the Marine Zoological Station "Professor Ioan Borcea", the Bio-Oceanographic Institute, which later became the Fisheries Research Station "Dr. Grigore Antipa", the Marine Biology Sector from Constanța of the "Traian Săvulescu" Institute of Biology from Bucharest, the Oceanographic Research Station from Constanța and Sulina and the Marine Sedimentology Laboratory, affiliated to the Geological Institute of Romania, merged into the Romanian Marine Research Institute (RMRI) from Constanța on March 1, 1970. The successor of RMRI since 1990 is the National Institute for Marine Research and Development "Grigore Antipa", in the same headquarters (Bd. Mamaia No. 300, RO-900581 Constanța). A definite confirmation of the value of the results of the Romanian marine research, over time, is, among others, the close professional relationships with CIESM, continued to the present. Thus, Romania has further promoted and supports marine research at national, regional and international level.

Keywords: The Black Sea, Romania, National Institute for Marine Research and Development "Grigore Antipa" Constanța, oceanography, R-D-I

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INTRODUCTION

The name of the Pontic basin comes from the double name: Pontus Euxinus in antiquity and the Black Sea in modern times, both having a common and analogous source. The ancient peoples knew the Iranian term *akhšaena*, meaning "dark", "gloomy", "black". Sailing in the Black Sea, the Greeks took from the natives the word *akhšaena*, for the insufficiently known sea at first as *Pontos axeinos* (inhospitable sea), an ominous name which they later replaced with *Pontos euxinos* (friendly sea), as the Storm Head will later become the Head of Good Hope. The Romans emphasized the word *pontus*, which characterizes the sea in general. Westerners, who entered this sea after the Mongol conquests, named it *Mare Majus*, *Mar Maggiore* or *Mer Maiour*, the greatest sea, instead of the Black Sea. The name of the Greatest Sea was taken over by Italian sailors from the Jews. In the cartographic documents, portolans (nautical charts), the Black Sea appears with the same name (Abulafia, 2014).

The name was also taken over by the chancellery of the first rulers of Muntenia and Moldavia, as the "great sea" appearing as the extreme limit of the possessions held at the end of the 14th century. Since then, it returns to the color connotation. In Greek *mavri thalassa* appeared since 1265 in the treaty with Venice, and *Mare Nigrum* appears from 1338. The present name *Black Sea* (Marea Neagră in Romanian) is identical in all the languages of the six coastal states: Черное море (Russian), Чорне море (Ukrainian), Черно море (Bulgarian), სვო ზღვა (georgian), Kara Deniz (Turkish), respectively.

The geographical position of the Black Sea, a *turntable* between East and West, at the intersection of civilizations, the importance of coastal states, close, or more distant that have economic, political and geostrategic interests here, attracted the attention of researchers in various fields (Fig. 1).



Fig. 1 Relations of scientific cooperation in the Black Sea at present (Boșneagu, 2021)

There are very valuable bibliographical references about the *history and geopolitics* of the Black Sea and with express references to the related Romanian space (e.g. Brătianu, 1988; Marin, 2005; Cristea and Papacostea, 2006; Papacostea and Ciocâltan, 2007; Fati, 2016; Marin *et al.*, 2022).

Currently, the maritime area of Romania has approximately 20,000 km² (https://ro.Wikipedia.org/wiki/Black_Sea#The_Sea_Space_of_Romania) consisting of (Fig. 2):

- inland waters – 753 km²,
- territorial sea – 4,487 km²,
- contiguous area – 4,460 km², and
- exclusive economic zone – 10,300 km².

Serpent Island (Călinescu, 1931; Pădureanu, 2004; (https://ro.wikipedia.org/wiki/Insula_Șerpilor) is an island in the Black Sea, 45 km from the shores of Romania and Ukraine, near Musura Bay (Fig. 3).

The International Court of Justice in The Hague ruled in 2009 that Romania has 9,700 km² of the continental shelf near the island, although the territorial claims of both states in disagreement (Romania and Ukraine) were significantly higher (Manea, 2004); it is noted to be the first and only extension of sovereign jurisdiction and sovereign rights of Romania after the Great Union of 1918 (https://ro.wikipedia.org/wiki/Insula_Șerpilor-decizie-favorabila-romaniei).

The increasingly thorough and complex research of the marine environment has known a spectacular evolution since the XIXth century, sharing a high human expertise and material and financial means, absolutely necessary to explore this fascinating and still incompletely discovered environment, with visions on the future of the seas and oceans of the world (e.g. Malița and Băcescu, 1980).



Fig. 2 The maritime space of Romania
(in blue, the territorial waters and the exclusive economic zone
of Romania in the Black Sea)
(https://ro.Wikipedia.org/wiki/Black_Sea#The_Sea_Space_of_Romania)



Fig. 3 Serpent Island in the Black Sea
(Source: <https://www.dw.com/ro/insulaSerpilor-decizie-favorabila-romaniei>)

THE BLACK SEA

In the most succinct and inspired definition, the Russian oceanographer Nikolai M. Knipovich considered the Black Sea (Fig. 4) an *unicum hydrobiologicum* (Knipovich, 1933).



Fig. 4 The Black Sea
(Source: <https://ro.wikipedia.org/wiki/Marea-Neagra>)

The Romanian naval Commander Alexandru Cătuneanu coordinated all the measurements that led to the first map of the Romanian Black Sea coast (Fig. 5), being awarded the gold medal at the Universal Exhibition in Paris, in 1900. The hydrographic document had been printed at the specialized of the French Ministry of the Navy and was then engraved on a copper plate by a well-known French engraver, Ettiene Delaune. In June 1904, 1000 printed copies arrived in Romania, accompanied by the engraved plaque. This map achieved in the XIXth century, was used to navigate until 1952 (Ionescu, 2016).

