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FEASIBILITY STUDY FOR THE EXECUTION OF
MEDITERRANEAN CO-ORDINATED POLLUTION MONITORING
AND RESEARCH PROGRAMMES

This report has been prepared by two consultants
at the request of the Intergovernmental Oceanographic
Commission of UNESCO on behalf of UNEP.

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List of abbreviations used in this text

- GFCM: General Fisheries Council of the Mediterranean of the Food and Agricultural Organization (FAO)
- ICSEM: International Commission for the Scientific Exploration of the Mediterranean
- IOC: Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO)
- MSc: Master of Science
- PhD: Philosophical Degree
- WHO: World Health Organization

I BACKGROUND

1. Under the joint auspices of IOC/GFCM/ICSEM, UNEP supported an International Workshop on Marine Pollution in the Mediterranean (Monaco 9-14 September 1974) which, inter alia, recommended the undertaking of co-ordinated pollution monitoring and research programmes and outlined nine such programmes. As a follow-up to this recommendation, the GFCM Working Party on Marine Pollution in Relation to the Protection of Living Resources (Monaco, 16-18 September 1974) drew up an implementation plan for four of the nine pilot projects dealing with the monitoring of, and research on, pollutants affecting living resources and fisheries. WHO took steps to develop the implementation plan for one of the pilot projects dealing with the sanitary quality of the coastal waters and IOC prepared a draft outline for the pilot project dealing with the coastal transport problems of pollution.
2. The International Workshop in Monaco emphasized that the recommended programmes should supplement and extend present facilities and capabilities and existing national and regional pollution studies as part of a future comprehensive programme for the Mediterranean. In this connexion the importance of advanced training to enable all the Mediterranean countries to undertake marine pollution research and monitoring was recognized and the organization of Mediterranean Institutions and Laboratories in a co-operative network was recommended.
3. Since it was felt that the available information on the ability of various Mediterranean institutions to take part in the co-ordinated pollution monitoring and research programmes, on the availability of capable and willing staff and adequate facilities (analytical instruments, ships, etc.), and on their readiness to participate in the recommended programmes, was inadequate, the IOC, on behalf of UNEP, initiated a feasibility study for the execution of Mediterranean co-ordinated monitoring and research programmes. This document is the report of this study.

II ORGANIZATION OF THE FEASIBILITY STUDY

4. An ad hoc Advisory Group was appointed to guide and advise a two-man mission to selected Mediterranean institutions and laboratories, and to the appropriate national authorities.
5. In view of the short time available for this mission it was decided that the French and Italian institutions would not be visited, but that data obtained from the responsible national authorities would be included in the report. These institutions are listed in annex II.
6. In all, 25 scientific institutions were visited (see annex I) in 13 countries (Egypt, Greece, Israel, Lebanon, Libya, Malta, Monaco, Morocco, Spain, Syria, Tunisia, Turkey, Yugoslavia). For technical reasons scientific institutions in Albania, Algeria and Cyprus were not visited although adequate information was received from Algeria; these institutions are also listed in Annex II with others not visited.
7. In addition, in most of the countries visited the authorities responsible for the creation and implementation of research programmes relevant to the recommended Mediterranean co-ordinated pollution monitoring and research programmes were contacted and informed about the feasibility study and their views were duly recorded.

III TIMING AND DATA SOURCES

8. The feasibility study is primarily based on the findings of the two-man mission which visited the various Mediterranean institutions and laboratories between 10 November and 18 December 1974, and obtained firsthand information by talking with staff and viewing the actual facilities available. A full and detailed report on each of the countries and institutions visited is in preparation.

9. In addition, the responsible national authorities of France and Italy provided a list of scientific institutions they wished to see co-operating in Mediterranean co-ordinated programmes. For the other countries visited data previously available from various international organizations and obtained by correspondence were also used.

