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REPORT OF THE IOC/FAO/UNEP AD HOC MEETING ON PERSISTENT SYNTHETIC MATERIALS

(Athens, 14-16 October 1987)

In co-operation with :

IOC FAO

UNEP

Athens, 1988

REPORT OF THE IOC/FAO/UNEP AD-HOC MEETING ON PERSISTENT SYNTHETIC MATERIALS

Athens, 14-16 October 1987

Background

Attention has focussed recently on the increasing amounts of litter found on beaches in various parts of the world, on floating debris, on the biological effects of discarded fishing gear, plastic strappings, plastic six-package strappings. Studies in many parts of the world on the theme of persistent synthetic materials in the marine and coastal environments (drifting and on beaches) concerning amounts and the associated effects on fauna and aesthetics, show that a global pollution problem has arisen requiring assessment on a regional basis together with identification of alternative control and protection mesures. Plastic litter has affected many marine animals. Victims include birds, mammals, fish and turtles.

The sources of the material are several: shipping, fishing, human recreation, land-based sources. It has been estimated that of the order of 7 million cans, 0.5 million bottles, 0.6 million pieces of plastics are discarded daily on a global basis from ships. The total litter generation by shipping and oil drilling within Mediterranean areas estimated at 325×10^6 kg/year.

The most abundant plastic litter in near-surface waters is polyethylene sheeting, derelict gillnets, trawl-net fragments, strapping and packing bands and plastic bags, which entangle and trap animals, in particular seals, but also birds. Raw plastic pellets have been found in intestines of birds causing death. Plastic debris has a long lifespan and an assumption made on basis of observations is that, generally, floating commercial derelict fishing gear comes ashore about two years after being discarded. Stranded litter on beaches persist but often becomes buried, and it is difficult to estimate the real quantities of debris and its fate.

In the Mediterranean all species of Cetaceans and the Monk seal are potentially entangled in a variety of gear but little information is available as to quantities. Bottlenose, striped and common dolphins are most frequently caught in the high density of nets occurring in the western Mediterranean, and sperm and minkwhales are entangled in driftnet fishing. Sea turtles have been reported to drown in a variety of gear. Plastic bags have been found in digestive tracts of four of seven species of sea turtles, including leather-backs in French coastal waters.

Persistent synthetic materials which may float, sink or remain in suspension and which may interfere with any legitimate use of the sea is one category of substances listed in Annex I of the Protocol for the Protection of the Mediterranean Sea against Pollution from Land-based sources which is one of the Protocols of the Convention for the Protection of the Mediterranean Sea against Pollution (Barcelona Convention). According to article 5 of the Protocol which entered into force in 1983,

" The Parties undertake to eliminate pollution of the Protocol Area from land-based sources by substances listed in annex I to this Protocol. To this end they should elaborate and implement jointly or individually as appropriate, the necessary programmes and measures. These programmes and measures shall include, in particular, common emission standards and standards for use".

According to a decision of the Contracting Parties to the Barcelona Convention, the Secretariat is responsible for preparing an assessment of the state of pollution by these substances highlighting the problems and recommending, if necessary, specific measures to be undertaken by the Parties.

The assessment will include inter alia chapters on sources and inputs, levels in the various compartments of the marine environment, effects on marine biota and humans and present legal and administrative measures at national and international level.

The present meeting was expected to review the presently available information on the above topics, pin-point gaps, decide on the possible specific actions to be undertaken and recommend a programme of action which would include among other things

a) proposals for further research and monitoring work, possibly leading to

b) proposals for undertaking of control measures,

The meeting took place in Athens on 14-16 October, 1987 at the Coordinating Unit for the Mediterranean Action Plan. It was attended by two participants from two countries together with representatives from IOC, FAO, and UNEP.

A list of participants is given in Annex I.

1. OPENING AND ADMINISTRATIVE ARRANGEMENTS

The meeting was opened by Mr. G. Kullenberg, Senior Assistant Secretary on behalf of the Intergovermental Oceanographic Commission, and by Mr. G.P. Gabrielides, Senior Fishery Officer (Marine Pollution) on behalf of the Food and Agriculture Organisation of the United Nations. The participants were welcomed and wished success of the meeting. Mr. A. Manos, Coordinator of the Mediterranean Action Plan, welcomed the participants on behalf of the United Nations Environment Programme and described the close relationship between various UN agencies, within the Action Plan. He described the work of the Unit in the context of the Barcelona Convention and its related protocols especially the Land-based Sources Protocol; a new action plan had been recently agreed and so the Unit had both a mandate and a time table to propose measures to control the inputs of substances listed in Annexes I and II of the above protocol.

