



GESAMP
Joint Group of Experts on the
Scientific Aspects of Marine
Environmental Protection

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**GESAMP - The Joint Group of Experts on the Scientific Aspects of Marine
Environmental Protection**

Report of the 38th Session of GESAMP

Sponsored by the IAEA – Environment Laboratories, Monaco, 9 to 13 May 2011



Notes

1. GESAMP is an advisory body consisting of specialized experts nominated by the Sponsoring Agencies (IMO, FAO, UNESCO-IOC, UNIDO, WMO, IAEA, UN, UNEP, UNDP). 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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EXECUTIVE SUMMARY

1 Introduction: The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) held its thirty-eighth session hosted by the IAEA Environment Laboratories, Monaco, from 9 to 13 May 2011. GESAMP was established in 1969 by a number of United Nations Organizations as a Joint Group to encourage the independent, interdisciplinary consideration of marine pollution and environmental protection problems with a view to avoiding duplication of efforts within the United Nations system. The main topics considered at this session are described below.

2 Support for GESAMP: With the welcome support for GESAMP by the Swedish Government in the period 2006-2010 having come to an end, GESAMP is moving into a new phase. Although finding structural support for GESAMP activities is still desirable, a more project-based way of working, including fund raising is being applied. This consists of sourcing external funds both for activities of the GESAMP Working Groups and for elements of the GESAMP 'New and Emerging Issues Programme' (see below). Moreover, a fee for GESAMP peer review activities will be charged. To fill the current vacancy in the GESAMP Office, the IMO Council has been requested to include funding for a new GESAMP Officer in the IMO Regular Budget for the period 2012 – 2013. As there is no guarantee that this proposal will be accepted, potential donors have been contacted to mobilize resources while temporary cover is being given to the Office. Meanwhile, Sponsoring Organizations of GESAMP have made an extra effort to ensure that all GESAMP members could attend this session without outside support.

3 Evaluation of the hazards of harmful substances carried by ships (WG 1): This Working Group evaluates, at the request of IMO, the hazards to the environment and human health of bulk liquid chemicals carried by ships, with around 900 hazard profiles currently on record. The hazard profile contains a unique fingerprint of each substance, providing information on 14 separate human health, environmental, and physico-chemical hazard criteria. WG 1 met twice since February 2010 reviewing 30 new substances in order to assign GESAMP hazard profiles. The members produced an article, describing the WG's unique method for estimating the acute inhalation toxicity of chemicals, which has recently been submitted for publication in a scientific journal. WG 1 has also begun an editorial review of GESAMP Reports and Studies No.64 (2002) on the Revised GESAMP Hazard Evaluation Procedure to take into account new developments in the field of chemical safety. GESAMP updated the terms of reference of WG 1 to include human health issues, in particular in relation to occupational health standards and safety issues associated with chemicals on board ships.

4 Review of applications for 'active substances' to be used in ballast water management systems (BWMS) (WG 34): WG 34 met five times since February 2010, evaluating 21 ballast water treatment systems and reporting their recommendations to IMO's Marine Environment Protection Committee (MEPC). A third stock-taking workshop was also held to review the methodology for evaluation of applications received from industry. GESAMP agreed that: (1) if BWMS industry proponents requested dialogue with the WG on the applications under review, this should be encouraged; (2) it would peer-review the new methodology including the modelling of the environment and the human health risk assessment; and (3) stock-taking workshops should be conducted annually.

5 Metals (formerly mercury) Working Group (WG 37): GESAMP noted that both Task Teams established in 2010 under WG 37 had delivered their reports to UNEP on schedule. The first Task Team was directed to fill the identified scientific data and information gaps on anthropogenic sources, releases and possible measures to control the releases of *mercury*. This work assists UNEP with the preparation, by 2013, of a binding international agreement to protect the environment from releases of mercury and its compounds. The second Task Team was directed to close listed scientific information gaps on *lead and cadmium* for integration into

UNEP's publication "Reviews of scientific information on lead and cadmium". No further requests on these topics would be forthcoming from UNEP, but the WG 37 Chair would continue to assist with the preparation of documentation for the draft agreement on mercury, if supported by UNEP. All the mercury findings would be published in the GESAMP Reports and Studies series, following both internal and external peer review.

6 Atmospheric input of chemicals to the ocean (WG 38): WG 38 reached a significant milestone towards finalizing its assessments after four years of work, and its final report will be published in 2012 as GESAMP Reports and Studies No.84. Some of the Working Group's output is also being published in the peer-reviewed scientific literature, as follows:

- "Impacts of atmospheric nutrient deposition on marine productivity: roles of nitrogen, phosphorus, and iron", *Global Biogeochemical Cycles* (in press);
- "Impacts of anthropogenic SO_x, NO_x and NH₃ on acidification of coastal waters and shipping lanes", *Geophysical Research Letters* (in press); and
- "Atmospheric organic material and the nutrients it carries to the ocean", *Global Biogeochemical Cycles* (to be submitted shortly).

GESAMP adopted WMO's proposal for WG 38 to undertake new studies related to the atmospheric anthropogenic nitrogen deposition to the global marine environment and its impact on marine biogeochemistry and climate. The Chairman of WG 38 will develop with WMO new terms of reference for this activity for approval by GESAMP.

7 Establishment of trends in global pollution in coastal environments (WG 39): GESAMP received a first status report of the activities of WG 39 established in 2010 and subsequently focused mainly on the organization of the WG's work. The purpose of this Group is to contribute to the reduction of stress in the coastal ecosystem by providing stakeholders, scientists and society with an objective and global assessment of pollution trends during the last century in sensitive coastal ecosystems.

8 Global assessment of (micro)-plastics (WG 40): In light of the successful "GESAMP Workshop on Plastic Particles as a Vector in Transporting Persistent, Bio-accumulating and Toxic Substances (PBTs) in the Oceans", held at UNESCO-IOC Headquarters in Paris in June 2010, (see the proceedings in GESAMP Reports and Studies No.82 at <http://www.gesamp.org>) and several international follow-up activities on this topic, GESAMP established a new Working Group (WG 40) on inputs, levels, distribution and fate of micro-plastics in the ocean, and potentially the role of micro-plastics as a pathway for persistent, bio-accumulating and toxic substances entering marine food-webs. WG 40 would be led by UNESCO-IOC and UNEP with co-sponsorship from UNIDO, IMO, IAEA and PlasticsEurope. The Members indicated their willingness to work with industry to tackle this important issue. GESAMP agreed that the terms of reference should focus on a limited number of critical topics, but that these should be viewed in the context of the overall marine debris and waste management problem. It was recognized that the draft work programme of the WG, to be developed by stakeholders in early July 2011 for approval by GESAMP, is likely to extend over 3-4 years.

