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IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP
Joint Group of Experts on the Scientific Aspects
of Marine Environmental Protection (GESAMP)

Report of the twenty-fourth session of GESAMP

New York, 21-25 March 1994

GESAMP REPORTS AND STUDIES No. 53

IMO/FAO/Unesco-IOC/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the
Scientific Aspects of Marine Environmental Protection (GESAMP)

REPORT OF THE TWENTY-FOURTH SESSION

New York, 21-25 March 1994

NOTES

- 1 GESAMP is an advisory body consisting of specialized experts nominated by the Sponsoring Agencies (IMO, FAO, Unesco-IOC, WMO, WHO, IAEA, UN, UNEP). Its principal task is to provide scientific advice concerning the prevention, reduction and control of the degradation of the marine environment to the Sponsoring Agencies.
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GESAMP XXIV

(21-25 March 1994)

1 INTRODUCTION

1.1 The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) held its twenty-fourth session at the Headquarters of the United Nations, under the chairmanship of Mr. J. Gray. Mr. O. Osibanjo was Vice-Chairman of the Group.

Opening of the session

1.2 Mr. J. P. Levy, Director of the Division for Ocean Affairs and Law of the Sea of the Office of Legal Affairs, welcomed the Group to the session on behalf of the Legal Counsel of the United Nations. In doing so, he expressed particular appreciation of the fact that the current session also marked the 25th anniversary of GESAMP. Mr. Levy emphasized that GESAMP is a very important component of UN system cooperation on marine and coastal area questions, and that the decision to revise its terms of reference in 1993 was done in recognition of the need for authoritative scientific advice over an increasingly wide range of complex issues.

1.3 Mr. Levy called the attention of the Group to the fact that the United Nations Convention on the Law of the Sea will enter into force on 16 November 1994 lending new impetus to the implementation of Chapter 17 of Agenda 21, which itself rests on the foundation provided by the Convention. He pointed particularly to the requirements in the Convention that marine environmental and resource management be scientifically based.

1.4 The Chairman thanked Mr. Levy on behalf of the participants for his good wishes for the success of the session.

Adoption of the agenda

1.5 The agenda for this session as adopted by the Group is reproduced in Annex I. The list of documents considered at the session is given in Annex II. The list of participants is shown in Annex III.

2 REPORT OF THE ADMINISTRATIVE SECRETARY

2.1 The Administrative Secretary of GESAMP introduced the Updated Memorandum on the Joint Group agreed by the Executive Heads of the Sponsoring Agencies extending the role of GESAMP "to cover all scientific aspects on the prevention, reduction and control of the degradation of the marine environment to sustain its life support systems, resources and amenities."

2.2 The Group also noted that the Intergovernmental Oceanographic Commission (IOC) of UNESCO has become a sponsoring agency of the Group.

2.3 The Updated Memorandum on GESAMP is shown in Annex IV.

3 ASSESSMENT OF THE CONDITION OF THE MARINE ENVIRONMENT

3.1 The IMO Technical Secretary of GESAMP recalled the origin of Working Group 36 and outlined the intersessional activities which had lead to the preparation of draft "Guidelines for marine environmental assessments". The work had involved two sub-groups: one meeting in London (6-10 December 1993), under the chairmanship of Mr. R. Boelens, and the other in Bangkok (2-5 February 1994), under the chairmanship of Mr. P. Tortell. The draft guidelines were presented as document GESAMP XXIV/3.

3.2 The IMO Technical Secretary for GESAMP indicated that he considered the Working Group had completed its task and invited GESAMP to review the guidelines with a view to adoption.

3.3 The Co-Chairman of Working Group 36, Mr. R. Boelens, introduced the report emphasizing that the Working Group had concentrated on preparing a clear and concise statement of the purposes, scope and content of regional assessments and the process involved. Thus, the more technical aspects of the guidelines were presented as annexes, rather than in the main body of the text.

3.4 In the subsequent discussion, a number of constructive comments were made as to how the guidelines might be improved. It was agreed to add a short account of the scientific resources needed for the production of assessment reports, to review the contents of Annex 1 (with particular attention to the section on hydrographic properties), and to prepare a short Preface giving the background to the guidelines and inviting feedback on their utility and practicality.

