

Cercetari marine	I.N.C.D.M.	Nr. 35	2004	7 - 23
------------------	------------	--------	------	--------

NEEDS FOR SUSTAINABLE DEVELOPMENT OF THE ROMANIAN BLACK SEA COAST

**S. NICOLAEV, N.C. PAPADOPOL, A.S. BOLOGA,
Adriana COCIASU, Elena DUMITRESCU, Tania ZAHARIA,
V. PATRASCU**

National Institute for Marine Research and Development

"Grigore Antipa" Constantza

E-mail : <rmri@alpha.rmri.ro>

ABSTRACT

Romania sharing an economic exclusive zone (EEZ) in the Black Sea, achieved notable results with respect to modern environmental legislation and devoted an important oceanological research effort in accordance with international Black Sea related conventions and agreements adhered to and with respect to European admission perspectives.

Due to these efforts and the decline of economic activities impacting on the marine environment, both in the Danube river basin and in the coastal zone, a slight but steady improvement trend of the marine ecosystem has been registered, environmentally and biostructurally.

An analysis of recent changes in the state of the marine ecosystem and their evolution trends based on the observations carried out by the National Institute for Marine Research and Development (NIMRD) "Grigore Antipa" during the last decade.

KEYWORDS: Black Sea, Romanian coast, EEZ, ecosystem, evolution trends

1. INTRODUCTION

The dynamics of environmental changes in the Black Sea, during the last decade, required a permanent and sustained assessment of the state of and trends in the marine ecosystem..

Romania 's are not isolated efforts, they join an increased and diversified regional co-operation, fostered by an intense interest on the part of the international community for the geographic, economic and geopolitical background of the Black Sea.

The last decade witnessed the most intense regional and international efforts to protect and insure a sustainable development of the marine ecosystem reflected by:

- the Bucharest Convention (1992),
- the Odessa Declaration (1993), and
- the Global Environment Facility (GEF) Black Sea Programme encompassing:
 - an Environmental Project (1994-1997), and subsequently
 - Ecosystem Rehabilitation Projects (2001-2005).

These initiatives can be considered as a transposition on a regional level of the principles stated at the UN Conference on Environment and Development of Rio de Janeiro (1992), whose pragmatism has been confirmed by the World Summit on Sustainable Development held in Johannesburg (2002).

The moment is thus appropriate for an analysis update of the state of health of the marine ecosystem; progress has been made compared to the ecological decline observed during the '70ies and '80ies; awareness of the scientific support that proved some positive evolution trends should not be passed over.

Results of oceanological research programmes and projects carried out by the NIMRD between 1990 and 2003 are taken into consideration and compared with historical data ('70ies to '80ies).

The paper includes a synthesis of the conclusions of a Romanian National Symposium that benefitted from international participation. Titled "Recent changes and evolution trends in the state of the Black Sea ecosystem", it took place in Constantza, Romania, from October 9 through 11, 2003 (INCDM, 2003).

2. MAIN CHARACTERISTICS OF THE ROMANIAN BLACK SEA SECTOR

Beside Bulgaria, Georgia, the Russian Federation, Turkey and the Ukraine, Romania, a Black Sea coastal state, is integral part of the Pontic community; the zone under its jurisdiction, including the littoral area, coastal and marine zone, evidences following main characteristics (SHOM, 1978 / 1994; CCINA, 2001; NICOLAEV, 2002; JAOSHVILLI, 2003):

- the Romanian littoral, between the border with the Ukraine in the North and with Bulgaria in the South stretches over 245 km representing 6% of the entire Black Sea coastline;

- from the total coastline, 163 km (67%) belong to the northern sector, represented by the Danube deltaic littoral; this sector, including the adjacent transitional waters, up to the 20 m isobath, is administered by the Danube Delta Biosphere Reserve Authority; its coastal relief is dominated by low, not developed, lying land and is a sparsely inhabited area;

- the central and southern sectors, 82 km long (33%) extend between Cape Midia and Vama Veche and represent the most densely inhabited and industrialized area; its relief includes moderately high cliffs, most developed beaches, and the harbours of Midia, Constantza and Mangalia;

- at the southern-most point of the southern sector, between the localities 2 Mai and Vama Veche, lies the second marine protected area (7 km long, covering 5,000 ha):

- the continental shelf off the Romanian coast covers about 30,000 km², namely 16% from the total Black Sea neritic zone; Romania's Economic Exclusive Zone (EEZ) encompasses about 25,000 km² to the 200 nautical miles offshore limit;

- the entire Romanian marine sector, but especially the northern one, is influenced by the Danube River discharge; the annual water input by the Danube, through its three branches, is about 200 km³, with an average flow of 6,300 m³/ sec.; this discharge contributes about one half of the total pollutant input from land sources;

- the main river discharges severely impact the environmental characteristics of the Romanian marine ecosystem, its biodiversity structure and bioproductivity; the ecological changes due to the solid discharge of the Danube, during the last four decades, decisively exacerbated coastal erosion processes, and the nature of the typical sandy and muddy facies of this large marine zone;

- the living resources potential of the marine environment undergoes the effects of both the annual fluctuations of the Danube discharges and of the

annually varying climatic and hydrological peculiarities, due to variable fishing exploitation intensity; the predanubian marine space constitutes a distinct sector, specific to anadromous species fishing, mostly endemic ones; the central and southern marine sectors are areas mainly devoted to catch gregarious pelagic species, and, complementarily, to demersal fishing.