9 Contribution to the United Nations 'Regular Process': GESAMP received a progress report on the UN global mechanism for assessing the state of the marine environment (UNRP), established by the UN General Assembly in 2009 and aimed at delivery of its first global assessment in 2014. GESAMP noted that the development of the UNRP had been slow, but that it was now at the point where agreement should soon be reached on the major structural issues. GESAMP noted that its offer, made both in 2009 and 2010, to contribute to UNRP had not been taken on board but, nonetheless, it welcomed the UNRP and reiterated its availability, if requested, to contribute to it.

10 Contribution to the Transboundary Waters Assessment Programme: In 2009, the IOC/UNEP/GEF Transboundary Waters Assessment Programme (TWAP) was launched, aimed at the development of a scientifically sound methodology for assessing the status and changing

conditions of the world's major shared freshwater- and marine water bodies, and which will, *inter alia*, feed into the UNRP. Having made a contribution to the preparatory phase of TWAP, in particular concerning the Large Marine Ecosystems (LMEs) and Open Ocean transboundary water systems, GESAMP discussed what contribution it could make to the TWAP Full-Size Project in the event it is approved for financing in 2011. The Members expressed their concern as to the feasibility of developing some of the potential indicators they had identified, in particular the availability of data and its geographical spread. GESAMP requested the Chairmen of WG 37, WG 38, WG 39 and WG 40 to prepare a project plan and budget for this activity during the intersessional period, and recommended that the Chairman of GESAMP should contact both the TWAP Large Marine Ecosystems and Open Ocean working groups in order to clearly define GESAMP's roles and responsibilities for the implementation of the TWAP Full-Size Project.

11 Identification of new and emerging issues regarding the degradation of the marine environment: Reconfirming that the 'radar function' on new and emerging issues was an important core element of its mission, GESAMP discussed the need for a more efficient process for identifying new and emerging issues of potential interest. It was agreed that more use could be made of existing foresight initiatives, e.g., for identifying emerging issues and pollutants. GESAMP also recognized that a wide variety of external bodies could act as informal or formal partners in the foresight process, scoping activities or formal work programme. This would allow Members to keep a watching brief in a more structured manner and raise emerging issues at appropriate intervals.

12 The following new and emerging issues were briefly discussed: (1) the increased use of nano-particulate silver as a biocide and its potential to enter the marine environment; (2) how the loss of lubricating grease as used on ships may affect the marine environment; and (3) the problem of wastes from recycled electrical apparatus entering the marine environment. GESAMP agreed that these issues were important but that it would be better to consider them as part of the abovementioned foresight process as it got underway. Members were, however, encouraged to prepare brief initial proposals to GESAMP if they so wished.

13 Scoping activities: GESAMP discussed a scoping paper on **biomagnification** of persistent organic pollutants in top predators in the marine environment with respect to both its ecological and human health implications. It considered that a global assessment of biomagnification in marine biota, if conducted, would require a multi-stakeholder, multi-disciplinary approach and would need to build on the expertise of UN Agencies such as WHO and FAO, and intergovernmental organizations such as IWC, AMAP, OSPAR and CIESM. A two-step approach to an eventual assessment was recommended. The first step could be carried out independently; biological indicators would be developed using data on common top predators and these could also feed into the TWAP process. In a second, possibly overlapping phase the implications of biomagnifications for human health would be assessed. GESAMP approved, in principle, to hold a scientific workshop for Step 1 as well as holding exploratory talks with FAO and WHO in collaboration with CIESM for undertaking Step 2.

14 Due to GESAMP's full agenda in 2010/2011 the plan, developed at GESAMP 37, to further develop the topic of endocrine disruption as a result of hypoxia in the marine environment, and to build support gradually through the medium of a workshop had been delayed. However, GESAMP agreed to make every effort to organize a workshop, which UNDP has offered to host in New York during the coming intersessional period. The scoping paper entitled "Hypoxia: new insights on an old pressing environmental problem", prepared by the Member Mr. Rudolf Wu, highlighted that hypoxia and anoxia caused by eutrophication are amongst the most pressing environmental problems in marine systems worldwide, and is published in GESAMP Reports and Studies No.81, Annex VII.

15 GESAMP agreed to defer further work on *Environmental Quality Standards* (EQS) until GESAMP 39 in 2012, but the correspondence group would remain active intersessionally.

16 Side event on “radioactive contamination of the marine environment, with particular reference to the Fukushima nuclear accident”: The event, organized by IAEA-Environment Laboratories, included seven presentations on this topic given by scientists from Japan, IAEA-EL, Italy, France and Australia. The presentations gave very recent observations and detailed information on the situation of the reactors, present levels and distribution of released radionuclides in nearby areas of the accident, modelling efforts to predict future radionuclide distributions in the medium- and long-term, recent monitoring measurements in Europe and comparisons with levels there following the 1986 Chernobyl accident, and risk assessment analyses that could be applied in context of the Fukushima accident in Japan. GESAMP found the workshop extremely informative and took note of this new information and all the activities designed to assess the present problem in the marine environment near Fukushima. GESAMP commended the efforts of all the presenters, and in particular IAEA-Environment Laboratories, to address the current problem which has generated so much concern worldwide.

17 Other GESAMP peer review issues

- The GEF/IMO/UNDP GloBallast Partnerships Programs, Global Industry Alliance (GIA) report on “Establishing equivalency in the performance testing and compliance monitoring of emerging alternative ballast water management systems was peer reviewed and substantially edited by GESAMP. This report has been published as a joint Globallast Monograph/GESAMP Reports and Studies No. 83 report in 2011 and is intended to stimulate discussion at IMO regarding novel systems which avoid the use of ‘active substances’ (biocides) to disinfect ships’ ballast water and prevent the transport of non-indigenous species.
- At the request of UNEP/DEPI Mediterranean Assessment Plan (MAP), the “Draft initial integrated assessment of the Mediterranean Sea: fulfilling step 3 of the ecosystem approach process”, was also peer reviewed by GESAMP in 2011. The report, which is one step of a process towards an ecosystem approach to marine environmental management, provides an important cross section of the status of the Mediterranean Sea, an area of great contrasts in terms of development and consequent pressures on the marine environment.

18 GESAMP developed a statement directed at the session of the UN Informal Consultative Process to be held in New York from 20 – 24 June 2011 when it discusses the preparations for the twentieth anniversary of Agenda 21 (Rio + 20). The statement highlights GESAMP’s work over the past two decades that has supported the scientific basis for implementing Agenda 21 and contributed broadly to international processes for improved ocean governance.

1 INTRODUCTION

1.1 The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) held its 38th session from 9 to 13 May 2011 in the Principality of Monaco. The session was held under the Chairmanship of Mr. Tim Bowmer, with Mr. Lawrence Awosika and Mr. Peter Kershaw serving as Vice-Chairmen. The session was preceded by the GESAMP Executive Committee (ExCom) meeting and GESAMP Members' informal meeting both held on 8 May 2011.

