

INSTITUTIONALIZED DEVELOPMENT OF MARINE RESEARCH IN ROMANIA (1893-present)¹

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The Black Sea “unicum hidrobiologicum”

Natural characteristics of the Black Sea, valued most suggestively and succinct as "unicum hidrobiologicum" (Knipovich, 1932) are well known (e.g. Antipa, 1941; Bologa *et al.*, 1994).

These features are completed by anthropogenic activities with severe impact on the Black Sea which originate in a hydrographic basin five times bigger than the sea surface itself. Territories of the Danube riparian and Black Sea coastal states include a population of over 165 million from 17 countries (81 million in the Danube basin). Most important activities may include:

- transport (Danube, Danube-Black Sea canal, Black Sea, river and sea ports, free zones);
- industry (cement, superphosphates, petrochemical, nuclear, etc.);
- agriculture (fertilizers, herbicides, pesticides);
- fishing (and overfishing);
- tourism (leisure, nautical sports, medical treatment).

Due to these activities, the Black Sea has evolved from an environmental perspective, in recent decades, from an initially diversified and productive ecosystem (particularly the fishery resources) in a pronounced eutrophic one with limiting life conditions for many plants and animals.

Most serious contemporary issues which led Global Environment Facility (GEF) experts to consider the Black Sea in 1992 as "the most seriously degraded over the planet" concern:

- progressive deterioration of coastal environment from erosion;
- expansion of *hypoxic* and/or anoxic zones;
- possible increase of H₂S concentration in euphotic layers;
- continuous accumulation of various *pollutants* from the atmosphere and terrestrial sources (heavy metals, radionuclides, hydrocarbons, herbicides, pesticides, detergents);

¹ Dezvoltarea instituționalizată a cercetării marine în România (1883-prezent), în *Dobrogea 1878-2008: orizonturi deschise de mandatul european*, V. Ciorbea (coord.), CJC / UOC, Ed. Ex Ponto, Constanța, 2008, 632-649

- reduction of *self-purification* capacity of coastal areas against chemical and microbiological contaminants;
- rapid extinction of species, dramatic decrease of *biodiversity*, drastical decline of economically valuable living resources.

Thus the Black Sea is facing at present a very serious ecological imbalance due to contamination / pollution from both land and air, which can be summarized in the sequence eutrophication → blooms (phyto-and zooplankton) → hypoxia and anoxia → mortalities → decline of diversity and biological resources.

It is undisputed that the state of the Black Sea is particularly worrying because of degradation of natural ecosystem with its living and non-living subsystems.

But the Black Sea is an ideal "laboratory" for studying the effects of that anthropogenic stress, climate and synoptic variability and ecosystems imbalances. Accordingly, this very particular sea is a natural test for understanding of common oceanographic phenomena in other areas of the World Ocean. Equally, however, the Black Sea shows a global interest since the phenomena taking place here constitute a natural warning to other regions of the world, and knowledge gained on this sea may serve to protect other segments of the World Ocean in a state of distress.

Romania, maritime country, supporter of marine research

As to maritime activities developed in Romania - economic, social, tourism, including scientific research – it has to be always remembered that our country was separated from the Black Sea for four centuries, until the War of Independence in 1877 (Bologa *et al.*, 1994, 1999).

However, Romanian marine research, initially linked only to the Black Sea, started over 100 years ago, with physical oceanography, which was motivated by two practical reasons: maintenance of navigation of the Danube mouths (Sulina) and design of the port of Constanta. These requirements have imposed to study the influence exerted on shore by suspended material transported by the Danube, the marine currents and the structure and characteristics of the Romanian shore.

Marine biological research began also to the late nineteenth century (Bologa, 2004). This start approximately coincided with similar concerns worldwide, such as, for example, the Belgian Antarctic expedition (1897-1898), involving the participation of most remarkable Romanian biologist E. Racovitza (Motas, 1948, Marinescu, 1990, 1993, 1997, Balaban, 1994).

Nine-month expedition on board the RRN cruiser "Elisabeta", organized by G. Antipa in 1893, continued in 1894 and 1895, presented a very special regional interest (Bacescu, 1954, Marinescu, 1994).

But even from the beginnings of Romanian oceanology (Șerpoianu and Malciu, 2002), scientific interest has exceeded the limited regional framework of territorial waters in the Black Sea. A proof in this respect is the invitation addressed to Romania besides the other co-founder countries, to create the International Commission for Scientific Exploration of the Mediterranean Sea (CIESM), already in 1910, due to the brilliant personality of ichthyologist G. Antipa (Bologa, 1993; Bologa and Marinescu, 2002). Thanks to G. Antipa, among others member of the Oceanographic Institute of Paris, and officially designated rapporteur for the Black Sea (1927), CIESM has expanded its oceanographic research by adding the Black Sea basin. He became, a year later, rapporteur for the entire Eastern Mediterranean: Black Sea, Marmara Sea and Aegean Sea. After Romania's membership (1925), two general assemblies and congresses of this prestigious and longevive international organization have occurred in Romania in Bucharest (1935) and Bucharest - Constanta (1966).

The first Romanian marine zoological station was founded by I. Borcea, predecessor of Romanian oceanology, at Agigea, in 1926, whose results were usually published in "Analele Universității din Iași" (Borcea, 1930; Bacescu and Mester, 1996; Bologa *et al.*, 2004).