3. MAIN ENVIRONMENTAL ISSUES OF THE ROMANIAN COASTAL ZONE (1960-2000)

- coastal erosion (especially in the northern sector);
- eutrophication;
- pollution (hydrocarbons, urban wastewaters, pesticides, PCBs etc.);
- allochthonous species;
- decline of living resources and biodiversity.

4. NATIONAL POLICY CONCERNING SUSTAINABLE MANAGEMENT OF THE MARINE ENVIRONMENT

Romania developed since 1990 and set up objectives aimed at a strategy for protection, rehabilitation and sustainable development of its marine environment; this strategy included:

- elaboration and implementation of modern environment related legislation, adapted to national necessities and put in line with the European integration process, as a response of Romania's commitment to and obligations within international agreements and conventions;
- initiation and support of protection / rehabilitation actions as to the natural marine patrimony, adjacent littoral, concomitantly the pursuit of reduction of anthropic intervention effects and development of a sustainable exploitation of marine resources;
- promotion of national research programmes, to substantiate protection measures and sustainable development, concomitantly with an active participation of Romanian oceanological researchers in projects of regional and international scientific co-operation.

A new legal framework (some 14 laws passed between 1990-2003) for the sustainable development of the marine environment has been enacted:

- Juridical regime of marine water under national jurisdiction (Laws 17 / 1990, 110 / 1996, 36 / 2002),
- Regulation of environmental protection and of coastal zone management (Environmental Law 137 / 1995 and 294 / 2003, Water Law 107 / 1996, Coastal Zone Law 280 / 2003),

- Regulation of juridical regime of protected areas (Laws 82 / 1993, 454 / 2001, 462 / 2001) ,
- Regulation of marine living resources exploitation (Laws 192 /2001, 423 / 2001),
- Participation of Romania in regional and international co-operation in the field of marine sciences through the Bucharest Convention (Law 98 / 1992), ACCOBAMS Agreement (Law 91 / 2000) and other international conventions.

Requests related to the European integration process induced sound efforts in the implementation of a sustainable management policy concerning the marine environment: EU Directives (Water Framework, ICZM, Habitats, Bathing Water, Molluscs Water), FAO Code of Conduct for Responsible Fisheries (INCDM, 2003; SERBAN, 2004; STADIU, 2004).

A decisive influence on the definition of the national environmental strategy for the Black Sea had the adoption of the Convention on the Protection of the Black Sea Against Pollution (1992), enforced in 1994, which completes, at regional level the provisions of the international MARPOL convention; other regional efforts, during 2003 and 2004, consist in the implementation of the IMO / GloBallast Programme; the advanced preparation state of the new Black Sea Fishing Convention, to which Romania has significantly contributed (NICOLAEV, 2002), should also be mentioned.

Romania has been and remains an active partner in all regional initiatives of the Black Sea GEF Programme, and its associated programmes, such as EU / PHARE and TACIS, NATO, UE / LIFE (Nature, Environment) IMO / GloBallast, which have substantially contributed to regional co-operation and benefitted the sustainable development of the Black Sea basin (NICOLAEV, 2001, 2002; INCDM, 2003).

Another evidence of Romanian efforts with respect to marine environment protection are its major investments, with European support, of over 100 million Euro, in extending the wastewater treatment systems in the central and southern littoral sectors and in Constantza harbour.

5. PRESENT STATE AND MAIN EVOLUTIONARY TRENDS OF THE MARINE ECOSYSTEM

The restructuring of economic activities, the increase of legal exigencies concerning the implementation of environmental policies, the setting up of marine protected areas and the new regulations for the exploitation of marine resources have launched, since 1990, a slow but

continuous rehabilitation process of the marine ecosystem. This tendency of ecological improvement is