Adoption of the agenda

1.2 The meeting approved the provisional agenda. The agenda for the 38th session is attached as Annex I to this report. The list of documents submitted to this session is shown in Annex II to this report and the list of participants in Annex III.

2 REPORT OF THE CHAIRMAN OF GESAMP

2.1 The 2010 to 2011 intersessional period was one of the most productive years in GESAMP's forty-two year history. GESAMP currently has five working groups and four 'New and Emerging Issues' Correspondence Groups. In addition, it is involved in the IOC/UNEP/GEF Trans-boundary Waters Assessment Programme (TWAP) and potentially in the UNGA Regular Process. It also has two peer review activities ongoing. The devotion of GESAMP's members to furthering the protection of the marine environment through independent scientific advice has been truly remarkable in this intersessional period.

GESAMP Funding

2.2 Between 2006 and 2010, GESAMP was honoured to receive financial support from the Swedish International Development and Cooperation Agency (Sida). This allowed GESAMP to expand its activities greatly, as well as to attract many more experts from developing countries to participate in all of its activities. With Sida's permission, the initial three-year contract was extended to five years. Sida has undergone reorganization and subsequent realignment of policy, and it had been clear for some time that their funding of GESAMP would come to an end. With great thanks to Sida for their support, GESAMP will enter a next phase.

2.3 GESAMP will continue to seek out new sources of structural funding to follow on from Sida's generous efforts. In the meantime, several measures will be taken to maintain momentum.

- .1 GESAMP has started to charge fees for peer review activities and found UNEP/DEPI/MAP a willing first partner with the review of their report “Draft initial integrated assessment of the Mediterranean Sea fulfilling step 3 of the ecosystem approach process” which is in the process of completion.
- .2 It is the intention to extend this policy to the peer review of the Ballast Water WG 34’s frequent reports, upon which the GESAMP members spend a significant amount of their time in support of IMO.
- .3 GESAMP will move to a more project-based way of working in which the leaders of Working Groups and task-teams, together with the Sponsoring Agencies, will also be asked to play a role in attracting project funding. WG 38 on atmospheric inputs and the micro-plastics New and Emerging Issue are good examples of how this can be successfully achieved.
- .4 GESAMP is a partner in an IOC and UNEP led project consortium, seeking funding from the GEF (Global Environment Facility) for Phase II of the Transboundary Waters Assessment Programme, an indicator-based assessment of five global water modules, including LMEs and the open oceans. GESAMP’s focus will be on global indicators of pollution. This will potentially involve several GESAMP Working and Correspondence Groups.
- .5 Contacts with the Ocean Policy Research Foundation in Japan allowed GESAMP to explore the possibility of seeking project funding from the Nippon Foundation. The issues discussed were bioaccumulation in top predators (New and Emerging Issues) as well as the storage of CO₂ in the oceans, this latter issue in the context of Japan, would require close co-operation with the London Convention and Protocol. This should be seen as part of a long-term effort to attract funding.

GESAMP Office

2.4 In tandem with Sida, the Swedish Maritime Authority (SMA) was able to second three Junior Professional Officers to IMO to act as GESAMP Officer in succession between 2007 and 2010. Through this very successful arrangement, GESAMP received the support of Mr. Fredrik Haag, Mr. Martin Søderberg, and most recently Mr. Andreas Odhage as full-time GESAMP Officers. This gave GESAMP solid central support and a dedicated administrator for the first time. I would like to take this opportunity to thank all three – an ‘integrated coastal and ocean manager’,

a lawyer and a master mariner, respectively, as they all brought something different to the job but their willingness to learn, their dedication and hard work was certainly a major gain for GESAMP.

2.5 GESAMP's most urgent need at present is, together with its UN Sponsoring Organizations, to find a way of supporting a full-time GESAMP Officer. The Executive Committee has accordingly been requested at this meeting to consider ways of achieving this as a priority.

Working Groups

2.6 The Chairman referred to the excellent work of GESAMP's five current working groups, whose activities are reviewed in detail in Section 5. GESAMP's Working Groups remain the mainstay of its activities; some of the highlights are given below:

- .1 WG 1 met twice in this intersessional period to evaluate chemicals in bulk maritime transport for IMO. The members produced an article, describing the WG's unique method for estimating the acute inhalation toxicity of chemicals, which has recently been submitted for publication in *Alternatives To Laboratory Animals*. The Working Group also commenced an editorial review of GESAMP Reports & Studies 64 (2002) on the Revised GESAMP Hazard Evaluation Procedure to take account of new developments in the field of chemical safety;
- .2 WG 34 met five times during this intersessional period, evaluating 21 ballast water treatment systems and reporting their recommendations to IMO's Marine Environment Protection Committee, as well as holding their third stock-taking workshop to review the methodology for evaluation of applications received from industry. The Working Group also published a paper in the World Maritime University's Journal of Maritime Affairs on the results of evaluating the first 25 systems;
- .3 WG 37 on metals in the marine environment is finalizing its reports on mercury in support of UNEP's preparation of an International Treaty on mercury. It will proceed to collate all of its findings on mercury in a report in the GESAMP Reports and Studies series;
- .4 WG 38 on atmospheric inputs of chemicals to the ocean, with the main focus on nutrients, also reached a significant milestone towards finalizing its assessments

after four years of work, and its final report will be published soon in the GESAMP Reports and Studies Series. The results of some of the Working Group's deliberations are also being published in the peer-reviewed scientific literature. Two papers are currently in press in *Global Biogeochemical Cycles* and *Geophysical Research Letters*, and a third paper is being submitted shortly. Discussions took place about the possibility of the Working Group undertaking new studies related to atmospheric anthropogenic nitrogen deposition to the global marine environment and its impact on marine biogeochemistry and climate. This potential opportunity will be developed during the intersessional period. The Chairpersons of both Working Group 38 and 37 will be discussing how they can best structure their assessment reports in a way which will have the most meaningful impact on different stakeholder groups, including policy makers and the scientific community; and

- .5 It was a great pleasure for GESAMP to welcome in April 2011 the initiation the first phase of its WG 39 to investigate the feasibility of assessing global trends in coastal pollution using radio-chronological methods.

The 'New and Emerging Issues' Programme

2.7 One of the highlights of the past inter-sessional period was to see the 'New and Emerging Issues' programme hold its first workshop. This meeting was called to explore the need for a global assessment of micro-plastics in the oceans. Generously hosted by UNESCO-IOC in Paris and sponsored by the European Commission and Sida, this was a good example of how GESAMP, with the help of its UN Sponsoring Organizations, can tackle an emerging issue, find external funding, bring the best experts together, and provide the UN system with up to the minute advice.

2.8 With the number of issues underway, GESAMP has had to postpone the next workshop on the biological effects of hypoxia including endocrine disruption but it hopes to make progress with this shortly.