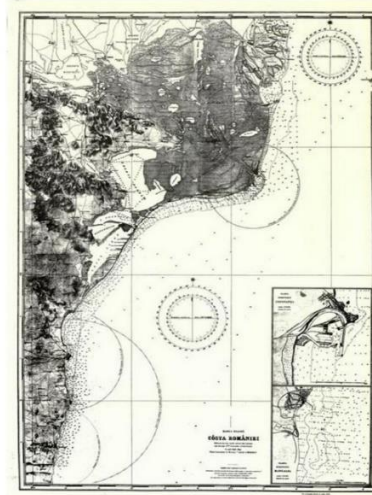


Fig. 5 The Alexandru Cătuneanu map from 1927
(Direcția Hidrografică Maritimă Constanța)

The Black Sea, an annex of the Mediterranean Sea from an oceanographic point of view, was "rediscovered" by contemporaries in its vast ecological, environmental and geopolitical issues, after 1990.

The Romanian Black Sea coast stretches for 245 km from the natural border with Ukraine (the Chilia arm of the Danube) to the north, to the border with Bulgaria to the south.

Compared to the approximately double total of 455 km, during Greater Romania, with the coast afferent to Bessarabia - Cetatea Albă and Izmail county from the Dniester estuary to the Chilia arm (currently Ukraine) of about 100 km and Caliacra county (currently Bulgaria) about 110 km (Fig. 6).



Fig. 6 Map of Great Romania including the entire sea coast
(Șiaicariu and Constantinescu, 1920)

The northern part, 165 km long, is an alluvial formation of low sandy beaches, supported by sand dunes and the Danube Delta. After Cape Midia the shore becomes rocky with cliffs descending steeply to the sea. The coastal area extends inland to the eastern bank of the Danube and is administered by the counties of Tulcea in the north and Constanța in the south.

The Black Sea is the largest intercontinental sea, with low tide and salt water in the world (Bologa, 2001, 2012).

The Black Sea general physical and chemical characteristics consists of the following:

- a large continental shelf of 144,000 km² (25%),
- high freshwater input with increased levels of nutrients and photoabsorbant detritus (e.g. 400 km³/year, 70 % on the north-western shelf, due to the Danube, Dnieper, Dniester, Bug, and Kuban rivers),
- the existence of cyclonic current systems (i.e., defining or characterizing the eastern and western halistatic zones having more stable salinity horizons),
- a weak horizontal water mass exchange with the Mediterranean through the Bosphorus strait (about 100 m deep),
- a marked increase in water density with depth between 0-200 m, (i.e., practically no vertical mixing between the deep and shallow layer),
- the highest anoxic volume (90%) due to the highest H₂S content in the entire World Ocean,
- large spatial and temporal variabilities of physical and chemical properties (e.g., especially in the northwest corner),
- separation of the water column in an upper ozygenated, biotic layer and a deeper anoxic, abiotic one containg hydrogen sulphide (H₂S), separated at a depth of about 150-200 m,
- salinities about half of those known in the World's Ocean from 18 to 19‰ at 2,000 m depth,
- high levels of nutrients (nitrogen and phosphates) and photoabsorbent detritus,
- a pronounced degree of eutrophication,
- slightly different ionic ratios of seawater from the rest of the marine and oceanic areas (e.g. more calcium (Ca²⁺), manganese (Mg²⁺), bicarbonate (HCO³⁻) and sulphate (SO²⁻).

The Black Sea ecosystem, especially its northwestern sector, continues to face severe environmental damage consisting mainly of coastal erosion, eutrophication, and long-term ecological changes, including the decline of biological diversity and living resources (Bologa *et al.*, 1994).

FOUNDERS OF ROMANIAN MARINE RESEARCH

Emil Racovitza (1878-1047)

Emil Racovitza (b. November 15, 1868, Iași - d. November 17, 1947, Cluj) (Fig. 7), Romanian biologist, explorer, speleologist and scientist, the founder of biospeleology (the study of underground fauna in caves and groundwaters). He was elected academician in 1920. President of the Romanian Academy between 1926 and 1929 (Murariu, 2011; http://wikipedia.org/wiki/Emil_Racovița).

Member of France Zoological Society.

He was recommended to participate as a naturalist in the Belgian Antarctic expedition (1897-1899) aboard the *Belgica*, led by Captain Adrien de Gerlache.

During the Antarctic expedition, Emil Racovitza had the opportunity to study the life of penguin and huge aquatic mammals; he remained in the history of science also as the discoverer of the beaked whale.



Fig. 7 Emil Racovitza

Thanks to the outstanding personality of E. Racovitza, Romania has officially joined the International Commission for the Scientific Exploration of the Mediterranean Sea (CIESM) in 1925.

Grigore Antipa (1867-1944)

Grigore Antipa (b. November 27, 1867 (b. November 27, 1867, Botoșani - d. March 9, 1944, Bucharest) (Fig. 8), disciple of Ernst Haeckel, biologist, zoologist, ichthyologist, ecologist, oceanologist, doctor of biological sciences, professor, full member of the Romanian Academy.



Fig. 8 Grigore Antipa

Founder of the National Museum of Natural History in Bucharest in 1908.

Initiator of indigenous research on the Danube, the Danube Delta and the Black Sea.

Organizer of the first Romanian research cruise in the Black Sea, on board the cruiser

of the Romanian Royal Navy Elisabeta in 1983, 1984 and 1985.

Founder of the Bio-Oceanographic Institute in Constanța în 1932 and of the Marine Research Station from Cape Caliacra in the Quadrilateral (now Bulgaria) in 1940.

Founder of the Romanian school of hydrobiology and ichthyology.

Co-founder of the national biological oceanography.

Organizer, general administrator and director general of the State Fisheries.

Author of the monograph *The Black Sea - volume 1 Oceanography, bionomy and general biology* (1941).

Creator of the concept of “diorama”.

Generously recommended by E. Racovitza, he became his successor as second National Delegate of Romania to CIESM, subsequently its Vice-president and Rapporteur for the Black

Sea, Marmara and East-Mediterranean Sea / Aegean Sea.

Organizer of the Xth Congress and General assembly of CIESM in Bucharest-Constantza (1935) and a distinguished forerunner of a remarkable fruitful scientific co-operation of Romania with this first, prolific and longevous European marine R&D organization devoted to the Mediterranean and Black Sea.

Member of the Oceanographic Institute of Paris.