It followed the foundation of the Bio-oceanographic Institute created by G. Antipa, organizer, director general and chief inspector of the State Fisheries, in Constanta, in 1932; this institute was transformed after 1945 into Marine Research Station, promoting the development of sea physics, zooplankton, ichthyofauna and fisheries.

Most marine research, both field and laboratory, after the Second World War was led by M.C. Bacescu, director of the Museum of Natural History "G. Antipa", in Bucharest, as continuer of the traditions of Romanian oceanology (Onciu, in press).

In 1954, under the auspices of the Commission for hydrology, hydrobiology and ichthyology of the Romanian Academy the Institute of Biology "Traian Savulescu" and the Fisheries Research Institute initiated through the marine biology sector in Constanta complex research on life and environmental conditions in the Black Sea.

International scientific collaborations with ex - USSR and Bulgaria have allowed not only to deepen the studies on benthic oceanology, fish feeding and migration, but also addressing new domains and areas, such as microphyto- and zoobenthos, the prebosporic area, or biological analysis of samples collected during the campaigns for marine research undertaken by other countries. For example, Romanian specialists are coauthors of "Handbook of Black Sea Invertebrates" published by the Academy of Sciences of the USSR in Russian (1968, 1969).

Soon the Institute for Hydrotechnical Research in Bucharest, the Oceanographic Research Station in Constanta and another smaller research station (Sulina) were created.

A Marine sedimentology laboratory was established in Bucharest in 1964.

A first complete bibliography on the Romanian Black Sea research has been published by the National Commission for UNESCO of the Romanian Academy (1965).

At the old Marine Zoological Station in Agigea E.A. Pora, Professor of animal physiology at the University of Cluj-Napoca, organized in 1969 in collaboration with the Mediterranean Association of Marine Biology and Oceanography (MAMBO), the first international course on the biology of Black Sea brackish waters with lectures published in two volumes "Biologie des eaux saumâtres" (1977).

Romanian Marine Research Institute (1970-1998)

It results that in the period 1960-1970 along 245 km of Romanian coastline five marine research units operated under different umbrella, which carried somewhat parallel activities, each with its own relatively modest means. So the unification of real-estate, information and personnel in an institution with a more unitarian marine research plan, in line with national economic needs and tendencies in this field worldwide, became necessary. Thus was born the Romanian Marine Research Institute (RMRI), as a result of combining the five preexisting institutions mentioned above (Table 1), with an aspirations to continue the previous tradition in marine research initiated by predecessors E. Racoviță, G. Antipa and I. Borcea (Bologa, 1995).

In the first 10 years, as an multi-and interdisciplinary research institution, RMRI belonged to the National Council for Science and Technology. After 1980 the institute was temporarily subordinated to the Ministry of Education (1981), then Ministry of Agriculture and Food Industry (1982), and afterwards to Central of Fish and Fish Industrialization (1982-1989). After the Romanian Revolution of December 16-22, 1989, RMRI was affiliated to the Ministry of Environment (1990).

The leadership of RMRI was provided by Directors Dr.Eng. V. Iordanescu (1970-1975), Dr.Eng. G. Șerpoianu (1975-1976), R.A. Eng. C. Tomescu (1976-1982), Eng M. Stanciu (1983-1990) and Director (1990-2000) and Director General Dr.Eng. S. Nicolaev (2000-present), besides Scientific Directors Dr. H.V. Skolka (1970-1973), Dr.Eng. G. Șerpoianu (1975-1976), Dr.Eng. V. Iordanescu (1977-1989) and Dr. A.S. Bologa (1990-present).

To institute began its activity with the following laboratories:

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

Creation of RMRI was undoubtedly an important qualitative and quantitative leap of Romanian marine research (Bologa and Șerpoianu, manuscript). Although until 1980 when its current building was finished the institute has been operating in three locations (“Centre”, Agigea and “Antipa”) and failed to obtain an own bigger research vessel, its establishment was extremely beneficial. Are worthy of note in this regard:

- deepening and widening of previous research (physical, chemical, biological, fishery oceanography),
- addressing new research areas, for example, pollution, geology and marine technology,

Table 1 - Major marine research institutions in Romania

| Institution | Period | Affiliation |
|--|-------------------------------|--|
| 1 | 2 | 3 |
| Marine Zoological Station "Prof. I. Borcea" Agigea * Founder / Director Prof. I. Borcea Director Prof. G. Mustața | 1926-1970 1990-present | Ministry of Education (University “Al. I. Cuza” Iassy) Ministry of Education, Research and Youth |
| Bio-Oceanographic Institute Constanta Founder / Director Dr. G. Antipa Fisheries Research Station “Dr. G. Antipa” Constanta * Director Dr. N. Ionescu | 1932-1945 1945-1970 | Ministry of Agriculture State fisheries (Institute for Fish Research and Design) |
| Sector of Marine Biology Constanta * Founder / Director Acad. M.C. Băcescu | 1954-1970 | Romanian Academy (Institute of Biology "Traian Savulescu") |

