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Meeting of Experts to Evaluate  
the Pilot Phase of MED POL and  
to Develop a Long-Term Monitoring  
and Research Programme for the  
Mediterranean Action Plan

Geneva, 12-16 January 1980

DRAFT  
LONG-TERM PROGRAMME  
FOR  
POLLUTION MONITORING AND RESEARCH IN THE MEDITERRANEAN  
(MED POL - PHASE II)  
DETAILED PROGRAMME DESCRIPTION



FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS



WORLD HEALTH ORGANIZATION



WORLD METEOROLOGICAL ORGANIZATION



INTERNATIONAL ATOMIC ENERGY AGENCY



INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION

NOTE

These additions to document UNEP/WG.46/5 have been received since 30 October 1980, i.e. after the document had been sent for printing and translation.

The numbering of the sections describing the various projects follows the system used in UNEP/WG.46/5.

## Contents

	page
4. MONITORING OF REFERENCE AREAS	1
4.2 Joint Yugoslav/Italian multidisciplinary programme on investigation of pollution in international waters of the Adriatic Sea (Yugoslav MED POL Focal Point)	1
7. DEVELOPMENT OF REPORTING FORMATS	11
7.1 Development of reporting formats required according to the dumping, emergency and land-based sources protocols of the Barcelona Convention (IMCO)	11
9. DEVELOPMENT OF SCIENTIFIC RATIONALE FOR THE FORMULATION OF ENVIRONMENTAL QUALITY CRITERIA	13
9.2 Evaluation of methylmercury in Mediterranean populations and related health hazards (WHO)	13
9.3 Enquiry on the chance of Mediterranean seafood consumers exceeding their allowable daily intake of mercury (FAO)	21
19. SUPPORTING ACTIVITIES	27
19.4 FAO's participation in the long-term programme for pollution monitoring and research in the Mediterranean (MED POL - PHASE II) (FAO)	27

#### 4. MONITORING OF REFERENCE AREAS

4.2 JOINT YUGOSLAV/ITALIAN MULTIDISCIPLINARY PROGRAMME ON INVESTIGATION OF POLLUTION IN INTERNATIONAL WATERS OF THE ADRIATIC SEA (ref. paragraphs 18-21 of UNEP/WG.46/4). Received from Yugoslav UNEP MED POL focal point: 7 December 1980\*.

##### Objectives

(a) Long-term objectives (until 1990)

- Assessment of the effectiveness of the measures taken under the Barcelona Convention and its protocols;
- Contributing information which may lead to eventual revisions of the related provisions of the Convention and the protocols and for the formulation of additional protocols;
- Contributing information which could be used in formulating environmentally sound national, bilateral and multilateral management decisions essential for the continuous socio-economic development of the Mediterranean region;
- Permanent monitoring and collection of data relevant for the assessment and control of the quality of water, sediments and organisms in the Adriatic Sea;
- Determination of the present state of pollution, on the basis of available data from both Yugoslav and Italian sides and on the basis of data on sources of pollution;
- Estimation (on the basis of physical, chemical and biological characteristics of the area) of the maximum assimilative capacity of pollution in the Adriatic Sea, in particular in the North Adriatic;
- Determination of the dispersion, fate, and effects of pollutants in the area in cases of continuous release and accidents;

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\* Clearance from the Italian counterpart in the programme requested by the Yugoslav UNEP MED POL focal point.

- Development of suitable mathematical models for hindcasting and forecasting basic pollution process of the Adriatic Sea;
- Pointing at problems and sectors in which intervention is necessary as a base for the protection and improvement of the quality of the Adriatic Sea.

(b) Short-term objectives (until 1983)

- To establish an operational network of Yugoslav and Italian institutions for taking samples and making pollutant measurements in the Adriatic Sea;
- To harmonize, test and intercalibrate in situ, the methods for sampling and pollutant analysis used by the institutions participating in the programme;
- To execute a sampling and analysis programme agreed upon by the participating institutions at specified stations in the Adriatic Sea;
- To develop a preliminary comprehensive picture of the distribution and variation of pollutant levels in the Adriatic Sea;
- To develop, using existing data, phenomenological and mathematical hydrodynamic circulation models of the Northern Adriatic Sea;
- To determine the rate of water exchange between the Adriatic and Mediterranean Seas, through the Strait of Otranto;
- To develop, using existing data, phenomenological and mathematical models of the nutrient-phytoplankton-zooplankton subsystem of the Northern Adriatic;
- To develop data bank service dedicated to the Adriatic project.

Background

Problem of the open waters pollution of the Adriatic Seas has been for some time the concern of scientists and administrators of Yugoslavia and Italy. As a result of such concern in February 1974 was signed the "Yugoslav/Italian Treaty on Co-operation on the Protection of the Adriatic Sea and Coastal Regions from Pollution". As envisaged by the Treaty the Joint Yugoslav/Italian Commission has been formed which is responsible for the fulfilment of the Treaty and organization of all necessary actions. Consequently, the Commission through its subcommissions has been working on various aspects of the Adriatic Sea pollution.

One of the results of such work was the "Joint Yugoslav/Italian Multidisciplinary Programme on the Investigation of Pollution in Open Waters of the Adriatic Sea". This programme was prepared in 1978/1979

during a series of meetings at which participated experts and administrators from both countries, and it was approved by the Commission in June 1979.

Field work of the Programme started in October 1979 with the intercalibration cruise in which participated scientists from both countries using three research vessels: "Vila Velebita", "Bannock" and "Umberto D'Ancona". The first monitoring cruise took place in November 1979 in which participated scientists and research vessels from both countries.

The monitoring efforts in the Adriatic Sea of MED POL - PHASE I, in which participated national institutions of both countries, were concentrated in coastal areas. These efforts, as well as earlier investigations indicated the necessity of the multidisciplinary comprehensive monitoring programme of the Adriatic open waters, especially of the Northern Adriatic. The experience and the knowledge gathered through the MED POL - PHASE I has been extensively used for the preparation and execution of the Joint Yugoslav/Italian Multidisciplinary Programme.