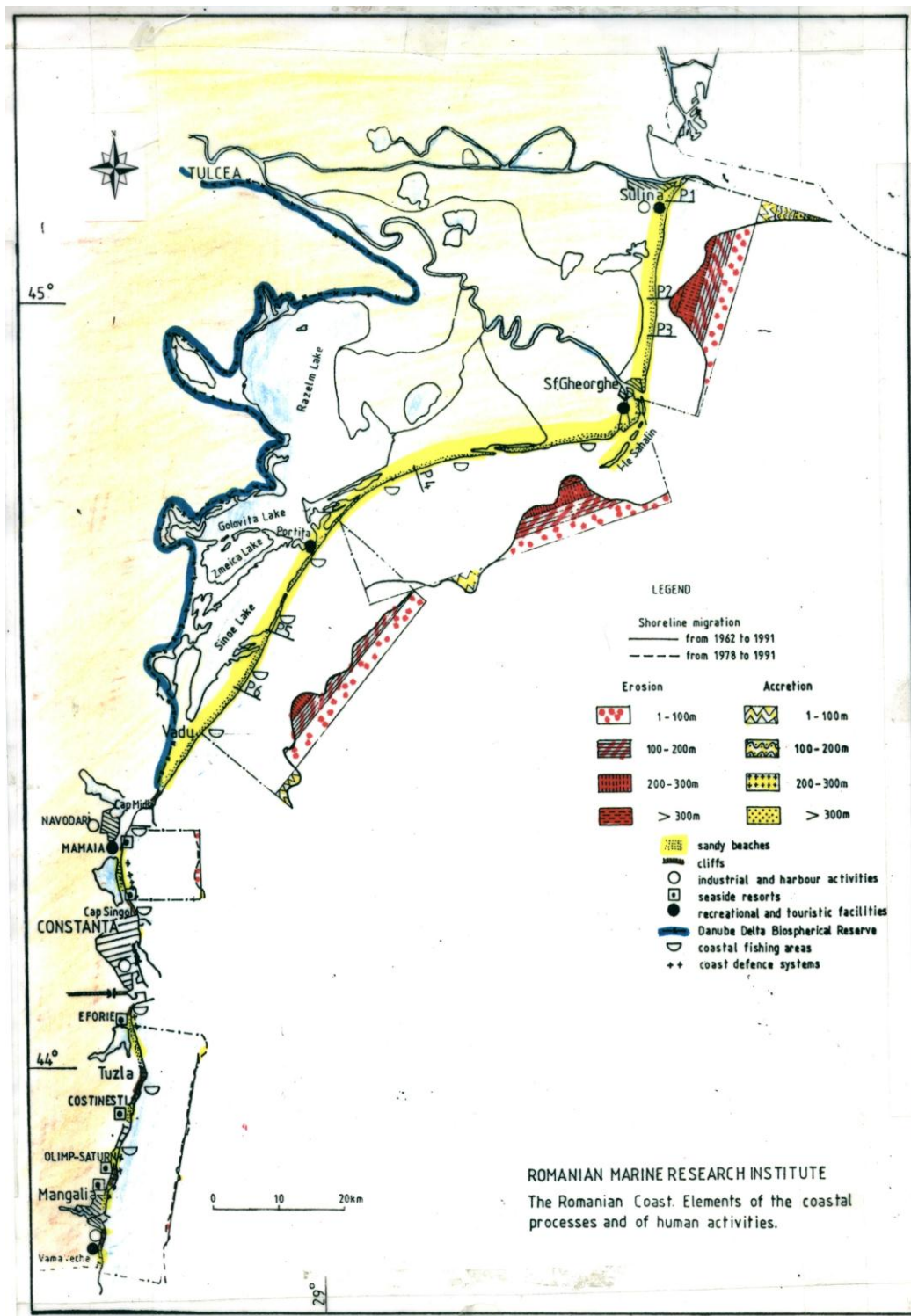


Fig.1 – Coastal erosion along the Romanian Black Sea coast

visible as to water quality parameters and at structural and functional levels of some Black Sea biota. Some relevant aspects of this process are exemplified (BOLOGA, 2001; INCDM, 2003, 2004):

- as to the evolution of coastal geomorphology, the reduction of sediment amounts discharged by the Danube in the sea, due to hydrotechnical works along the upper course of the river, the intercourse of some hydrotechnical works on the marine current routes (dams at Sulina and for protection of Midia harbour), including the important advance of the second delta of Chilia (silting), all together combined with sea level rise, influenced the alarming increase of coastal erosion, in the central and southern sectors of the Romanian littoral (Fig. 1);

- eutrophication, evidenced in the early '70ies, reached its highest level during the '80ies, reflected as intense increase of nutrients (nitrates and phosphates), simultaneous with a significant decrease of silicates; after 1990, even more significant since 1995, a gradual reduction in eutrophication took place, paired with an improvement of marine water quality, a consequence of annual nutrient input decline (Fig. 2);

- in the marine predanubian space, pollution is still evident, because of Danube pollutant discharge; recent results by gaschromatographic technique (Hewlett Packard gas chromatograph with electron capture detector 5890) highlighted alarming concentrations of various organochlorinates, pesticides, both in water and sediments (Fig. 3); in the central and southern sectors, the use of "ski-jet" boats in the summer season, induced occasionally intense pollution of bathing waters especially with polyaromatic hydrocarbons;