| 1 | 2 | 3 |
|--|---|--|
| <p>Oceanographic research station Constanta *</p> <p>Founder: Dr.Eng. C. Bondar</p> <p>Oceanographic research station Sulina</p> <p>Founder: Dr.Eng. C. Bondar</p> <p>Marine Hydrological Station Constanta</p> <p>Founder: Dr.Eng. C. Bondar</p> <p>Marine Hydrological Station Sulina</p> <p>Founder: Dr.Eng. C. Bondar</p> <p>Marine Hydrology Service Constanta</p> | <p>1967-1970</p> <p>1970-1973 1967-1970</p> <p>1973-1995</p> <p>1970-1995</p> <p>1995-present</p> | <p>State Committee for Water (Institute of Hydrotechnical Studies and Research)</p> <p>Romanian Marine Research Institute</p> <p>State Committee for Water (Institute of Hydrotechnical Studies and Research)</p> <p>National Council for Water (Institute of Meteorology and Hydrology)</p> <p>National Council for Water (Institute of Meteorology and Hydrology)</p> <p>National Administration Romanian Waters / Dobrogea-Littoral Water Directorate</p> |
| <p>Laboratory of Marine Sedimentology Bucharest-Constanta *</p> <p>Founder / Director Acad. G. Murgeanu</p> | <p>1964-1970 1970-1974</p> | <p>Geological Institute of Romania</p> <p>Romanian Marine Research Institute</p> |
| <p>Laboratory of Marine Geology and Sedimentology Constanta</p> <p>Director Dr.Eng. N. Panin</p> | <p>1975-1993</p> | <p>Institute of Geology and Geophysics Bucharest</p> |
| <p>Romanian Marine Research Institute Constanta (Created by merging the five units above *)</p> <p>Founders: Acad. M.C. Băcescu Acad. E.A. Pora</p> <p>Directors: Dr.Eng. V. Iordănescu Dr.Eng. G. Șerpoianu R.A. Eng. C. Tomescu Eng. M. Stanciu Dr.Eng. S. Nicolaev</p> | <p>1970-1999</p> <p>1970-1975 1975-1976 1976-1982 1983-1989 1990-1999</p> | <p>National Council for Science and Technology, Ministry of Education, Ministry of Agriculture and Food Industry (Central for Fish and Fishery Products), Ministry of Environment.</p> |
| <p>Romanian Centre of Marine Geology and Geoecology Bucharest - Constanta</p> <p>Director Dr.Eng. N. Panin</p> | <p>1993-1999</p> | <p>Ministry of Science and Technology</p> |

| 1 | 2 | 3 |
|--|---------------|--|
| National Institute of Marine Research and Development "Grigore Antipa" Constanta Director General Dr.Eng. S. Nicolaev | 1999- present | Ministry of Environment and Forests |
| National Research and Development Institute for Marine Geology and Geoecology (GeoEcoMar) Bucharest – Constanta Director General Prof. N. Panin | 1999- present | Ministry of Education, Research, Youth and Sport |

- training of young researchers in various fields, in some of the best specialized institutes in the country and abroad,
- successful resolving of requests received from certain economic sectors related to exploitation of oil and gas from Romanian continental shelf, opening of the Danube – Black Sea Canal, achievement of industrial objectives in coastal areas, beaches and facilities of the port premises, fishing in the Black Sea and the Atlantic Ocean, etc.,
- broadening international cooperation by adhering to international professional bodies.

Major fields of research aimed at the Black Sea, the Romanian sector in particular, but complex scientific expeditions have been undertaken as well in the Mediterranean (Libya), the Atlantic Ocean (Argentina) and the Indian Ocean (Somalia), over time.

A particularly important action of RMRI resulted in successful completion of the research contract with A.R. Libya, involving investigations conducted in the territorial waters and the development of studies on living exploitable resources. The contract was achieved through a complex multidisciplinary research programme, with trawler “Danube Delta” (IPO Tulcea) and R/V "Gilort" belonging to the institute, during the four seasonal expeditions of 40 days each, between 1975 and 1976, amounting a total of U.S. \$ 1,150,000. Despite objective and subjective difficulties, the success demonstrated both professional and organizational ability of the institution and desire of affirmation of entire scientific team.

Along the way, marine geology work was transferred to Institute of Geology and Geophysics, Bucharest (Table 1), and the marine technology related activities concerning mainly underwater work, passed to the Romanian Navy.

One can add that the Ministry of Agriculture and Food Industry gave preferential attention to research closely related to the exploitation of fishery resources in the Black Sea and ocean areas in which Romanian fishing fleet activated.

Evolution of the Romanian vessels dedicated to marine research in the Black Sea, was resumed for the period 1893-1996 (Bologa *et al.*, 1999).

National Institute for Marine Research and Development "Grigore Antipa"

By GD No. 686/23.08.1999 RMRI was reorganized into National Institute for Marine Research and Development "Grigore Antipa" (NIMRD).

Recognition of tradition and continuity in Romanian oceanology was confirmed by the addition of the illustrious predecessor's name Grigore Antipa, following the proposal put forward on the occasion of 25th anniversary of the RMRI (1995) and subsequent steps in this regard. Thus NIMRD is mainly involved in basic, applied and technological research, essential for understanding, protection and management of coastal and marine environment in own exclusive economic zone of Romania in the Black Sea. NIMRD is also the technical operator of the national network of physical, chemical and biological monitoring and of assessment of coastal erosion.

Located in an area of 5,800 m², the institute has modern laboratories with research equipment to international requirements, experimental seawater tanks (400 m²) network of sea level records (Sulina, Constanta, Mangalia), connection to SIMIN network for meteorological information, R/V "Steaua de Mare 1" (132mT/570HP), boat "Marsuin" (7m/150HP), 4 vehicules, a library with 43,500 books (the oldest from 1733), periodical "Cercetări marine - Recherches marines" (sent to over 200 institutes in 60 countries), database (physical, chemical, biological) for the Romanian coastal waters (from '60s).