Ioan Borcea (1879-1936)

Ioan Borcea (b. Buhoci, county Bacău, January 13, 1879 - d. Agigea, county Constanța, July 30, 1936) (Fig. 9), Romanian zoologist, corresponding member of the Romanian

Academy, specialist in Black Sea fauna, who dedicated his life to the knowledge of marine ecosystems, co-founder of Romanian biological oceanography, founder of the Marine Zoological Station at Agigea, corresponding member of the Romanian Academy, co-founder and full member of the Academy of Sciences (currently Romanian Academy of Scientists), freemason, dignitary of the Dimitrie Cantemir Lodge in Iași, which he represented at the solemn meeting in Iași of the United Romanian Freemasonry.



Fig. 9 Ioan Borcea

Dean of the Faculty of Sciences of the University of Iași.

His major achievement, which has survived to the present day, consist of the founding of the Marine Zoological Station, at Agigea (Constanța), in 1926 (Bologa, 1996, 2004a, b, 2014; Bologa *et al.*, 2013, Bologa și Bavaru, 2018). He was the director of this Station in his last 10 years of life, until his untimely death, in full creative force. Thus, he is one of the creators of the Romanian biological oceanography. The various results obtained by I. Borcea and his collaborators at this Station brought him a rapid fame in Romania and abroad, especially in France and Italy.

Director of the Museum of Natural History in Iași (1912-1936).

Minister of Cults and Public Instruction between 1919 and 1920.

Interim Minister of Commerce.

Doctor honoris causa of the University of Montpellier, France (1936).

Maria S. Celan (1898-1989)

Maria S. Celan (Fig. 10) is certainly the most renowned marine algologist in Romania. Doctor of Natural Sciences from the famous Sorbonne University in France. He marked the history of Romanian marine algology through his prodigious didactic and scientific activity carried out uninterruptedly for five decades.



Fig. 10 Maria S. Celan

The main biographical landmarks are included in previously published contributions on the history of science (Bologa, 1987/88, 1989a, b, c, d, 1990b, 1991, 2017, 2018a, b, 2019, 2020; Bologa and Toma, 1988; Mustață and Mustață, 2014; Toma, 1996, 2015; Sava, 2016).

A first documentation and familiarization with botany and especially with the algological flora, in general, took place at the Botanical Institute and at the famous Museum of Natural History in Vienna - Austria.

But the deepening, perfection and professional recognition by the top of French botany really occurred at the Sorbonne Faculty of Science and the National Museum of Natural History in Paris - France.

During her prolific stay in France, Maria Celan visits other Marine Research Stations, e.g. in the Mediterranean, Villefranche and the English Channel, Dinard and Roscoff.

The French Republic awarded him the Doctorate in Natural Sciences (Fig. 11).



Fig. 11 Diploma Doctor of Natural Sciences, Paris, France,
of October 22, 1942 / January 5, 1943

Maria Celan was noticed immediately after graduation by Dr. Grigore Antipa and recommended for employment as soon as possible by Professor Ioan Borcea, at the Marine Zoological Station he founded 15 km south of Constanța, at Agigea, in 1926 (Bologa *et al.*, 2013), as our first marine algologist.

Already the first scientific results allowed her to brilliantly defend a state doctorate at the Sorbonne, with the dissertation "*Recherches cytologiques sur les Algues rouges*" (Celan, 1940/41), completed with a secondary thesis (Celan, 1940). On this occasion, Professor A. Guilliermond mentioned: "... it is certainly one of the best botanical theses defended at the Sorbonne in recent years." He also wrote that the original opera "went far beyond the realm of algology and even botany." (xxx, undated).

M. Celan identified a total of 157 species of marine macrophytes, many new for the Romanian Black Sea coast, some new for the entire Black Sea basin and one representing a new species for science, a red alga (Rhodophyceae) dedicated to one of the her mentors - Grigore Antipa, namely *Gelidiella antipae* (Celan, 1938), highlighted also, for example, in the identification manual *Opredețitel' zelenykh, burykh i krasnykh vodoroslei juzhnykh morei SSSR* (Zinova, 1967).

M. Celan addressed several extensive memoirs to E. Ceausescu, calling for understanding and support on marine research, the rescue of the Marine Zoological Station at Agigea and the protection of the environment, in 1979 and later.

M. Celan will dedicate her scientific research activity mainly, her whole long life, to the study of green, brown and red multicellular seaweeds, as well as vegetal associations, from the Romanian Black Sea coast (Bologa, 1987/88).

Ileana Cautiș (1921-2020)

Ileana Cautiș (Fig. 12) was a doctor of fish engineering and distinguished principal scientific researcher, author for over two decades of investigating the ichthyofauna of the Romanian Black Sea coast and the northwestern African coast of the Atlantic Ocean.



Fig. 12 Ileana Cautiș

Dr. Eng. I. Cautiș, Doctor of fishery engineering and distinguished senior scientific researcher, author for over two decades of investigating the ichthyofauna of the Romanian Black Sea coast and the north-western African coast of the Atlantic Ocean.

Her main *research concerns* aimed at:

- ichthyological research applied to important species in the Black Sea, in particular: sprat, horse makrel, clupeids in general,
- initiator of the study of populations of species of economic importance, especially sprat,
- initiator of the application of statistical variations and mathematical methods in the study of fish populations.

I. Cautiș promoted her doctorate in fish farming at the Polytechnic Institute of Galați with the thesis "Dynamics of sprat populations (*Sprattus sprattus* L.) on the Romanian coast of the Black Sea", in 1970.

Her prolific *international activities* included several most relevant achievements:

- in 1967 (for 2 months) research at the Museum of Natural History in Genoa - Italy, in collaboration with Professor Enrico Tortonese, publishing the results of their joint work in the *Annals* of the institution, as follows:
 - Ricerche morfologiche e comparative alla popolazione di *Sprattus sprattus* vivente nel Mar Ligure,

- Révision des poissons de la famille des Sparidées vivants près des côtes de la Roumanie,

- Les Zeus de la mer Noire (Poissons Zeoformes),

- Les Esturgeons de la mer Noire.