- during the '80ies the excessive increase of planktonic primary production resulting from eutrophication and manifested as intense summer algal blooms, usually over the support capacity of natural systems, induced negative side effects on the other components of the food chains/webs, also affecting the water quality in tourism areas; by 1990 and up to 1995 the constant reduction in nutrient input showed a decreasing trend in phytoplanktonic productivity, both in numeric densities and in annual biomasses (Fig. 4); nevertheless, the present level of nutrient concentrations is still high enough to determine, under favourable climatic and hydrological conditions, phytoplanktonic blooms of variable intensity or explosive developments of macrophytes;

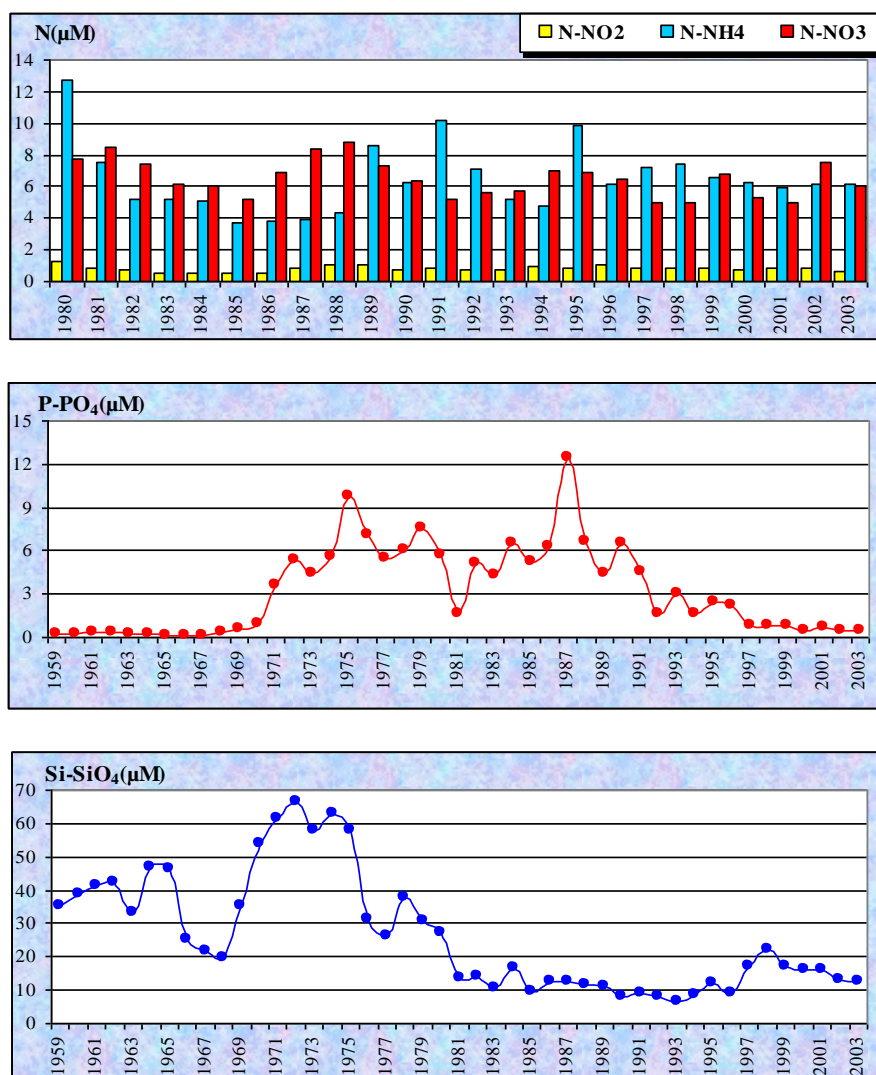


Fig. 2 - Evolution of nutrient concentrations in the Romanian Black Sea sector between 1959 and 2003