The current co-ordination of the institute by the Ministry of Environment and Forests and the change at national level of former narrow mentality on scientific research, including the establishment of the Ministry of Education, Research and Technology (1992), currently the Ministry of Education, Research, Youth and Sport had favored conduct of marine research (Bologa, 1994).

Present permanent staff is 94 out of which 52/45 graduated, 18 Doctors of Sciences, 9 Drd. and 2 associate professors.

Organizational structure

Scientific activity is supported within three research departments and related teams:

- Department of Oceanography, marine and coastal engineering:
 - Physical oceanography;
 - Chemical oceanography;
 - Coastal engineering;
 - Marine technology.
- Department of Ecology and Environmental Protection:
 - Marine ecology;
 - Marine radioecology;
 - Biochemistry and ecophysiology.
- Department of Marine living resources:
 - Ichthyology - Marine living resources;
 - *Regional Activity Centre for Fisheries*;
 - Aquaculture - Ecological restoration.
- Research departments are completed by three support departments:
 - Department of programmes management, resources, public and international relations,
 - Marketing.
 - *Secretariat of Romanian National Committee of Oceanography*;
 - Inventions and quality assurance;
 - Editing of periodical “Cercetari marine – Recherches marines”, Library;
 - Center for professional training B.EN.A / NIMRD;
- Department of Economic, financing - accounting:
 - Finance Office - accounting, economic analysis, contracts;
 - Purchasing, administrative, archival, IDPs.
- Technical Department:
 - Vessels;
 - Vehicules;
 - Investments.

Need for marine research conducted by NIMRD

Current environmental status of marine environment concerns all components along the Romanian sector, abiotic and biotic: emerged sediments (beaches) and submerged (sea bottom), water column, benthic and planktonic organisms (flora and fauna especially macroflora, invertebrates and fish).

The most serious environmental issues currently include beach erosion, increased eutrophication, biodiversity decline with the reduction of biological resources. Causes of irreversible changes in ecosystem leading to disequilibrium especially along the Romanian coast, are transport, industry and agriculture, which affect primarily fisheries, public health and tourism.

Thus, the need for research programmes on marine ecology and environmental protection is current and very urgent. Effective integrated measures can only be adopted based on systematic scientific results. These results also serve to correct the actions of an adequate management of marine resources.

Main research activities include the following topics:

- sedimentology and coastal morphodynamics,
- hydrology and marine physics,
- marine chemistry and biochemistry,
- marine biology and microbiology,
- marine ecology and radioecology,
- applied ecology and aquaculture,
- marine pollution,
- management of marine living resources,
- engineering and marine technology,
- environmental protection and rehabilitation of coastal lakes.

NIMRD activities are mainly oriented towards providing necessary scientific support for proper management and protection of marine and coastal zones.

So marine research serves explaining fundamental and applied aspects such as:

- knowledge of matter and energy flow and their transport and transformation mechanisms in the marine environment;
- understanding the mechanisms governing structure, functionality and productivity of marine ecosystem components;
- assessment of the effect of human actions on the status and stability of marine environment and resources.

Research results contribute to the achievement of following main objectives:

- scientific validation of the national strategy of management and protection of the marine environment;
- scientific validation of the legal framework for legal support of national policy regarding management and protection of the marine environment;
- development of concrete measures and regulations for the management of marine environment, coastal zone and their resources to ensure sustainable development;
- insurance of knowledge and data required for studies and analyzes on impact of economic activities in the marine environment;

- determining ways and methods for improving the state of marine environment and its living resources.

A special attention is paid to the fulfillment of scientific research obligations of Romania at the bilateral, regional and international levels through:

- agreements;
- conventions and declarations;
- research programmes and projects.

Main activities promoted by NIMRD

A. *Research and development*

a) Within the National Plan for Research, Development and Innovation (PNCDI) I and II, basic and applied research is carried out in the following areas:

- structure, functioning and evolution of marine ecosystems,
- biological productivity of marine and paramarine ecosystems,
- monitoring and evaluation of environmental factors and biodiversity of the coastal zone and littoral lakes,
- assessment and forecast of marine living resources,
- process modeling based on the functioning of marine ecosystems,
- environment under the influence of anthropogenic factors and their impact on natural resources and biodiversity,
- basic processes in the climate system, particularly at land-ocean-atmosphere interface,
- rehabilitation and protection of coastal zone through integrated technologies and limitation of coastal erosion,
- rehabilitation of marine and paramarine ecosystems modified by human inappropriate intervention,
- ecological recovery in populations of marine organisms under regression,
- improving of investigation techniques and technologies of the marine environment and of habitat protection in emergency situations,
- developing specific aquaculture biotechnology of marine areas,
- integrated fisheries research in areas of interest for Romania in the World Ocean,
- development of Geographic Information System (GIS) and remote sensing techniques applied to the marine environment,
- implementation of integrated coastal zone management process,

- scientific validation of laws and regulations governing environmental protection and management of marine living resources,
- implementing international conventions on the Black Sea, specific investigations and studies,
- research to harmonize national legislation with EU legislation on environmental management issues.

To achieve above objectives, the institute performs research and experimental laboratory work by research expeditions with own R/V or jointly with other institutions.

b) In addition to PNCDI I and II applied research is carried out to solve other problems and requests:

- development of experimental techniques, methodologies and *in situ* and laboratory measurements,
- development of marine environment related quality standards,
- development of studies and research at the request of various operators,
- production of equipment for specific research activity,
- sectoral strategic plan of action to protect and rehabilitate the marine environment,
- development and annual reports on the state of marine environment,
- development of oceanographic databases.