• between 1970 and 1976 she became permanent ichthyologist expert at the annual meetings in Rome in the frame of the Commission Générale des Pêches pour la Méditerranée (CGPM) - FAO,

• between 1971-1976 she attended, as expert ichthyologist the annual meetings in the participating countries, on the annual fishing forecasts in the Atlantic Ocean, within the Fisheries Agreement (Mutual Economic Assistance Council),

• in 1975 she took part in an exchange visit of specialists in the USA organized by the National Ocean and Atmospheric Administration (NOAA) at Providence, Boston, Miami, San Diego and Woods Hole.

Other *concerns* consecrated her as:

- initiator, in collaboration, for applying the method of artificial reproduction of carp, in order to populate the nurseries of intensive growth of this species (1963),

- initiator, in collaboration, in the drafting of *an Atlantic Ocean Fish Guide, North-west area*,

- initiator, in collaboration, of the *Fish on the West African Coast*, I. - 1-229 pp, II - 230-399 pp, III - 400-654 pp.

A complete data on the list of works and photos are given in the volume *History Romanian Ichthyology* (Vasiliu and Manea, 1987).

The perseverance proved continuously in her field of work also targeted the concern for the practical finality of the undertaken research. Thus, she was praised for the value of the results obtained, holding public dignities in scientific bodies of international notoriety. She perfected her professional skills in various study trips and exchanges of experience in Bulgaria (1957), U.S.S.R. (1959), Italy (1967), Libya (1974) and the USA (1975).

As head of laboratory and responsible for scientific topics, although usually with relatively limited funds, she supported and encouraged novel professional aspirations that she coordinated and endorsed.

Indeed, life was harsh with this Lady of Romanian marine ichthyological research, not sparing her from a family drama and other major difficulties.

During one of these visits, she confessed, with her usual modesty, the satisfaction she still felt, after so many years, of being the first researcher to use the mathematical apparatus in ichthyological research in Romania, in her doctoral thesis.

Among other Romanian scientists of national and international notoriety that have studied the Black Sea and the Serpent Island with professionalism, erudition and passion, there are, for example, Raoul Călinescu (Călinescu, 1931), Gheorghe Brătianu (Brătianu, 1988), Nicolae N. Constantinescu (Constantinescu, 1997), who profoundly enriched the knowledge of geography, biology and history of this unique water body, as well as other authors outside Pontus Euxinus.

MARINE RESEARCH STRUCTURES ON THE ROMANIAN SEASHORE, ACTIVATING BEFORE THE FONDATION OF THE ROMANIAN MARINE RESEARCH INSTITUTE IN CONSTANȚA

In the period 1960-1970, on the current total length of the Romanian coast of 245 km, there were five marine research units with different tutelage, each carrying out research activities and programmes, having their own material means and funding. This is it:

- Marine Zoological Station „Professor Ioan Borcea” (founder Ioan Borcea), affiliated to the Ministry of Education (1926-1970),
- Bio-Oceanographic Institute / Fisheries Research Station „Dr. Grigore Antipa” (founder Grigore Antipa), affiliated to the State Ministry of Agriculture and Fisheries (1932-1970),
- Marine biology sector Constanța of Traian Săvulescu” Institute of Biology (founder Academician Mihai C. Băcescu), affiliated to the Romanian Academy (1954-1970),
- Oceanographic Research Stations Constanța and Sulina (Dr. Eng. C. Bondar), affiliated to the State Water Committee (1960-1970),
- Marine Sedimentology Laboratory (founder Academician G. Murgeanu), affiliated to the Geological Institute of Romania (1964-1970).

„Professor Ioan Borcea” Marine Zoological Station (Agigea)

Relevant archival data about the Marine Zoological Station “Professor Ioan Borcea” (Fig. 15) founded at Agigea (15 km south of Constanța) in 1926 are reviewed in chronological order and kept at the Constanta County Service of the State Archives (Stock Nr. 323 / Inventory Nr. 339, files 1/1926-11/1932-1936 și nr. 324), filed chronologically, comprising mainly the following documents (Serviciul Județean al Arhivelor Naționale Constanța, 1926; Bologa, 2014).



Fig. 15 The Marine Biological Station “King Ferdinand I”, later on the Marine Zoological Station “Professor Ioan Borcea”, founded at Agigea (15 km south of Constanța) in 1926

The directors of the Marine Zoological Station “Prof. Ioan Borcea ”from Agigea have been over time:

Ioan Borcea (1926-1936),

Constantin Motaș (1936-1941),

Ioan G. Botez (1941-1949),

Sergiu Cărăușu (1953-1960),

Paul Borcea (1961-1962),

Ion Suciu (1962-1963),

Nicolae Gavrilescu (1964-1966),

Ionel Andriescu (1966-1970),

[RMRI] Nicolae Ionescu, Geza I. Müller, Florica Porumb (1970-1980),

Gheorghe Mustață (1990-2008),

Victor Surugiu (2008-2011),

Mircea Nicoară (2011-2018),

Emanuel Ștefan Baltag (2018 - present).

His wife, Dr. Lucia Leon Borcea, Lecturer at the Laboratory of Medical Natural History of the Faculty of Medicine in Iassy, was transferred as Lecturer to the Marine Biological Station “King Ferdinand I” in Agigea; she requested the issuance of an “*certificate of determination about the circumstances under which my husband Professor Ion Borcea got sick and died*” (which was delivered by the administrator of the Station I. Gavrilescu as document No. 6 / August 12, 1936).

Among those who wrote about the disappearance of the founder was also his successor as manager of the Station, Professor Constantin Motaș (Motaș, 1936): *On the evening of July 30 Professor Ion Borcea from the University of Iassy, founder of the maritime zoological station from Agigea (Constanta county) closed his eyes forever, on the land of Dobrogea, put into shock by a septicemia acquired at the worktable. The scholar from Iași, known in the western scientific circles thanks to his numerous articles in the field of zoology in French, dies aged almost 57year, in full scientific matureness and under so tragic circumstances, which make us*

deplore more his disappearance. ...The creation of this Station constitutes perhaps Professor Borcea's highest achievement. The zoological station from Agigea is for our country and for the University of Iassy, as, for example, is the biological station from Roscoff for France and the Sorbonne. ...By the so untimely death of Professor Borcea the Romanian science has lost one of its most well known representatives; the University "Mihăileana" has lost an eminent professor; the country one of its most worthy sons.