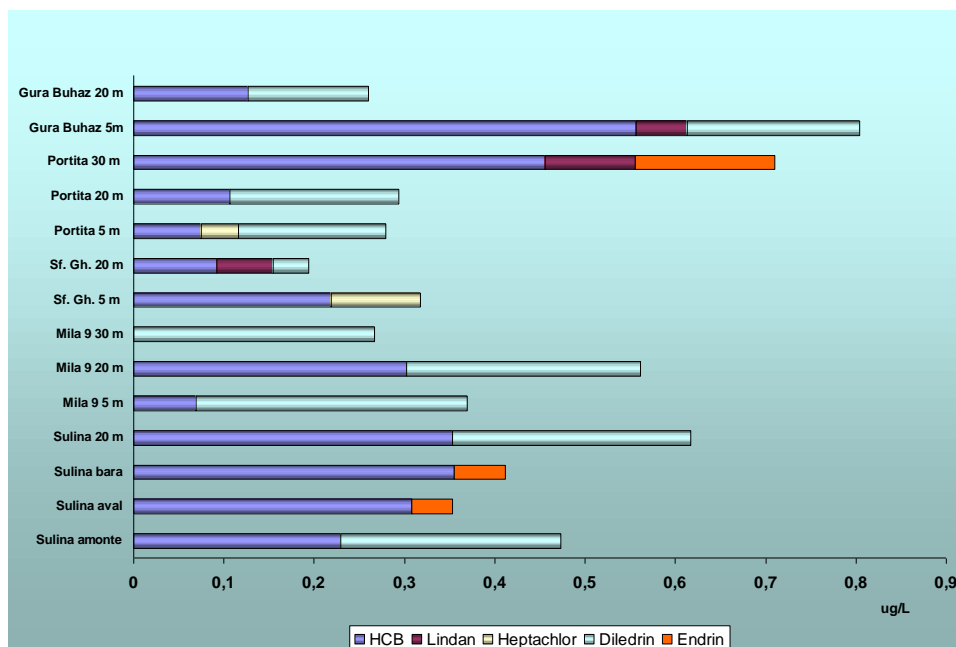


Fig. 3 - Organochlorinate pesticide concentrations ($\mu\text{g/L}$) in predanubian transitional waters in 2003

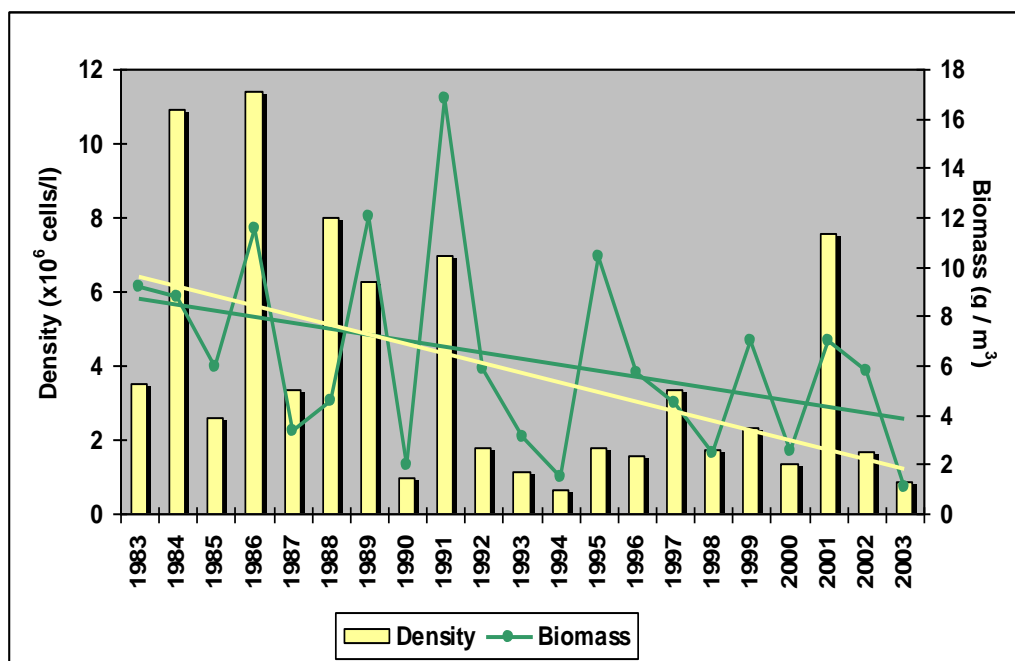


Fig. 4 - Dynamics of phytoplankton numeric density and biomass in the Romanian coastal waters between 1983 and 2003

- the reduction of eutrophication and of certain pollutants led to a recovery of the secondary production, at trophic zooplankton level (Fig. 5); this tendency is more evident from 1995, influencing positively the productive potential in the coastal waters, and the maintenance of feeding grounds for gregarious pelagic fish species; be it mentioned that during last four-five years, *Noctiluca scintillans*, known “indicator species” for marine pollution, significantly diminished its weight share in the total zooplankton structure; simultaneously, the biomass of such immigrant species as *Mnemiopsis leidyi* and *Beroe ovata* shrank as well, without registering their past high outbursts;