B. *Activities related to research and development*

- coordination and scientific expertise in marine sciences,
- cooperation with international bodies involved in activities related to knowledge, protection and exploitation of the marine environment and ocean,
- collaboration with foreign institutions and corporates to conduct joint research, based on joint programmes or other forms of collaboration,
- technical assistance, professional expertise and environmental impact assessments and audits,
- performance in collaboration with specialized units of tools, equipment and facilities needed in marine research,
- participation in development of other structures or Euroregions,
- collaboration with national institutes in the field of environmental protection, fisheries and aquaculture,
- technical secretariat activities for international agreements or conventions,

- providing logistical support and participation of specialists in the operation of activity centre and focal points in regional and international research programmes for environmental protection and conservation of marine living resources,
- ensuring representation of Romania in international scientific organizations by national delegates,
- collaborations with academic institutions and scientific societies in the country and abroad,
- collections of marine scientific and didactical items,
- organizing of national and international sessions, symposia, roundtables, conferences and other events in the framework of its activities.

C. Professional training activities

- managerial staff training in environmental protection and management of living marine resources,
- collaboration with NGOs, universities and high schools in environmental education programmes and raise of public awareness.

Research and development activity

Research topics are addressed within various national and international programmes. NIMRD actively collaborates with many Romanian institutions, maintains scientific and technical cooperation with foreign institutions and permanent contacts with various international bodies.

National programmes

- Programme "ORIZONT 2000",
- Core Programme PN 03 14/CEMAR (2003-2005)
- PNCDI Programmes (MENER, AGRAL, BIOTECH, INVENT, RELANSIN, INFRAS etc.),
- Programmes CEEEX 2005,
- CNCSIS grants,
- BENA sponsor programmes,
- Environment Programme.

Examples of finalized projects:

- Improving water and sediment quality from coastal areas of tourism and recreational interest using biofiltrators (ORIZONT 2000);
- Research on the state of marine fishery resources for their protection and sustainable management (ORIZONT 2000);

- Study of the Danube mouth river fronts and their effects on the dynamics of water masses, nutrients and pollutants (ORIZONT 2000);
- Evaluation of trends of physical and chemical indicators of marine environment in relation to anthropogenic influences and climate change (NUCLEU);
- Characterization of biodiversity structure in the Romanian coastal zone (NUCLEU),
- Solutions for reviving the Black Sea demersal fisheries (AGRAL)
- Development of pilot biotechnologies for medical and pharmaceutical products applications from marine organisms (BIOTECH);
- Floating structures used as dam for waves dissipation (INVENT);
- New bioactive products obtained by stroma collagen and shark liver oil (RELANSIN).

International programmes

- EC Framework Programmes 5, 6, 7
- EC-LIFE NATURE
- MATRA / Senter (NL)
- GEF Black Sea Programme (1 and 2)
- NATO Programmes
- IAEA
- Bilateral cooperations.

Examples of projects:

- Nutrient management in the Danube basin and its impact on the Black Sea-DANUBS (FP5);
- A Regional Capacity Building and Networking Programme to Upgrade Monitoring and Forecasting Activity in the Black Sea basin-ARENA (FP 5)
- European lifestyles and marine ecosystems - ELME (FP 6);
- International Action for Sustainability of the Mediterranean and Black Sea environment - JASON (FP 6);
- Conservation of Dolphins in the Waters of the Romanian Black Sea (LIFE NATURE);
- Pilot monitoring exercise of Environmental Status Indicators on the Black Sea / Control of eutrophication, hazardous substances and related measures for the Black Sea ecosystem rehabilitating (GEF);
- Sea level European system (ESEAS);

- A Pan-European Network for Ocean and Marine Data and Information Management (SEA SEARCH);
- Implementation of the Water Framework Directive (WFD) and Integrated Coastal Zone Management (ICZM) (MATRA / Senter / NL);
- Identify the relationships between chemical and ecological status of surface waters (REBECCA).

The results obtained by RMRI / NIMRD during the last three decades have been recorded regularly for major programmes (e.g. Bologna, 1996, 1999).

Monitoring activities

Romania, owner of an Exclusive Economic Zone (EEZ), has obtained important results in modern environmental legislation and has made an important oceanological research effort in line with international conventions and agreements on the Black Sea and with its quality of European Union member since 2007 (Nicolaev *et al.*, 2004). Thanks to such efforts and due to the decline of economic activities affecting the marine environment, both from the Danube river basin and coastal area, there was a slight but steady trend of improvement of the state of the marine ecosystem in environmental and biostructural terms. Status and trends of environmental evolution in the Romanian marine sector are subjected to an integrate physical, chemical and biological monitoring by NIMRD; results of this monitoring are used for the "Annual Report on the status of environmental factors in Romania", Report on the status of the Black Sea" (Black Sea Commission) and transmitted to the European Environment Agency (Copenhagen / Denmark).

Increasing and more integrated attention began to be paid at national, regional and international level to environmental issues in the Black Sea after 1990 (Nicolaev and Bologna, 2005): they are particularly targeted at ecosystem research, development of integrated quality monitoring and strengthening of regional cooperation.

International reference documents advocating for long-term sustainability of the marine environment and sustainable use of its resources, including the Black Sea are mainly the Law of the Sea (UN Convention on the Law of the Sea / UNESCO), the UNCLOS report "The Marine environment. Are we destroying the Oceans?" (with special reference to marine habitat destruction, pollution and over exploitation of living and non-living resources), Agenda 21 (Rio de Janeiro, 1992) and the Report to the Johannesburg Summit (2002).