3.5 The Co-Chairmen of the Working Group undertook to review the guidelines taking into account the comments received from GESAMP members. On this basis, GESAMP agreed that the guidelines should be published as GESAMP Reports and Studies No. 54.

4. EVALUATION OF THE HAZARDS OF HARMFUL SUBSTANCES CARRIED BY SHIPS

4.1 The IMO Technical Secretary informed GESAMP that the twenty-ninth session of the Working Group on the Evaluation of the Hazards of Harmful Substances carried by Ships had been held during the intersessional period. The

Technical Secretary then summarized the main achievements made by the Working Group as outlined in its session report (GESAMP XXIV/4).

4.2 The Chairman of the Working Group, Mr. P.G. Wells, emphasized that it had been the main task of his group to prepare hazard profiles for substances proposed for transport at sea, and to review existing hazard profiles in cases where new information had been made available. He then drew attention to the following issues considered by the Working Group.

4.3 The Working Group had considered information made available on copper and copper compounds, used as marine antifouling paints replacing organotin-based formulations. The Working Group, however, felt that there was still not sufficient data yet available to perform a comprehensive hazard assessment of copper-based antifouling paints in the marine environment. The Working Group agreed that this matter should stay under review. A number of studies concerning copper-based formulation for paints are being carried out in many countries and by many organizations, and Mr. Wells asked GESAMP members to provide any information on results and contacts in this field to the IMO Technical Secretary.

4.4 Draft guidelines for the measurement of odour detection thresholds in water have been developed by the Working Group with a view to identifying chemicals that are liable to taint seafood when spilled at sea. GESAMP confirmed that efforts be made to validate the draft guidelines and it requested the IMO Secretary to contact ASTM and chemical manufacturers' associations asking them for advice.

4.5 The Working Group has deleted "White Spirits" from its composite list of substances, noting that under this name a wide variety of different hydrocarbon mixtures of varying compositions and often tailored to customers' demands were transported in large quantities. Several mixtures had been tested and evaluated by the Working Group. However, the Working Group recognized that these were not representative for the many mixtures transported in bulk under this name. In this connection the Group was also advised that "White Spirits" were carried in oil tankers rather than in chemical tankers, and that no hazard evaluation was necessary for transportation and discharge requirements of "oils" (MARPOL 73/78, Annex I). GESAMP took note of the action taken by its Working Group, but asked the Working Group to review its position in light of "White Spirits" mixtures transported as packaged goods under conditions set out in the International Maritime Dangerous Goods Code.

4.6 The Group was informed of comments submitted by Greenpeace International to IMO criticizing the GESAMP hazard evaluation system, and in particular the biological testing protocols used by the GESAMP Working Group when evaluating the hazards of harmful substances carried by ships. The Working

Group had considered the comments, which were largely out of context and inaccurate, and prepared responses thereto. The Group requested the IMO Technical Secretary to pass on the Working Group's comments as set out in its report.

4.7 The Group endorsed the arrangements made for the review and update of GESAMP Reports and Studies No. 35, i.e., the description of the evaluation process and its scientific basis, and the results achieved, including testing guidance prepared by the Working Group.

4.8 With regard to the problems related to the finalization of the computerized data base, the Group appreciated the progress achieved so far and advised that this be made available as a CD-ROM disc.

4.9 The Group endorsed the report of the twenty-ninth session of its Working Group and, in particular, approved the hazard profiles that had been reviewed or established during the intersessional period.

4.10 A summary of the report of the twenty-ninth session of the Working Group, its terms of reference and members is shown in Annex V.

5 INDICATORS OF MARINE ECOSYSTEM HEALTH

5.1 The UNEP Technical Secretary of GESAMP reminded the participants that the Working Group on Indicators of Marine Ecosystem Health had been established on the initiative of experts of GESAMP at its twenty-second session (Vienna, March 1992). IMO, FAO, UNESCO, IAEA, UN and UNEP agreed to support the Working Group activities. UNEP has acted as lead agency. Mr. J. Gray had been nominated as Chairman of the Working Group.

