

---

# Biological effects monitoring in MED POL Phase III Programme

**Presented by:**

**Volodymyr MYROSHNYCHENKO**

CEP-CAP Data and Information Management Expert (DIME)

CEP Program Coordination Unit,

63 Golestan Alley, Valiasr Avenue,

1966733413 Tehran

I.R. Iran

E-Mail: [volodymyr.myroshnychenko@undp.org](mailto:volodymyr.myroshnychenko@undp.org)

# General information on MED POL Phase III

---

Time period: 1996 -2005

Objectives:

- to determine temporal trends of some selected contaminants in order to assess the effectiveness of actions and policy measures;
- to present periodical assessments of the state of the environment in hot spots and coastal areas (needed to provide information for decision makers on the basic environmental status of the areas which are under anthropogenic pressures), and
- to enhance the control of pollution by means of compliance to national/ international regulatory limits.

Monitoring Agreements are signed with 10 countries of the region. Monitoring data are reported to UNEP MAP.

# Monitoring Stations

---



# Biological effects monitoring component

---

Biological effects monitoring (monitoring with biomarkers) has been included in the monitoring programmes as a pilot activity to test the methodology as well as its utilization as an early-warning tool to detect any destructive effects of pollutants on marine organisms at the initial stage of exposures.

Biological effects monitoring is the only component of the monitoring activities that will provide direct information on the impacts of the pollutants to marine life.

Biomarkers can be considered as the most direct method to assess exposure to, and effects of, chemical contaminants at very early stages (at cellular or organism level).

# Main aspects of bio-effects monitoring program

---

- Choice of sentinel organisms: *Mytilus galloprovincialis* is the recommended mollusc but if not available *Patella* sp. can be used; concerning fish, *Mullus Barbatus* (MB) species is recommended
- Use of a battery of biomarkers:
  - **for stress** (reveal a stress syndrome by integrating the effects of a wide range of environmental pollutants ): lysosomal membrane stability (**LMS**), micronuclei frequency (**DNAx**), etc.,
  - **and exposure** (reflect the response of the organisms to particular classes of toxic chemicals) such as **EROD** (Ethoxyresorufin O-deethylase) activity (induced by organic aromatic xenobiotics such as PAH, PCBs, etc...), metallothionein content (**MT**) (induced by metal cations such as Cd, Cu, Zn, Hg, etc)
- Development of a quality assurance programme