The Joint Yugoslav/Italian Multidisciplinary Programme on the Investigation of Pollution in open waters of the Adriatic Sea is in close relation to the provisions of the Barcelona Convention and its protocols, and should be considered as a contribution to MED POL - PHASE II.

As the programme develops, the participation of experts from Greece and Albania (and from other Mediterranean countries) is envisaged.

#### Activities envisaged

The Multidisciplinary Programme on the Investigations of Pollution in International waters of the Adriatic Sea consists of following basic components: monitoring, data bank, ecophysiology, and modelling.

##### (a) Areas covered by monitoring

This programme covers open waters of the Northern, Middle and Southern Adriatic. Sampling stations are indicated in Figure 1.

The Northern Adriatic is covered with 21 sampling stations with transect Pula-Rimini as its open waters boundary.

The Middle Adriatic is covered with two transects: Giulianova-Kornat Islands (7 stations) and Ortona-Sibenik (4 stations).

The Southern Adriatic (Strait of Otranto) is covered with 3 stations of the transect Otranto-Othonoi (Fano) island.

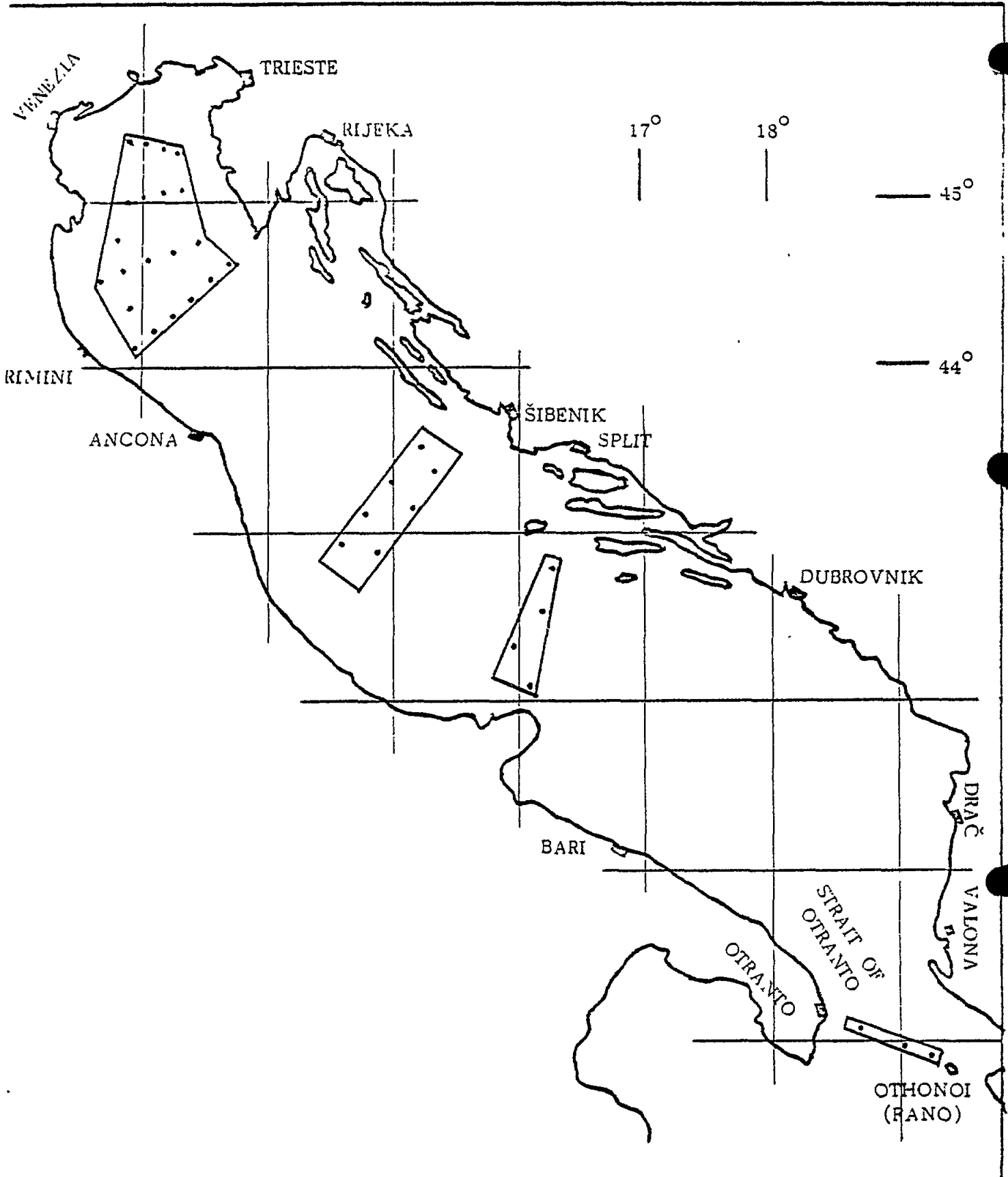


Fig. 1 Adriatic Sea with the indication of regions of monitoring with sampling stations

(b) Parameters to be measured

The following parameters have been chosen to be measured in the programme:

1. Basic parameters in air and air-sea interface.

1.1 Meteorological parameters: wind, air temperature, relative air humidity, atmospheric pressure, visibility, cloudiness, incident radiation, precipitation, sea state.

2. Basic parameters in sea water.

2.1 Physical parameters.

2.1.1 Hydrological parameters: depth, pressure, sea temperature, salinity, density, light attenuation coefficient, horizontal irradiance, water transparency, sea colour.

2.1.2 Dynamic parameters: sea current, sea level, wave motion, diffusion coefficient.

2.2 Chemical parameters:

- Dissolved oxygen, pH, alkalinity, nitrates, nitrites, ammonia, phosphates, silica.