10. Owing to the lack of time for this feasibility study, the reported results ought not to be considered as final and accurate in all details, but should be viewed rather as an indication of the readiness of the Mediterranean scientific institutions and national science policy-making authorities to participate in the recommended co-ordinated Mediterranean pollution monitoring and research programmes.

IV CO-ORDINATED PROGRAMMES AND OTHER MEANS, ACTIVITIES AND FACILITIES COVERED BY THE FEASIBILITY STUDY

11. Of the nine co-ordinated programmes outlined by the International Workshop in Monaco, only seven programmes apply to a joint venture possible for all the Mediterranean riparian countries, although the implementation of the other two sub-regional programmes might have a profound impact on the Mediterranean as a whole. Therefore, this report covers only the feasibility study of these seven programmes which are:

1. Baseline studies and monitoring of oil and petroleum hydrocarbons in marine waters
2. Baseline studies and monitoring of metals, particularly mercury, in marine organisms.
3. Baseline studies and monitoring of DDT, PCBs and other chlorinated hydrocarbons in marine organisms
4. Effects of pollutants on marine organisms and their populations
5. Effects of pollutants on marine communities and ecosystems
6. Coastal transport problems of pollutants
7. Coastal water quality control programmes

12. In addition to these programmes the feasibility study attempted to evaluate other relevant national and international means, activities and facilities which might be relevant to the successful execution of the co-ordinated programmes. These were:

- national means for co-ordination of environmental programmes
- national, sub-regional and regional data centres
- biological and chemical analytical service facilities
- ships available for multi-ship programmes.

V FINDINGS OF THE FEASIBILITY STUDY

A. General

13. The great majority of the scientific institutions visited expressed an eager wish to participate in the co-ordinated Mediterranean pollution research and monitoring programmes (see annex I) in spite of the often meagre and even rudimentary facilities and inadequately trained staff in most of the riparian countries. This wish was generally shared by the science policy-making authorities.

14. It was frequently emphasized that the co-operative programmes should be restricted to institutions from Mediterranean riparian countries and that this principle should be applied as far as possible to the training programmes as well as to the recruiting of experts.

B. National ways and means of co-ordinating environmental programmes

15. In most of the Mediterranean countries there were national organizations or authorities, usually at interministerial level or attached to certain ministries, to deal with environmental matters and consequently with the protection of the sea. These organizations were frequently only advisory or co-ordinating bodies but in a few countries they had mandatory power too.

C. National data centres

16. A few countries operated a national data centre and some of them had had successful experience in data handling and exchange between themselves and with appropriate World Data Centres. Although in some countries there were restrictions concerning the exchange of certain types of oceanographic data, in general most countries viewed favourably the use of their national data centres as a means of exchanging data.

17. For the purpose of the co-ordinated Mediterranean pollution research and monitoring programmes, the Banque Nationale de Données Océanographiques in Brest, France might be considered as the potential sub-regional data centre.

D. Institutions and laboratories able to participate in co-ordinated programmes

18. Only a few of the institutions and laboratories visited could as yet fully participate in the recommended programmes as these required a complex of field sampling facilities, analytical techniques, other laboratory facilities and the expertise necessary for a critical evaluation and interpretation of the data obtained.

19. A greater number of the national institutions and laboratories that were seen could participate in the co-ordinated programmes either by providing samples to be analysed by institutions and laboratories where there were adequate facilities, or by carrying out limited laboratory experiments or field observations, or by offering analytical services for samples from other laboratories.

20. An even greater number of national institutions and laboratories visited would need training and/or laboratory facilities (analytical equipment chiefly) to be able to participate in the co-ordinated programmes according to their wishes.

21. Detailed information on the institutions and laboratories discussed in the previous three paragraphs has been provided by the consultants to UNEP and the relevant Specialized Agencies. It must be remembered that Albania, Algeria, Cyprus, France and Italy have not been included in this review.

22. Three scientific institutions in the Mediterranean have a sub-regional or international character and expressed their wish to participate in the co-ordinated programmes offered their research facilities, analytical services, scientific expertise and possibilities for in-service training.

