STEPS IN THE IMPLEMENTATION OF THE "SHELLFISH WATERS" DIRECTIVE (CEE 79/923) IN ROMANIA

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ABSTRACT

The paper presents a synthesis of Directive No. 97/923 "Shellfish Waters" implementation in Romania, adapted to the specific Black Sea conditions and related national legislation. The EU Directive No. 97/923 "Shellfish Waters" was implemented in Romania based on Government Decision No. 201/2002 modified and completed with Government Decision No. 467/2006 consisting of technical methods regarding the water quality for molluscs. In 2007 the Ministry of the Environment issued the Ministerial Order No. 1888/2007 that approves the list of organohalogenated compounds and heavy metals, including the maximum accepted limits for water, sediments and molluscs, based on the proposals forwarded by the National Institute for Marine Research and Development (NIMRD) "Grigore Antipa" Constanta. Based on the studies carried out by NIMRD, the Ministry of the Environment issued the Order No. 1950/2007 completed by the Ministry of Agriculture, Forestry and Rural Development Order No. 38/2008 that delimited and inventoried marine areas suitable for the growth and exploitation of molluscs. Based on the data provided by NIMRD during 2005-2009, Romania has reported to the EC and EEA the conformity to the Directive No.79/923/CEE. NIMRD has implemented a monitoring system of littoral waters, sediments and molluscs according to the requirements of the EU Directive No. 97/923 and of national requirements, and a set of mitigation measures towards the reduction of pollution and water quality required by EU legislation.

KEY WORDS: EU Directive No. 97/923, Black Sea coastal water quality, molluscs.

INTRODUCTION

Within the requirements of implementing in Romania EU legislation is the EU Shellfish Waters Directive No. 79/923 EEC. According to the Directive, the EU Member States must (i) designate marine waters (including coastal waters, gulfs, fjords, etc.) that require protection or improvements in quality, as a support for mollusc growth, (ii) develop programs for water pollution reduction in the above selected areas, (iii) establish a set of values for the parameters listed in the Directive's Annex, and (iv) to implement a water monitoring program for molluscs (*Directive No. 79/923/CEE*).

For the implementation of the EU Directives the following steps were accomplished: (i) the delimitation of four favourable areas for the development and exploitation of molluscs in the Romanian coastal area (*Order No. 1950/2007*); (ii) developing a monitoring system of the marine environment in the designated areas; (iii) establish the maximal allowed limits of organohalogenated substances and heavy metals in water, sediments and marine molluscs (*Order No. 1888/2007*). The reporting towards the European Commission (EC) and the European Environmental Agency (EEA) regarding the conformity to the quality goals required by the Directive were done annually based on the data obtained during 2005-2009.

The paper presents a synthesis of reported data to the EC and EEA and the conformity to the Directive No. 79/923 EEC between 2005 and 2009, along the Romanian Black Sea coast.

MATERIALS AND METHODS

Marine water, sediments and living molluscs were monitored during 2005-2009.

Physical, chemical and biological factors of the marine environment (water and sediment) in living molluscs (water temperature, salinity, dissolved oxygen total hydrocarbons, organohalogenated substances, heavy metals, faecal coliforms) were analyzed by the analytical methods set out in Annex to Directive No. 79/923 and Government Order No. 201/2002.

The main species monitored were the mussel M*ytilus galloprovincialis* and the snail *Rapana venosa.* The quality of economically important molluscs of in terms of heavy metals contamination, pesticides and microbial load was evaluated within each of the four delimited areas.

The evaluation of the quality of the marine environment and of marine molluscs was carried out in the four designated areas for growth and commercial exploitation (Fig. 1 and Table 1).