2.3 Biological parameters:

- Chlorophyll a, primary production ( $^{14}\text{C}$ ), qualitative and quantitative analysis of phytoplankton, qualitative and quantitative analysis of zooplankton, heterotrophic bacteria.

3. Basic parameters in sediments.

3.1 Physical parameters:

- Granulometric analysis, density, water content, specific surface, rate of sedimentation.

3.2 Chemical parameters:

- Mineralogical analysis, carbonates, pH, Eh, organic carbon, nutrients.

3.3 Biological parameters:

- Biomass, abundance.

4. Specific parameters of pollution.

4.1 In sea water: polyaromatic hydrocarbons, saturated hydrocarbons,



chlorinated hydrocarbons, total surface active substances, anionic detergents, benzopyren monooxygenase induction, complexation capacity, trace elements (lead, cadmium, mercury, zinc and copper).

- 4.2 In suspended matter: polyaromatic hydrocarbons, saturated hydrocarbons, chlorinated hydrocarbons, trace elements (lead, cadmium, mercury, zinc and copper).
- 4.3 In sediments: polyaromatic hydrocarbons, saturated hydrocarbons, chlorinated hydrocarbons, trace elements (lead, cadmium, zinc, copper and mercury), total  $\beta$ -radioactivity,  $\gamma$ -spectrometry.
- 4.4 In organisms: polyaromatic hydrocarbons, saturated hydrocarbons, chlorinated hydrocarbons, trace elements (lead, cadmium, zinc, copper and mercury), total  $\beta$ -radioactivity,  $\gamma$ -spectrometry.

(c) Frequency and distribution of sampling in monitoring areas

In order to monitor the Northern Adriatic two cruises, winter and summer, will be performed each year in the period from 1981 to 1983.

In the Middle and Southern Adriatic two cruises, winter and summer, will be performed each year in the period from 1982 to 1983.

Due to scientific, financial and organizational reasons not all parameters will be measured at every cruise and each station. Same also applies for number of depths at which measurements will be done.

(d) Methodology

For every parameter listed in paragraph (b) a common methodology has been or will be agreed upon taking into account methodologies recommended as reference methods by various international programmes, in particular MED POL.

(e) Intercalibration

An intercalibration exercise is an integral part of the programme, including intercalibration cruises, comparison of sampling, sampling treatments, laboratory analytical techniques and data processing. For parameters monitored as part of MED POL - PHASE II the agreed Mediterranean reference methods will be used for intercalibration purposes. A manual which will include all details for all parameters in the programme is under preparation.

(f) Data bank

A data bank service dedicated to the Adriatic project is under development

to produce suitable numerical information and data treatment for other components (particularly modelling) of the programme as well as for various international data banks.

(g) Ecophysiology

The main goals of the ecophysiology programme are to investigate the alteration of the basic metabolic processes, the specific biochemical effects, the genetic implications and the population behaviour of the organisms living in polluted conditions.

The programme will be mainly carried out as experimental laboratory work, and in general it will be related to the pollutants considered in the monitoring programme.

Representative and selected animal and plant species will be used as test organisms, taking into consideration mainly their specific ecological valence and physiological characteristics, their trophic level and economic importance.

(h) Modelling

The final goal of the proposed programme is to develop suitable mathematical models for hindcasting and forecasting basic pollution processes of the Adriatic region. The programme will proceed along two lines of study, hydrodynamic and interactive modelling.

In the first phase collection, classification and descriptive analysis of existing data of the North Adriatic will be done with the purpose of producing hydrodynamic and interactive phenomenological models.

Comparative analysis of the structure and validity of some existing hydrodynamic models will be done considering their applicability to the Northern Adriatic. Existing hydrodynamical models will be improved, introducing non-linear terms and three dimensional structure.

In the interactive modelling different mathematical formulations of processes of interest will be compared and best applicable ones for the use in the Northern Adriatic will be selected in order to produce the model of the nutrient-phytoplankton-zooplankton subsystems of the Northern Adriatic.

(i) Participants

Participants in the programme are marine research centres of Yugoslavia and Italy, selected by their governments. Once the programme is fully developed it is expected to be supported by 7 Yugoslav and 7 Italian research centres. Five research vessels from both Italy and Yugoslavia are participating in the programme.

(j) Co-ordination

Under the overall authority of the Joint Yugoslav/Italian Commission and its relevant Subcommittee the technical (operational) co-ordination of the programme is in the hands of a Joint Yugoslav-Italian Co-ordinating Board.

Outputs

(a) From 1981 - 1983

- Yearly reports on the distribution and variation of pollutant levels in the Adriatic Sea;
- Manual on the detailed methodology of sampling, procedure for treating samples, instruments to be used in laboratory, measuring methodology and way of presenting results;
- Bibliography of all papers and reports dealing with natural characteristics or pollution of the Adriatic Sea;
- Directory of all institutions working on the investigation of natural characteristics or pollution of the Adriatic Sea;
- Phenomenological and mathematical models of the circulation of the Northern Adriatic;
- Phenomenological and mathematical models of the nutrient-phytoplankton- zooplankton subsystem of the Northern Adriatic;
- Operational data bank service dedicated to the Adriatic project.

(b) From 1984 - 1990

- Permanent monitoring system of the pollution for the Adriatic Sea;
- Comprehensive State of the Pollution for the Adriatic Sea;
- Evaluation of progress made in pollution control and environmental management for the Adriatic Sea;
- Periodic scientific evaluation reports;
- Mathematical models for hindcasting and forecasting basic pollution processes of the Adriatic Sea;
- Evaluation of maximum assimilative capacity of pollution in the Adriatic, in particular in the Northern Adriatic.