Other major endorsements are contained in the Washington Declaration on protecting the marine environment from land-based activities, the Global

Programme of Action to protect the marine environment from land-based activities (GPA) and the International Convention of Biodiversity.

Global Environment Facility (UNEP, UNDP, World Bank) has established ecosystemic principles for transboundary issues. Concrete achievements consisted of the development of the Strategic Action Plan for the Rehabilitation and Protection of the Black Sea (BS-SAP), transboundary diagnostic analysis of the Black Sea (BS-TDA) and the concept of Large Marine Ecosystems (LME), including the Black Sea as No. 62 on the LMA map of World and Associated Watersheds.

In 2005 major issues and achievements of NIMRD were reviewed: ecosystem changes and recent trends in coastal and transitional waters, integrated coastal zone management approach, integrated physical, chemical and biological monitoring of the marine and coastal environment, implications and contributions to the convention, declarations and agreements on the Black Sea, cooperation with relevant international organizations concerning the Black Sea, successful participation in the programmes / projects / joint commitments on major environmental issues (reports, summaries, views, National Action Plans, technical / juridical documentations, legal implementation of EU directives) (Nicolaev and Bologa, 2005b).

Very recently the requirements for implementing sustainable development in marine and coastal Black Sea zones were summarized (Nicolaev, personal communication).

Participation in consortia, networks, technological platforms

- ERA - ENV Network established through the project "Integration of Candidate and New Member States in European Research Area by environmental issues - ERA ENV;
- Black Sea Universities Network;
- Consortia for programmes ORIZONT 2000, NUCLEU, MENER, AGRAL, BIOTECH.

Organization of national and international scientific events

National scientific events

- Scientific sessions of RMRI / NIMRD Constanta, 1990, 1992, 1994, 1996.1998;
- National Symposium with international participation, dedicated to the celebration of its 30th anniversary of the founding of the institute, 2000;
- National Symposia with international participation "The protection and sustainable management of the Black Sea ecosystem, imperative of the third millennium, 2003, 2005, 2007;

- National Symposia with international participation, AQUADEPOL, organized in collaboration with NC-APDM / Galati, 1992 – 2009;
- National Colloquium "Ecological protection of navigable channels", organized in collaboration with Romanian Naval League - Constanta, 1996;
- International scientific conference "Black Sea environmental degradation", organized in cooperation with NATO, Constanta, 1997;
- National Conference, NUC-INFO'99 MCT / ANEA, co-organizer, Constanta, 1999;
- Colloquium on cetaceans monitoring in the Black Sea, organized in collaboration with ACCOBAMS Secretariat, Mamaia, 2001;
- Symposia dedicated to the International Black Sea Day, organized in collaboration with the Navy League Romanian, NARW - DADL Constanta Students Club - Constanta, 1999-2008.

Domestic trade fairs and exhibitions

- Romanian science and innovation "Week of Romanian science" - SIR 2000;
- Exhibitions Concieved in Romania - CONRO 2001, 2002;
- Research exhibitions in Romania - CIR 2000, 2001;
- International exhibitions of inventions, scientific research and technologies – INVENTICA 2000, 2001;
- DELTA FISH EXPO exhibition, 2002.

International trade fairs and exhibitions

- Exhibition on Sustainable Development, Johannesburg, South Africa, 2002.

Examples of significant results in fairs and exhibitions

- International Symposium on coastal erosion - Problems and solutions, June 2003: Diploma of Excellence;
- International Exhibition of Inventions Geneva - 2005 - bronze medal for the product "shark liver oil";
- CONRO (Conceived in Romania), September 2002, Bucharest - Diploma of Excellence, for poster "Using indigenous biofiltrators for improving marine water quality in tourism areas;
- CONRO (Conceived in Romania), September 2002, Bucharest - Diploma of Excellence, for poster "Japanese oyster cultivation technologies at the Romanian seaside;
- Fish - Delta, September 2002: Diploma of Excellence.

Offer of R-D and Services

Also under the premises of NIMRD functions the accredited Laboratory for Measurements and Physico-chemical Analyses (Accreditation certificate No. 229 - L / 13.10.2003) RENAR for the following tests:

- determination of nutrients (phosphate, nitrate, silicate) in seawater;
- determination of heavy metals in sediments and organisms;
- determination of organochlorine pesticides in sediments;
- determination of polyaromatic hydrocarbons in sediments,
- determining the food value of marine organisms (soluble protein, total carbohydrates and glycogen, fat) of organisms.

Other parameters are in the process of accreditation: chlorophyll *a* and nutrients (NO₃, NH₄) in sea water, metals (Hg) in marine sediments and organisms, organochlorine pesticides and aromatic hydrocarbons in organisms.

NIMRD also collaborated in completing international databases and files (CIESM / GIRMED, IAEA / MARDOS, IAEA / GLOMARD, FAO, CECAF, CoMSBlack, NATO, EEC / EROS, 2000, 2001).

NIMRD continues to provide scientific and technical assistance on request to different organizations, local authorities, central state and private companies from Romania and abroad (e.g. PROFILE SA Constanta, RENEL, ICIM Bucharest, Technical University - Istanbul / Turkey, Enterprise Oil Ltd. / UK etc.).