Contacts with the UN Sponsoring Agencies

2.9 The following contacts/visits were made in the intersessional period:

- A working visit was made to UNEP (DEWA and DEPI) Nairobi, Kenya (Tim Bowmer and Andreas Odhage);
- A working visit was made to IAEA – Environment Laboratories, Monaco (Tim Bowmer and Andreas Odhage);
- GESAMP was represented at the UNGA Ad Hoc Working Group of the Whole on the Regular Process (René Coenen, Tim Bowmer and Mike Huber within the delegation of IMO);
- The PICES 2010 annual science conference was attended and a presentation given to the Marine Environmental Quality Committee, Portland Oregon (United States), sponsored by UNDP (Peter Kershaw);
- GESAMP was present at the NOAA Microplastics Workshop, Tacoma Washington (United States), as well as the SETAC North America annual conference, Portland Oregon (United States), sponsored by UNDP (Peter Kershaw);
- GESAMP attended the GEF-TWAP Steering Committee meeting, Nairobi (Kenya), sponsored by UNEP (Peter Kershaw);
- The 5th International Marine Debris Conference, Honolulu Hawaii (United States) was also attended, sponsored by Sida (Peter Kershaw); and
- Finally, GESAMP contributed to a writing workshop for the UNEP Year Book 2011, Prague (the Czech Republic), sponsored by UNEP (Peter Kershaw).

Pool of Experts

2.10 The GESAMP Pool of Experts database was used to search for suitable experts on two occasions, i.e. for the Microplastics Workshop and for the UNEP DEPI Mediterranean Assessment Plan (MAP) Integrated Assessment peer review. The former search yielded no suitable experts, possibly because of the specialist nature of the topic, but the latter search yielded four pool experts in the Mediterranean region who subsequently participated in the peer review process.

Peer review activities

2.11 The peer review of the Ballast Water WG 34's reports is a recurring task for GESAMP members. However, in the intersessional period GESAMP carried out two additional peer review activities for outside bodies:

- .1 The GEF/IMO/UNDP GloBallast Partnerships Programs, Global Industry Alliance (GIA) report on "Establishing equivalency in the performance testing and compliance monitoring of emerging alternative ballast water management systems (EABWMS)" was peer reviewed by a six person GESAMP panel. This report was then completed with the assistance of GESAMP members and a consultant, Mr. Rick Boelens, and has been published as a joint Globallast Monograph/GESAMP Reports and Studies No. 83. This report is intended to stimulate discussion at IMO's Marine Environmental Protection Committee regarding novel systems which avoid the use of biocides to disinfect ships' ballast water and prevent the transport of non-indigenous species; and
- .2 The UNEP DEPI Mediterranean Assessment Plan (MAP) requested GESAMP to peer review the "Draft initial integrated assessment of the Mediterranean Sea: fulfilling step 3 of the ecosystem approach process". This peer review is in the process of completion. The report, which is one step of a process towards an ecosystem approach to marine environmental management, provides a fascinating cross section of the status of the Mediterranean Sea, an area of great contrasts in terms of development and consequent pressures on the marine environment.

2.12 The peer review teams consisted of GESAMP members who were ably assisted by additional scientists chosen for their specific expertise in relevant areas or, as in the case of the latter review, with relevant regional knowledge and experience.

3 REPORT OF THE ADMINISTRATIVE SECRETARY OF GESAMP

Outcome of the meeting of the Executive Committee of GESAMP (ExCom)

3.1 The Administrative Secretary of GESAMP, Mr. René Coenen (IMO) presented an overview of the main decisions which ExCom had reached at its session held on Sunday, 8 May 2011, as shown in paragraphs 3.2 to 3.11 below.

3.2 GESAMP noted that ExCom had last met for a telephone conference on May 2010 to review the draft Memorandum of Understanding (MoU) for GESAMP containing a text using the templates developed by the United Nations Development Group (UNDG). Although some progress was made at that conference with, inter alia, the acceptance, in principle, of the incorporation of a "Three-Tier (Corporate) membership" to GESAMP, hardly any activity had been undertaken on the MoU since that conference. Also work on the complementary "Strategic Plan", aimed at an external audience, and the "Organizational Arrangements", aimed at internal use, had not progressed significantly since that time.

3.3 In light of the recent changes in the GESAMP secretariat at IMO, ExCom accepted the commitment of the incoming 'GESAMP team' at IMO to look again at all options for an agreement, drawing on: (1) existing draft materials; (2) the current GESAMP MoU in place since 1993; and (3) the current practice of bilateral agreements between UN Sponsoring Organizations to transfer funds for GESAMP activities. IMO would start consultations with the other Sponsoring Organizations in the coming months regarding a work-plan for the MoU, with a timeline, aimed at conclusion on the matter within a reasonable timeframe but preferably before the next session of GESAMP.

3.4 ExCom discussed an overview of the financial and in-kind support which the nine UN Sponsoring Organizations of GESAMP committed to support the activities of GESAMP in 2011-2012. It was noted in this regard that the UN Sponsoring Organizations were more positive and forward-looking in their support than in recent years, as illustrated by the fact that the same number of members had been sponsored to attend GESAMP 38 as with GESAMP 37, despite the termination of Sida's support for GESAMP.

3.5 At the same time ExCom had acknowledged that the UN Sponsoring Organizations need to commit, as a collective responsibility, to the implementation of the funding strategy for GESAMP, as outlined in Section 2 of this report.

3.6 ExCom approved, subject to some editorial changes, the draft final report to Sida analyzing the achievements of GESAMP in the period 2006 – 2010, which was prepared in accordance with article 8.2 of the 2005 agreement between IMO and Sida to support GESAMP. ExCom agreed that with small adaptations and the addition of an executive summary, the report might also serve as a positive record of GESAMP's recent achievements for use when contacting potential new donors.

3.7 ExCom discussed the slow implementation of the UN Regular Process, established in 2009, and noted that it was not clear what support the UN General Assembly expected from the UN specialized agencies and GESAMP for the Regular Process.

3.8 ExCom also reviewed a report on the completion of the first phase of the Global Environment Facility funded Transboundary Waters Assessment Programme Medium-Size Project (TWAP), led by UNESCO-IOC and UNEP, and agreed to recommend the continuation of GESAMP's involvement in the Full-Size Project phase of TWAP, on the condition that more robust support was given to the members preparing GESAMP's contribution.

3.9 ExCom noted that UNDP was the next Sponsoring Organization in line to organize GESAMP 39 in 2012. The UNDP Technical Secretary to GESAMP had indicated to IMO that it was willing to host this session in New York (see chapter 10 of this report). ExCom requested the GESAMP Office to provide an overview of the hosting requirements to UNDP to assist it with the preparation of GESAMP 39.

3.10 GESAMP, wholeheartedly, endorsed the decision by ExCom to offer Mr. Lawrence Awosika the honorary title of 'GESAMP Member Emeritus', in recognition of his long, substantial and distinguished services to GESAMP which Mr. Awosika accepted with appreciation.