Workplan and timetable

2nd Intercalibration cruise for the Northern Adriatic	February 1981
2nd Monitoring cruise for the Northern Adriatic	February 1981
State of the art of modelling in the Northern Adriatic, report	February 1981
Manual of Methodologies applied in the Adriatic programme	April 1981
Phenomenological model of the circulation in the Northern Adriatic	April 1981
Establishment of the detailed monitoring programme for the Middle and Southern Adriatic	April 1981
Establishment of the detailed workplan for the ecophysiological component of the programme	June 1981
Intercalibration cruise for the Middle and Southern Adriatic	August 1981
3rd Monitoring cruise for the Northern Adriatic	August 1981
Comprehensive bibliography of relevant papers and reports	December 1981
Directory of Adriatic Institutions	December 1981
Phenomenological model of chemical and biological characteristics of the Northern Adriatic	December 1981
Data bank service becoming operational	December 1981
4th Monitoring cruise for the Northern Adriatic	February 1982
2nd Monitoring cruise for the Middle and Southern Adriatic	February 1982
Mathematical circulation model of the Northern Adriatic	February 1982
Mathematical model of the nutrient-phytoplankton-zooplankton subsystem of the Northern Adriatic	February 1982
5th Monitoring cruise of the Northern Adriatic	August 1982
3rd Monitoring cruise of the Middle and Southern Adriatic	August 1982

Budget

(a) Mediterranean Trust Fund contribution

It is expected that the Mediterranean Trust Fund will contribute to the Adriatic project equipment necessary for the fulfilment of the project to the value of US\$ 120,000 for each of the years 1981, 1982 and 1983.

(b) Yugoslavian and Italian contribution

Total cost of the Adriatic project is estimated to be about US\$ 2,000.000 for 1981, 2,400.000 for 1982 and 2,900.000 for 1983. Yugoslavia and Italy will jointly finance the project.

## 7. DEVELOPMENT OF REPORTING FORMATS

7.1 DEVELOPMENT OF REPORTING FORMATS REQUIRED ACCORDING TO THE DUMPING, EMERGENCY AND LAND-BASED SOURCES PROTOCOLS OF THE BARCELONA CONVENTION (ref. paragraph 39b of UNEP/WG.46/4). Received from IMCO : 17 November 1980.

### A. Reporting formats under the Dumping Protocol

#### (a) Permits issued for the disposal of wastes at sea.

A format for the notification of permits issued for dumping in accordance with Articles 7 and 10 of the Dumping Protocol was prepared by a Meeting of Experts (UNEP/WG.28/3) and will be under consideration at the next meeting of Contracting Parties to the Barcelona Convention.

#### (b) Notification in cases of force majeure

A format for notification of dumping in cases of force majeure under the conditions set out in Article 8 of the Dumping Protocol may be developed by a future meeting of experts after the Contracting Parties to the Barcelona Convention have agreed to do so.

#### (c) Consultation in critical situations of exceptional nature

A format for consultation in critical situations of exceptional nature as required by Article 9 of the Dumping Protocol was prepared by a meeting of experts (UNEP/WG.28/3) and will be under consideration at the next meeting of Contracting Parties to the Barcelona Convention. This format might be amended in the light of the outcome of the Fifth Consultative Meeting of Contracting Parties to the London Dumping Convention (22-25 September 1980). In order to avoid duplication of work for States which are Contracting Parties to both the London Dumping Convention and the Barcelona Protocol, the Fifth Consultative Meeting of Contracting Parties to the London Dumping Convention agreed its Interim Procedures and Criteria for Determining Emergency Situations as follows:

"For Contracting Parties being also Contracting Parties to a regional agreement on the prevention of marine pollution by dumping a consultation procedure adopted within that regional agreement may be substituted for the above procedures provided that it is consistent with the requirements set out below (refers to details of the LDC procedure). The Secretariat of the regional agreement will immediately submit any information on emergency

situations to the Organization, which will then follow, as necessary and appropriate, the procedures developed within the framework of the London Dumping Convention taking into account the procedure being followed under the regional agreement." (LDC V/12, Annex 5, paragraph 2.2).

(d) Notification of wastes dumped per calendar year

A format for the notification of type and amount of wastes dumped at each dumping site per calendar year was prepared by a meeting of experts (JNEP/WG.28/3) and will be under consideration at the next session of Contracting Parties to the Barcelona Convention.

(e) Monitoring of dumping sites

The Dumping Protocol does not include provisions related to the reporting of dumping site monitoring. It might, however, be appropriate that an additional format for reporting monitoring activities carried out for the purpose of the Dumping Protocol be considered, taking into account similar formats which are used within the framework of other regional and international agreements on dumping.

B. Reporting formats under the Emergency Protocol

The contents of a report to be made in cases of accidents in accordance with Article 9 of the Emergency Protocol is set out in Annex to the Protocol. Arrangements for reporting procedures for emergencies involving harmful substances other than oil will be considered within the Regional Oil Combating Centre in Malta and any recommendations in this regard in the context of future work programme of the Centre will be considered by the Contracting Parties to the Barcelona Convention.

C. Reporting formats under the Protocol on Land-Based Sources

Formats for emergencies arising from failures of industrial installations and other formats for notification of discharges from land-based sources (operational discharges of oils, acids, mercury and other Annex I substances etc.) may be developed within the framework of the Protocol on Land-Based Sources if the Contracting Parties to the Barcelona Convention have decided to do so.

9. DEVELOPMENT OF SCIENTIFIC RATIONALE FOR THE FORMULATION  
OF ENVIRONMENTAL QUALITY CRITERIA

9.2 EVALUATION OF METHYLMERCURY IN MEDITERRANEAN POPULATIONS AND RELATED  
HEALTH HAZARDS (ref. paragraphs 39e, 39h and 39i of UNEP/WG.46/4).  
Received from WHO : 21 November 1980.

Objectives

The long-term objectives of MED POL - Part B are described under the  
chapter "Objectives" of the document UNEP/WG.46/4.

The specific objectives of the proposed activity are the following:

- Evaluation of the health hazards arising from methylmercury content in  
Mediterranean fish;
- Assessment of methylmercury exposure in the critical segments of the  
population;
- Selection of populations in the Mediterranean having a high intake of  
MeHg;
- Identification of groups whose MeHg intake exceeds the WHO Provisional;  
Tolerable Weekly Intake;
- Estimation for the above groups of their: (i) size, (ii) patterns of  
individual consumption of seafood, and (iii) actual concentrations of  
MeHg in the various species consumed.