Other services provided by NIMRD consist of access to a rich specialized oceanographic library, interventions with SCUBA diving, organizing of national and international symposia in various fields (integrated coastal zone management, biodiversity, marine and ocean fishing, oil pollution) organizing of training courses, preparation of documentations.

NIMRD is certified as Senior Valuer, Senior Auditor and assures studies on environmental impact assessment and environmental audit. The institute develops viewpoints and expertise on various works and investments, at the request of domestic and foreign economic agents.

NIMRD does also edit and print specialized publications: Cercetari marine – Recherches marines, Oceanographic Yearbook, guides, monographs, annual reports on the state of the marine environment.

Other initiatives

Other national and international initiatives aiming at developing inter- and multidisciplinary collaboration in the Black Sea area, stating that increasing attention is currently paid to this endangered sea, as well as the economic and political importance of this issue, then added:

- Black Sea University Foundation (Bucharest, 1992);

- Convention for the Protection of the Black Sea against Pollution (Bucharest Convention, 1992);
- Coordination Unit (PCU) of the Black Sea Environment Program (Istanbul, 1993);
- Black Sea Economic Cooperation (Istanbul, 1994).

No less important proved clear-themed scientific meetings, allowing the exchange of opinions, comparisons of the work methodology and maintenance of a continuous dialogue between partners, for interpreting data and developing new concepts. In this context took place, e.g., the NATO advanced scientific symposium (ARW) entitled "*Black Sea environmental degradation: problems and remedies*", organized by NIMRD and the Institute of Marine Sciences in Erdemli (Turkey), under the aegis of the Ministry of Environment, the Ministry of Research and the Romanian Academy, in Constanta, between October 6-10, 1998. The symposium, comprising four sections (physical and chemical processes, ecology, contamination, modeling), brought together 55 well-known specialists in the region and beyond, to debate the most pressing and relevant environmental issues. It managed synthesizing current knowledge on the Black Sea, presenting the recent field and laboratory results, mathematical modeling, and highlighted progress in communication networks and managing the marine environment, supported by databases and geographic information systems (GIS) and, where possible, proposal of remedies for recovery of current environmental status in the near future. Contributions were published in the NATO Scientific Series 2. Environmental safety vol. 56 (Besiktepe *et al.*, 1999). At the same time, the event was dedicated as Romanian initiative to the International Ocean Year and International Year of Salvation of the Mediterranean and Black Sea (1998).

Main cooperation in R-D-I

National

- Romanian Academy;
- Danube Delta Biosphere Reserve Administration – Tulcea;
- National Research and Development Institute for Marine Geology and Geoecology - Bucharest-Constanta;
- National Institute for Research and Development Danube Delta – Tulcea;
- National Institute of Meteorology and Hydrology - Bucharest;
- Institute of Physics and Nuclear Engineering - Bucharest;
- Institute of Nuclear Reactors - Pitesti
- AQUAPROIECT S.A. - Bucharest;
- Institute of Biology - Bucharest;

- Biological Research Center - Cluj-Napoca;
- Maritime Hydrographic Directorate - Constanta;
- National Museum of Natural History "Grigore Antipa" - Bucharest;
- Natural Sciences Museum Complex - Constanta;
- University "Ovidius" Constanta;
- Constanta Maritime University;
- Naval Academy "Mircea the cel Batran" Constanta;
- University "Dunarea de Jos" Galati
- "Black Sea" University;
- Romanian Committee of History and Philosophy of Science – Bucharest.

Regional

- "P.P. Shirshov" Institute of oceanology - Moscow (Russian Federation);
- "P.P. Shirshov" I.O. southern branch - Gelendzik (Russian Federation);
- Institute of Marine Biology - Vladivostok (Russian Federation);
- Institute of Fishery Oceanography - Kerch (Russian Federation);
- Institute of Marine Hydrophysics - Sevastopol (Ukraine);
- "A.O. Kovalevski" Institute of Biology of Southern Seas - Sevastopol (Ukraine);
- IBSS Branch Odessa - Odessa (Ukraine);
- Institute of Oceanology - Varna (Bulgaria);
- Institute of Fishery Resources - Varna (Bulgaria);
- Marine Research Institute - Erdemli (Turkey);
- Institute of Marine Research and Technology - Izmir (Turkey);
- Marine Research Institute - Kiel (Germany);
- Woods Hole Oceanographic Institution - Woods Hole, MA (USA).

International

- International Commission for Scientific Exploration of the Mediterranean Sea (CIESM);
- United Nations Educational, Scientific and Cultural Organization (UNESCO) - Intergovernmental Oceanographic Commission (IOC);
- United Nations Environment Programme (UNEP);
- United Nations Development Programme (UNDP);
- United Nations Food and Agriculture Organization (FAO) - Fisheries Committee;

- General Fisheries Council for the Mediterranean (GFCM);
- Northwest Atlantic Fisheries Organization (NAFO);
- Fishery Committee for Eastern Central Atlantic (CECAF)
- International Advisory Committee for Fisheries in Inland Waters;
- International Atomic Energy Agency (IAEA);
- Marine Environment Laboratory (MEL) - Monaco;
- European Society of Radiobiology (ESR);
- ACCOBAMS;
- International Maritime Organization (IMO);
- International Union of History and Philosophy of Science (IUHPS).