The reasons for calling this ad-hoc meeting were outlined. Persistent synthetic materials are listed in Annex I to the Protocol for the Protection of the Mediterranean Sea against Pollution from Land-based Sources. Therefore, a review has to be prepared of the existing information, environmental amounts and harmful effects as for other Annex I substances. Based on this review a set of recommendations will be made for monitoring,

research and regulatory action. These recommendations have to be firmly based on the scientific evidence available. Mr. L. Jeftic, Senior Marine Scientist, UNEP, outlined the timetable for the review of Annex I substances. An assessment document should, if possible, be put before a meeting of the Scientific and Technical Committee in 1989 for consideration at the meeting of the Contracting Parties of the Convention for the Protection of the Mediterranean Sea against Pollution in 1989. In the meantime funds were available for a limited monitoring and research programme during 1988.

The meeting agreed that Mr. Kullenberg would serve as coordinator and rapporteur.

The Agenda was adopted (Annex II).

2. DEFINITION OF MATERIAL TO BE CONSIDERED

The meeting agreed to consider material on beaches and at sea separately. The same categories of material should preferably be included in the studies and evaluations to the extent possible.

The meeting also agreed to adopt a relatively broad approach in considering relevant material to be included. On the basis of studies and categorizations made elsewhere in Europe and in several states of the USA the following categories with sub-divisions were agreed to be included in the proposed pilot study of material on beaches, as well as for the pelagic and benthic studies, as far as possible.

Material Category		Subdivision
1.	Plastic	caps; bags; containers; others
2.	Styrofoam	
3.	Fishing gear	nets; buoys; ropes; others
4.	Glass	bottles; pieces
5.	Metal	cans; others
6.	Rubber	car tyres; others
7.	Wood	including abandoned construction material, driftwood, and others;
8.	Abandoned construction material other than wood	
9.	Clothing	shoes; others

3. PRELIMINARY ASSESSMENT OF THE PROBLEM

During the last two decades there has been a growing concern about the increasing amount of refuse which litters the world beaches. The origin of this litter may be from the sea by ships that dump their refuse, and from land either through the sewer systems or by people who come to the beach for recreation.

Many studies were conducted on various beaches of the world with the aim of identifying the litter components and estimating its quantity. The litter components ranges from granules of plastic of a few mm in size to several meters blocks of building refuse. It consists of plastics (sheets, bags, containers etc), glass, tin cans, clothings, tyres, metal scraps and construction refuse. Most of these materials are floating in sea water until they eventually land on the beach. In this way the beach has turned into the collecting bin of persistent, hardly degradable, track of the garbage.

Coastal litter has several harmful aspects: hazard to coastal animals that get entangled in fishing net, 6-pack plastic etc. and die as well as their feeding. It also has a repelling effect (from the aesthetic point of view) on people who come to the beach for recreation purposes.

Hardly any studies were conducted on coastal litter on the Mediterranean beaches. Yet the Mediterranea Sea is a land-locked sea, bordered by countries which range from developing to very well developed industrially. This sea carries also a significant portion of the global marine traffic. At the same time, its temperate climate and warm water makes the beaches of the Mediterranean ideal for bathing and recreation.

The sources of the material were considered by the meeting to be mainly shipping, fishing, tourism and general land and beach use. There is no doubt that considerable amounts of synthetic materials produced, e.g. plastic bags, strappings, end up in the marine environment or on beaches. Assuming that about 20% of the world's shipping passes through the Mediterranean a rough estimate, using a total beach length of 50,000 km, would indicate that of the order of 100 pieces (including cans, plastic and bottles) per 100 m^2 of beach per year could end up on the Mediterranean beaches. This estimate does not take into account the influence of oceanographic and meteorological factors on the distribution of the material.

The pelagic study in North-eastern Mediterranean (A note on plastic materials in trawl catches in the North-eastern Mediterranean, F. Bingel, D. Avsar, M. Unsal, 1985) gave orders of magnitude of 100kg per km^2 of plastic material. The total amounts over the whole investigated area were in the range of 15-150 tons for the depth range of 0-100m. The distribution was unequal, clearly depending upon oceanographic and topographic features, and varying with season. Largest amounts were found in the 0-10m and 50-100m ranges. In all the cases the deeper levels contained the maximum amounts, being in the range of 10-100 tons.