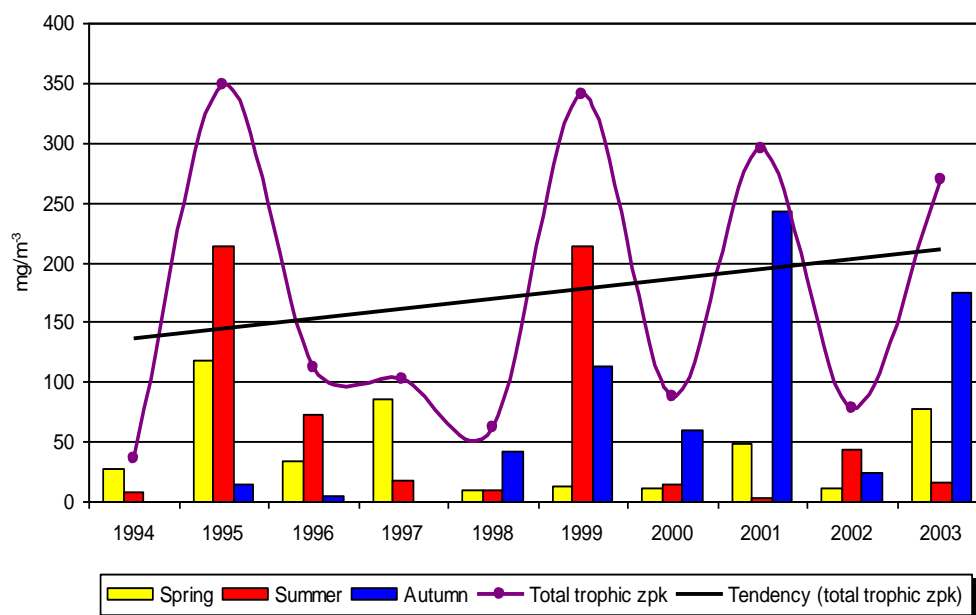


Fig. 5 - Dynamics of zooplankton numeric density and biomass in the Romanian coastal waters between 1994 and 2003

- ecological equilibrium recovery is also visible in benthic coenoses, of macrozoobenthos with trophic role for the tertiary level; these tendencies are reflected by an increase in species diversity, which indicates an improvement of habitats; so, if between 1990 and 1999 the species diversity was about 20 species in all sectors, during the last four years the structural diversity reached 44 to 53 species in the northern and central sector and 39 species in the southern one (Fig. 6). Between 2002 and 2003 benthic biomasses remained relatively low in shallow waters about 100 to 200 g/m², while offshore, at depths between 30 to 50 m they reached up to 700 g/m²;

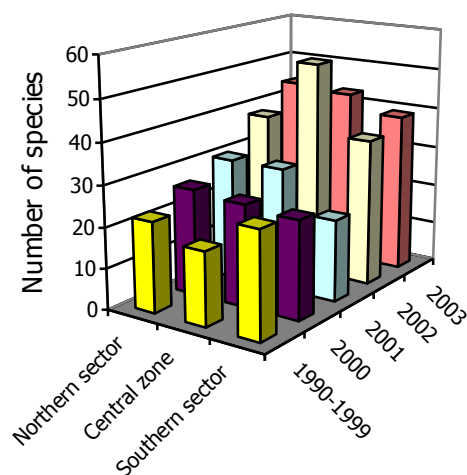


Fig. 6 - Evolution of macrozoobenthos species diversity in Romanian coastal waters between 1990 and 2003

- in general, both for zooplanktonic and zoobenthic communities, most recovery tendencies are observed offshore, at depths exceeding 30 to 40 m;
- pelagic and shallow water benthic coenoses continue to be vulnerable to direct or indirect anthropic activities from the coastal zone;

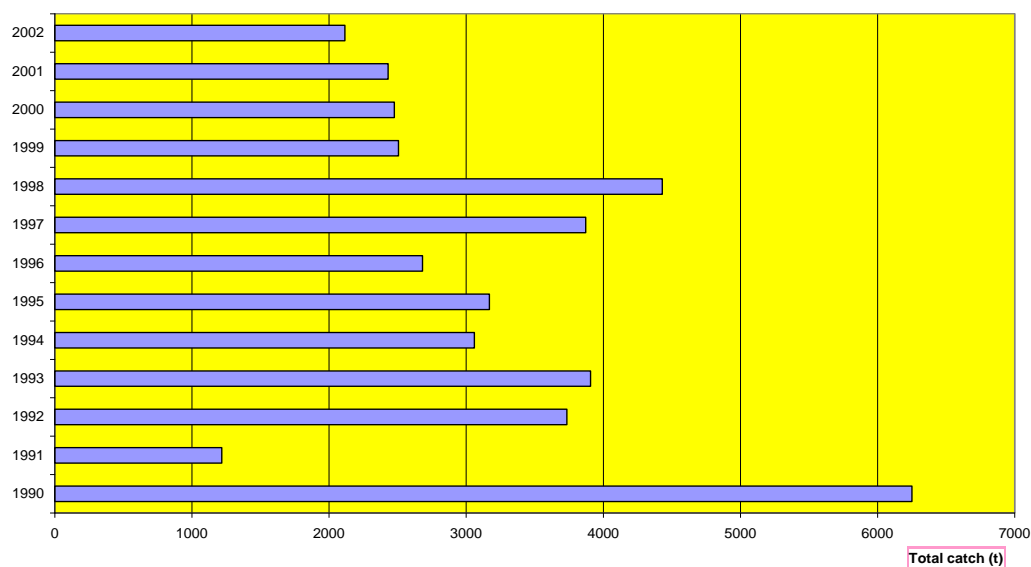


Fig. 7 - Dynamics of total catches in the Romanian marine fishing between 1990 and 2002