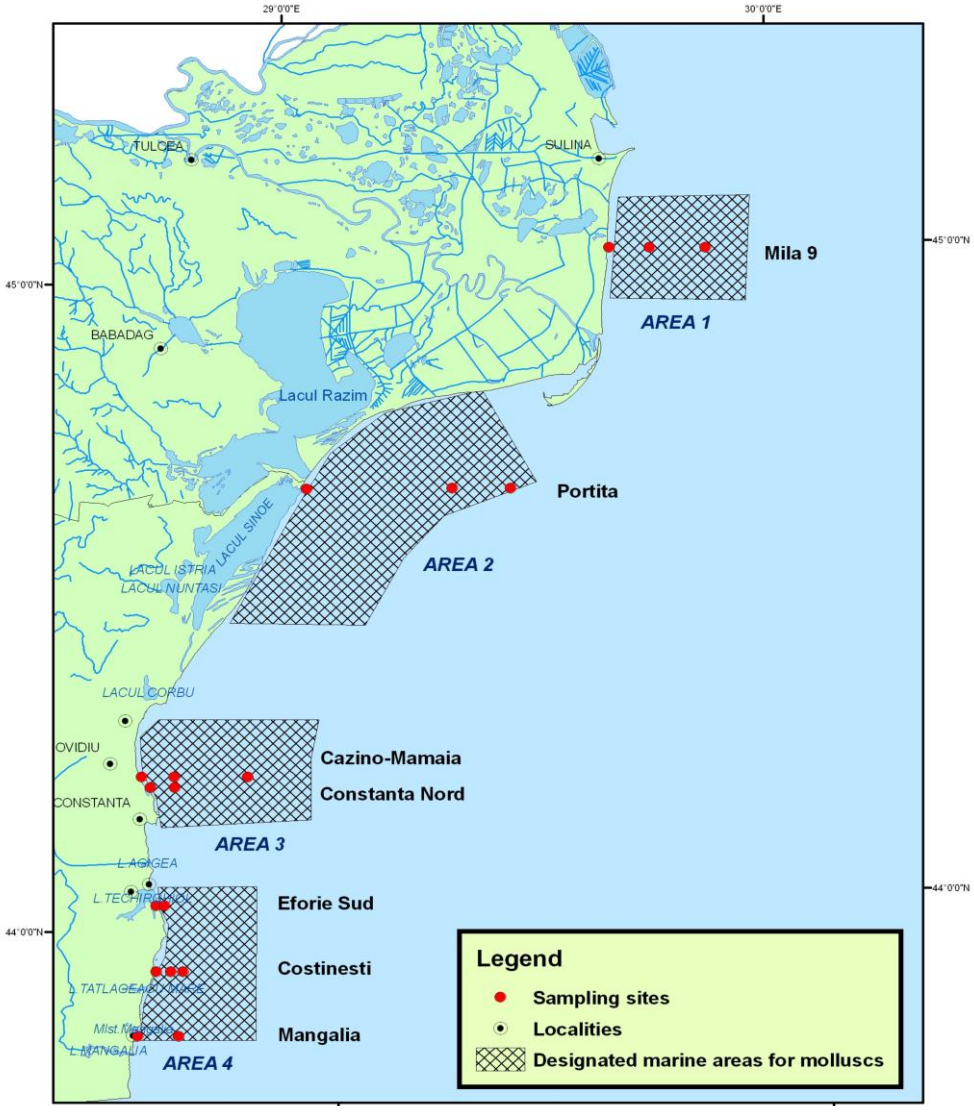

Fig. 1 - Map with sampling sites from designated marine areas for growth and economic exploitation of molluscs

Table 1 - The location, area and sampling sites along transects in each of the four designated areas

Area	Geographic limits	Area	Sampling transects (location and isobath)
1	Sulina and Sf. Gheorghe	142 Mm^2	Mila 9 45°01'N 29°39'E (5 m depth) 45°01'N 29°44'E (20 m depth) 45°01'N 29°51'E (30 m depth)
2	Perişor and Chituc	215 Mm^2	Portiţa 44°40'N 29°00'E (5 m depth) 44°38'N 29°12'E (20 m depth) 44°37'N 29°20'E (30 m depth)
3	Năvodari and Constanţa Harbor	109 Mm^2	Cazino-Mamaia 44°14'50''N 28°38'50''E (5 m depth) 44°14'50''N 28°42'50''E (20 m depth) 44°14'50''N 28°51'E (30 m depth) Constanţa Nord 44°13'N 28°39'E (5 m depth) 44°13'N 28°42'E (20 m depth)
4	Agigea and Mangalia	101 Mm^2	Eforie Sud 44°02'N 28°39'E (5 m depth) 44°02'N 28°40'E (20 m depth) Costineşti 43°56'N 28°39'E (5 m depth) 43°56'N 28°41'E (20 m depth) 43°56'N 28°45'E (30 m depth) Mangalia 43°50'N 28°36'E (5 m depth) 43°50'N 28°41'E (20 m depth)

