



UNITED NATIONS ENVIRONMENT PROGRAMME

SEPTEMBER 1989

*Comparative toxicity test of
water-accommodated fractions of oils
and oil dispersants to marine organisms*

Reference Methods For Marine Pollution Studies No.45

Prepared in co-operation with



FAO



IAEA

UNEP 1989

NOTE: This document has been prepared in co-operation between the Food and Agriculture Organization of the United Nations (FAO), the International Atomic Energy Agency (IAEA) and the United Nations Environment Programme (UNEP) under project TF/5102-88-03.

For bibliographic purposes this document may be cited as:

UNEP/FAO/IAEA: Comparative toxicity test of water-accommodated fractions of oils and oil dispersants to marine organisms. Reference Methods for Marine Pollution Studies No. 45 UNEP 1989.

PREFACE

The Regional Seas Programme was initiated by UNEP in 1974. Since then the Governing Council of UNEP has repeatedly endorsed a regional approach to the control of marine pollution and the management of marine and coastal resources and has requested the development of regional action plans. The Regional Seas Programme at present includes ten regions and has over 120 coastal States participating in it. (1), (2)

One of the basic components of the action plans sponsored by UNEP in the framework of the Regional Seas Programme is the assessment of the state of the marine environment and of its resources, and of the sources and trends of the pollution, and the impact of pollution on human health, marine ecosystems and amenities. In order to assist those participating in this activity and to ensure that the data obtained through this assessment can be compared on a world-wide basis and thus contribute to the Global Environment Monitoring System (GEMS) of UNEP, a set of Reference Methods and Guidelines for marine pollution studies are being developed as part of a programme of comprehensive technical support which includes the provision of expert advice, reference methods and materials, training and data quality assurance (3). The Methods recommended to be adopted by Governments participating in the Regional Seas Programme.

The methods and guidelines are prepared in co-operation with the relevant specialized bodies of the United Nations system as well as other organizations and are tested by a number of experts competent in the field relevant to the methods described.

In the description of the methods and guidelines the style used by the International Organization for Standardization (ISO) is followed as closely as possible.

The methods and guidelines, as published in UNEP's series of Reference Methods for Marine Pollution Studies, are not considered as final. They are planned to be periodically revised taking into account the development of our understanding of the problems, of analytical instrumentation and the actual need of the users. In order to facilitate these revisions the users are invited to convey their comments and suggestions to:

Marine Environmental Studies Laboratory
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which is responsible for the technical co-ordination of the development, testing and intercalibration of Reference Methods.

PREFACE cont'd.

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- (1) UNEP: Achievements and planned development of the UNEP's Regional Seas Programme and comparable programmes sponsored by other bodies. UNEP Regional Seas Reports and Studies No. 1 UNEP, 1982.
 - (2) P. HULM: A Strategy for the Seas. The Regional Seas Programme: Past and Future UNEP, 1983.
 - (3) UNEP/IAEA/IOC: Reference Methods and Materials: A programme of comprehensive support for regional and global marine pollution assessments. UNEP 1988.

This issue of the Reference Method for Marine Pollution Studies No 45 was prepared in co-operation with the Food and Agriculture Organization of the United Nations (FAO) and the International Atomic Energy Agency (IAEA). It includes comments received from a number of scientists who reviewed the method and particularly the conclusions of the FAO/UNEP Consultation meeting on the toxicity of selected substances to marine organisms held in Villefranche-sur-mer, France, 13-14 October, 1988. The assistance of all those who contributed to the preparation of this reference method is gratefully acknowledged.

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1. SCOPE AND FIELD OF APPLICATION

This reference method describes a simple procedure for comparing the toxicity of oil, oil dispersants, and mixtures thereof, to marine animals. It allows the toxicity of different dispersants to be rapidly compared to that of oil, or of a mixture of oil and oil dispersant. It is designed for routine monitoring and screening purposes and is not appropriate as a research method.

NOTE: The physical and chemical properties of oil and oil dispersants create many difficulties in the measurements of their toxicity to marine organisms. Strictly speaking, their toxicity can only be accurately estimated using complex procedures and apparatus. (A relatively simple apparatus for preparing oil/water or oil/water/oil dispersant emulsions is described in Appendix B). Simpler methods can provide useful information, provided their limitations are clearly understood and taken into consideration in the assessment and application of their results. Some of the special considerations relating to the measurement of the toxicity of oil and oil dispersants are described in Appendix A. The Appendix also explains the rationale and limitations of the method described here. (Appendix A should be carefully read before this method is attempted.)

