

A MODEL TECHNICAL COOPERATION PROJECT ON THE MARINE RADIOACTIVITY ASSESSMENT IN THE BLACK SEA REGION

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INTRODUCTION

"Marine Environmental Assessment of the Black Sea Region" is a wide scope Regional Technical Co-operation Project coded as RER/2/003 implemented by the International Atomic Energy Agency (IAEA) in the period 1995-2001. This multidisciplinary project was designed in response to the needs of participating Member States - the six Black Sea coastal countries (Bulgaria, Romania, Ukraine, Russian Federation, Georgia and Turkey)- to establish capabilities for reliably assessing radionuclides in the Black Sea environment and applying tracer techniques to marine pollution studies. The IAEA assisted laboratories in the region by providing expert services, training, equipment and materials (Göktepe et al., 1998; Osvath et al., 1997-2000).

TECHNICAL COOPERATION IN THE BLACK SEA REGION

The model Technical Cooperation Project (TCP) on the Marine Radioactivity Assessment among Black Sea countries has various important aspects: Scientifically; one of the major environmental issue radioactivity pollution is addressed. Marine radioactivity data is accumulated. Technically; laboratory capability for transuranic analysis is being developed. Economically; the reversing the ecological deterioration and developing sustainable uses of the Black Sea and its natural resources is one of the major interests. Politically; responsibility of pollution control and rehabilitation plans of six Black Sea countries are addressed through various convention and declarations. Socio-economically, fisheries and tourism sectors are expected to benefit (Göktepe et al., 2000).

One of the main targets of the project design and management was set as the integration of strong practical co-operation mechanisms into the joint work. In order to achieve the best results, annual planning and co-ordination meetings were held from the start of the activities. A good co-operation scheme between the IAEA and all participant countries as well as other ongoing projects and international organizations is integrated into the work. A first joint scientific cruise with 31 participants is organized to the Black Sea western basin in 9-23 September 1998 and a Ministerial Meeting is convened in Monaco to discuss future project strategies. The second joint cruise organized to the Eastern part of the Black Sea during the period 21 September-11 October 2000 with a goal to complete the marine environmental assessment initiated in 1998. The Cruise was carried out on board with the Ukrainian Research Vessel "Prof. Vodyanitskyi". 30 scientists from research institutes in all Black Sea countries have taken part in the cruise.

JOINT RADIOACTIVITY MONITORING PROGRAMME

The joint monitoring program of the IAEA's "Marine Environmental Assessment of the Black Sea Region" TCP is implemented by the six Black Sea countries in 1996. The monitoring programme is organized in such a way that specific samples collected from the selected stations of each country and the laboratory analysis are carried out twice a year by using a harmonized methodology.

The specific samples to be collected for the radioactivity analysis of the joint monitoring programme are:

- Fish (*Merlangius euxinus* and *Trachurus trachurus*),
- Mussel (*Mytilus galloprovincialis*),
- Alg (*Cystoseria barbata*),
- Beach sand and
- Surface water samples.

Several sampling stations along the coastal zone of the six Black Sea countries are selected for routine radioactivity monitoring programme. The main monitoring stations of Turkey; Trabzon, Sinop, Zonguldak and Şile are shown in Fig. 1.



Figure 1: Turkish monitoring stations

RESULTS

Large volume of samples collected and analyzed over the past four years. Valuable data is accumulated on the Black Sea marine radioactivity assessment. As an illustration of the analytical work; fish sample results extracted from the Turkish coastal monitoring are shown in Table 1-3 (Goktepe et al., 2002).

^{137}Cs and $^{239+40}\text{Pu}$ activity concentrations in fish samples in the Black Sea marine environment is related to the Chernobyl accident in 1986 and the atmospheric weapons tests carried out in 1945-1980.

Activity concentrations ^{137}Cs and $^{239+40}\text{Pu}$ are found to vary between 0.35-2.50 Bq.kg⁻¹ and 0.02-0.06 Bq.kg⁻¹, respectively. It can be seen that, no significant difference in radioactivity levels among the samples collected between 1998-2001 encountered.