The GESAMP Office

3.11 It was noted that the GESAMP Office, established at IMO as a co-sponsorship arrangement among the current sponsors of GESAMP, had been staffed until 31 December 2010 when the contract of Mr. Andreas Odhage, on secondment from the Swedish Maritime Administration, expired without a replacement. GESAMP was informed that ExCom had reviewed the options for filling this vacancy based on IMO's reconfirmed commitment to support the GESAMP Office and its attempts to fill the vacancy, as follows:

- .1 A request had been submitted to the IMO Council for consideration in June 2011 to include a new GESAMP Officer post into the IMO Regular Budget for 2012 – 2013 (ultimately this was not successful);
- .2 IMO was furthermore exploring the feasibility of re-allocating some of the extra budgetary funds generated by IMO's revenue-raising programmes associated with GESAMP Working Groups to the GESAMP Office and its activities; and
- .3 IMO was in contact with a number of potential donors, including Sida, to mobilize resources for the Office.

3.12 The main activities of the GESAMP office, in its fourth year of operation, were reported and GESAMP took note of these developments.

Activities and achievements of the Sponsoring Organizations of GESAMP since 2010

3.13 Mr. Coenen also presented an overview of the activities and achievements of the Sponsoring Organizations of GESAMP, with the aim of providing a context of their involvement and interest in the activities GESAMP undertakes (GESAMP 38/3/Rev.1). The highlights of these achievements are reported in detail in Annex IV to this report.

3.14 In discussing this overview, it was suggested that GESAMP should be represented at the 12th session of the UN Open-ended Informal Consultative Process (ICP) on Oceans and the Law of the Sea (ICP) (New York: 20 – 24 June 2011) having as agenda an analysis of the achievements and gaps in oceans governance (Rio + 20) since Agenda 21 was adopted. In this context it was also noted that the government of Monaco had the intention to organize an "Ocean Day" during the Rio + 20 Conference and that GESAMP might wish to support such an initiative.

3.15 GESAMP agreed to provide an input to the ICP that could be delivered through the UN Oceans Coordinator as shown in Annex V to this report.

4 GESAMP OFFICE

GESAMP Website

4.1 GESAMP noted that the GESAMP website had been improved and updated further since GESAMP 37, but that despite this the functionality of the site was occasionally compromised. It was agreed that the members of GESAMP would provide their comments on the functionality of the website to the Secretariat, which would then prepare a status report on the improvements made or still required. A website maintenance contract had been secured until 20 October 2012 with the same company where the server was located. The GESAMP Office was requested to prepare for a successor arrangement to ensure continuity.

4.2 It was noted that the GESAMP website was visited frequently. It was agreed that links should be made from the GESAMP website to the site of the UN Atlas of the Oceans as a window to the 'UN Oceans' network, but also to the appropriate pages of the nine UN Sponsoring Organizations.

Pool of Experts

4.3 GESAMP noted that, after nearly four years in operation, the Pool of Experts database continued to grow, although at a fairly slow rate. At present there are 194 nominations for experts in the Pool, representing institutions from some 45 different countries. From this total, 162 nominations (~84%) had been vetted and could be used by GESAMP for its activities. Of the validated experts to date, 84% are male and 16% are female.

4.4 It was recalled that in 2009, GESAMP 36 had established a Membership Committee to expand and maintain the Pool of Experts and that, since GESAMP 37 had met during 2010, IMO had assisted that Committee with an expansion of the Pool. A two-level vetting process had been set up, with the aim of vetting the non-vetted experts registered in the Pool. Criteria for a first level of the vetting process were approved by the Membership Committee in May 2010. Its purpose is to select experts within their own field of expertise and CVs that might be of interest to GESAMP. The second level of vetting was being developed, and is linked to more specific tasks and/or to more specific expertise, in consultation with the Chairmen of the various GESAMP Working Groups.

4.5 GESAMP noted that the Pool of Experts database had been used for the Micro-plastics Workshop held in June 2010 and for the UNEP-MAP Mediterranean Sea assessment peer review conducted in early 2011. The former search had yielded no suitable members, possibly because of the specialist nature of the topic, but the latter search had yielded four pool members in the Mediterranean region who subsequently participated and provided valuable contributions to the peer review process.

4.6 It was recalled that GESAMP 37 had considered ways of improving communication with Pool members, being concerned that their expectations should be realistically managed and also to avoid that Pool members might leave if they were not engaged in GESAMP activities. GESAMP noted that to address this and other issues, the GESAMP Office had actively communicated in 2010 both with vetted and newly recruited experts with the view to increasing the effectiveness of the Pool as a search engine for GESAMP related work. The GESAMP Office had requested full CVs where these had not been provided, as well as updates of those currently held. Unfortunately, only 15% of the people contacted by email had provided the requested CVs or updates.

4.7 After discussion the following was agreed for the GESAMP Office to follow up:

- .1 The idea of issuing a GESAMP newsletter (two/three times per year) should be recommended, electronic issues to be distributed to the entire Pool which could then be used to update the Pool members of upcoming GESAMP activities requiring fresh expertise. The IMO Public Information Services would be contacted to assist with the newsletters;
- .2 Participants of Task Teams and Workshops organized by GESAMP should be invited to register in the Pool;
- .3 Log-in problems in the Pool had persisted and these should be resolved in contact with the IMO IT services.
- .4 An automatic reminder would be implemented to request GESAMP members and experts in the Pool to update their CV once a year.
- .5 Members of the Pool of Experts should receive electronic copies of all GESAMP publications; with several important reports in preparation there is an ideal opportunity to improve communication with the Pool members.

4.8 GESAMP recognized that there were immediate needs to recruit the following expertise for its Working Groups and Task Teams: eco-toxicology, toxicology, corrosion, marine engineers and occupational health and safety.

5 PLANNING OF GESAMP ACTIVITIES

This section contains the progress reports of the Working Groups of GESAMP as delivered by their Chairpersons. Each section is followed by a brief record of GESAMP's deliberations with regard to decisions or approval of proposed actions required by the Working Groups in order to fulfill their terms of reference.

5.1. Evaluation of the hazards of harmful substances carried by ships (WG 1)

A report of the activities of WG 1 was given by Mr. Tim Bowmer, Chairman of the Working Group.

Introduction and background

5.1.1 At the request of IMO, the GESAMP Working Group on the Evaluation of Hazards of Substances carried by Ships (known to IMO as the EHS Working Group of GESAMP) evaluates the hazards to the marine environment and human health of bulk liquid chemicals carried by ships, and has provided support to IMO in this field for more than 40 years to assist with the implementation of MARPOL Annex II and the International Bulk Chemicals Code. WG 1 draws 50% of its funds from fees that are charged to manufacturers for each chemical that is evaluated, while the other 50% comes from the IMO membership. Some 10 to 20 chemicals are evaluated at a typical session of the Group and are assigned a GESAMP Hazard Profile. These profiles contain a unique fingerprint of each substance, providing information on 14 separate, human health, environmental and physico-chemical hazard criteria. The profile is compatible with the UN Globally Harmonised System (GHS) for chemicals classification and consists of an alphanumeric notation designed to communicate hazard while maintaining confidentiality of the data. The hazard profiles are unique in that they have all been revised in the last twelve years, are peer reviewed by an international expert group based on data provided by industry, and are backed up by a well-maintained electronic and paper database allowing each profile to be reconstructed should it be queried by third parties. IMO publishes the hazard profiles annually as the **GESAMP Composite list** (BLG.1/Circ.31) and they are placed on the IMO website for the use of Administrations, the shipping industry and chemicals manufacturers. WG 1 maintains around **900 hazard profiles** of bulk liquid chemicals carried by ships.