E. Available sub-regional analytical and intercalibration services

23. A certain number of scientific institutions and laboratories visited were ready to provide analytical services for samples collected by institutions which were, at present, unable to analyse themselves. In most cases the institutions providing these services required aid either in the form of equipment or cash to cope with the additional workload and manpower requirements.

24. Among the institutions and laboratories that offered extensive analytical services were: 1/

- Instituto de Investigaciones Pesqueras, Barcelona, Spain (atomic absorption spectrophotometry)
- International Laboratory of Marine Radioactivity, Monaco (atomic absorption spectrophotometry, gas chromatography)
- Israel Oceanographic and Limnological Research Ltd., Haifa, Israel (gas chromatography, atomic absorption spectrophotometry)
- Laboratory for Trace Element Analysis, University of Rijeka, Rijeka, Yugoslavia (X-ray fluorescence spectrophotometry)

1/ See paragraph 21

- Radioanalytical Laboratory, Nuclear Research Centre "Demokritos" Aghia-Paraskevi, Greece (neutron activation analysis)
- "Rudjer Boskovic" Institute, Zagreb and Rovinj, Yugoslavia (gas-chromatography, atomic absorption spectrophotometry, polarography, neutron activation analysis)

25. All the scientific institutions visited were ready to participate in the intercalibration exercise of their analytical methodology and viewed this exercise as the basis for the comparability of the data obtained. As the potential organizer of the exercise and supplier of standard and reference materials the International Laboratory of Marine Radioactivity, Monaco, was singled out. The Laboratory had the best experience in carrying out such operations and had in the past produced various reference materials. Considerable financial help would be required for the preparation of the reference material and for the conducting of the intercalibration exercise.

F. Training facilities and requirements

26. A general lack of scientists trained for pollution research was a serious obstacle to the full participation in the recommended co-ordinated programmes of most of the scientific institutions and laboratories visited.

27. Within the Mediterranean region there were a few institutions which had facilities, adequate staff and considerable experience in providing formal education for marine scientists, including marine pollution research. Three of the institutions visited stated that they were prepared to provide a broad spectrum of training.

28. Additionally, there were more institutions with adequate facilities and limited experience of conducting shorter specialized courses with the help of outside experts as lecturers.

29. Specialized in-service training in various analytical techniques and research methodology was the most urgent need for most of the institutions and laboratories. Fortunately, such training was available in several experienced and well-equipped Mediterranean centres, particularly in those listed in paragraph 24.

30. The total number of in-service training posts could not be precisely estimated but it would seem that for the implementation of the seven recommended programmes about 300 man-month fellowships would be needed; no fellowship should last less than six months. 2/

G. Research vessels available

31. Only a few research vessels belonging to countries visited were available to participate adequately in multi-ship programmes or in programmes covering the open sea. Among these were: 3/

- RV Arar, 26m, Istanbul, Turkey
- RV Bios, 28m, Split, Yugoslavia

2/ See paragraph 21

3/ See paragraph 21

- RV Cornide de Saavedra, 54m, Malaga, Spain
- RV Faras El-Bahr, 20m, Alexandria, Egypt
- RV Shikmona, 25m, Haifa, Israel
- RV Villa Velebita, 26m, Rovinj, Yugoslavia

32. In addition to the research vessels mentioned in paragraph 31, there were several smaller boats in operation and under construction which could efficiently carry out coastal work around the Mediterranean. In several countries naval units were used for national programmes.