Table 1. ^{137}Cs and $^{239+40}\text{Pu}$ concentrations (Bq.kg⁻¹ in dry weight, $\pm 1\sigma$) in fish sample (*T. trachurus*)

Location	Date	^{137}Cs	$^{239+40}\text{Pu}$
Sile	Nov./1999	2.50 $\pm$ 0.90	0.06 $\pm$ 0.03
	June/2001	1.30 $\pm$ 0.40	0.03 $\pm$ 0.01
Zonguldak	June /1998	0.93 $\pm$ 0.20	0.04 $\pm$ 0.02
	June /2000	1.70 $\pm$ 0.72	0.04 $\pm$ 0.02
	June /2001	0.99 $\pm$ 0.49	0.04 $\pm$ 0.02
Sinop	1998	0.54 $\pm$ 0.20	0.02 $\pm$ 0.01
	June /2001	1.14 $\pm$ 0.49	0.03 $\pm$ 0.01
Trabzon	1998	1.60 $\pm$ 0.47	0.05 $\pm$ 0.02
	Nov./1999	1.40 $\pm$ 0.31	0.06 $\pm$ 0.02
	Dec./2000	2.45 $\pm$ 0.96	
	June /2001	0.84 $\pm$ 0.38	0.03 $\pm$ 0.02

Table 2. ^{137}Cs and $^{239+40}\text{Pu}$ concentrations (Bq.kg⁻¹ in dry weight, $\pm 1\sigma$) in fish sample (*M. Barbatus*)

Location	Date	^{137}Cs	$^{239+40}\text{Pu}$
Sile	Nov./1999	0.43 $\pm$ 0.36	0.034 $\pm$ 0.004
Sinop	June /2000	0.39 $\pm$ 0.33	0.032 $\pm$ 0.004
Trabzon	Nov./1999	1.11 $\pm$ 0.62	0.032 $\pm$ 0.002

Table 3. ^{137}Cs and $^{239+40}\text{Pu}$ concentrations (Bq.kg⁻¹ in dry weight, $\pm 1\sigma$) in fish sample (*M. euximus*)

Location	Date	^{137}Cs	$^{239+40}\text{Pu}$
Sile	Dec./1998	1.40 $\pm$ 0.30	0.026 $\pm$ 0.016
	Nov./199		0.020 $\pm$ 0.010
Zonguldak	1998	2.60 $\pm$ 0.51	0.021 $\pm$ 0.010
Sinop	June /1998	1.80 $\pm$ 0.35	0.028 $\pm$ 0.005 0.026 $\pm$ 0.005
	Dec./1998	0.35 $\pm$ 0.28	
	June /2000	1.12 $\pm$ 0.38	
	June /2001		
Trabzon	June /1998	2.20 $\pm$ 0.40	0.023 $\pm$ 0.012 0.036 $\pm$ 0.012 0.032 $\pm$ 0.013
	June /1999	0.70 $\pm$ 0.40	
	Nov./1999		
	Dec./2000	1.30 $\pm$ 0.57	
	June /2001	1.99 $\pm$ 0.56	

Achievements:

The major achievements of the TCP can be summarized as follows:

- Institutions equipped for radioactivity monitoring pollution in all Black Sea countries
- Organization of training courses and advanced technical workshops on assessment and measurement radionuclides in marine samples and use of radiotracers for marine studies;
- Provision and commissioning of sediment samplers, radiometric equipment and laboratory supplies;
- Initiation of quality assurance program;
- Co-ordination of coastal radioactivity monitoring;
- Collaboration with other parallel programs for Black Sea environmental monitoring and protection.
- Communication between marine research centers, scientist and environmental NGOs.
- Accumulation of reliable Black Sea marine radioactivity data.
- Publication of several papers and articles on Black Sea marine radioactivity.

CONCLUDING REMARKS

Black Sea, a unique marine environment has been facing an environmental degradation as a result of the over exploitation in a period of last four decades, particularly in its use for discharges and disposal of waste from many kinds of human activities (domestic, agricultural and industrial) and releases from ships.

Eutrophication is regarded as the most significant cause of the Black Sea ecosystem degradation. Nitrogen and phosphorus known as the two major pollutants causing the eutrophication are transported into the Black Sea by major rivers in the Black Sea basin.

The radioactivity levels in the Black Sea marine environment has always been one of the major issues in terms of public concern However, the preliminary results of the “Marine Environmental Assessment of the Black Sea region” project show that radioactivity levels have no significance in terms of human health and environmental safety.

Pollution prevention, rehabilitation and sustainable development of the Black Sea region will require continuous national efforts as well as international cooperation. The Turkish Atomic Energy Authority recognizes the importance of scientific, economic and political issues related to the Black Sea, therefore fully supports the regional research, cooperation activities related to the environmental management of the Black Sea. In this respect current model TCP enabled the improve the technical capacity of the laboratories for the marine radioactivity pollution assessment and systematic radioactivity monitoring of the West to East, along the coast of Turkish Black Sea. On the other hand excellent communication means achieved among the scientific

communities of the marine research institutes in the region as well as politicians and administrative authorities.

In addition to radioactivity assessment, the use of nuclear and isotopic techniques are gaining more importance in the environmental management studies. Therefore it is recommended that Eurasian countries should cooperate on surface water and underground water pollution assessment as well as protection of water resources and rehabilitation of wetlands.

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