Progress since GESAMP 37

5.1.2 It was noted that WG 1, which met on two occasions since GESAMP 37, (EHS 47 and 48 were held on 26 to 30 July 2010 and 11-15 April 2011 respectively) had reviewed 30 new substances in order to assign GESAMP Hazard Profiles.

5.1.3 It was recalled that at GESAMP 36 held in Geneva, it recommended that WG 1 should take steps to promote this valuable information more widely and to raise the visibility of the Working Group. In line with this recommendation, a contribution to a survey on existing international classification lists of chemicals which utilize GHS principles was made. A questionnaire issued by the Sub-Committee of Experts on the GHS of Classification and Labelling of Chemicals has been submitted by the Secretariat for consolidation in this exercise. A document summarizing all inputs received so far has been issued on the United Nations Economic Commission for Europe (UNECE) website under the reference UN/SCEGHS/19/INF.4.

5.1.4 Additionally, the use of GESAMP Hazard Profiles is also being promoted in two projects aimed at enhancing knowledge availability for emergency response procedures in the event of chemical losses. The first project which is coordinated by the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) is to enhance their Mediterranean Integrated Decision Support Information System decision support tool for dealing with chemical spills whilst the second, coordinated by the European Maritime Safety Agency (EMSA), aims to develop tailored datasheets for a number of specific chemicals for marine pollution response purposes.

5.1.5 The hazard profiles are all assigned based on GESAMP Reports and Studies No.64, "The Revised GESAMP Hazard Evaluation Procedure for Chemical Substances Carried by Ships" which sets out the working methods of WG 1. It has been agreed that there is a need to update and re-issue this publication as the report was now out of print, but there was nevertheless always an ongoing interest in this document. It was noted that the revised procedure was prepared ahead of the finalization of the GHS which itself has also now since been revised twice. Whilst it is not the intention to make substantive changes to either the basis of the GESAMP hazard profile or the rating procedures, it was recognized that some additional guidance and interpretation would now be beneficial in relation to certain aspects of the GHS and developments in the hazard evaluation of chemicals.

5.1.6 In preparing a second edition of Reports and Studies No.64, it was agreed that the following editorial updates and improvements needed to be addressed:

- .1 incorporation of the original addenda from Reports and Studies No. 64 into the second edition;
- .2 inclusion of the rationale for the estimation of inhalation toxicity in the text for column C3;

- .3 the provision of additional guidance on the interpretation of long-term toxicity criteria, in particular for: carcinogenicity, target organ systemic toxicity and sensitization, including respiratory sensitization;
- .4 consolidation of the sections dealing with floaters & sinkers, including a review of the examples used; and
- .5 an update of suitable biodegradation tests in the light of recent developments and publications.

5.1.7 With respect to paragraph 5.1.6.2 above, it had been agreed that to promote the methodology developed for the estimation of inhalation toxicity in the context of bulk maritime transport, a scientific paper should be developed for publication which included details of a validation study undertaken in support of the methodology now used. A paper was produced by members of the Working Group and subsequently submitted to *Alternatives To Laboratory Animals* for review, with publication expected in 2011.

5.1.8 Additional work items undertaken during EHS 47 and EHS 48 included the following activities:

- .1 Assignment of generic hazard profiles for gasoline/petrol and diesel (automotive) in order to assist in the evaluation of bio-fuel blend shipments;
- .2 Finalisation of data sets for 17 substances identified by GESAMP WG 34 as materials of interest as they were common by-products from many of the ballast water management systems which had been evaluated or were under investigation (see GESAMP 38/5/2, paragraph 13);
- .3 Confirmation of flashpoint values for a number of substances in the IBC Code which were noted by IMO to have this information missing; and
- .4 Consolidation of information held in the GESAMP EHS database via an ongoing review of the EHS files resulting in updates and amendments as appropriate.

5.1.9 It was noted that it had still not been possible to recruit a senior toxicologist in order to sustain the expertise levels in this field within the working group. Attempts were still being made to involve experts from developing countries and it was agreed that this should be pursued further

over the coming year. It was noted that any efforts that could be made via GESAMP to attract suitable candidates to register with the GESAMP Pool of Experts would be greatly appreciated.

5.1.10 The future work programme would include updating the Terms of Reference (ToR) for the Group to include human health issues, in particular, in relation to occupational health standards and guidelines on ships. It was noted that the ToR had not been updated since 1974.

Action taken by GESAMP

5.1.11 After discussion, GESAMP agreed that:

- .1 The terms of reference for the Working Group as last revised in 1974, will be amended as follows to meet IMO's requirements under the revised MARPOL Annex II with regard to human health and safety issues associated with chemicals on board ships:

“To examine and evaluate data and to provide such other advice as may be requested, particularly by IMO, for evaluating the hazards to the environment and human health of harmful substances carried by ships, in accordance with the rationale approved by GESAMP for this purpose.”, where ‘rationale’ is understood to mean Reports and Studies No. 64 and subsequent editions of this document; and

- .2 The Working Group will give priority to the preparation of Reports and Studies No.64 second edition with a view to presenting a table of any unavoidable substantial issues for approval by GESAMP 39 in 2012.

5.2 Review of applications for ‘active substances’ to be used in ballast water management systems (WG 34)

A report of the activities of WG 34 was given by Mr. Jan Linders, Chairman of the Working Group.

Introduction and background

5.2.1 The International Convention for the Control and Management of Ships' Ballast Water and Sediments, (hereafter referred to as the BWM Convention) was adopted at IMO on 13 February 2004, in response to the increasing concern of the international community with regard to the transfer of invasive species in ships' ballast water. It was noted that to date, 28 of the required minimum of 30 countries representing 25.8% of the world's shipping tonnage had ratified the BWM Convention. It is anticipated that the conditions for entry into force will be met in the next twelve months.

5.2.2 Within this framework, an approval procedure has been set up for those ballast water management systems which make use of an Active Substance or Preparation to comply with the Convention. The procedure consists of a two-step approach for granting Basic Approval and Final Approval. The approval is granted by the Marine Environmental Protection Committee (MEPC) based on the advice provided by the Ballast Water Working Group of GESAMP (WG 34). WG 34 is funded from fees charged by IMO for the evaluation of these systems.