5.2 A preliminary report had been submitted to the twenty-third session of GESAMP. The Group provided its comments and requested the Chairman to finalize the report and present it to the present session for approval.

5.3 Mr. Gray presented the report of the Working Group, prepared at its second meeting convened during the intersessional period. The summary of the report, the terms of reference of the Working Group and the list of participants are given in Annex VI. He emphasized the difficulties which his group had to overcome in preparing its report, especially with regard to the definition of such terms as "normal functioning of a system", "health", "ecosystem", "stress" and "disturbance".

5.4 In the discussion following the presentation of the report, the Group raised a number of questions and issues which need to be resolved before the draft report can be approved for publication.

5.5 The Group appreciated the difficulties of defining "health" and "ecosystem", but it accepted the adoption of an operational definition of "ecosystem". It was agreed that the title of the final report should avoid the use of the term "health". The following title was adopted: "The measurement of biological responses to stress in the marine environment".

5.6 The Group further advocated the preparation of a clear and concise executive summary that provided a "road map" to the layout and contents of the document.

5.7 The Group agreed that the following actions should be accomplished before a decision on publication could be taken:

- All interested GESAMP members will send their comments on the report to the Chairman by the end of April;

- The Chairman will revise the report accordingly, prepare a detailed executive summary and send the report to all members of GESAMP, as well as to all sponsoring agencies;

- The decision on publication of the report will be taken by the Chairman of GESAMP on the basis of the reactions of GESAMP members and the sponsoring agencies.

6 ENVIRONMENTAL IMPACTS OF COASTAL AQUACULTURE

6.1 The FAO Technical Secretary of GESAMP Working Group 31 on Environmental Impacts of Coastal Aquaculture informed the Group on previous work carried out by this Working Group, in particular the preparation of GESAMP Reports and Studies No. 47 "Reducing the environmental impacts of coastal aquaculture". The Working Group met in Rome from 17-21 January 1994, to address the term of reference concerning the establishment of scientifically-based monitoring requirements and procedures for aquaculture pollutants leading to the assessment of the environmental capacity available for existing and planned coastal aquaculture sites. A summary of their interim report is given in Annex VII.

6.2 The Chairman of the Working Group, Mr. R. Gowen, introduced the draft report entitled "Monitoring the ecological effects of coastal aquaculture". He

pointed out that the report focusses on monitoring ecological effects of particulate and dissolved waste, and contains discussions of:

- the role of monitoring for the purposes of environmental protection within a management framework, as suggested in GESAMP Reports and Studies No. 45;
- selected interactions between coastal aquaculture and the natural environment;
- basic considerations (e.g. reference stations, statistical analysis, flexibility of monitoring intensity) in the design of monitoring programmes;
- parameters commonly used in monitoring programmes with consideration of their interpretative value;
- the design of hypothetical monitoring programmes;
- environmental capacity and biological standards.

6.3 Key points highlighted by the Chairman were: (a) it is impractical to define specific monitoring programmes because of the variety of aquaculture practices and the diversity of environments; and (b) there is a need to work towards the application of the concept of environmental capacity and the use of biologically-based environmental quality standards.

6.4 The Group appreciated the draft as presented, and commended the suggestion of a flexible approach to monitoring. Discussions by the Group focused on a variety of issues including the anticipated target audience, the relationship between monitoring and EIA requirements, enforcement problems, aquaculture site selection as a method of reducing the need for monitoring, and the concept of mixing zones. It was suggested that the number of scenarios should be increased to cover a wider range of aquaculture practices and should be carefully reviewed for technical consistency. It was further proposed that the report should contain a clear reference to GESAMP Reports and Studies No. 47, which describes the relevance of monitoring in relation to ecological effects of coastal aquaculture.

6.5 The FAO Technical Secretary informed the Group of comments on the report which had been received from a number of experts. In general, the response to the draft report was positive. There were suggestions to consider: all major types of coastal aquaculture; methods for prediction of impacts and hazard assessment; evaluation of monitoring programmes as carried out in tropical environments; general guidelines to help decision-making in relation to different environments and aquaculture practices.