As the human foetus is considered to be the most sensitive target, special  
attention should be given to the estimation of MeHg intake by pregnant  
women.

The attainment of the above objectives will significantly assist the  
relevant government authorities in the Mediterranean in selecting and  
formulating regulatory action to limit intake of MeHg through seafood.

Background

The First Meeting of Contracting Parties to the Barcelona Convention



(Geneva, 5-10 February 1979) endorsed the development of environmental quality criteria in the framework of the Mediterranean Action Plan. It was stated in particular that:

"Work should be continued on the development of the scientific rationale for the criteria applicable to the quality of recreational waters, shellfish-growing areas, waters used for aquaculture, and seafood. Based on this rationale and taking into account existing national provisions and international arrangements and agreements, the criteria should be formulated on a scientific basis and submitted to the Governments and the EEC for their consideration." UNEP/IG.14/9, Annex V, paragraph 13).

The meeting of the Bureau of the Contracting Parties (Geneva, 26-27 June 1979) considered the matter and urged the Secretariat to take steps in developing the environmental quality criteria for bathing waters and mercury in seafood.

Interagency consultations were held in November and December 1979 on the design and implementation of a co-operative programme on health-related aspects of mercury levels in edible marine organisms. The objectives of such a programme were formulated as follows:

- to obtain reliable information on mercury contents in fish and shellfish in various parts of the Mediterranean region;
- to establish patterns of consumption of fish and shellfish in selected communities around the Mediterranean and to identify high risk groups;
- to gather epidemiological information on exposure levels and related possible health effects on high risk groups and general populations;
- to review the recommended national and international limits and guidelines for mercury levels and intake by man in the light of latest available information and in relations to consumption patterns of fish and shellfish in the Mediterranean region;
- to establish environmental and health monitoring systems and to recommend safeguards and measures for the reduction and control of exposure to mercury from consumption of fish and shellfish.

In view of the necessity to provide the member states of the Mediterranean region with advice related to consumption of mercury-contaminated seafood prior to the meeting on the long-term monitoring and research programme, it was agreed to undertake preparatory activities as follows:

- compilation and evaluation of data on concentration of mercury in seafood;
- collection, evaluation and interpretation of available data on seafood consumption patterns, giving emphasis to high exposure groups, including results of pilot studies in selected countries;

- collection of available data on mercury levels in blood and other tissues and, if possible, augmentation of these data by biological monitoring of selected groups;
- review of latest available data on health effects of mercury in seafood, with particular reference to dose-response relationships;
- review of national legislation and enforcement practices related to the subject;
- updating the data profiles on mercury.

These tasks were completed following the Consultation to re-examine the WHO Environmental Health Criteria for Mercury, organized by UNEP/WHO, Geneva 21-25 April 1980, (WHO - EHE/EHC/80.22).

In the light of available evidence and from the evaluation of hazards related to the intake of mercury by populations through seafood in the Mediterranean region, it is considered that a part of the population in the Mediterranean area may have an intake of MeHg through seafood which exceeds the WHO PTWI.

It is therefore recommended that the total intake of MeHg through seafood should be limited. In order to enable governments to choose from various possible options, additional information should be obtained.

The gathering of the above information is the goal of the present project.

#### Proposed Activities

##### Part A:

1. Evaluation of all available data to select populations likely to have a high intake of MeHg.

In order to obtain reliable figures on the exposure to methylmercury, it is important to select a sufficient number of representative villages having similar fishing patterns, local ecologies and ways of living.

Hotspots may also be located from places where elevated methylmercury levels in fish and shellfish species are experienced in the monitoring programme.

In the identified communities families believed to have the highest fish consumption should have priority for sampling. The number of families sampled will be determined by local conditions but should be sufficient to allow adequate statistical analysis. Usually all members of the family will be sampled should this not be possible every effort should be made to sample the women of childbearing age.

Employees of the fish restaurants and their families believed to have high fish consumption should also be sampled.

Similarly other groups having high fish consumption should also be identified whenever possible.

2. Studies of Hg levels in hair in the populations selected (item 1 above) to identify groups whose MeHg intake exceeds the WHO PTWI.

It appears that the analysis of samples of head hair offers the best means of determining seasonal exposure to methylmercury. The hair samples should be collected and analysed in several ways so as to allow sufficient accurate recapitulation of past exposures, and to indicate seasonal variations.

At this stage, blood analysis is not required.

3. Development of an appropriate recording form which should be completed for each sampling. The form should allow unique identification of the person, the area and date of sampling and information on the fish consumption during the last two weeks, if possible.

#### Part 3:

4. For each group identified from the above activities under 1, 2 and 3 as having an MeHg intake that exceeds the WHO PTWI, the following activities will be undertaken:

- Continuation of human monitoring for hair levels of mercury and its extension to the area for which the population is representative.
- Assessment of dietary intake of methylmercury in this population or group.

This will include the patterns of individual consumption of fish, shellfish or fish commodities and determination of mercury levels if they are not available.

Special attention should be given to the estimation of MeHg intake by pregnant women considering that the human foetus is the most sensitive target.

It is advisable to undertake concurrently with part A a pilot project to check the reliability of technique used for the determination of pattern of individual consumption. The proposed FAO project "Enquiry on the chance of Mediterranean seafood consumers exceeding their allowable daily intake of mercury" (UNEP/WG.46/5 addendum 1) is intended to cover the above pilot activity.

- Determination of actual concentration of MeHg in the various species consumed.

5. If circumstances allow, a carefully planned epidemiological study will be carried out in the Mediterranean area related to possible health effects of both adult and pre-natal exposure.