5.2.3 The general outline, scope and aim of the BWM Convention have been addressed in the report to GESAMP 35 and the Terms of Reference of WG 34 are shown in Annex VI to this report.

5.2.4 The following paragraphs focus on the main activities of WG 34, which consist of the evaluation of several Ballast Water Management Systems (hereafter BWMS) and the further development of the work Methodology of the Working Group, which has been accepted as a 'living' document. This means that the Methodology will be a discussion item at (almost) each meeting of the Working Group and changes and improvements are made, as appropriate.

'Active Substances'

5.2.5 'Active Substances' are defined by the BWM Convention as "substances or organisms, including a virus or a fungus that have a general or specific action on or against harmful aquatic organisms and pathogens", and the approval of systems using such substances is described in resolution MEPC.169 (57) adopted in 2008. The Procedure for approval of ballast water management systems that make use of Active Substances (G9) contained in this resolution distinguishes also 'Relevant Chemicals' and 'Other Chemicals' and, as a result, all other substances considered relevant are taken into account in the evaluation report.

5.2.6 Therefore, WG 34's task is to evaluate the risks for the crew, the ships' safety, the risk for the public at large and the environmental safety of the BWMS. WG 34 performs these evaluations in a consistent and transparent manner, according to a methodology that is also available to the Administrations and the Applicants. Being aware of the methodology applied may help Administrations to prepare a concise application dossier containing all the necessary data. The Methodology, as developed by WG 34 in the course of its work process, serves as guidance in the evaluation.

5.2.7 WG 34 convened five times since GESAMP 37 to evaluate proposed BWMS and also held a Stocktaking Workshop (STW) to discuss items related to the Methodology. During these

meetings, a total of 21 BWMS were discussed and evaluated. Four of these systems were discussed in the week just preceding this session of GESAMP, so no conclusive statements can be made on the results of these BWMS. Of the other 17 BWMS, nine received a recommendation for Basic Approval and six received a recommendation for Final Approval. One system was denied a recommendation for Final Approval because, amongst other deficiencies, it could not be demonstrated that the system would have no unacceptable effects on the receiving aquatic environment due to the fact that no neutralisation step was proposed in this system. Finally, one system was considered to be outside the remit of the Group as MEPC had previously decided that BWMS applying only UV-light should no longer be evaluated by GESAMP. During its meeting in October 2010, MEPC endorsed the pending recommendations of WG 34 in all cases and granted the approvals accordingly. At the moment there are still seven and potentially another four evaluations pending for adoption at MEPC 62 in July 2011. Basic Approval was recommended to BWMS from the following IMO member states: Germany, Greece, Japan (three times), the Republic of Korea (two times) and Singapore (two times). Final Approval was recommended to BWMS from China, Germany (two times), Japan (two times), Norway and the Republic of Korea. An overview of the systems evaluated in these meetings is shown at <http://www.imo.org/OurWork/Environment/BallastWaterManagement/Pages/BWMTTechnologies.aspx>

5.2.8 It was not possible to clear the list of BWMS applications, as three additional BWMS that were submitted in time to MEPC 62, have yet to be evaluated. This will take place in an additional meeting of WG 34 in September 2011.

Methodology for information gathering and the conduct of work of WG 34

5.2.9 The evaluation Methodology of WG 34 was determined to be a living document based on increasing experience in the evaluation of BWMS. The work on the further development of the Methodology has been continued during the third Stocktaking Workshop (STW(3)) which was held at IMO Headquarters from 4 to 6 April 2011. Again external experts had been invited to help in the further development of the Methodology.

5.2.10 The main aim of STW(3) was to finalize the current proposals for amending the Methodology, in particular the development of tools for risk assessment, including:

- *Marine Antifoulant Model to Predict Environmental Concentrations – Ballast Water (MAMPEC-BW)* a marine environmental risk assessment model,
- Human health risk assessment approach for BWMS on board ships, and

- Data base containing hazard data on frequently occurring chemical by-products of the process of disinfection of ballast water.

MAMPEC was originally developed to model the risks from anti-fouling biocides on ships and was modified at the request of WG 34 to model ballast water discharges and renamed MAMPEC-BW. The final parameters of the discharge environment to be used in the model have been established and also the associated database of physico-chemical properties of the most frequently occurring disinfection by-products (DBP). The finalization of the Human Exposure Scenario includes decisions on the definition of the exposure levels and periods of occurrence during handling and storage of chemicals used in BWMS. The risk assessment equations governing the exposure and the hazard have also been agreed and put in place. For 17 frequently occurring chemicals, Active Substances and Relevant Chemicals, most of which are DPB, standardised data had been gathered on the physico-chemical characteristics, the environmental fate and toxicological hazards for human health and the environment. Based on the original work carried out by WG 1, WG 34 was able to finalize the work and adopt the final fact sheets for the 17 substances during STW(3).

5.2.11 The newly developed tools are not yet ready for submission to GESAMP and MEPC, as WG 34 was of the opinion that further development of the current text is needed. Unfortunately, this will lead to a delay in the amendment of the Methodology for new submissions of BWMS as it may only be discussed now during MEPC 63, which will meet in March 2012. Following approval by GESAMP and subsequent endorsement of the methodology by MEPC, the WG will start to apply the methodology in practice.

5.2.12 An interim report on the progress made during the STWs has been prepared for MEPC 62, while more work has to be carried out to ensure that a robust updated Methodology is submitted to MEPC for approval. It is the intention of WG 34 to have regular meetings (preferably once a year) to continue the upgrade of its Methodology of work in accordance with the latest developments related to risk assessments worldwide.

5.2.13 GESAMP noted that further work on checking of modelling parameters against real values in the environment (validation), and the compilation of a glossary of the terms involved in the work on ballast water had to be postponed to a future stocktaking workshop due to time constraints at the meeting.

Future work

5.2.14 The reports of the 13th, 14th, 15th, and 16th sessions of WG 34 had already been reviewed by GESAMP before these were forwarded to MEPC 61 (report 13) and MEPC 62 (reports 14, 15 and 16). In addition, the report of the 17th meeting (2 to 6 May 2011) would be forwarded shortly to the members of the GESAMP. The next two meetings of WG 34 had already been planned as follows: GESAMP-BWWG(18) from 5 to 9 September 2011 and GESAMP-BWWG(19) from 12 to 16 December 2011. It can already be foreseen that a 20th session would be required to meet all the requests for evaluation currently in the pipeline.

Acknowledgement

5.2.15 The Chairman of WG 34 thanked all the members of GESAMP that took the time to critically review the work of WG 34. It goes without saying that the quality of the work has been improved as a result from this peer review process.

Discussion by GESAMP

5.2.16 Following a demonstration of the MAMPEC-BW model it was noted that it had originally been developed to evaluate anti-fouling chemicals and had been adapted for the evaluation of active substances in ballast water discharges. The model is publicly available and it was agreed that a link from the GESAMP web-site to the model should be implemented. It was also noted that the GLOBALLAST Programme has information about 500 harbours and that this information could be included as default values in the MAMPEC-BW model.