H. Available and required facilities other than ships

33. With the exception of a few well-equipped research centres, there was a general lack of good and up-to-date analytical equipment in most of the scientific institutions and laboratories visited. The following were among the well-equipped centres visited which had the relevant facilities for the recommended programmes: 4/

- American University, Beirut, Lebanon (gas chromatography, atomic absorption spectrophotometry, facilities for biological experiments)
- Conseil National de la Recherche Scientifique, Beirut, Lebanon (gas chromatography, atomic absorption spectrophotometry)
- Environmental Health Laboratory, Hebrew University, Jerusalem, Israel (facilities for microbiological programmes)
- Hydrobiological Research Institute, Rumelihisari, Istanbul, Turkey (atomic absorption spectrophotometry, facilities for programmes dealing with effects of pollutants on marine organisms and communities, instruments for physical oceanography)
- Institute for Oceanography and Fisheries, Split, Yugoslavia (instruments for physical oceanography)
- Institute of Oceanographic and Fishing Research, Agios Kosmas Hellimikon, Greece (atomic absorption spectrophotometry, gas chromatography)
- Institute of Oceanography and Fisheries, Alexandria, Egypt (instruments for physical oceanography)
- Instituto de Investigaciones Pesqueras, Barcelona, Spain (atomic absorption spectrophotometry, gas chromatography, facilities for microbiological work)
- Instituto Espanol de Oceanografia, Madrid, San Pedro dal Pinatar and Palma de Mallorca, Spain (gas chromatography, atomic absorption spectrophotometry, spectrophotofluorimetry, instruments for physical oceanography)

4/ See paragraph 21

- International Laboratory of Marine Radioactivity, Monaco (gas chromatography, atomic absorption spectrophotometry, facilities for biological laboratory experiments)
- Israel Oceanographic and Limnological Research Ltd, Haifa, Israel (atomic absorption spectrophotometry, gas chromatography, instruments for physical oceanography)
- Laboratory for Trace Element Analysis, University of Rijeka, Rijeka, Yugoslavia (X-ray fluorescence spectrophotometry)
- Nuclear Research Centre "Demokritos", Aghia Paraskevi, Greece (nuclear activation analysis)
- Royal University of Malta, Msida, Malta (gas chromatography, spectrophotofluorimetry)
- "Rudjer Boskovic" Institute, Zagreb and Rovinj, Yugoslavia (atomic absorption spectrophotometry, gas chromatography, polarography, nuclear and activation analysis, facilities for microbiological work and for study of the effects of pollutants on marine organisms and communities)

34. In spite of the seemingly impressive list given above, these facilities were still inadequate, because of their number, geographic distribution and the paucity of equipment for the recommended co-ordinated programmes. It was estimated that the minimum additional requirements would be about ten instruments for analysis of metals, ten instruments for analysis of pesticides and selected organic pollutants, and a greater number of various standard laboratory and field instruments.

VI CONCLUSIONS AND RECOMMENDATIONS

35. The initiation of the recommended co-ordinated Mediterranean pollution research and monitoring programmes would be feasible using the existing national facilities and scientific expertise.
36. Due to limitations in facilities and scarcity of trained scientists all programmes should start as pilot projects.
37. The participation of national research centres in the co-ordinated programmes should be based primarily on their present activities, available facilities and existing manpower.
38. Laboratories and institutions participating in the pilot projects should be organized into collaborating networks. The participation in such networks should not be limited to the centres able to deal with the task in a complex way but should include institutions capable of limited contributions in order to further their own development.
39. The co-ordinated programmes should be carried out by national institutions from the Mediterranean riparian countries together with sub-regional and international teaching and research centres.
40. To initiate the implementation of the pilot projects, meetings of experts selected from institutions identified as potential participants in various programmes should be

organized. The meetings should draw up a detailed operational document for each pilot project. These documents should specify the network of participating laboratories, the sampling and analytical methodology to be followed, the available sub-regional analytical services, the procedures to be followed in the intercalibration exercise, the need for training, education and additional equipment, the ways and means of co-ordination and any other questions relevant to the execution of the pilot projects.

