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Consultation Meeting on the preparation
of a research programme on Eutrophication
and Plankton Blooms

Athens, 19 - 20 March 1992

**REPORT OF THE CONSULTATION MEETING ON THE
PREPARATION OF A RESEARCH PROGRAMME ON
EUTROPHICATION AND PLANKTON BLOOMS**

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1. The problem of eutrophication and plankton blooms which aggravated in recent years in many areas of the Mediterranean, was the subject of discussion at a number of meetings organized in the framework of the Mediterranean Action Plan.
2. The latest meeting which discussed specifically the implications and control of undesirable plankton blooms took place in Athens from 4 to 6 April 1989 (UNEP(OCA)/MED WG. 4/2). The conclusions and recommendations of this meeting were discussed by the Inter-Agency Advisory Committee (IAAC) for MED POL in 1990 which agreed that additional funds should be sought for the realization of some of the activities proposed. The meeting, therefore, decided to recommend to the Contracting Parties to the Barcelona Convention that, for the biennium 1992/93, 50% of the entire amount allocated for MEDPOL research (US\$ 295,000) should be used for activities on eutrophication and plankton blooms. The Contracting Parties adopted this recommendation at their meeting in Cairo (8-11 October 1991).
3. The IAAC Meeting which met in December 1991 agreed on the procedures to be followed for the implementation of that decision. As a first step, it was decided that a small consultation meeting should be convened in the beginning of 1992 to prepare a detailed workplan for a regional programme. In this connection, the Meeting on the implication and control of undesirable plankton blooms mentioned above had recommended (para.21) "the establishment of a working group of competent scientists from the Mediterranean region who would have the responsibility to propose activities, projects and organizational details to be submitted to the MAP Coordinating Unit for consideration and eventual approval".
4. As a consequence, a small consultation meeting was held from 19 to 20 March 1992 at the MAP Co-ordinating Unit in Athens. Five scientists of proven experience in the field of eutrophication and plankton blooms were invited to attend as well as the MED POL Co-operating Agencies in charge of the technical follow up and implementation of the MED POL research component (see list of participants as annex I).
5. During the course of the two-day meeting, the expert group discussed extensively the most effective approach to be followed in order to organise a regional co-ordinated research programme which could produce some tangible results. The Group, considering that the phenomenon of eutrophication and plankton blooms is a local phenomenon, although quite spread around the Mediterranean, agreed that the best approach to follow would be to organise case studies in areas where the problems were evident and where scientific work had already been going on and to carry out a research programme by making use of local scientists and local experience.
6. Following this decision, the Group examined a number of representative areas around the Mediterranean region in order to recommend from a scientific point of view those where such case studies could take place. As a result, the following areas representing lagoons, closed bays and straight coastlines were selected: Alexandria bay, Golfe de Gabès, Etang de Prévost, Gulf of Trieste, Emilia-Romagna Coast and Thermaïkos Gulf. An effort would be made to initiate case studies in these areas following the establishment of research groups, the submission of research proposals and the availability of funds.
7. Subsequently, the group discussed and agreed upon a detailed scientific programme which should be followed in each case study (see annex II). The Group felt that the best way to achieve the objectives of the programme would be through the development of a model which would be used as a tool. Eight study areas were identified which could be undertaken by different research groups.

8. It was further agreed that a number of eutrophication aspects still require research. Such aspects were the degradation rate of organic matter, the triggering conditions for blooms, the conditions for massive death, etc.
9. The Group did not discuss the health-related aspects of eutrophication and plankton blooms, as these had already been covered by a WHO/UNEP consultation on health risks from contaminants in Mediterranean seafood, held in Athens from 10 to 14 December 1991. The recommendations of this meeting regarding toxic algae are reproduced in Annex III, and the actions indicated will be incorporated in the case studies, or performed at overall Mediterranean level, as appropriate.

ANNEX I

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ANNEX II

BASIC SCIENTIFIC PROGRAMME FOR EACH CASE STUDY

The main objectives of any eutrophication programme should, in general, be the ones indicated below. However, such objectives could not be achieved in the framework of this MED POL exercise, given the time and resources available, and therefore each local research group should, before initiating a case study, define the problem and set its own specific objectives. At any rate, any case study initiated should aim in interpreting the phenomena and analysing the effects of reducing nutrient inputs into the area. The best tool for achieving the objectives would be a model the development of which forms the basis of the programme which follows.