Membership in professional organizations / associations

NIMRD researchers and experts are members of the following national and international professional organizations and associations:

- Academy of Romanian Scientists / Biology Section
- Commission on Fisheries and Aquaculture of the Academy of Agricultural and Forestry Sciences
- Black Sea Fisheries Convention
- Romanian National Committee of Oceanography / UNESCO (Chair)
- Romanian Committee for History and Philosophy of Science, Constanta Branch
- Romanian National Committee for "International Geosphere Biosphere Programme (IGBP Global Change)
- Romanian Society for Molecular Biology of the Romanian Academy;
- Chemical Society of Romania;
- Romanian Society of Malacology;
- Romanian Society for Aquaculture;
- Ichthyology Society of Romania, Constanta branch;
- Association of Fishermen from Romania
- Regional Fishery Activity Center;
- Marine Reserve Custody 2 Mai - Vama Veche;
- Initiative team for the founding of the Romanian Society of Limnology / University of Bacau;
- NGO Romanian Naval League, Constanta Branch;
- NGO "Mare Nostrum";
- NGO Balkan Environmental Association (BENA);

- International Commission for Scientific Exploration of the Mediterranean Sea;
- International Ficological Society;
- International Society for the Study of Algal Harmful Blooms;
- European Research Network on Aquatic Invasive Species (ERNAIS)
- International Union of Radioecologists;
- European Society of Radiobiology;
- European Association of Aquaculture;
- Black Sea Regional Committee (CRMN) of IOC;
- International Ocean Institute;
- GOOS;
- MedGLOSS;
- Black SeaGOOS;
- EOSS.

Publications

Among RMRI / NIMRD publications / periodicals there are worth mentioning “*Cercetări marine - Recherches marines*”, „*Anuarul oceanografic*” and “*Halieutica – serie noua*”, author and/or co-authorship to: “*Ecologie marină*”, volumes 1 to 5 (1965-1976), «*Ghid al peștilor din Oceanul Atlantic*» (1970), «*Ghid al peștilor din Oceanul Atlantic de nord-vest*» (1971), «*Peștii de la coasta vest africană*» (1973), «*Tratat de algologie*», vol. 1-4 (1976-1981), «*Le chinchard de la mer Noire, Etude monographique*», vol. 1-2 (1979), «*Îndrumătorul tehnologului*» (1985), «*Productivitatea primară marină*» (1987), «*Principalele specii de pești și cefalopode din Oceanul Indian de vest. Determinator*» (1987), «*Tehnologia pescuitului prin traulare cu nave de mic tonaj în Marea Neagră*» (1988), «*Cartea traulistului*», vol. 1-2 (1989), «*Ghidul principalelor specii de pești și cefalopode din zona Oceanului Atlantic est – central*», vol. 1-2 (1989), «*Principalele specii de pești și cefalopode din zona Oceanului Atlantic de sud-est*» (1991), «*Diversitatea lumii vii. Mediul marin*» (1995), «*Ghid de evaluare a stocurilor de pești*» (2006), «*Ghid de eșantionaj pentru prelucrarea datelor și statistica pescărească*» (2006), pliante «*Vegetația submarină de la litoralul românesc al Mării Negre*» (2006), «*Habitat marine românești de interes european*» (2007), «*Rezervația Marină 2 Mai – Vama Veche*» (2007), «*Dicționar multilingv de pești și nevertebrate marine*» and fishing maps for FAO 34 and FAO 47 zones (1991).

Conclusions

Consequently, NIMRD as multi- and interdisciplinary unit, is the leading institution in Romanian marine research, national coordinator and focal point for many international duties and responsibilities assumed by Romania in marine sciences through the ministries of environment, research and foreign affairs.

NIMRD is also empowered to propose legislation in the field of environment and environment protection and to represent Romania in marine sciences related organizations and groups of experts of international conventions to which it belongs (Bucharest Convention / 1992, Convention on the Law of the Sea, ACCOBAMS).

The main responsibilities of NIMRD at national and international level are:

- Secretariat and Presidency of the Romanian National Committee for Oceanography / CNR-UNESCO;
- Permanent Technical Secretariat of the National Coastal Zone Committee;
- Coordinator and secretary of the International Secretariat for South – East Europe of the Balkan Environment Association (B.EN.A.);
- GEF Coordinator and Secretary / Programme for Regional Activity Centre on environmental issues in the field of fisheries and management of other marine living resources, as well as 5 other national focal points;
- scientific representation in international organizations (UNESCO / IOC, CIESM, FAO, CGPM, CECAF, ICES, NATO, GEF / Black Sea, ACCOBAMS).

Major activities since NIMRD establishment until now reside in:

- Oceanographic expeditions in the Romanian marine sector and related EEZ (annually approx. 60-80 days)
- Participation in other international scientific expeditions in the Black Sea, for example, on board R/Vs "AKADEMIK" / BG (1992), "KNORR" / USA (2002), "PROFESSOR VALKANOV" / BG (2005, 2007), "AEGEO" / GR (2007)
- Programmes of national and international interest:
 - Integrated monitoring of marine and coastal environment (Ministry of Environment)
 - Conservation of the marine ecosystem and promotion of its sustainable use (Ministry of Research)
 - Protection and sustainable development of living marine resources (National Agency for Fisheries and Aquaculture);

- Protection and conservation of dolphins in the Romanian marine waters (EC-LIFE NATURE, ACCOBAMS)
- Marine radioactivity and radioecology (IAEA / Monaco)

This review about RMRI / NIMRD achievements during its 40 years of existence is certainly very brief and can not cover many other moments of its scientific life, past accomplishments and failures, current aspirations and hopes for the future.

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