The meeting agreed that the preliminary evaluation indicated the need for obtaining more data, quantifying the amounts of material per unit length of area and identifying the category of material, as specified in section 2 above. It was considered necessary that a pilot study aimed at generating the basic information on the severity of the problem be carried out, including an attempt to estimate the "production" of litter-type material.

4. METHODS OF OBSERVATION AND QUANTIFICATION

4.1 Method of observation and quantification of litter quantity on the Mediterranen Beaches (pilot study)

Objectives

The objectives of this study are:

1. Assess the quantity of litter on selected beaches of the Mediterranean.
2. Determine if there are any seasonal changes in the litter composition and quantity.
3. Determine the origin (sea or land) of the litter, to the extent possible.
4. Estimate rate of litter accummulation.
5. Note any harmful effects of the litter on biota.

Method

1. Select two or more beaches for the purposes of this survey. The beaches selected should differ from each other in terms of their morphology (cliffed beach, dune beach, flat coastline etc) and in terms of human activity on or near the beach (bathing beach, near harbour, near industrial center, desolate beach etc).
2. On each of these beaches establish a permanent point which will be used as a reference point for determination of sampling transect.
3. Use a random number table for selecting a three digit number. This number will be the number of paces you have to walk from the reference point along the beach to the sampling transect, and this will be the transect and sample number.
4. Fill out the sampling form (see Appendix I)
5. Mark the transect with a line running perpendicular to the beach orientation from the waterline to the back of the beach (the foot of the cliff, dune, road etc). Use another line parallel to the first line and at a distance of three meters from it. The sampling transect is between the two lines.
6. Measure and record the length of the transect in meters.
7. Collect all the material items (see Appendix II) found on the surface of the transect which are larger than 1 cm and put in a bag. Mark the beach name transect number and date on the bag.
8. When the sampling is complete repeat steps 3, 4, 5, 6 and 7 to carry out another sampling. Conduct as many samplings as you can.
9. In the laboratory devide the sample components according to the Counting Sheet (see Appendix II), count and record the number of pieces in each category. Then weigh and record the litter in each category. Use the

10. The above sampling procedure should be carried out in all the beaches selected for the study at a frequency of once a month.

11. Send copy of sampling forms and Counting Sheets to coordinator, G. Kullenberg, IOC/UNESCO, Paris, France.

4.2 Pelagic and benthic studies

Records by trawl-nets

During studies for the assessment of trawlable fish biomass trawls can be examined for their litter contents. Quantitative trawl nets with small mesh-sizes (14mm if available) should be used. Depending on the bottom topography a depth range of 0-100m is to be covered. If possible 30 minute catches should be made.

1-2 technical assistants or students per ship should be sufficient for these investigations. They have to collect the garbage for counting and weighing in the laboratories. Field investigations and laboratory analyses should be coordinated by a scientist.

Data to be noted on the vessel:

1) coordinates when setting and heaving the net
2) type of the net
3) net size (opening between the wingtips)
4) mesh size (14mm if possible)
5) speed of the vessel
6) time-span of the survey (30 minutes)
7) water-depth
8) day, month, year

Analysis of type, number and weight of the litter can be made in the laboratory. Data should be collected at least according to the categories given in section 2, giving number of digits and weight.

The forms in Appendices I and II should be used for data reporting.

Indications of the origin of the refuse are sometimes given from the information printed on plastic, paper, metal and glass items. In these cases the country of origin is to be noted.

To compare the results, all data are to be normalized to a base of number counts on an area of 1 km^2. The data should be evaluated according to different coastal areas and depth ranges. Depending on the whole time-span of the investigations, the seasonal distribution may also be of special interest.

5. DESIGN OF PILOT STUDY

It is imperative that as many Mediterranean laboratories as possible would participate in the study to ensure proper presentation of the litter conditions in the Mediterranean and reliability of the results. The methods of operation should be uniform for all the laboratories to ensure comparability. A scientific co-ordinator will be in charge of designing the methods used in the study, ensuring that they are properly executed, obtaining the results from the various laboratories as soon as they are generated, conducting the analysis of the data and submitting the final report as far as this project is concerned.

In selecting the participating laboratories it is important to ensure geographical presentation of the Mediterranean and therefore laboratories from the east, central west and southern coastlines of the Mediterranean will participate in the study. Furthermore, in each participating country at least two beaches, and preferably more, will be used for sampling. As mentioned in the Method chapter, the selected beaches should present both morphological variety as well as variety in human activity.