6.6 The FAO Technical Secretary proposed that Working Group 31 should finalize the draft report, including all the comments received, and undertake:

- an evaluation of the use of hazard assessment methods and impact prediction models within the context of the design and implementation of monitoring programmes for aquaculture;
- an evaluation of existing monitoring approaches and programmes, with particular emphasis on their applicability to major aquaculture practices in tropical and sub-tropical environments; and
- preparation, for inclusion in the report, of specific guidance on the various purposes, principles and applications of aquaculture-specific monitoring programmes, with particular attention to developing countries.

This task should be carried out during the forthcoming intersessional period. The Working Group would meet in October 1994 to finalize the report for presentation at GESAMP XXV. The Group endorsed this proposal.

6.7 With respect to the term of reference relating to chemical usage in coastal aquaculture, the Group agreed that a preliminary assessment should be undertaken. This should be done by correspondence among a small number of experts co-ordinated by the Technical Secretary, in consultation with the Chairman. For this purpose, relevant information available from industrialized countries would be used to assess problems associated with chemical usage in coastal aquaculture in developing countries. The first drafts for this preliminary review could be discussed briefly during the Working Group's meeting in October 1994, and would be presented to GESAMP XXV for discussion and consideration of possible future work.

6.8 With regard to the term of reference relating to the integration of aquaculture into coastal area management schemes it was recommended that the members of the Working Group continue to compile and review relevant information with particular emphasis on related experiences worldwide.

7 THE SEA-SURFACE MICROLAYER

7.1 The WMO Technical Secretary of GESAMP recalled that the problem of the sea-surface microlayer as a significant source of contaminant accumulation and its significance for biological processes and air-sea exchange was mentioned at the twenty-second session of GESAMP in 1992 as an issue of concern. In 1993, GESAMP XXIII established Working Group 34 on the Sea-Surface Microlayer to address the following issues, with particular reference to its role in global environmental change: physical processes in the microlayer and their relation to

changes in heat, momentum and mass exchange; biological effects of chemical change in the microlayer; effects of solar radiation and photochemical reactions on the chemistry and biology of the microlayer; and techniques for investigating the surface layer of the ocean. The meeting of the Working Group was held in the form of a workshop/working group meeting in Rhode Island, USA, from 20-24 February 1994. The meeting began with presentations of thirteen scientific papers prepared by the participants and continued at three theme groups and at plenary sessions of the Working Group where the interim report was prepared for discussion and comments by GESAMP XXIV. It was the intention of the Working Group to publish the proceedings of the workshop.

7.2 The Chairman of Working Group 34, Mr. R. Duce, introduced document GESAMP XXIV/7 as an interim report of the Working Group. It was acknowledged that this report contained too much scientific detail of a specialized nature to be suitable for publication as a GESAMP report, and that a further meeting of some of the Working Group members during the intersessional period was desired to allow editing of the document for presentation at GESAMP XXV in 1995. A summary of the interim report is given in Annex VIII.

7.3 A discussion of the interim report ensued. GESAMP commended the quality and value of the scientific detail in the interim report, particularly the section on photochemical processes. However, speakers were unanimous in their criticism of the section on the biological effects of chemical enrichment. Specifically, this section was considered to be lacking in clear, critical appraisal of the scientific evidence for the biological significance of microlayer enrichment of toxic materials. Specific, documented biological effects were not presented. Rather, the section was considered to depend too much on speculation. As a consequence, the report gave the impression that very significant effects might be expected, a view that is out of balance with the actual evidence discussed. It was further noted that a hazard assessment approach might be useful in rectifying this imbalance, although this may involve making some assumptions about exposure times for microlayer organisms.

7.4 The emphasis in the report on the vulnerability of larval-stage microlayer organisms to contamination was considered to be based largely on circumstantial evidence. Although important implications for fisheries were suggested in the report, the significance of these was considered very difficult to accept given the very great natural variability in the mortality of eggs and larvae.