41. The pilot projects should have an operational phase of at least two years.
42. An intercomparison of techniques should be an integral part of every pilot project.
43. To increase the number of participants in various programmes an intensive in-service training of scientists and technicians should be organized and additional equipment should be provided as the best basis for the development of the abilities of national laboratories and institutions.
44. The in-service training should be organized and confined within the Mediterranean region to the largest possible extent.
45. The institutions where training was given should, after the return of the trainee, maintain regular contact with the institution from which the trainee came.
46. Training of staff should precede the provision of equipment to research centres.
47. If visiting experts were required to provide training they should be selected as far as possible from the Mediterranean research centres.
48. The means for an efficient co-ordination of the recommended pilot projects should be established and the relationships between the co-ordinating bodies and the participating institutions should be clearly defined.

ANNEX 1

List of the Scientific Institutions and Laboratories visited and their intended participation in the co-ordinated pollution research and monitoring programmes

EGYPT

Institute of Oceanography and Fisheries, Mediterranean Branch, Alexandria.

Programmes 1, 2, 3, 4, 5, 6, 7.

GREECE

Radioanalytical Laboratory, Nuclear Research Centre "Demokritos", Aghia-Paraskevi.

Programme 2.

Institute of Oceanographic and Fishing Research, Agios Kosmos-Hellimikon.

No specific programme decided upon as yet.

Laboratory for Zoology, University of Athens, Athens.

Programme 4.

ISRAEL

Israel Oceanographic and Limnological Research Ltd., Haifa.

Programmes 1, 2, 3, 4, 5, 6.

Environmental Health Laboratory, Hebrew University, Jerusalem.

Programme 7.

Department of Food Engineering and Biotechnology, Israel. Institute of Technology, Haifa.

Programme 2.

LEBANON

National Council for Scientific Research, Laboratory at Jounieh, Jounieh.

Programmes 2, 3, 4.

American University of Beirut, Beirut.

Programmes 2, 3, 4, 5, 6.

LIBYA

Marine Fisheries Research Centre, Tripoli.

Participation in programmes not specifically discussed.

MALTA

Department of Biology, The Royal University of Malta, Msida.

Programmes 1, 2, 4, 7.

Department of Physiology and Biochemistry, The Royal University of Malta, Msida.

Programmes 1, 3, 4, 7.

MONACO

International Laboratory of Marine Radioactivity, Monaco.

Programmes 2, 3, 4, 5.

Centre Scientifique de Monaco, Monaco.

Programme 7.

MOROCCO

Institut des Pêches Maritimes, Casablanca.

Programmes 4, 5.

SPAIN

Laboratorio der Mar Menor, Instituto Español de Oceanografía, San Pedro del Pinatar.

Programmes 1, 2, 3, 4, 5, 7.

Laboratorio Oceanografico de Baleares, Instituto Español de Oceanografía, Palma de Mallorca.

Programmes 2, 3, 5, 7.

Instituto de Investigaciones Pesqueras, Barcelona.

Programmes 1, 2, 3, 4, 6, 7.

SYRIA

Faculty of Sciences, University of Damascus, Damascus.

Present participation in programmes not specifically discussed.

The Marine Research Centre of Latakia has plans for the future but is not yet in operation.

TUNISIA

Institut National Scientifique et Technique d'Océanographie et de Pêche, Salammbô.

Not interested in participating in any programme.

TURKEY

Hydrobiological Research Institute, Istanbul.

Programmes 1, 2, 3, 4, 5, 6.

YUGOSLAVIA

Center for Marine Research, "Rudjer Boskovic" Institute, Rovinj and Zagreb.

Programmes 1, 2, 3, 4, 5, 7.

Marine Biology Station, University of Ljubljana, Portoroz

Programmes 2, 3, 4, 5, 7.

Institute for Oceanography and Fisheries, Split.

Programmes - 1,2,3,4,5,6,7.

Laboratory for Trace Element Analyses, University of Rijeka, Rijeka.

Programmes 1, 2, 6.

ANNEX II

List of Scientific Institutions and Laboratories not visited but known to be potentially interested in participating in the co-ordinated pollution research and monitoring programmes

ALBANIA

Institut d'Hydro-météorologie, Tirana.

Programme 6.