The great Romanian historian Nicolae Iorga wrote (Iorga, 1975): *Professor Ion Borcea has fallen in the battle which he fought for years in order to clarify the mysteries of nature. ... He had reached a Romanian chapter on the knowledge of maritime fauna, and through the fruit of his labors it got richer year by year. ... But we'll be proud whenever a science book will note the enthusiasm and readiness to sacrifice of good Professor Borcea".*

The contemporary written press (*Dobrogea Jună*, 1936) recorded immediately this moment: *"Thursday afternoon Professor I. Borcea former Minister of in the Federation Government and former Director of the Institute [Station] for Maritime Research from Agigea has died in the hospital "Dr. Sion" in Constanta. The death is due to a septicemia caused by a sting of a marine creature which Professor has recently found during his research on the Black Sea fauna. ... his death leaves unanimous regrets".*

Particularly valuable are, inclusively for comparative purposes with the present situation (INCDM, 2013), the regularly gathered data on the fish catches off the Station: *"Mister Director, I have the honor to report that during this week at this station the following fish amounts have been fished: ...; it would certainly be interesting to compare also the past fish price with the present one even if the abundance and frequency of the species along the Romanian Black Sea coast (Atanasiu, 1940; INCDM, 2013) significantly differ nowadays, compared with the period 1920-1940 (e.g. sturgeons, turbot, shad, a.o.): The price was for horse mackerel from 9.50 lei to 15 lei and the blue mackerel was sold between 50 to 90 [lei] kg (Report 28 / July 3, 1927).*

Unfortunately, the frequent presence of the Station's Director and Romanian zoologist at the Marine Zoological Station "Anton Dohrn" in Naples / Italy, traced by the author personally on the occasion of his participation in the 8th International Congress of History of Oceanography, on the premises of the Station and visiting its archives in July, 2008 (Groeben, 2013; Bologa *et al.*, 2013), has not been adequately documented by written material.

Among the Romanian personalities who visited the Station have included, e.g., Dr. R.I. Calinescu from the Descriptive Zoology Laboratory in Bucharest (1935), biologist M. Niculescu-Duvăz (1935), Professors A. Borza, I. Grințescu, I. Popescu-Voitești, I. Nyarady from the University of Cluj (1933), Dr. L. Rodewald from the Zoological Institute of the University of Cernăuți [Czernowitz] (1935),

Professors G. Marinescu and F. Rainer from the Faculty of Medicine in Bucharest (1935), Dr. T. Gane from the Ministry of Labour, Health and Social Care (1936). Foreign guests such as Professor G.E. Palade - Nobel laureate USA, E. Slastenenko - Director of the State Fisheries / USSR, A. Valkanov - Director of the Marine Zoological Station Varna / Bulgaria, Professor H.A. Jack - delegate of the Department Science and Education for the Study of European Maritime Stations / USA, among others, have visited the Station and remained deeply impressed by its contributions, one more reason for the memory of the outstanding merits of Professor I. Borcea up to now.

The Academician Eugen A. Pora has organized in 1969, in collaboration with the Mediterranean Association of Marine Biology (MAMBO), the first international course on brackish water biology, with publication of the lectures in two volumes *Biologie des eaux saumâtres* (Pora, 1977).

The Bio-Oceanographic Institute / Fisheries Research Station „Dr. Grigore Antipa”

The Bio-Oceanographic Institute (Fig. 16) was founded by Dr. Grigore Antipa, in Constanța (entrance to the summer marine resort Mamaia), in 1932.



Fig. 16 Bio-Oceanographic Institute / Fisheries Research Station "Dr. Grigore Antipa"

The documentation on the Fisheries Research Station „Dr. Grigore Antipa” from Constanța is kept at the Constanța County Service of National Archives (Fund No. 340 / Inventory No. 178), filed, chronologically, comprising mainly the following documents (Constanța County Service of National Archives, 1932).

The Marine biology sector of the "Traian Săvulescu" Institute of Biology

About the Marine Biology Sector of the “Traian Săvulescu” Institute of Biology (Fig. 17) no documents or other testimonies have been identified, at least so far. According to Academician Dumitru Murariu, Director General of the institute since 2016, unfortunately, a devastating flood affected in 2014 both the Archive and part of the library's collection, temporarily moved to the basement during the rehabilitation works of the institute's headquarters and equipping laboratories with modern equipment for scientific research.



Fig. 17 The Marine Biology Sector of the Institute of Biology „Traian Săvulescu”

In 1954, under the auspices of the Commission for hydrology, hydrology and ichthyology of the Romanian Academy, the “Traian Săvulescu” Institute of Biology and the Institute of Fisheries Research initiated through the Marine biology sector in Constanța, a complex research regarding the life and environmental conditions from the Black Sea.

Several other scientific research establishments have been set up on the Romanian littoral.

Thus, in 1960, the Hydrotechnical Research Institute created the **Hydrometeorological Station Sulina** (Fig. 18) and soon the Oceanographic Research Station in Constanța.



Fig. 18 The Hydro-meteorological station Sulina

The Institute of Geology in Bucharest created the **Marine Sedimentology Laboratory** in Constanța-Agigea in 1964.

Scientific collaborations with the USSR then allowed not only the deepening of studies on benthal cenology, fish feeding and migration, but also the approach of new areas and living spaces, such as microphyto- and zoobenthos, the prebosporic zone, or the analysis of biological samples collected during marine research campaigns undertaken by other countries. For example, Romanian specialists are co-authors of the *Invertebrate Identification Manual from the Black Sea*, published by the USSR Academy of Sciences (1968, 1969).

The first *bibliographies* on the Romanian research along the Black Sea have been published by the National Commission for UNESCO of the Romanian Academy and by the State Water Committee attached to the Council of Ministers of the S.R. Romania (Băcescu, 1965; Chiriac *et al.*, 1966).