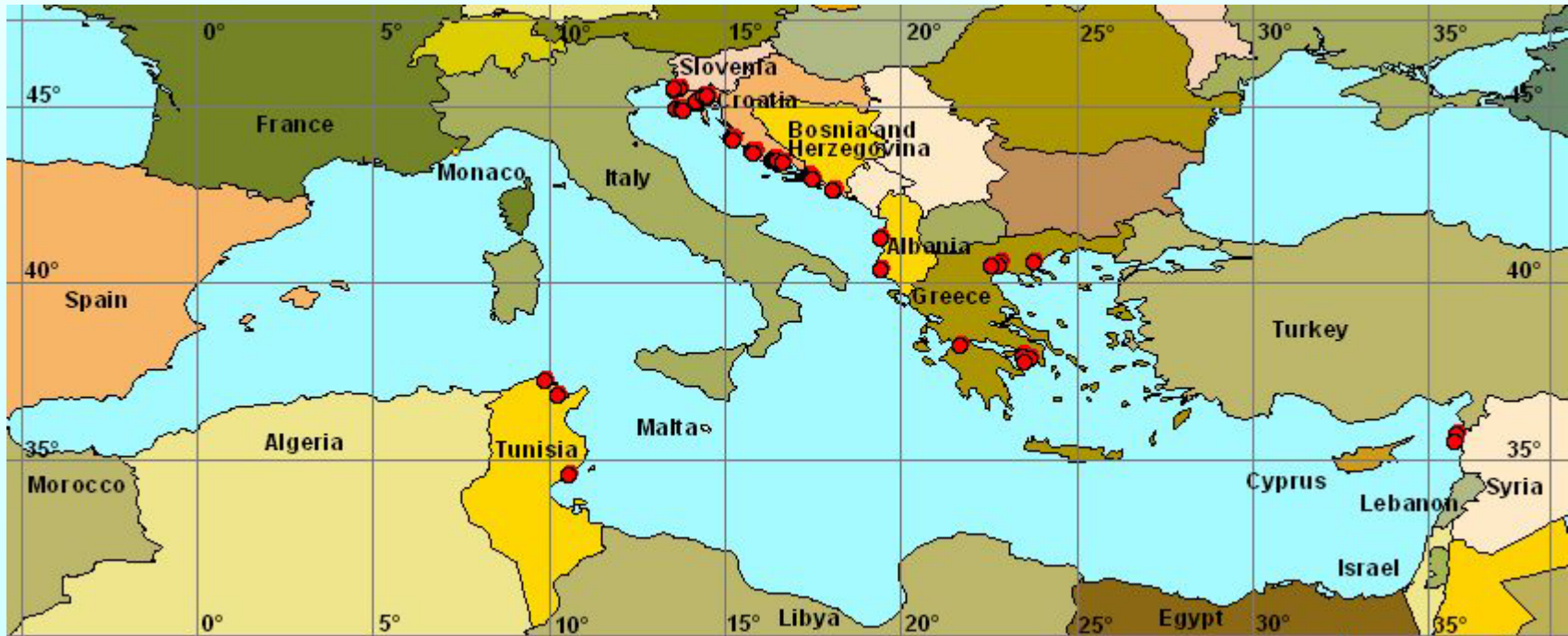
# Monitoring Criteria

Parameters	Sampling Frequencies	Species (Tissue)		Number of samples/specimen
DNA <sub>x</sub> EROD MT LMS	Quarterly or semi-annually	EROD, DNA <sub>x</sub>	MT, LMS	Min. 5 parallel samples for the selected species
		MB, if not available Mugil sp. (Liver)	MB, if not available Mugil sp. (Liver) Mytilus sp. if not available Patella sp. (digestive gland, hepatopancreas for limpets)	

# Participation in the biological effects monitoring

Country	Biomarkers for General Stress	Biomarkers for Specific Stress	Other biomarkers	Number of participating institutes
Albania	√	√		2
Croatia	√	√	√	1
Greece	√	√	√	3
Slovenia	√	√		1
Syria		√		1
Tunisia	√	√	√	2

# Bio-effects monitoring stations





# Quality assurance programme

---

- Distribution of a UNEP/MAP manual for biomarker utilisation
- Diffusion of a video produced by RA.MO.GE. in collaboration with UNEP/MAP showing how to utilize the biomarker methodologies
- Organisation of a series of training courses to prepare the researchers to participate to the biomonitoring program
- Organization of an "Intercalibration Program"

It is important to point out that during the training course special attention was paid to the importance of a standard protocol for animal collection and transport, storage of biological sample, biomarker utilisation and data transmission.

# European Biomonitoring Programme

---

European Biomonitoring Programme - BEEP (Biological Effects of Environmental Pollution in marine coastal ecosystems) was initiated with the support of the European Union.

Most of the core biomarkers selected by the European Programme are the same utilised in the MED POL Biomonitoring Programme thus allowing an easier integration of the possible future common activities.

# Future tasks

---

- Integration the biological data with the results of the chemical analyses (it is important to collect the two data on the same sample or, at least, in the same sites and at the same time).
- Developing web site in which every participant may find all the information for the field and laboratory activities, biomarker methodologies, biomarker videos, statistic instruments and the database related to the different activities.
- Setting up of an “expert system” which made it possible to include data from different biomarkers and thereby to rank the level of stress syndrome affecting organisms living in polluted waters.
- Scientific aspect: studying of pollutant effects at genomic level, introducing new biomarkers, methods, laboratory equipment, etc.
- Improvement of inter-comparison exercises