The project should last for a full year with monthly samplings. This will ensure detecting any seasonal changes in the litter quantity and composition (if any).

In order to ensure uniformity in methods of data collection, detailed descriptions are given in this report. Furthermore, Appendices 1 and 2 to this report provide data sheets that if properly completed by the participants while they carry out field and laboratory work, will result in uniformity in execution and high quality results.

It is envisaged that towards the end of the project a meeting of all the participants may take place. In this meeting the results of all the laboratories as well as the ideas of participating members will be analysed and discussed.

The analysis of the data should lead to the following information: a) assessment of the quantity of persistent garbage which litter the Mediterranean; b) geographical distribution of the litter taking into account factors which control this distribution (currents, winds, shipping lanes, industry etc); c) seasonal effect on distribution (composition and quantity) of litter; d) sources of litter (from land or sea and in what proportion); e) rates of litter accumulation.

6. IDENTIFICATION AND CONSIDERATION OF AREAS TO BE STUDIED IN PILOT STUDY

The meeting discussed the areas or regions which ideally ought to be covered by the pilot study, considering separately the beach and the pelagic studies. It was agreed that the number of regions to be covered must be adjusted to some extent to budgetary restrictions. Oceanographic and meteorological features influencing the distribution of material should be taken into account to the extent possible when selecting specific areas in the regions.

The results from driftcard experiments performed in the past may be used together with the general knowledge of the circulation and wind conditions. It was considered premature to use numerical models of circulation or spreading of materials, although such tools may be useful at a later stage for more detailed studies. At present, the aim is to design a rather broadbrush type of baseline study. With this in mind the meeting agreed that, to the extent possible, regions in the eastern, central, western southern and northern parts of Mediterranean should be covered.

6.1 Beaches

Driftcard experiments in the Southeast Levantine basin (summarised in UNEP/WG.118/Inf.6, presented at the Third Meeting of the WGSTC for MED POL, Athens 27-31 May 1985) suggest possible accumulation areas immediately west of Aboukir Bay, Egypt.

The Ligurian Sea driftcard experiment (op.cit) indicates several potential accumulation areas, including the central Spanish coast, western Corsica and Sardinia and central Algeria.

The general oceanographic and meteorological characteristics of the Mediterranean would certainly suggest parts of the southern shores, the eastern Mediterranean, and the western part of Cyprus.

On the basis of these deliberations the meeting suggested that 1-3 beaches be selected, following the local criteria given in section 4.1 above, in the regions:

Western Cyprus
Central Egypt, west Aboukir Bay
Greece, southern parts
Italy, central eastern part
northern western part
Israel, central parts
France, western Corsica
Libya, central parts
Spain, central eastern parts.

6.2 Pelagic and benthic regions

For the pelagic part, the meeting agreed that only relatively few regions could be covered in the pilot study. Considering the oceanographic features and the desirability of coupling the pelagic studies to the beach studies the meeting agreed that the following regions ought to be covered or included:

Cyprus and if possible Greece
Italy (e.g. Trieste and Genova)
Israel
France, (e.g. Villefranche area)
Spain, (e.g. Barcelona area)
Turkey

7. IDENTIFICATION OF PARTICIPATING LABORATORIES AND THEIR NEEDS

7.1 Laboratories

The meeting agreed that relevant laboratories in the countries identified in section 6 should be invited to participate in the pilot study.

It was not possible to identify laboratories in each of the countries. The contact and invitation will have to go through the National Focal Points.

Tentatively the following laboratories were identifed:

Cyprus, Department of Fisheries, Ministry of Agriculture and Natural Resources (Demetropoulos)

Israel, Israel Oceanographic and Limnological Research (Golik)

Turkey, Institute of Marine Sciences Erdemli-Icel (Bingel)

Greece, National Centre for Marine Research (Bousoulengas)

Italy, Trieste, Genoa

France, Villefranche

Spain, Barcelona

Yugoslavia, Split

Libya, National Focal Point

7.2 Needs of the participating laboratories

1) Large and strong plastic bags for collecting the litter

2) Gloves

3) String-scales in different sizes
(Weight of very large items can be estimated)

For the beach surveys: possibility to use a car or a landrover

For the surveys of the sea-bottom: possibility to use a fishing vessel or if possible a research vessel equipped with appropriate trawl (in section 4.2).