The proposed activities in Part A will be carried out during 1981-1983. At the end of 1983, it is expected to have results which will indicate the need or not to undertake Part B. If this need is assessed, Part B will be initiated in 1984. Part A will be initiated with the selection of population segments likely to have a high intake of MeHg. This will be carried out with the assistance of a specialist in the field and in close collaboration with the nominated and participating relevant national services.

During Part A special attention should be paid to collection, storage transportation and analysis of hair samples. The detailed organization for the above work will be studied by an ad hoc group of specialists in the field of mercury analysis for relevant decision of the responsible Mediterranean authorities. The methodology should be standardized and a strong quality control (intercalibration) should be instituted before the start of Part A.

A central laboratory may be decided upon for the overall coordination and analytical work and its relevant collaboration with national laboratories participating in the project. The work to be undertaken by the central laboratory may be sub-contracted to an appropriate national laboratory.

A Select Standing Steering Committee (SSSC) is proposed to be established to review progress of the work and make relevant recommendations on a regular basis. The first task of the SSSC will be to estimate the scope of the work load including the sample size.

In particular at the end of Part A a thorough evaluation of the results of this project and project 9.3 will be undertaken and detailed recommendation for future action during Part B will be made.

## 6. Technical Assistance

### 6.1 Equipment

It is intended to provide basic equipment for the collection of hair samples, their storage and dispatch, to a limited number of collaborating national laboratories nominated by the responsible national authorities to participate in the project.

Similarly some equipment for carrying out the analysis of hair samples will be provided to a few collaborating national authorities, according to existing needs and tasks assigned to them.

## 5.2 Training

In a number of Mediterranean countries there is a substantial need to train personnel, especially at the technical level, in the field of analytical techniques and more specifically in the analysis of mercury in hair. Such training may best be provided through short courses and on-the-job training. This will also promote mutual contact and exchange of knowledge and experience. Furthermore, the discussion on and the application of standardized methodologies will promote their adoption and comparability of results.

### Outputs

For the period of 1981-1983 (Part A) the following outputs are expected:

- Indication of the upper range of daily intake of MeHg;
- The seasonal variation;
- The peak level attained;
- The individuals or sub-groups having the highest levels of mercury.

For the period 1984-1990 (Part B)

In case the results of Part A identify populations or groups having high exposure whose MeHg intake exceeds the WHO PTWI, Part B will take place and the following output will be expected:

Better data base for regulatory action by responsible governmental authorities.

Work Plan and timetable

Activities	Starting and ending (from month 0 = June 1981)
Part A	
1. Evaluation of all available data to select populations likely to have a high intake of MeHg.	0 ----- 6
1.1 Assistance of a specialist	0 ----- 3
2. Studies of Hg levels in hair in the populations selected to identify groups whose MeHg intake exceeds the WHO PTWI.	7 ----- 30
3. Development of an appropriate form for unique identification of the person, the area and date of sampling and information on fish consumption during the last two weeks, if possible.	0 ----- 6
4. Select Standing Steering Committee (SSSC) Meetings	0 - 4 days duration 12 - 4 days duration 24 - 4 days duration
5. Training activities	
5.1 On-job training	7 ----- 24 (for a total of 9 m/m)
5.2 Short courses	6 --- one week duration 12 --- one week duration
Part B (subject to identified groups having an MeHg intake that exceed the WHO PTWI)	
1. Continuation and extension of human monitoring for hair levels of mercury	1984 onwards
2. Assessment of dietary intake of MeHg.	1984 onwards
3. Determination of actual concentration of MeHg in various species consumed.	1984 onwards
4. Epidemiological study in the Mediterranean area related to possible health effects of adult and pre-natal exposure.	1984 onwards

Budget

	1981	1982	1983	1984-1990
Experts	12,000	-	-	
Contractual Services	40,000	150,000	100,000	
Equipment	-	50,000	50,000	
Training	-	15,000	15,000	
(i) Direct assistance	52,000	215,000	165,000	
(ii) Meetings	13,000	13,000	13,000	
(iii) Co-ordination	11,000	25,000	25,000	
(iv) Reporting cost	1,000	4,000	5,000	
(v) Miscellaneous	3,000	3,000	3,000	
Total	90,000	260,000	210,000	130,000 (per year)
WHO Contribution in services	16,000	50,000	40,000	

9.3 ENQUIRY ON THE CHANCE OF MEDITERRANEAN SEAFOOD CONSUMERS EXCEEDING THEIR ALLOWABLE DAILY INTAKE OF MERCURY. (ref. paragraphs 39e, 39h and 39i of UNEP/WG.46/4). Received from FAO : 21 November 1980.

#### Objectives

The project is related to previous activities in the framework of the pilot project MED POL II, namely:

- baseline analyses of mercury in Mediterranean marine organisms, and a
- pilot study on dietary seafood intake in selected Italian coastal sites to tentatively estimate the mercury intake of above-average consumers.

It is related as well to ongoing and future biological monitoring of Mediterranean organisms, the results of which will be used to enlarge the data base on contaminant levels in seafood. This, together with improved information on consumption, are the basic inputs into a consumer risk simulation model which will not only allow for the risk assessment under present dietary conditions, but also after various simulated - management or administrative measures have been taken.

#### Short term objectives:

In the course of the project basic information will be provided on dietary patterns in selected high exposure groups in Mediterranean countries, high exposure being understood as referring to dietary intake excluding other sources such as occupational exposure to mercury. This information will, together with input on mercury levels in seafood species, be used to found the data bases for the consumer risk simulation model. The model will assess the mercury intake of the individuals and estimate various risk levels as requested by the user. It provides several options to simulate a variety of management and administrative responses to eventual elevated mercury intake. These may be used to evaluate the impact of any measures to be taken and will allow for the selection of the most appropriate ones based on considerations of their efficiency, costs and benefits. Additional hair analyses on a limited number of panelists might be used as one means for quality control and may help in paralleling results from the respective studies.

Complementary analyses of blood and urine samples of the same panelists in relation to chromosome aberrations and changes of enzyme activity could generate further evidence on early indicators for subclinical effects of mercury exposure.