THE "NATIONAL INSTITUTE FOR MARINE RESEARCH AND DEVELOPMENT "GRIGORE ANTIPA"

About the Romanian Marine Research Institute

Between 1960 and 1970, along the 245 km of the Romanian coastline, there were at least five marine research units, with different tutelages. They carried out to some extent parallel activities, each with its own relatively modest means. As a result, the need to unify the staff, the material and the information base in a higher-ranking

institution appeared, with a more unitary research plan, in line with the growing requirements of the national economy and the existing trends in this field of activity and scientific creativity on the world plan.

Thus, as a result of the joint initiative of Academicians Mihai C. Băcescu and Eugen A. Pora, in 1970 the mentioned teams merged into the Romanian Marine Research Institute, known under the acronym RMRI (Fig. 19). The goal of unifying the scientific and auxiliary staff, the material and documentary bases was achieved. In the same time, the continuation of the previous tradition was ensured, due to the illustrious predecessors in oceanography Emil Racovitza, Ioan Borcea and Grigore Antipa (Bologa, 1995a, b).



Fig. 19 Headquarters of the Romanian Marine Research Institute, Blvd. Mamaia No. 300, Constanța (1970 and present)

Its birth certificate was the **Decision of the Council of Ministers No. 256/970 on March 16**, regarding the establishment of the Romanian Marine Research Institute, where and how this institute should function (Bologa, 2022).

At the date of its establishment, the institute started its activity in three different locations, in Dobrogea Regional Meteorological Centre (‘Centru’), the Marine Zoological Station ‘Professor Ioan Borcea’ from Agigea (‘Agigea’) and the Fisheries Research Station ‘Grigore Antipa’ from the entrance to the Mamaia resort (‘Antipa’).

In the archives of the former Romanian Marine Research Institute, the **PROTOCOL** of its establishment, namely by taking over the Marine Zoological Station ‘Professor Ioan Borcea’ from Agigea, can be found, dating from 1970.

Other four Protocols concern the merging of the Marine Fishery Station ‘Grigore Antipa’ from Constanța, the Marine Biology Sector from Constanța of the Institute of Biology ‘Traian Săvulescu’ (Bucharest) and the Black Sea Hydrology Laboratory in Constanța of the Institute of Meteorology and Hydrology (Bucharest, in the newly created institute).

According to the Government Decision No. 983/27.08.1990, by which the Romanian Marine Research Institute is transferred from the structure of the

Ministry of Agriculture and Food to the structure of the Ministry of Environment, this protocol is concluded between the Ministry of Agriculture and Food and the Ministry of Environment.

The Ministry of Agriculture and Food, through the Headquarters for Fisheries and Fish Industrialization, submits to the Ministry of Environment the entire patrimony of the Romanian Marine Research Institute, according to the annexes that are an integral part of this protocol.

The leadership of RMRI was provided by the directors Dr. Eng. Virgil Iordănescu (1970-1975), Dr. Eng. G. Șerpoianu (1975-1976), Rear Admiral Eng. Constantin C. Tomescu (1975-1983), Eng. Marcel Stanciu (1983-1989) and by the deputy scientific directors Dr. Hilarius V. Skolka, Dr. Eng. Virgil Iordănescu and Dr. Eng. Gheorghe Șerpoianu.

In the first 10 years of existence, RMRI, as a multi- and interdisciplinary research institution (unlike the neighboring states on the Black Sea where marine research institutes were distinct from those with a fisheries profile), functioned under the National Council for Scientific Research (later the National Council for Science and Technology), followed by the temporary affiliation of other ministries, more or less appropriate: the Ministry of Education (1981), the Ministry of Agriculture and Food Industry (1982) and finally the Headquarters for Fish and Fish Industrialization (1982-1989). After the Romanian Revolution of December 16-22, the RMRI - the National Institute for Research and Development "Grigore Antipa", respectively, was affiliated to the Ministry of Environment (since 1990), and will later return, again, to other tutelary fora, and currently to the Ministry of Research, Innovation and Digitization.

The first functional laboratories were:

- marine geology,
- hydrology and marine pollution,
- marine ecology,
- ichthyology,
- fishing technique,
- marine technology.

Along the way, the activity of marine geology was transferred to the Institute of Geology and Geophysics of Bucharest, and the one of marine technology, with concerns related to the penetration and work of man underwater, partially passed to the Navy.

Among the various tutelary fora, the Ministry of Agriculture and Food Industry, through HFFI, paid preferential attention to research activities on the strict knowledge and exploitation of fishery resources in the Black Sea and ocean areas where the Romanian fishing fleet operated.

At the beginning of its activity, the Institute possessed the research vessels *ARIEȘUL*, *GILORTUL*, *PĂLĂMIDA* and later on *STEAUA DE MARE I*.

Rear Admiral Constantin C. Tomescu was appointed director of RMRI the Romanian by the address R.C/P./Central Committee/Personnel Section, Bucharest, No. 102, of February 20, 1976 and led the institute in the period 1975-1983 (Bologa and Ciorbea, 2020).

The list of scientific and technical works, elaborated by RA Constantin Tomescu includes 8 articles, 7 communications, information and conferences, 2 innovations / rationaliza-tions, 3 other papers and 2 translations from Italian (Tomescu, 1975). As director of RMRI C. Tomescu published the articles “Glorious traditions of Romanian oceanology”, in the periodical *Cercetări marine - Recherches marines*, with a summary in French (Tomescu, 1976), “The future of the Romanian coast and the perspectives of keeping clean waters for tourism, sports, health ”, sent by Dr. M.C. Băcescu and Dr. M. Guțu for publication in *Travaux du Muséum National d’Histoire Naturelle “Grigore Antipa”* (Tomescu *et al.*, 1978) and “Forecast of wave energy recovery in the Socialist Republic of Romania” (Tomescu and Enache, 1980).

