

MEDITERRANEAN MUSSEL WATCH: A REGIONAL PROGRAM FOR DETECTING RADIONUCLIDES, TRACE- AND EMERGING-CONTAMINANTS

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Abstract

A regional monitoring program - the CIESM Mediterranean Mussel Watch (MMW) - has been running for a few years, using the mussel *Mytilus galloprovincialis* as unique bio-indicator species. The network consists of some 20 marine environmental laboratories from 15 different Mediterranean and Black Sea countries. As of today, more than 50 sites have been sampled to produce the first distribution map of ¹³⁷Cs in coast waters at the Mediterranean basin scale. After a successful MMW Phase I, the objectives of Phase II include extension of monitoring activities to other radionuclides and selected trace- and emerging-contaminants along with enlargement of the network via the association of five additional Eastern Mediterranean countries.

Keywords : *Monitoring, Bio-indicators, Nile, Pollution, Bivalves.*

Introduction

In the aftermath of the Chernobyl accident, a coordinated research program called GIRMED (Global Inventory of Radioactivity in the MEDiterranean Sea) was launched by CIESM during its 31st Congress held in Athens in 1988, with the objective to assess the regional impact of this major accident. However, as the data collected were usually obtained from various indicator species, procedures and methods, this made direct comparison of results on spatial or temporal scales difficult. In 2002, a new program started aiming to organize the production of monitoring data on a common basis and to set up an effective observation tool on an extended scale. A dedicated workshop was called to design a permanent Mediterranean Mussel Watch dealing with radionuclides and other trace contaminants [1]. A common agreement was reached on the objectives and the general framework of the monitoring network, including strategies, procedures and methods.

Implementation phase

The main objectives are to develop an international trans-Mediterranean infrastructure of cooperating scientists and laboratories aiming at monitoring levels of selected contaminants in coastal waters and to document reliable baseline levels of radionuclides in the Mediterranean and Black Sea coastal waters. Some 20 marine environmental laboratories from 15 different Mediterranean countries are now involved in this international, dynamic network, the first in the region specifically designed to monitor radionuclides before its extension to other selected pollutants.

The selected bio-indicator species is the Mediterranean mussel *Mytilus galloprovincialis*, widespread in the region and for which background knowledge on biology and physiology is available. In sectors where natural populations are rare or absent, samples can be obtained from transplanted mussels [2]. More than 50 sites have been sampled so far, usually before and after the spawning season, although the south and east coasts are still poorly documented. Sampling procedures and treatment of samples is homogenous among the participants. Trace level measurements of radionuclides are performed by direct gamma spectrometry as a routine technique. Initial intercalibration of all participating analytical laboratories is a very important step in the implementation phase. This was achieved with the making of a specific reference material (AIEA-437), used to carry out a large inter-comparison exercise across the entire network, financially supported and coordinated by the IAEA-MEL, Monaco and IRSN, France.

Results

The MMW network has been able in 2005 to produce the first distribution map of ¹³⁷Cs at the regional level. This artificial radionuclide mostly originated from global fallout of former nuclear weapons is now detected at very low level (usually less than 1 Bq.kg⁻¹ w.w.) in all Mediterranean coastal waters. However, in the Black Sea and North Aegean Sea, ¹³⁷Cs activity in mussels is still over one order of magnitude higher than in the Western basin, showing the remaining impact of Chernobyl accident.

Next steps

The main goals of the MMW Project Phase II are:

- To extend the survey and monitoring activities using the well-established network developed in Phase One (15 countries, 50 stations) by adding up to six additional countries and 36 monitoring stations in order to guarantee

the monitoring coverage of the entire basin.

- To complete the ¹³⁷Cs survey with data from the South and East Mediterranean coasts to produce a more comprehensive overview of this contaminant.

- To include the monitoring of the radioactive element Polonium-210 (P-210) and the trace elements: arsenic, cadmium, copper, lead, zinc, silver and mercury.

- To monitor emerging contaminants.

Polonium-210 is a radioactive element that occurs naturally in low concentration in the marine environment. It is also a by-product of phosphate fertilizers and phosphoric acid industries. High levels of ²¹⁰Po may represent a health hazard in marine coastal areas. The other trace elements selected also occur naturally in the marine environment, where human activities such as manufacturing, agriculture and mining can dramatically increase their level. Phase Two will put a special emphasis on emerging contaminants, an area of CIESM expertise (see CIESM Monograph on "Novel Contaminants" published in 2004; <http://www.ciesm.org/online/monographs/Neuchatel04.pdf>). These new generations of pesticides, pharmaceutically active compounds (like tranquilizers, antibiotics, hormones), and industrial chemicals are discharged by hundreds of tons in rivers before reaching coastal waters.

Within the framework of the program, an active collaboration (expertise and/or funding) with the IAEA-MEL (Principality of Monaco), the IAEA/TC (Vienna) and MED-POL (Athens) will be sought. Indeed, the three above mentioned institutions will greatly contribute to the feasibility of the MMWII. For example, the IAEA-MEL will provide expertise in implementing the monitoring program and assist in the AQCS (e.g. by providing appropriate reference materials and helping with the setup/coordination of the inter-calibration exercise).

Results obtained from Phase Two will reliably map the current distribution of Polonium-210 and of the selected trace- and emerging-contaminants in wild and transplanted mussels across the entire Mediterranean Basin. This unique dataset will provide critical information on the particular issue of seafood safety for human health, fishing and aquaculture. The scientific outcomes of the project will be published in international scientific journals, and be made accessible to broader audience as well. All data produced by the participants will be synthesized in a CIESM database, where they will be fully available on-line to all concerned parties.

References

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