7.5 Some speakers commented on a lack of discrimination in the report on the specifics of the microlayer in relation to the surface region in which neustonic organisms prevail. In response, Mr. K. Hunter, member of the Working Group, summarized the February workshop discussions on this point, noting that the concept of the microlayer, and therefore its physical dimensions, was not simple to

define in a manner that encompassed all relevant physical, chemical and biological processes. It was concluded that this important aspect needed to be brought out more clearly during the revision of the report.

7.6 A need to understand the absorbance properties of microlayer components was identified as critical in the report. However, it was pointed out that only the UV absorbing properties of surface film materials had been considered. Some discussion of the remainder of the electromagnetic spectrum was required. This discussion should consider not just the surface microlayer but a range of depths near the sea surface relevant to the neustonic community.

7.7 In addition, several other points were discussed. In particular, a need to take advantage of a wealth of fundamental knowledge arising from physical chemical studies of surface films and of mineral flotation processes in engineering was mentioned. It was also noted that bubbles in whitecaps comprised a surface area much larger than the geometric area of the air-sea interface, and they could be included in a broadened concept of the sea surface microlayer. In a similar vein, the importance of bubble flotation and aerosol formation processes to the horizontal dispersion of aquatic micro-organisms, and the electrification of the air-sea interface, were raised.

7.8 It was agreed that during the next intersessional period a core group of the Working Group should meet to complete and revise the report, taking into account the comments made by GESAMP, and to present the final report to GESAMP XXV in 1995. The members of GESAMP were requested to send additional comments, if any, to the Working Group Chairman by the end of May 1994.

8 OPPORTUNISTIC SETTLERS AND THE PROBLEM OF THE CTENOPHORE *MNEMIOPSIS LEIDYI* IN THE BLACK SEA

8.1 The UNEP Technical Secretary of GESAMP reminded the participants that the Working Group on opportunistic settlers and the problem of the ctenophore *Mnemiopsis leidyi* in the Black Sea had been established by GESAMP at its last session at the request of UNEP. The main task of the Working Group was to advise Black Sea countries and UNEP on possible courses of actions to manage the problem of the massive population explosion of *Mnemiopsis leidyi* in the Black Sea. IMO, FAO and UNESCO had agreed to support activities of the Working Group. Mr. Y. Sorokin and Mr. P. Wells were requested to co-chair the Working Group. Its first meeting was convened in Geneva from 10 to 14 January 1994.

8.2 Introducing the first part of the report of the Working Group, Mr. Wells described the modification of the terms of reference suggested at that meeting.

The following modified terms of reference were presented for GESAMP consideration and approval:

- to assess the occurrence, distribution, reproductive biology and physiological features of the intruder ctenophore, its ability to compete for the food with pelagic fish, and control of its population by predators in its natural habitat;
- to assess the probable causes of the ctenophore outbreaks and their connection with other destabilizing factors and developments in the Black Sea region;
- to assess the impact of the ctenophore on pelagic and benthic communities and its consequence for fisheries;
- to develop a strategy, and to recommend measures, to overcome the ctenophore and similar invasions in other parts of the world, using the Black Sea region as an example.

8.3 He then presented a brief summary of the discussion on distribution, biology and ecology of *Mnemiopsis leidyi*, and on its occurrence in the Black Sea region. He pointed out various features of the ctenophores' biology that made it such a successful invading species.

8.4 Introducing the second part of the report, Mr. Sorokin presented the outcome of the discussion of problems related to alteration of the Black Sea ecosystem, impact of *Mnemiopsis leidyi* on Black and Azov Seas fisheries, monitoring and modeling the role of the ctenophore *Mnemiopsis leidyi* in the Black Sea region, and the strategy for the control of the invasion of *Mnemiopsis leidyi* in the Black Sea.

8.5 After the discussion of the problem presented by the Co-Chairmen and described in the report, the Group agreed with the suggested modification of the terms of reference, commented positively on the progress being made on the analysis of the problem, but concluded that any suggested strategies for control measures should be based on a sound scientific knowledge of the species biology and ecology. More knowledge on the species distribution and ecology was the recommended priority for research. A cautious approach was strongly advised about strategies involving the introduction of predatory species.