4) Personnel requirements.
One principal investigator for each participating country or laboratory who will be responsible for organizing the work and delivering the data each month.

The technical or assistance personnel required for the field work will have to be identified by each laboratory.

8. WORK PROGRAMME

1. Identification of participating laboratories	Dec. 1987
2) Hiring of consultants	Jan. 1988
3) Initiation of assessment document	Feb. 1988
4) Execution of sampling programme	Jan.-Dec. 1988 (monthly)
5) Evaluation of monitoring data	Nov. 1988-Jan. 1989
6) Possible meeting of participants to review results of monitoring programme	Dec. 1988
7) Completion of assessment document	Jan. 1989

Eventhough the above work programme was prepared, the Group felt that a more realistic approach would be to aim the finalization of the assessment document for the end of 1989.

9. OUTLINE OF CONTENT OF ASSESSMENT DOCUMENT

The assessment document which will result from he pilot study and the work of the consultant will consist of the following headlines:

I - Assessment Study

1. Introduction
   - 1.1 Definition of the problem
   - 1.2 Reference to protocol for protection of the Mediterranean sea against pollution from Land-based sources
   - 1.3 Scope and purposes

2. Definition of materials included in study, referring to the protocol and studies made outside the Mediterranean.

3. Sources and Inputs
   - 3.1 Production of litter
   - 3.2 Uses and sources

4. Levels and Amounts
   - 4.1 Methods of obtaining data
     - 4.2.1 beaches
     - 4.2.1 pelagic and benthic
   - 4.2 Observations on beaches
     - 4.2.1 composition of litter
     - 4.2.2 quantities - by number of pieces and by weight per unit of beach area
     - 4.2.3 evaluation of the results
   - 4.3 Observations in the sea - pelagic and benthic
     - 4.3.1 composition of litter
     - 4.3.2 quantities - by number of pieces and by weight per unit area
     - 4.3.3 evaluation of the results

5. Factors influencing distribution and fate of litter.
   5.1 Physical factors - winds, currents, waves
   5.2 Human activity - shipping lanes, industry, tourism etc.

6. Effects
   6.1 Damage to biota - e.g. entanglement, poisoning, injury
   6.2 Aesthetic problems
   6.3 Harmful effect on legitimate use of the sea

7. Conclusion of the assessment study.

II-Control Measures

8. Existing national and international control measures to prevent marine pollution by persistent synthetic materials.

9. Cleaning strategies employed and their cost effectiveness.

10. Scientific rationale for recommended measures.

11. Recommended measures to control and restrain coastal and marine litter.

ANNEX I

IOC/FAO/UNEP-MAP AD-HOC MEETING ON PROBLEMS OF PERSISTENT SYNTHETIC MATERIALS IN THE MEDITERRANEAN SEA

Athens, 14-16 October 1987

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ANNEX II

IOC/FAO/UNEP-MAP AD-HOC MEETING ON PROBLEMS OF PERSISTENT SYNTHETIC MATERIALS IN THE MEDITERRANEAN SEA

Athens, 14-16 October 1987

AGENDA

1. Opening and administrative arrangements

2. Definition of material to be considered

3. Preliminary assessment of the problem

   - on beaches
   - on seasurface
   - in sub-surface layers and on the bottom

4. Methods of observation and quantification for

   - beaches
   - sea surface
   - sub-surface layers and on the bottom

5. Identification and consideration of areas to be studied in pilot study

6. Design of pilot study programme

7. Identification of participating laboratories and their needs

8. Preparation of workplan for implementation

9. Outline of content of assessment documen

10. Adoption of the Report

11. Close

APPENDIX I

Coastal Litter Survey

Sampling Form

Name of Beach_____ Date_____ Hour_____

Number of paces to transect_____ Length of transect_____

Weather Conditions:

Wind: dir._____ speed_____
rain or fair_____
sea state _____

Describe any dead or entangled animals on the beach (in or outside transect):

Describe any outstanding phenomenon on the beach or litter:

Name of persons participating in sampling _____

_____

_____

Signature of responsible
for sampling

_____

APPENDIX II

Coastal Litter Survey

Counting Sheet

Date:_____

Beach name_____ Transect No._____ Sampling date_____

Sample components	number of pieces	weight
Plastics		
Styrofoam		
Fishing gear		
Glass		
Metal		
Rubber		
Wood		
Constuction material		
Clothing		

Record any written labels on the sample components:

_____ _____ _____ _____ _____

Counting and weighing was done by: _____

Signature