In 1980, the new building of the institute was put into operation, named according to the execution project “RMRI Laboratory Complex”, together with the taking over of the research teams from Agigea and Pescărie (Mamaia). The funds were obtained from the Danube-Black Sea Canal Directorate, as compensation for the decommissioning of the Marine Biology Station "Ioan Borcea" - Agigea and environmental alteration through works and dredging, with damage difficult to assess to the Sea Dune Reserve with unique vegetation from Agigea and marine research itself.

The headquarters of the Station returned after 1990 to the "Alexandru I. Cuza" University of Iași - the former holder (and the headquarters of the former "Grigore Antipa" Station to the "Pasteur" Institute in Bucharest).

According to the Decision of the Council of Ministers No. 256/1970, with the corrections brought by Decrees No. 79/1975 and No. 240/1977, the activity, attributions and tasks of the institute - and through them of the Romanian oceanology - were channeled from the beginning on precise main objectives and directions.

During 1975-1982 various important events took place, among which:

- the research contract concluded with A.R. Libya for the exploration of fishery resources in the eastern territorial waters, carried out on board the heavy trawler *DELTA DUNĂRII* (Fig. 20) rented from the Oceanic Fishing Enterprise Tulcea and R/V *GILORTUL* in four 40-day oceanographic expeditions (spring, summer, autumn, winter), between 1975 and 1976, completed by the Contransimex agency.



Fig. 20 *DANUBE DELTA* trawler, of the former Ocean Fishing Company in Tulcea, equipped for research during the four expeditions in territorial waters of A.R. Libya in 1975 and 1976

- the celebration of 50 years of Romanian oceanology (1976) by RMRI, in its own premises and at the PARC hotel in Mamaia,
- the visit of the famous French oceanographer Jacques-Yves Cousteau, with the diver Albert Falco and other collaborators, at RMRI (1977).

Later, 100 years of Romanian oceanology have been celebrated, fulfilled from the cruises undertaken by Dr. Grigore Antipa, aboard the cruiser of the Romanian Royal Navy *ELISABETA*, in 1893, 1894 and 1895 (Fig. 21).

The entire staff and the property of the institute, including the marine biology section from Agigea, moved in 1980 to the new headquarters, on Lenin Boulevard (Mamaia after 1990), No. 300.



Fig. 21 Philatelic envelope with the three defining elements - subject, special stamp, adequate postage stamp (design A. Bologa)

Following the events of December 1989 and the creation of the National Salvation Front (NSF), including the RMRI in Constanța, the author offered a file with the main testimonies,

to the Constanța County Service of National Archives on May 13, 2021; the documents (handwritten, typed, printed) are arranged chronologically between January 3-29, 1990.

The new elections for the leadership of RMRI, including a total number of 168 votes, ended with the following result:

director (167 valid votes, 1 canceled):

S. Nicolaev - 116, C. Maxim - 42, G. Șerpoianu - 9.

deputy scientific director (168 valid votes):

A. Bologa - 155, G. Müller - 13.

Regrettable NSF, which from an initial patriotic and declared apolitical organization turned quickly into a political new(crypto)communist party, proved to be one of the major post-revolutionary disappointments.

The National Institute for Marine Research and Development "Grigore Antipa" and its Fiftieth Anniversary (2020)

RMRI became by the **Government Decision No. 686/23.08.999** the National Institute for Marine Research and Development "Grigore Antipa" (NIMRD) (Fig. 22).

Located on an area of 5,800 m², the institute has owned from the beginning modern laboratories, equipped with research equipment at international level, used experimental pools with seawater (400 m²), a network of tidal graphs (Sulina, Constanța, Port Tomis, Mangalia), connection with the SIMIN network for meteorological information, the R/V STEAUA DE MARE 1 (132 mT / 570HP), the boat *MARSUIN* (7m / 150HP), off-road vehicles, a library, the own scientific journal *Cercetări marine - Recherches marines* and a physical, chemical and biological database for the Romanian coastal waters (since the 1960s).

The organizational structure, the need for research and development activities, as well as the design and execution of the marine monitoring network, participation in consortia, other networks and technological platforms, organizing domestic and international scientific events,



Fig. 22 The National Institute for Marine Research and Development
“Grigore Antipa” Constanța

e.g. *NATO Advanced Research Workshop “Environmental Degradation of the Black Sea - Challenges and Remedies”*, at Constanța, between October, 29-31, 2007 (Fig. 23), participation in national and international fairs and exhibitions, offers of research services and assistance, and other initiatives have evolved continuously to the present day.

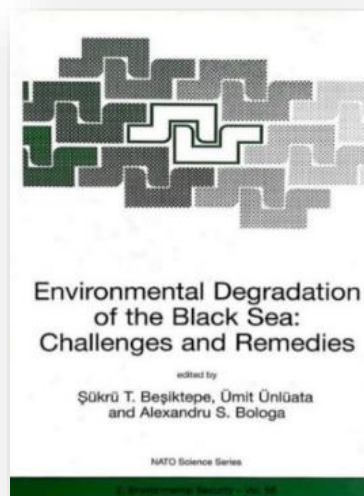


Fig. 23 Volume published following the 1997 NATO Symposium

Cooperation in R-D-I at national and international level, has included numerous research institutions, universities and private indigenous and foreign companies. Researchers and experts from NIMRD have been and are members of various national and international professional organizations and associations.

On October 29, 2020, the fiftieth anniversary of NIMRD "Grigore Antipa" took place, with the awarding of the Anniversary diploma.

ROMANIAN MARINE RESEARCH AT OVER 100 YEARS

The fact that Romania has a strong maritime vocation, despite the fact that it was temporarily separated from the Black Sea, is obvious. Mihail Kogălniceanu stated unequivocally "The key to our salvation is the road of the Danube to the Great Sea open to all". Indeed, this reality was also the premise of the birth and development of Romanian marine research, over a hundred years ago (Dănăilă, 2002; Bologa and Charlier, 2011) and is still in continuous development.

The Romanian marine research, initially linked naturally to the Black Sea and later extended to other marine and oceanic areas, began over 100 years ago (Bologa, 2011b; 2016; Bologa and Charlier, 2011), with physical oceanography (Șerpoianu, 1990). The marine biological research, or the biological oceanography, has begun in the late 19th century (Bologa, 2004b).