9 FUTURE WORK PROGRAMME

Oil in the Marine Environment

9.1 The IMO Technical Secretary introduced document GESAMP XXIV/9/1 addressing the concern of the IMO Marine Environment Protection Committee (MEPC) regarding the implications of new tanker design to the various oil release rates during accidents of different types. Two questions were presented to GESAMP by MEPC:

"1. If in a given period of time, a number of tanker accidents occur, which of the following two scenarios would result in the least ecological damage:

1.1 one tanker accident resulting in a relatively large spill at one location, or

1.2 several tanker accidents resulting in relatively small spills at different locations.

2. If in a given period of time, accidents occur in a given area, which of the following two scenarios would result in the least ecological damage:

2.1 have the entire quantity spilled at one instance, or

2.2 have the same quantity spilled by a number of smaller spills distributed over the time period."

9.2 The Group concluded that many factors influence the fate and effects of each spillage of oil, and that these factors (including weather, type of oil, location, and hydrographic features) are highly variable and unpredictable for each spill event. Most importantly, oil effects (both acute and chronic) are not directly related to the amount of oil spilled, particularly for wildlife species. Any attempts to answer these questions in their current form would lead to hypothetical and, very likely, misleading answers. Such an exercise would necessitate going through many dozens of spill scenarios and not provide useful answers to MEPC.

9.3 On the question of oil input into the marine environment, GESAMP, in its report "Impact of oil and related chemicals and wastes on the marine environment" (GESAMP Reports and Studies No. 50), provided estimates of oil amounts that enter the world's seas and oceans, as prepared by the U.S. National Academy of Sciences, which concluded that the amounts of oil entering the sea due to marine transportation activities had been reduced from 1.4 million tonnes in 1981 to 0.57 million tonnes in 1989. Oil input from all sources has during that period of time been reduced from 3.28 million tonnes in 1981 to 2.35 million tonnes in 1989.

9.4 At the thirty-fifth session of MEPC (7-11 March 1994), Friends of the Earth International pointed out that GESAMP, in the above-mentioned report, also quotes

other data from regional sources. When the estimates for the various regional sea areas are added, a different picture emerges: as much as 7.3 million tonnes of oil could be entering the seas annually.

9.5 The Group felt that the question of improving the accuracy of oil input figures from shipping could be addressed by a small task group or by correspondence, aided by the IMO Technical Secretary. The question of estimating oil inputs into the sea from all sources in all regional seas was a much larger question; the Group agreed that quoted values probably had very large but unknown errors and were likely to be very variable in time and space. At this point in time, it is only possible to re-check original published sources of the data, but not initiate a large and thorough new study.

Definition of marine pollution

9.6 The IMO Technical Secretary informed the Group of ongoing discussions related to a review of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (the London Convention, 1972), in particular the inclusion in a revised text of a definition of marine pollution (GESAMP XXIV/9/2). The Group was invited to comment on the proposals currently under discussion, recalling that deficiencies in the GESAMP definition have been the subject of lengthy considerations at previous sessions of the Group.

9.7 The Group confirmed that a definition of pollution of the marine environment developed by the Scientific Group of the above Convention was technically correct; however, it advised that a definition which is selected for inclusion in any new or revised international agreement should conform to the definition contained in the United Nations Convention on the Law of the Sea, especially considering that this Convention will enter into force in 1994.

Task Force on integrated coastal management

9.8 The FAO Technical Secretary of GESAMP informed the Group of the need for scientific advice on how to practically implement Integrated Coastal Area Management (ICAM) programmes, particularly in developing countries, in order to ensure sustainable use of coastal resources (GESAMP XXIV/9). This was a priority concern expressed in Chapter 17, Oceans, of Agenda 21 of UNCED.

9.9 One member of the Group, Mr. S. Olsen, invited as an expert on this issue, explained that coastal management is a rapidly evolving field, and that this process will continue in the coming decades. The field has its origins in coastal zone management (CZM). CZM programmes were a response to the realization that sector by sector management in coastal areas too often produces costly development "mistakes" and social inequities. Coastal Zone Management