ALGERIA

Centre de Recherche d'Océanographie et de Pêches, Algiers.

Programmes 1, 2, 3, 4, 5, 6.

CYPRUS

Department of Fisheries, Nicosia.

Programmes 2, 5.

EGYPT

Institute of Oceanography and Fisheries, Inland Waters and Fisheries Branch, Cairo.

Programme 4.

Institute of Public Health, Alexandria.

Programme 7.

FRANCE

Centre National pour l'Exploration des Océans, Paris.

Programme 1

Institut Français du Pétrole et des Carburants Lubrifiants, Paris.

Programme 1.

Institut Scientifique et Technique des Pêches Maritimes, Nantes and Sète.

Programmes 1, 2, 3, 4, 5.

Laboratoire de Physiologie Générale de Comparée, Muséum d'Histoire Naturelle, Paris.

Programmes 1, 4, 5.

FRANCE
(cont.)

Laboratoire d'Océanographie Physique, Muséum d'Histoire Naturelle, Paris.

Programme 6.

Commissariat à l'Energie Atomique, Paris and Pierrelatte.

Programmes 2 and 3.

C.E.R.B.O.M. Nice.

Programmes 3, 4, 5, 7.

Laboratoire Central d'Hygiène Alimentaire, Paris.

Programme 2.

Laboratoires du Centre de Recherches Vétérinaires, Maisons-Alfort.

Programme 2.

Laboratoire de Chimie Appliquée à l'Expertise, Montpellier.

Programme 3.

Institut de Phyto-pharmacie, Marseilles.

Programme 3.

Laboratoire d'Hydrologie, Faculté de Pharmacie, Marseilles.

Programmes 4, 5.

Station marine d'Endoume et Centre d'Océanographie, Marseilles.

Programmes 4, 5.

Station Zoologique, Villefranche-sur-Mer.

Programmes 4, 5.

Laboratoire de Biologie Marine de l'Université de Paris, Banyuls-sur-Mer.

Programmes 4, 5.

Laboratoire Solaigue, Nîmes.

Programmes 4, 5.

Laboratoire de Biologie Générale, Université de Nice, Nice.

Programmes 4, 5.

Laboratoires Municipaux d'Hygiène, Ministère de la Santé, Paris.

Programme 7.

GREECE

Medical School, University of Thessaloniki, Thessaloniki.

Programme 7.

Polytechnic School, University of Thessaloniki, Thessaloniki.

Programme 6.

ITALY

Instituto di Zoologia, Universita di Messina, Messina.

Programmes 2 and 4.

Instituto di Idrobiologia, Universita di Messina, Messina.

Programme 7.

Instituto Ricerca Acque C.N.R. Rome.

Programmes 2, 3, 4, 5, 6.

Instituto di Anatomia Comparata, Universita di Siena, Siena.

Programmes 2, 4.

Gruppo Oceanologico, Universita di Genova, Genoa.

Programmes 2, 4, 5, 6.

Instituto di Biologia del Mare, C.N.R., Venice.

Programmes 3, 4, 5.

Instituto di Zoologia ed Anatomia Comparata, Trieste.

Programmes 4, 5.

Osservatorio Geofisico Sperimentale, Trieste.

Programme 6.

MALTA

Department of Physics, Royal University of Malta, Msida.

Programme 6.

SPAIN

Laboratorio Oceanografico de Malaga, Malaga.

Programme 6.

Instituto de Agroquimica y Tecnologia de Alimentos, Valencia.

Programmes 2, 3.

TUNISIA

Mediterranean Marine Sorting Center, Khereddine.

May provide taxonomical services.

TURKEY

Hydro-biological Laboratory of the Aegean University, Izmir.

Programme 5.

Department of City Sanitation and Planning, Technical University, Istanbul.

Programme 7.

YUGOSLAVIA

Biological Institute, Dubrovnik.

Programmes 4, 5.

Institute for Marine Biology and Oceanography, Kotor.

Programmes 2, 3, 5, 6, 7.