RESULTS AND DISCUSSION

Implementing Directive No. 79/923 started with Government Decision No. 201/2002 for the approval of Technical Requirements regarding water quality for molluscs, thus defining marine waters for molluscs in need of protection and improvement, for the persistence and development of snail and bivalve molluscs (*Government Decision No. 201/2002*). This was further completed by the Decision No. 467 regarding the changes in water quality for molluscs as previously approved by Government Decision No. 201/2002, with corrections and detailed specifications.

The implementation of the "Shellfish Waters" Directive in Romania will not only protect mollusc populations in the coastal waters from the detrimental effects of pollution and thus improve the quality of molluscs for human consumption, but will allow the export of molluscs to other EU countries (DUMITRESCU *et al*., 2003, 2005).

In 2006 it was made a new proposal for the Parliament and European Council Directive regarding the water quality required for molluscs, consisting of the codification (COD 2006/0067), clarifications and details for a better understanding (*Decision No. 467/2007*).

Implementing the "Shellfish Waters" Directive must be achieved in parallel with the "Shellfish Hygiene" Directive No. 91/492 EEC which requires cataloguing marine waters designated for molluscs according to their quality. The government has elaborated three ministerial orders to fulfill this requirement and provide a thorough regulation of national waters regarding water and marine mollusc quality within the Romanian coastal waters. These orders were Order of the Ministry of the Environment and Sustainable Development No. 1888/27.11.2007 for the approval of the list of organohalogenated substances and heavy metals, and their highest tolerated values in water and sediments and Ministry of the Environment and Sustainable Development No. 1950/12.12.2007 together with Ministry of Agriculture and Rural Development No. 38/18.01.2008 for the delimitation and registering of marine areas favorable for the development and economic exploitation of molluscs.

The parameters measured and the minimal/maximal values accepted were those included in the Annex of the Directive: pH with values between 7 and 9, colour that must not vary with more than 10 mgPt/l; suspended solids that must not register values higher than 30% compared to unaffected waters, salinity with values between 12-38‰, dissolved oxygen with values higher than 70%, petroleum hydrocarbons and their derivatives that must not form films, total number of faecal coliforms below 300/l00 ml (*Directive No. 79/923/CEE*). All analyses were done according to the methods included in the Annex of the Directive No. 79/923 and the Government Order No. 201/2002.

The level of conformity to the "Shellfish Waters" Directive quality requirements of the Romanian coastal waters have been considered (Table 2). Thus pH was only rarely measured, the values ranging between 7 and 9. Within the integrated monitoring program of the Romanian coastal waters pH is not measured anymore, since marine water has a high buffering capacity.

Table 2 - The level of compliance for quality parameters of shellfish water with the objectives set by Directive 79/923 and HG 201/2002

Parameter	**Level of compliance resulted in shellfish areas-% No samples with values between allowable limits** *** % No samples with values outside the maximum (MA) and/or recommended (MR)**																**Level of compliance set -% No samples with values below the maximum allowable (MA) and / or recommended (MR)**
Area	**1**				**2**				**3**				**4**				
	2006	2007	2008	2009	2006	2007	2008	2009	2006	2007	2008	2009	2006	2007	2008	2009	
pH	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	(MA) - 75
Salinity (g ‰)	**66,6***	**50***	**0***	**0***	**88,3***	100	**60***	**80***	100	100	**64***	100	100	100	**94,28***	100	(MA and MR) -95
Dissolved oxygen (% saturation)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	(MA and MR) -95
Petroleum hydrocarbons	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	(MA) - without film
Organoclorurated substances *a. water (ug/l)*																	(MA) - 100
HCB	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Lindane	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Aldrin	100	100	100	100	100	100	100	100	**87,5***	100	100	100	100	100	100	100	100
Dieldrin	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Endrin	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
DDT total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	**85,71***	100	100
b. sediments																	