- marine fishing shows after 1989/90 a strong decline in catches, stabilizing at about 2,000 to 2,500 t/year between 1999 and 2002 (Fig. 7). This phenomenon is directly related to alteration of environmental living conditions and previous overfishing. In the particular case of Romanian marine fisheries, there are furthermore economic difficulties specific to the restructuring of this sector, and especially, to the reduction of the operational fishing fleet that went from 20 vessels in 1995 to only 7 in 2003 (NICOLAEV, 2003);

- the decrease of fishing activities and the installment of favourable environmental conditions brought about some slight recovery tendencies of gregarious pelagic fish stocks; the biomasses of spratt, main species in active fishing within the Romanian marine area, shows a slight reequilibration between 2000 and 2003 (Fig. 8); such tendencies are also noticed for anchovy, and to a lesser extent for horse mackerel and blue fish; the catches for bottom dwellers (shark and turbot) continue to remain insignificant, and preliminary results of assessments in 2003 emphasize a critical state for these species;

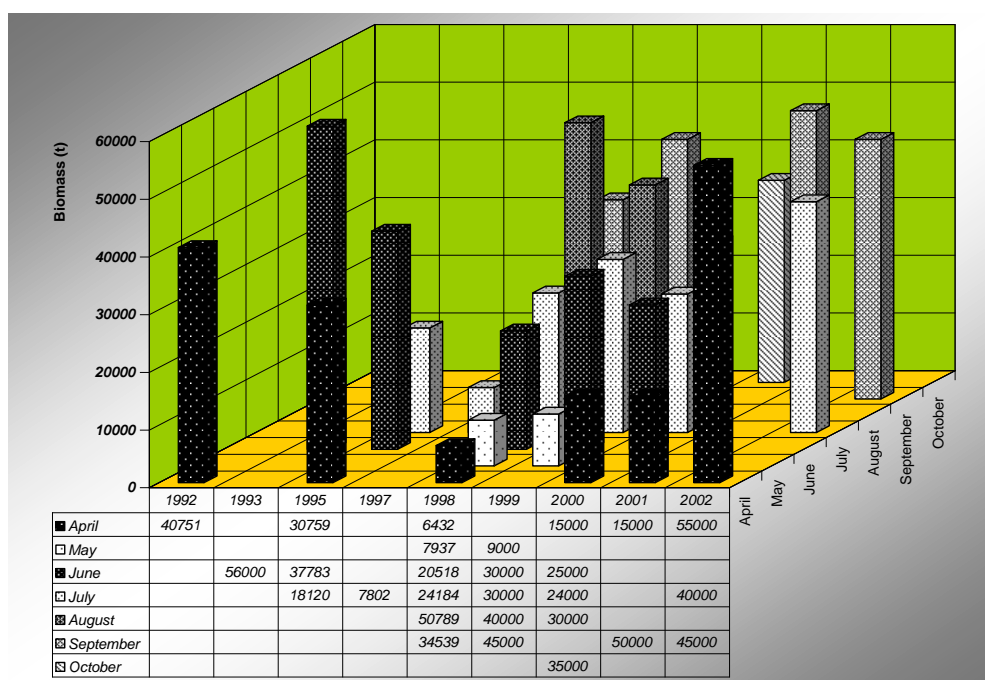


Fig. 8 - Evolution of spratt biomass stocks in the Romanian coastal waters between 1992 and 2002

- between 2002 and 2003 dolphin groups have been far more frequently observed in the Romanian Black Sea sector, showing a possible rehabilitation of the three native species (Fig. 9); fishing with gillnets and tremmel nets constitutes the most serious threat as to their bycatch; in 2002 due to illegal fishing practiced by foreign fishing boats over 100 individuals have beached, most of them *Phocaena phocaena*;



Fig. 9 - Herd of dolphins off Constantza in August 2003

- concerning biodiversity in the Romanian marine ecosystem in 2003, the list of endangered species included 206 taxa, most belonging to the ichthyofauna (Fig. 10);

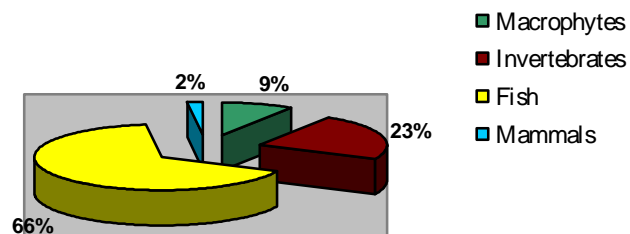


Fig. 10 - Distribution of endangered biota groups in the Romanian coastal waters



Fig. 11 - Male individual of *Callinectes sapidus* at Agigea in 2002

- simultaneously, previously declining species reappeared in larger numbers (decapods, pilchard, mackerel, bonito), some recent immigrants appeared and underwent naturalization, some are of ecological and economic importance, e.g. the blue crab *Callinectes sapidus* (Fig. 11);