#### Long-term objectives:

An expansion of the consumption study will, through a representative



coverage of groups with high intake, more realistically reflect the true situation. It will permit a quantitative estimate on the groups potentially at risk, that are most likely to be identified among

- fishermen and their families;
- workers in fish processing plants and their families;
- waiters in fish restaurants and their families;
- subjectives in the vicinity of 'hot spots', restricted areas of elevated mercury levels of either natural or anthropogenic origin.

It will considerably improve the estimates of the model and thus the quality of management suggestions.

### Background

There is a noteworthy tendency in many countries to abandon or at least enforce less strictly the concept of national action levels on fish commodities. This is due to the actual difficulties of enforcing such limits and to the fact that, with the probable exception of prenatal exposure, it is the total quantity of ingested methylmercury that may be a hazard to human health. Thus, rather than imposing strict limitation on, or even the closure of the fishery, more subtle action may be suggested to control mercury intake through seafood assumed to be the major source of organic mercury. Since the same amount of methylmercury may be taken in through the consumption of a small quantity of highly contaminated fishery products or through a greater quantity of seafood with low mercury levels, both variables require some investigation.

Research on and monitoring of various marine organisms have already provided a vast body of contamination data in the Mediterranean. Some additional information may be needed on certain commercial species and some areas that were not well covered by previous MED POL activities. Sufficiently detailed dietary information is, however, even more urgently required. Most surveys on eating habits or household expenditure so far available in Mediterranean countries just identify fish as one category in their enquiry scheme. In view of the great variation in mercury levels between different species this approach will not yield meaningful results. Since individual characteristics such as sex and weight will decisively influence the tolerable mercury intake as provisionally recommended by WHO and up to now currently accepted, a specific study will have to be carried out. As part of the pilot project MED POL II so far, a tentative enquiry was conducted in 3 Italian coastal sites. They were selected on the assumption that population groups with easy access to fish would be likely to be the first ones at risk since average consumption of fishery products in the Mediterranean region tends to be low. The first results confirm these assumptions; the limited scope of the enquiry so far, however, does not allow for the extrapolation of consumption throughout the year due to

pronounced seasonal variability in the access to the fishery resources. A rough estimate from FAO/OECD country profiles of the countries bordering the Mediterranean generates a figure of about 350,000 persons involved in primary fishing operations with resulting easy access to the resource.

When more data become available, particularly on seafood consumption, they can be used as the basic input into the consumer risk simulation model, originally developed for the US Food and Drug Administration to assess consumer risk and estimate the impact of administrative response to it. The model offers far-reaching options to the user, such as:

- substitution of species for one another if data on single fish or shellfish species are lacking;
- division of species by weight to account for differences in contaminant levels;
- modification of consumption by changing the quantity and/or frequency of certain or all species consumed in order to simulate variation in dietary patterns;
- change of the current tolerable intake, if necessary, to reflect any adaptation to eventual new scientific evidence;
- setting up any legal action level or enforcement level as required to simulate the impact of various administrative measures;
- distinction of discrete groups for risk assessment, i.e. women in childbearing age, to estimate more specifically the eventual hazard;
- variation of the confidence levels for risk estimate to assess the size of the population at various risk levels.

The model also allows for separate or simultaneous treatment of consumer data from various countries so as to assess impact of either national or regional Mediterranean control measures. However, it is clear that this requires sufficiently reliable and representative data input to provide a reliable evaluation of the situation.

#### Activities

##### (a) Part A (1981-83)

In the first part of the previous pilot consumption studies will be complemented by additional ones on the same panelists to cover a year cycle.

For quality control purposes with respect to reporting reliability, a detailed intake study on a limited number of individuals will be paralleled by hair analyses. The hair analyses will be carried out in the same centre

as those from project 9.2 to guarantee high analytical standards and comparability of results.

Another exercise will be carried out to estimate representativeness of data obtained in the enquiries by conducting a short-term study on a vast number of subjects from the same area.

Other communities with above-average mercury intake from sources other than through occupational exposure will be identified and consumption enquiries initiated. For this, use will be made of experiences from eventual previous household expenditure surveys and on-going hair sampling programmes (project 9.2).

Enquiries may be channelled through already existing structures such as local authorities of the public health system, fishing cooperatives, unions in the fish processing industry, etc.

Analyses of blood and urine samples of the same subjects with respect to chromosome aberrations and enzymatic activity should provide further evidence on any correlation with mercury exposure. Such tests might serve to establish early indicators of subclinical effects of mercury intake.

Joint evaluation of projects 9.2 and 9.3 will be made by a group of Mediterranean experts to determine the following Phase II of both projects.

(b) Part B (1984-1990)

During the second part, emphasis will be put on the representativeness of the study which will have to result in an extension of the enquiries to cover adequately the high intake populations and thus guarantee the effectiveness of any management suggestions generated by the simulation model.

Outputs

(a) Part A

- Detailed information on dietary pattern in a limited group of the population in the Mediterranean, preferably above average consumers and accuracy;
- Knowledge of the precision of such information;
- Results of studies on early biochemical indicators of mercury exposure;
- Identification of those subjects that exceed the currently accepted tolerable intake;
- Evaluation and recommendation of administrative and management control measures.

(b) Part 3

- Exact determination of the size of the population groups at various risk levels;
- Improved recommendations on control measures.

