

## THE CASE FOR A BIOMONITORING PROGRAMME OF POLLUTION IN THE MEDITERRANEAN\*

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Monitoring programmes absorb a lot of resources both human and financial in order to secure the reliable assessment of quality of the environment and "health" of ecosystems. Most of the presently operated projects focusing only on chemical parameters (often only of a limited range of suspected contaminants) are unable to provide adequate information to fulfil the aforementioned objective. Therefore it seems logical that a proper monitoring should include the right mixture of chemical and biological parameters, that is the assessment of the quality of the environment also on the basis of the response of organisms to pollution or other stressors. Any cost-effective environmental monitoring programme must integrate a wide range of chemical and biological monitoring techniques, thereby avoiding replication and providing the sufficient scientific information required to predict the risk of damage to living resources or to man at the earliest possible stage.

The range of biomarkers applicable to the Mediterranean has been recently reviewed by SCULLOS (1993) and AXIAK (1993). The types of bioassays which are currently available and which have shown a proven potential for field monitoring are included in table 1. A wider range of bioassays are indeed available, but these are either of dubious specificity, sensitivity or ecological relevance or have not been sufficiently tested yet in the field. At this stage of bioassay development, it is possible to develop an effective biomonitoring programme, which would be integrated in the current chemical monitoring programmes, and which would be based on the use of biochemical markers such as MFO, methallothioneins, and cellular changes. A pilot biomonitoring programme has been recently proposed to be introduced within the Mediterranean Action Plan. The success of this pilot project will initially depend on the political will and availability of adequate resources for its implementation.

The limitations and inadequacies of the present chemical monitoring programme include : insufficient data quality control, incomplete geographical coverage and insufficient implementation of the required standardized methodologies. The realization of such limitations will be an essential prerequisite in optimizing the present monitoring strategies and in ensuring the effective integration of a biomonitoring component in such a programme. Ultimately, the success of any region-wide environmental monitoring programme will depend on its compatibility with on-going national monitoring programmes and on its ability to communicate effectively relevant information on the state of the environment to the decision makers and environmental authorities.

Table 1. A comparative review of some bioassays and their potential for use in environmental monitoring programmes in the Mediterranean.

	Mixed Function Oxygenases	Methallothioneins	Cellular Changes	Genetic Changes	Scope For Growth	Species Diversity/abundance
Organisms used	Mostly fish	Mostly mussels	Various	Various	Mostly bivalves	
Specificity of response	Organics	Heavy metals	General	General	General	General
Sensitivity	Varies	High	Medium	Varies	High	High
Dose-response relationship	Good	Good	Low	Unknown	Good	Low
Ability to monitor recovery	Unknown	Unknown	Unknown	Unknown	High	High
Ecological significance	Low	Medium	Medium	Unknown	High	High
Sampling validity	High	High	Medium	Unknown	High	Varies
Time of response	Hours	Hours - days	Days - months	Days - months	Days - months	Months
Costs	Medium	Medium	Low	Medium	Medium	Low - Medium
Relative ease	Complex	Complex	Medium	Medium - Complex	Medium	Labour intensive
Potential for monitoring	High	High	Medium	Unknown	High	High

*Adapted from HOWELL et al. (1990)*

### REFERENCES

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- HOWELLS G., GRAY D., and WELLS P. G., 1990. An analytical approach to the assessment of long-term effects of low levels of contaminants in the marine environment. *Mar. Pol. Bull.* 21(8) : 371-37.

\* An introduction to the round table discussion on monitoring.