6. SHORT TERM PRIORITIES TO ENSURE A SUSTAINABLE

DEVELOPMENT OF THE MARINE ENVIRONMENT

- Actions at national level:
 - Implementation of ICZM process (Law no. 280 / 2003, with about 30 technical-juridical provisions)
 - Implementation of Water Framework Directive
 - Implementation of Shellfish Water Directive
 - Implementation of Habitats Directive
 - Implementation of National Strategic Action Plan
 - Implementation of National Action Plan for Dolphin Conservation
 - Implementation of National Action Plan to Minimize the Transfer of Harmful Marine and Pathogen Organisms in Ships' Ballast Water for the Black Sea Region
 - Elaboration of quality norms for various types of water, discharges, indicators etc.
 - Implementation of the FAO Code of Conduct for Responsible Fisheries.
- Actions at regional level:
 - Adoption of new Convention / Protocol of Fishing and Conservation of Black Sea Living Resources
 - Revision of Protocol (Bucharest Convention) on Land-Based Pollution Sources
 - Adoption of Protocol (Bucharest Convention) on Transboundary Transfer of Hazardous Substances
 - Adoption of Regional Strategy on Biodiversity and Landscape Conservation
 - Strengthening of regional co-operation through:
 - Black Sea Commission
 - ACCOBAMS
 - Black Sea Economic Co-operation (BSEC).

7. GENERAL CONCLUSIONS

1. The present analysis took place after about one decade after the launching of regional initiatives which raised the interest of the coastal states and international community for the environmental problems of the Black Sea and for Panpontic co-operation.

2. During the last 10 years Romania developed a coherent national strategy for the environment, through adoption of a modern legislation, relentlessly applied to the protection and rehabilitation of the marine environment, its coastal zone, and sustained by concerted measures for diminishing the negative impact of anthropic activities.

3. On the background of restructured economic activities and of increased exigencies concerning the implementations of environment related policies, a slight but continuous recovery process of the marine ecosystem has taken place during the last years: the improvement trends are reflected both in water quality parameters and at structural and functional levels of some biotic components.

4. Ecologically, the marine ecosystem as a whole can be assimilated to a state of *convalescence*, still vulnerable, in fragile equilibrium, to anthropic impact, ecological accidents and effects of global climatic changes.

5. The continuity of the natural process of health recovery of the sea depends on the continuity and accomplishment of the conservation, protection and management measures with respect to the marine environment, both at national and regional level, for the entire Black Sea basin.

ACKNOWLEDGMENTS

The authors express their sincerest gratitude to Prof. Roger H. Charlier, Free University Brussels (Belgium) / Northeastern University Illinois (USA), for checking the English translation of the original paper.

REFERENCES :

- BOLOGA A.S., 2001 - Recent changes in the Black Sea ecosystem. *Ocean Yearbook*, 15, Chicago and London: 463-474.
- Camera de Comerț, Industrie, Navigație și Agricultură (CCINA) Constanța, 2001 - *Dobrogea turistică*, Ed. Dobrogea, Constanța, 128 pp.
- Institutul Național de Cercetare-Dezvoltare Marina "Grigore Antipa" (INCDM) Constanța, 2003 - *Document final, Simpozion Național, cu participare internațională: Protecția și gestionarea durabilă a ecosistemului Mării Negre, imperativ al mileniului trei*, Constanța, 9-11.10.2003, 7 pp.
- INCDM, 2004 - *Raport privind starea mediului marin în anul 2003*, Constanța, 24 pp.

- JAOSHVILLI V.S., 2003 - *The Rivers of the Black Sea*, Tbilisi State University, Tbilisi, 186 pp.
- NICOLAEV S., 2001 - Main environmental issue of the Black Sea, *Journal of Environmental Protection and Ecology*, Thessaloniki, Greece, 193-200.
- NICOLAEV S., 2002 - The Romanian marine fisheries: an overview of current status and needs for sustainable development, *Conference BENA*, Preveza, Greece, 15 pp.
- STADIU F., 2004 - Gospodaria apelor, baza a dezvoltarii durabile a Romaniei. Stadiul actual si perspective, *Apa - Factor al dezvoltarii durabile*, Comisia Nationala permanenta de elaborare a Strategiei de Dezvoltare Durabila a Romaniei "Orizont-2025", Bucuresti, 62 pp.
- SERBAN P., 2004 - Managementul integrat al resurselor de apa in perspectiva aderarii la Uniunea Europeana, *Apa - Factor al dezvoltarii durabile*, CNESDDR, Bucuresti, 32 pp.
- Service Hydrographique et Oceanographique de la Marine (SHOM), 1974 / 1994 - *Mer Noire et Mer d'Azov, Instructions Nautiques D7*, Brest, 367 pp. et *Corrections*, fasc. 7/D, Brest, 92 pp.