2. REFERENCES

- REISH, D.J. AND OSHIDA, P.D. (1986) Manual of Methods for Marine Environment Research. Part 10. Short-term static bioassays. FAO Fish. Tech. Pap. (No.247) 62pp.
- UNEP/FAO/IAEA(1989) Test of the acute lethal toxicity of pollutants to marine fish and invertebrates: Reference Methods for Marine Pollution Studies No. 43, UNEP.
- WARD, G.S. AND PARRISH, P.R. (1982) Manual of Methods in Marine Environment Research. Part 6. Toxicity tests. FAO. Fish. Tech. Pap. (No.185) 23pp., Rome, FAO.

3. PRINCIPLES

Aqueous extracts of oil, of oil dispersants or of mixtures of oil and oil dispersant are made. Samples of 10 test animals are exposed to each of a series of dilutions of this extract. The concentrations of the extracts which kill half of the test animals within 24 hours are estimated. A simple test of significance is used to indicate the relative toxicity of the substances tested. If a standard oil or standard oil dispersant is available, the toxicity of an oil dispersant can be compared to that of the standards.

NOTE: In some countries, experiments on living animals are subject to certain legal restrictions. Investigators should ensure that they hold any necessary licenses or permissions before commencing any experiments.

4. REAGENTS

4.1 Sea Water

This water may be natural sea water, artificial sea water made from commercial sea salt, or synthetic sea water made up by dissolving the appropriate chemicals in demineralised water. It is strongly recommended that natural sea water be used whenever possible. Commercial sea salts (e.g. "Instant Ocean" are acceptable as second choice. Synthetic sea water (see section 4.1.3) should only be used if there is no alternative. Investigators should be aware that such synthetic sea water may be contaminated with trace heavy metals, even when high-grade chemicals are used.

4.1.1 Natural sea water: Depending upon its origin, natural sea water may require settling and/or filtration before use. It should be drawn from an uncontaminated area and should not have been in contact with metallic pipes or pumps.

4.1.2 Artificial sea water made from commercial sea salts (as supplied for aquaria): Should be made up exactly according to the manufacturer's recommendations (some adjustment to salinity may be made, according to local conditions). Sufficient sea water should be made up to last for the entire duration of the experiment or experiments. Before use, the sea water should be aerated vigorously for at least 48 hours to ensure equilibration with air, and the pH should stabilise at 8.1 - 8.2. After equilibration, any precipitate which has formed should be removed by settling or filtration. Avoid contact with metallic implements.

NOTE: Many species do not thrive in freshly-prepared artificial sea water. Ideally, the water should be "conditioned" in a recirculating laboratory aquarium for as long as possible before it is used for experimental purposes.

4.1.3 Synthetic sea water may be made up from the following formula:

Chemical	Quantity (g)
NaCl	23.926
Na ₂ SO ₄	4.008
KCl	0.677

NaHCO ₃	0.196
KBr	0.098
H ₃ BO ₃	0.026
NaF	0.003
MgCl ₂ .6H ₂ O	10.83
CaCl ₂ .2H ₂ O	1.52
SrCl ₂ .2H ₂ O	0.02
Distilled water	to 1000g

Dissolve the substances in the order shown in distilled water, and make up to 1000g. Note that this formula gives sea water of 35 salinity. If other salinities are required, adjust the amount of distilled water pro rata, e.g. for sea water of 37 salinity, dissolve the above chemicals with distilled water to 946 g.

Analytical grade reagents should be used. Sufficient sea water should be made up to last for the entire duration of the experiment or experiments. Equilibration should be carried out as in section 4.1.2. Any precipitate formed should be removed by settling or filtration. Avoid contact with metal implements.

NOTE: Sea water made by this method is very expensive.

4.2 Oil

If the oil is required for a relatively small number of tests, proceed as in 4.2.1. If the oil is to be used as a standard or reference material in a longer programme of testing, proceed as described in 4.2.2.

预览已结束，完整报告链接和二维码如下：

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