Workplan and timetable

Activity	Timetable
Nomination of participating institutions	May 1981
Meeting on survey design	July 1981
Quality control study (detailed intake assessment paralleled by hair sampling)	July-December 1981
Tests on blood and urine samples to trigger any chromosome aberrations and changes in enzymatic activity that can be correlated to mercury exposure	July-December 1982
Small-scale consumption enquiries in selected Mediterranean communities	July 1981 - December 1982
On the spot polls to estimate representativeness of enquiries	Autumn 1981 - Spring 1982
Validation of data	October 1981 February 1983
Data processing by simulation model	October 1981 - July 1983
Evaluation meeting: reporting results and proposals for future work	October 1983
Joint evaluation of projects 9.2 and 9.3 and determination of part 3 activities of both projects	December 1983

Budget

The following total budget will be required:

(a) Estimated contribution from MED Trust Fund:

	1981	1982	1983	1984-1990
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1. Direct assistance to national institutions				
Experts	12,000	9,000	13,000	
Material	1,000	1,000	1,000	
Training	4,000	2,000	-	
Services	6,000	6,000	6,000	
Travel	3,000	5,000	3,000	
2. Meetings	6,000	-	12,000	
3. Co-ordinating costs (FAO) (staff costs are shown as separate budget)				
Computer services (keyboarding and maintenance)	5,000	5,000	5,000	
Travel	1,500	1,500	1,500	
4. Reporting costs			2,000	
5. Miscellaneous	2,000	2,000	2,000	
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Total	87,500	31,500	56,500	
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(b) Contribution from the participating institutes:

- Personnel (senior scientists, scientists, technicians)
- Provision of laboratory and use of equipment (an indicated figure of the equivalent of approximately US\$ 60,000 will be the average cost for such a contribution)
- Other costs (secretarial assistance, stationery, etc.).

## 19. SUPPORTING ACTIVITIES

19.4 FAO'S PARTICIPATION IN THE LONG-TERM PROGRAMME FOR POLLUTION MONITORING AND RESEARCH IN THE MEDITERRANEAN (MED POL - PHASE II). (ref. paragraphs 8, 9, 15, 17, 39a, 39h, 39i, 39j, 39k and 39l of UNEP/WG.46/4). Received from FAO : 4 December 1980.

FAO is participating in the Joint FAO (GFCM)/UNEP Co-ordinated Project on Pollution in the Mediterranean (TF/UNEP 0503-75-07 ME/0503-75-07) since 1975. The present pilot phase of the project (MED POL - PHASE I) will terminate on 31 March 1981.

As a follow-up of this project, a long-term programme for pollution monitoring and research in the Mediterranean (MED POL PHASE II) is programmed to be executed during the period 1 April 1981 - 31 December 1990.

Depending upon the decision on whether the projects to be jointly implemented by FAO and UNEP will continue to be administered from FAO's Headquarters in Rome (Alternative I) or whether overall co-ordination of all projects of the long-term programme will be centralized in an interagency team to be established in a location to be decided upon (Alternative II), the following co-ordination costs are envisaged:

(a) Contribution expected from the Mediterranean Trust Fund or UNEP

### Alternative I

(FAO/HG-based project, costs same as in pilot phase)

	1981	1982	1983	1984-90
10 Project Personnel Component (m/m)				
11 Experts (Project Co-ordinator)	(8) 48,000	(12) 79,200	(12) 87,120	
13 Administrative support (secretary)	(8) 16,600	(12) 27,390	(12) 30,129	
<b>Total</b>	<b>64,600</b>	<b>106,590</b>	<b>117,249</b>	<b>130,000 (per year)</b>

Alternative II

(Project based in the same place as interagency team)

	1981	1982	1983	1984-90
10 Project Personnel Component (m/m)				
11 Experts (Project Co-ordinator and Project Assistant (16)	85,200	(24) 140,580	(24) 154,638	
13 Administrative support (2 secretaries)	(16) 33,200	(24) 54,780	(24) 60,258	
<b>Total</b>	<b>118,400</b>	<b>195,360</b>	<b>214,896</b>	<b>230,000</b> (per year)

(b) Contribution in kind expected from FAO

	1981	1982	1983	1984-90
	20,000	33,000	36,000	43,000 (per year)

FAO, in principle, would be prepared to co-operate with UNEP in the execution of the long-term programme for pollution monitoring and research in the Mediterranean on the understanding that funds to meet the costs for the co-ordination will continue to be provided. In particular, FAO could co-operate in the following projects (numbers refer to those used in UNEP/WG.46/5 and UNEP/WG.46/5/Add.1 unless otherwise specified):

3. Monitoring of coastal waters

3.1 Monitoring of coastal waters influenced by pollution from primary or secondary sources (UNEP/WG.46.4, paragraphs 8, 9 15, 16 and 17)

6. Development of sampling and analytical techniques

6.1 Levels of pollutants in marine biota (UNEP/WG.46.4, paragraph 39a)

13. Research on toxicity, persistence, bioaccumulation and carcinogenicity of selected substances

13.1 Research on the effects of oil dispersants on marine organisms (UNEP/WG.46.4, paragraph 39h)

- 13.2 Correlation between DNA and the mutagenicity of the PAH-polluted environment (UNEP/WG.46.4, paragraph 39h)
- 13.3 Research on the effects of PCBs on marine organisms (UNEP/WG.46.4, paragraph 39h)
- 14. Research on eutrophication
  - 14.1 Study on eutrophication phenomena with emphasis on irregular phytoplankton blooms (UNEP/WG.46.4, paragraph 39i)
- 15. Study of ecosystem modifications
  - 15.1 Study of pollution-induced ecosystem modifications of selected Mediterranean areas as the basis for long-term ecological monitoring of the Mediterranean Sea (UNEP/WG.46.4, paragraph 39j)
- 16. Effects of thermal discharges
  - 16.1 Effects of thermal discharges on coastal organisms and ecosystems (UNEP/WG.46.4, paragraph 39k)
- 17. Biogeochemical cycle of mercury
  - 17.1 Impact assessment of mercury through a study of the biogeochemical cycles of mercury and selenium (UNEP/WG.46.4, paragraph 39l)

In addition to the projects listed above, the following project proposal was submitted to UNEP recently:

Enquiry on the chance of Mediterranean seafood consumers exceeding their allowable daily intake of mercury (UNEP/WG.46/5, paragraph 9.3).

Nearly all, and probably some additional laboratories, participating in the pilot phase are expected to participate in the coastal waters monitoring part of the programmes (3), and only selected laboratories will take part in the proposed research projects.