The main objectives of the programme

- (1) To assist the policy-makers in taking valid decisions for sustainable development
 - 1.1. To assess the eutrophication problem in the case study area
 - 1.2. To analyse the effects of reducing nutrient inputs
 - 1.3. To assess the impact of actions under different development scenarios
- (2) To develop techniques for the continuous measurement of some relevant variables
- (3) To test the capabilities and validity of the available models

General guidelines

The following should be observed by all research groups in charge of case studies :

- (1) All earlier information should be compiled, critically reviewed and the gaps should be identified.
- (2) The quality of the data generated by the programme should be assured
- (3) Relevant Statistical treatment and processing of the data should be made.

Studies to be included in the programme

As stated above the primary aim of the programme is the development of a 3-dimensional or 2-dimensional layered model capable of interpreting eutrophication phenomena. The studies described below are necessary for a complete and integrated programme. However, some are less important than others and could be omitted if local expertise is not available. If local expertise is not available for important studies, assistance should be sought through the Coordinating Unit for the Mediterranean Action Plan.

- (1) Study of the geomorphology of the area, including its bathymetry and the sediment structure
- (2) Hydrodynamics

The aim is to develop a 3-dimensional or two-dimensional layered model capable to interpret eutrophication phenomena

Data required: Salinity, temperature and density
Currents and tides
Wind pattern

Output expected: Stratification and stability
Residence time
Rates of advection and diffusion

- (3) All sources bringing nutrients into the area should be studied. These could be land-based point or diffused sources: riverine, agricultural, industrial and sewage effluents, atmospheric inputs and sediment.

Data required: flux of water, nutrients and suspended sediments (+ total organic matter)

frequency: measurements should be as frequent as possible, if not continuous
peak input phases should be identified and monitored more closely

In studying the sources a link should be made to the catchment area

- (4) Catchment area

Survey objectives: Geomorphology, pedology, land use
Drainage system
Farming practices (manure, chemical fertilizers)
Industries - Urban centres: Water treatment and disposal Toxic wastes

Satellite images and ground observations could be used

- (5) Coastal zone: mariculture, coastal engineering development (ports, breakwaters, dredging)

- (6) Meteorology

Data required: Wind, precipitation, solar radiation. Air temperature. Pattern of atmospheric pressure

N.B. - the frequency of the data is left to the needs of the modelers.

- (7) Water

The following measurements should be made at a grid of stations and at several levels. Most important is the layer overlying the bottom.

The availability of continuous record sensors should be investigated. Otherwise the frequency of the measurements should be as high as practically possible:

- dissolved oxygen
- Nitrogen: nitrate, nitrite, ammonia and total N.
- Phosphorus: inorganic phosphate and total P
- Silicate: reactive silicate
- (pH), Nutrient ratios

(8) Algal blooms

Both macro- and microalgae should be considered:

Biomass: For microalgae: Cell count and measurement of chlorophyll and phaeophytin content. For macroalgae: D.W.

Species: Determination of species composition of the population.
Computer aided taxonomy is advocated.

Bioassay: Laboratory assays will be made to determine the limiting nutrient at each stage of the bloom

Nutrient ratios: Nutrient content in algae will be measured

Bacteria: The bacterial population will be monitored during the bloom

Degradation: the rate of degradation of organic matter by bacteria in the sea is still not well known. An appropriate methodology has to be developed.

ANNEX III

Recommendations regarding toxic algae made by the WHO/UNEP Consultation
on health risks from contaminants in Mediterranean seafood
Athens, 10-14 December 1991

1. WHO should organize a thorough survey on occurrences of toxic algae in the Mediterranean.
2. Within the framework of the MED POL programme, and possibly also that of other appropriate programmes, WHO should organize coordinated studies and projects for the comparison and improvement of techniques for sampling and for identification of toxigenic algal species, as well as comparative studies, using standardized methodology, to enable evaluation of the occurrence and distribution of toxigenic algae throughout the different countries and areas of the Mediterranean.
3. WHO should organize a coordinated survey on current methodology in use for assessing algal biotoxins in shellfish.
4. WHO should develop, and promote the use of, standardized techniques for evaluating the relationship between species of toxicogenic algae, their density in seawater, and shellfish toxicity.
5. Within the framework of the MED POL programme, WHO should consider the promotion of collaborative studies to investigate the relationship between environmental parameters (such as eutrophication factors, bacterial flora, temperature, and sunlight intensity) and the problem of shellfish toxicity.
6. In view of the inadequacy of current reporting on diseases attributable to consumption of shellfish containing algal biotoxins, WHO, in cooperation with the Public Health Authorities in Mediterranean countries, should develop improved training on the type, and diagnosis, of diseases from shellfish toxicity, in order to enable medical practitioners and public health services to achieve better recognition and reporting of such diseases.
7. WHO and Public Health Authorities in Mediterranean countries should promote epidemiological studies to evaluate the impact of shellfish toxicity from toxin-producing micro-algae on human health within the region.
8. WHO reference laboratories for algal biotoxins should be designated.