



International Mussel Watch

Coastal Chemical Contaminant
Monitoring Using Bivalves



The International Mussel Watch

A Global Assessment of Environmental Levels of Chemical Contaminants

Prepared by

**The International Musselwatch Committee
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The International Mussel Watch Project: Executive Summary

Background

The problem being addressed concerns the consequences of the continued, and in some cases, increasing use of biocides/pesticides in tropical and southern-hemispheric regions. The project looks specifically at the levels of organochlorine pesticides in the nearshore and coastal marine environment and the possible implication for human health, the use of marine resources and the changes in coastal ecosystems. Since the time scales of their persistence in the environment are of the order of tens of years, the present problem is urgent. A recent study by the World Health Organization (WHO) on DDT in mother's milk showed much higher levels in several developing countries than in European countries that controlled its usage decade ago.

The program has been triggered by: i.) the realization that the production and major use of persistent biocides/pesticides has shifted from northern hemispheric regions to tropical and southern hemispheric regions, and ii.) the knowledge gained from similar studies in the 1960's and 1970's in the Northern Hemisphere, which concluded that excessive use of persistent biocides/pesticides resulted in grave impacts on coastal marine ecosystems and on the health of the environment. The solution applied to the problem in most Northern Hemisphere countries was a ban or a regulation on the use and the production of selected biocides. This solution, however,

may not be appropriate for the countries of the regions presently under discussion. Education in the controlled use of biocides, coupled with the introduction of alternative substances, may be a more practicable solution.

The project uses bivalves for monitoring the concentration of selected pollutants and as an indicator of bioavailability. Bivalves are chosen because of their worldwide distribution and ubiquitous abundance, their general ability to bioconcentrate most pollutants, and their sedentary habits.

Studies similar to this proposed program have been carried out in North America and in the North Atlantic (coordinated through ICES), and resulted in the identification of zones of high and low contamination levels which can serve as reference areas. Experience gained in the design of techniques for sampling, analysis, preservation, and evaluation from these studies have been taken into account in the present design. Lessons learned from the previous project include the need for stringent data quality control and quality assurance; agreed common methods of sampling, preservation and analysis; and, participation in intercalibration exercises by all participating laboratories.

International Mussel Watch Goals

The primary goal of the International Mussel Watch is to ascertain and assess the

levels of chlorinated hydrocarbon pesticide (CHP) and polychlorinated biphenyls (PCB) in bivalves collected from coastal marine waters throughout the world. The emphasis is on tropical and southern hemispheric locations where the use of these biocides continues and appears to be increasing. Increased use of these persistent toxic biocides may result in contamination of living coastal resources from whole ecosystems to specific food resources with consequent implication for human health and the integrity of marine communities.

Comparison of the measured values with those from the northern hemisphere of the 1960's and the 1970's (at which times morbidities and mortalities related to chlorinated hydrocarbon pollution were observed) will provide an assessment as to whether populations at upper trophic levels, the most susceptible parts of the ecosystem (e.g., mammals and birds), are at risk from these compounds.

Another goal for the International Mussel Watch Project will be to help develop a sustainable activity for observation and monitoring chemical contamination in especially susceptible regions of the world's oceans. Such a global scientific network will provide comparable and reliable data sets for environmental decision makers.

International Mussel Watch Objectives

* To establish on a global scale the levels of contamination of selected organochlorine

pesticides and the polychlorinated biphenyls, in the coastal marine environment.

* To compare, where possible, present day levels of organochlorine compounds found in the tropics and the southern hemispheric locations with those found in the northern hemisphere during the 1960's and 1970's, where ecosystems disturbances at the upper trophic levels (fish, birds, cetaceans) were apparent.

* To establish an archive of samples to provide a basis for a time series comparison for both these compounds and as yet unidentified industrial and agricultural contaminants.

* To contribute to the global data base for the evaluation of the present oceans. Provide laboratories and regional organizations with baseline data against which to interpret to make future environmental management decisions.

Important Products of the Project

* Stimulation of an approach whereby regional specialized networks of laboratories employ the sentinel organism technique for surveillance and monitoring of contamination.

* A global network of sentinel organism data exchange between regional networks, with agreement on associated quality control, sample analysis, data exchange and data analysis procedures.

* A sustainable organization or mechanism capable of obtaining quality controlled data on priority contaminants on a global basis in the near-shore and coastal zone using tested methods of sampling and analysis,

either for baseline studies, "hot spot" monitoring or future trend monitoring.

* A data base on the distribution of organochlorine residues in sentinel bivalves on a global scale.

* Publications on the state of the marine environment with respect to these pesticides and industrial chemicals and a critical assessment of those contaminants in reference to finding published in the open scientific literature.

* Evaluations for use by decision-makers in governments.

* Increased national capabilities to assess environmental problems related to organochlorine pesticides and industrial chemicals and other contaminants in the broader context of a global baseline.

* A base for assessment of priorities for future research and monitoring in relation to the information gathered.

Follow-up Actions

In addition to the sample analysis and synthesis of acquired data, consideration will be given to: a) monitoring of additional sites in consultation with participating national laboratories, b) negotiating with scientists on the expanded use of the archival material for other pollutant classes, c) strengthening national capabilities to continue the monitoring effort, d) acquisition of national production and use data.

Project Benefits

The successful completion of the program will provide a format for future international activities whose goals are to maintain or improve the quality of the global environment. Although there have been regional programs in marine pollution (noteworthy are those of UNEP in their Regional Seas activities and those of the IOC through GIPME/MARPOLMON) very few (e.g. MARPOLMON) have been as widespread geographically and have been carried out under a non-governmental umbrella.

A major benefit will be the acquisition of an initial set of data for chemical contaminants in sentinel organisms to evaluate the extent and severity of chemical contaminants in coastal areas on a regional and global basis. This will be significant initial step in a continuing program that could comprise a sustained and expanded regional and global monitoring effort to assess chemical contamination in coastal areas. These data and their interpretation will provide a sound basis for formulation and implementation of policies for protection of human health and for wise management of coastal ecosystems.

We expect that this project will benefit from and integrate with existing national and regional efforts. In addition, we expect that the project will provide a basis for additional national and regional activities concerned with pollution of coastal areas.

An added benefit will be dissemination to the world community of the results of a

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collaborative experience with reference to: sampling, sample storage, chemical analysis quality assurance procedures; and data interpretation strategies emanating from this program.

Required Resources

Costs for a global monitoring program were estimated in the original report at US\$500,000 per year, for a regional approach

that divided the sampling into four major global regions. This cost estimate presumed a 5-year program and did not include ongoing national and international efforts which would contribute significantly to the International Mussel Watch effort.

Costs for the initial implementation phase which is operational in 1991-92 are estimated separately.

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