Parameter	**Level of compliance resulted in shellfish areas-% No samples with values between allowable limits** *** % No samples with values outside the maximum (MA) and/or recommended (MR)**																**Level of compliance set -% No samples with values below the maximum allowable (MA) and / or recommended (MR)**
Area	**1**				**2**				**3**				**4**				
(µg/g)									100								
HCB	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Lindane	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Aldrin	100	100	100	100	100	100	100	100	100	100	100	100	**95***	100	100	100	100
Dieldrin	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Endrin	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
DDT total	100	100	100	100	100	100	100	100		100	100	100	100	100	100	100	100
																	(MR) - 100
c. molluscs																	
(µg/g)									100								
HCB	100	100	100	100	100	100	100	100	**83,3***	100	100	100	100	100	100	100	100
Lindane	100	100	100	100	100	100	100	100	**83,3***	100	100	100	100	100	100	100	100
Aldrin	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Dieldrin	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Endrin	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
DDT total	100	100	100	100	100	100	100	100		100	100	100	100	100	100	100	100
Metals																	(MA) - 100
a. water (µg/l)																	
Cu	100	100	100	100	100	100	100	100	100	100	100	100	**95***	100	100	100	100
Cd	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Pb	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Ni	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Cr	100	100	100	100	100	100	100	100	100	100	100	100	100	100	**85,71***	100	100
b. sediments ug/g)																	
Cu	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Parameter	**Level of compliance resulted in shellfish areas-% No samples with values between allowable limits** *** % No samples with values outside the maximum (MA) and/or recommended (MR)**																**Level of compliance set -% No samples with values below the maximum allowable (MA) and / or recommended (MR)**
Area	**1**				**2**				**3**				**4**				
Cd	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Pb	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Ni	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Cr	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
c. molluscs (ug/g)																	(MR) - 100
Cu	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Cd	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Pb	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Ni	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Cr	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Faecal coliforms Nr./100ml	100	100	100	100	100	100	100	100	100	100	100	100	100	100	**85,71***	100	(MR) - 75

Total suspended solids had overall low values without impact on water quality. Water temperature was not influenced by point discharges. Salinity evinced often values below the minimal recommended threshold of 12‰. Dissolved oxygen filled well to the requirements in all four areas. The presence of petroleum hydrocarbons films was visually assessed, but was not reported within the investigated areas. Organohalogenated substances were identified in both water and sediments but within concentrations allowed by Ministerial Order No. 1888/2007, with the exception of Areas 3 and 4 in 2006 and 2008. Thus, in Area 3 the maximum limit allowed for Aldrin concentration was exceeded in 2006 in water and for molluscs for Lindane and Aldrin. In Area 4 concentrations that exceeded the limits were recorded for Aldrin in sediments in 2006 and for DDT in water in 2008. The heavy metals (Ministerial Order No.1888/2007) exceeded the allowed concentration limits only in water from Area 4 for copper in 2006 and chromium in 2008. Overall organohalogenated substances and heavy metals contamination was extremely low and their concentration in mollusc meat did not present a threat for human consumption.
Faecal coliforms were present in molluscs at concentrations below the threshold, with a single exception, in 2008, for mussels collected at 12 m depth at Eforie Nord
Based on the monitoring results are being recommended the following measures for complete fulfillment of the requirements of the "Shellfish Waters" Directive: (i) limiting the inputs of nutrients carried by the Danube; (ii) improving the ability to treat wastewater along the coastline, (iii) a rigorous control of ballast water, wastewater and garbage disposal related to shipping; (iv) limit and control the use of fertilizers and pesticides on agriculture fields close to the coastline; (v) increase awareness of the public regarding the risks of consumption of contaminated molluscs and on the needs for environmental quality.

CONCLUSIONS

Water and sediment quality along the Romanian coastline was overall in conformity with the Shellfish Waters Directive. The only parameter under the minimal value was salinity in the northern part of the Romanian coastline due to the freshwater transported by the Danube River.

Acknowledgments

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