The Romanian national affirmation in the vast field of marine sciences started with the biologist Emil Racoviță, through his participation in the memorable Antarctic cruise. Another reference personality in the study of the Black Sea is the biologist Grigore Antipa (1867-1944), who organized the first Romanian scientific expeditions in the Black Sea, aboard the RMR cruiser *Elisabeta*, between 1883 and 1885. Among the illustrious predecessors of Romanian marine research is also the biologist Ioan Borcea, whose actual research activity took place in his foundation, the Marine Zoological Station, which would bear his name, founded, with intense efforts, at Agigea, in 1926.

In 1970 the former marine research institutions from the Romanian littoral merged into the Romanian Marine Research Institute, transformed in 1990 into the National Institute for Marine Research and Development "Grigore Antipa" in Constanța (1990), owner, initially besides other smaller ships, sea above, of the R/V *Steaua de mare 1* (Fig. 24) (Bologa, 1990a).



Fig. 24 The research vessel *Steaua de mare 1*

From the already mentioned Marine Sedimentology Laboratory, which became the Laboratory of Marine Geology and Sedimentology and later on the Romanian Centre of Marine Geology and Geocology, in 1999 the National Research and Development Institute for Marine Geology and Geo-ecology (GEOECOMAR) was established in Bucharest and Constanța, possessor of the R/V *Mare Nigrum* (Fig. 25).



Fig. 25 The research vessel *Mare Nigrum*

ROMANIA AND THE INTERNATIONAL COMMISSION FOR THE SCIENTIFIC EXPLORATION OF THE MEDITERRANEAN SEA

The beginnings of Romanian oceanography went beyond the limited regional framework of the territorial waters of the Black Sea. The best example is the invitation of Romania, together with the other co-founding states, to the creation of the Mediterranean Commission (CIESM, 1970; Bologna, 2011a), later called the International Commission for the Scientific Exploration of the Mediterranean Sea (CIESM), already since 1910, by the brilliant personality of Romanian biology, Emil Racoviță (Bologna, 1993a, b; Bologna and Marinescu, 2002). Thanks to Grigore Antipa, who was officially appointed rapporteur for the Black Sea in 1927, CIESM expanded its field of oceanographic research by adding the Black Sea basin to the broad scope of its concerns. In 1928 he also became rapporteur for the entire eastern Mediterranean, the Marmara Sea and the Aegean Sea. Since the official election and accession of Romania as a member state (1925), two congresses and general assemblies of this oldest, prolific and long-lived European R-D-I organization have taken place in Romania, in Bucharest in 1935 and in Bucharest - Constanța in 1966. The remarkable results, implications and connotations of the Romanian marine research, obtained in an institutionalized way in different scientific and higher education establishments, have thus had echo and recognition abroad, e.g. from CIESM (Fig. 26).



Fig. 26 Headquarters of the International Commission for Scientific Exploration of the Mediterranean Sea, Monte Carlo, Monaco

Romania's national delegates (and also vice-presidents) to CIESM, out of the members or holding leadership positions in the various scientific committees of this body were: Emil Racovitza (1925), Grigore Antipa (1926-1944), Traian Săvulescu (1959), Theodor Bușnitza (1961), Vasile Chiriac / Mihai C. Băcescu substitute (1966), Mihai C. Băcescu (1967-1993), Alexandru Ș. Bologa (1994-2011) and Tania Zaharia (2011-2020).

Extensions of international cooperation outside the Pontic area existed as well, for example, the scientific cruises organized by RMRI in the Mediterranean Sea (Libya), the Atlantic Ocean (Argentina), the Indian Ocean (Somalia) a.o.

In the same time, the fulfillment of Romania's scientific research obligations at bilateral, regional and international level, through agreements, conventions and declarations, within the joint research programmes and projects (CIESM, 1970; Aubrey *et al.*, 1992; Ūnlúata *et al.*, 1994; Bologa, 1999) is pursued.

CONCLUSIONS

1. Romania, as a maritime state, after being separated from the Black Sea coast for 400 years, until the War of Independence in 1877, has a tradition in the marine sciences for over 100 years.
2. The illustrious ancestors of Romanian oceanography, especially biological oceanography, are Emil Racoviță, Grigore Antipa and Ioan Borcea.
3. From an oceanographic point of view, E. Racovitza distinguished himself as a biologist of the famous Antarctic multinational expedition, under the command of Captain Adrien de Gerlache, from Belgium, aboard the vessel *Belgica*, between 1997 and 1998.
4. G. Antipa is the founder of the Bio-Oceanographic Institute in Constanța (1932) and of the Biological Research Station in Caliacra (currently in Bugaria) and in this

context he held the positions of organizer, general administrator and director general of the State Fisheries, as the second national delegate of Romania at the International Commission for the Scientific Exploration of the Mediterranean Sea (CIESM), and as rapporteur for the Black Sea, Marmara and the Eastern Mediterranean, as well as organizer of the first Congress and General Assembly of CIESM in Romania in Bucharest in 1935.

5. I. Borcea's main scientific achievement is the creation of the Marine Zoological Station in Agigea, in 1926, which bears his name to this day, with the maintenance of close collaborative relations in the field of marine biology, especially with France and Italy.

6. The main marine research institutions, namely the Marine Zoological Station "Professor Ioan Borcea", the Bio-Oceanographic Institute, which later became the Fisheries Research Station "Dr. Grigore Antipa", the Marine Biology Sector from Constanța of the "Traian Săvulescu" Institute of Biology from Bucharest, the Oceanographic Research Station from Constanța and Sulina and the Marine Sedimentology Laboratory, affiliated to the Geological Institute of Romania, merged into the Romanian Marine Research Institute (RMRI) from Constanța on March 1, 1970.

7. The successor of RMRI since 1990 is the National Institute for Marine Research and Development "Grigore Antipa", in the same headquarters (Bd. Mamaia No. 300, RO-900581 Constanța).

8. A definite confirmation of the value of the results of the Romanian marine research, over time, is, among others, the close professional relationships with CIESM, continued to the present.

9. Thus, Romania has further promoted and supports marine research at national, regional and international level.

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