Action taken by GESAMP

5.2.17 In conclusion, GESAMP agreed that:

- .1 Dialogues should be encouraged between BWMS industry proponents and the Working Group;
- .2 'Exposure modelling' of 'near-field' environmental risks should not be applied retrospectively on BWMS already approved;
- .3 The URL for the MAMPEC-BW model should be added to the GESAMP Web-site on the appropriate page;

- .4 As requested by the WG, GESAMP will peer review the new methodology including the modelling on the environment and the human health risk assessment; and
- .5 Stock taking should be conducted annually.

5.3 Metals in the marine environment (WG 37)

A report of the activities of WG 37 was given by Ms. Helen Keenan, Chairperson of the Working Group.

5.3.1 During GESAMP 37, UNEP had presented two proposals to GESAMP resulting in the re-direction of the activities of WG 37 as follows: A GESAMP Task Team was established under WG 37 to fill the identified scientific data and information gaps on anthropogenic sources, releases and possible measures to control the releases of mercury. This work provided by GESAMP would assist UNEP with the preparation, by 2013, of a binding international agreement to protect the environment from releases of mercury and its compounds. A second Task Team under WG 37 was established to close known scientific information gaps on lead and cadmium. This information was to be integrated into UNEP's publication "Reviews of Scientific Information on Lead and Cadmium" by August 2010, a report that is intended to inform policy makers on the need for global action in relation to these metals. GESAMP stressed that the Task Team should give ample attention in its work to the deposition from the atmosphere of lead and cadmium, as well as the mobility of lead in the environment.

The report was duly delivered in August 2010 and incorporated into UNEP's final draft by October 2010.

5.3.2 The mercury Task Team of the Working Group delivered a preliminary report in August 2010 and a final report was presented in 2011. By 2011, all report sections were combined and submitted to UNEP and a reformatted version of the summary was prepared. UNEP has since asked for further information outside the agreed terms of reference and assistance is being given where possible. All the documentation used and prepared by WG 37 as part of its work can be accessed on a special website, however, it is recommended that this also be made available on the GESAMP website.

5.3.3 GESAMP was invited to review this report and, in particular, to consider the following issues:

- .1 To incorporate the GESAMP information into the UNEP Global Mercury Assessment that will be developed during 2011-2012, UNEP has suggested that Helen Keenan join the group that will put together the UNEP report; in that connection, it may also be necessary for her to attend the forthcoming Third Session of the Intergovernmental Negotiating Committee (INC 3) in Nairobi, 31 October – 4 November 2011, which activities UNEP would support;
- .2 It has taken considerable time, effort and resources in getting the reports prepared. Understandably, UNEP is mainly concerned with certain sections which fit their remit for the preparations of the International Treaty on Mercury. The information gathered that UNEP is unlikely to use is, however, of great value to the scientific community in general (e.g., the compilation of fate & transport models, methods of analysis for various matrices, speciation, CRM's etc). Therefore, WG 37 proposes to prepare a GESAMP report to encompass all aspects relevant to the marine environment; and UNEP has requested an estimate of printing costs for the publication of this report; and
- .3 In preparation for this effort, Helen Keenan would like to meet with a small group of GESAMP and WG members (possibly at IMO) to develop an outline of the report in the preferred format. It is anticipated that the report could be finished, including internal and external peer review, prior to GESAMP 39 in 2012.

5.3.4 GESAMP was informed that a special session has been accepted for the 10th International Conference on Mercury as a Global Pollutant, Halifax, Nova Scotia July 2011 (10th ICMGP). This session will incorporate the work of GESAMP on the TWAP indicators (mercury) and WG 37. Furthermore, Helen Keenan has been invited to be a member of the organizing committee of the 11th ICMGP to be held in Edinburgh in 2013.

Action taken by GESAMP

5.3.5 GESAMP took the following action:

- .1 It noted the declaration of the UNEP Chemical Branch that the WG had effectively completed the original request for scientific advice under the amended terms of reference from 2010 (see Annex VI to this report) and that no further requests would be forthcoming;

.2 It agreed that the WG Chairperson would continue to support the aforementioned drafting activities with respect to the documents supporting the International Treaty on Mercury, provided suitable support would be provided by the UNEP Chemicals Branch; and

.3 It approved the plan of the WG and its Chairperson to publish all of the mercury findings in the GESAMP's Reports and Studies series following both internal and external peer review, which GESAMP would facilitate and whose publication would be taken care of by the UNEP Chemicals Branch.

5.4 Atmospheric input of chemicals to the ocean (WG 38)

A report of the activities of Working Group 38 was given by Mr Robert Duce, Co-Chairman of the Working Group.

Introduction

5.4.1 Since 2007 GESAMP WG 38 has been studying the atmospheric input of chemicals to the ocean. These efforts have focused specifically on the following subjects:

.1 Assessing the need for the development of new model and measurement products for improving our understanding of the impacts of the atmospheric deposition of nitrogen species and dust (iron) to the ocean;

.2 Reviewing the present information on the atmospheric deposition of phosphorus species to both the marine and terrestrial environments, considering both natural and anthropogenic sources, and evaluating the impact of atmospheric phosphorus deposition on marine and terrestrial ecosystems. Consideration was also given to whether such a review of any other substance would be useful; and

.3 Cooperating with the WMO Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS) and with the WMO Precipitation Chemistry Data Synthesis and Community Project in order to evaluate the needs of the marine community and assist in clearly articulating them in the development of these WMO efforts.

Activities and achievements

5.4.2 The subject mentioned in paragraph 5.4.1.3 above was satisfied earlier by submitting to WMO recommendations on GESAMP cooperation with two WMO programmes: SDS-WAS and Precipitation Chemistry.

5.4.3 GESAMP noted that the earlier work of WG 38 had taken place at two meetings: in Arizona, (United States) (December 2008) and London, (United Kingdom) (January 2010). These meetings, and the work in the intersessional periods mentioned in paragraphs 5.4.1.1 and 5.4.1.2 above, have resulted in three peer-reviewed scientific papers, which are expected to be published in the scientific literature soon, as follows:

“Impacts of atmospheric nutrient deposition on marine productivity: roles of nitrogen, phosphorus, and iron”. *Global Biogeochemical Cycles* (in press).

“Impacts of anthropogenic SO_x, NO_x and NH₃ on acidification of coastal waters and shipping lanes” *Geophysical Research Letters*, (in press).

“Atmospheric organic material and the nutrients it carries to the ocean”. *Global Biogeochemical Cycles* (to be submitted shortly).

5.4.4 The Co-Chairman of WG38 described the major scientific results and conclusions of these three papers. WMO concluded that more specific elaboration of the role of minerals carried by dust in marine biological production was required, and therefore proposed in 2010 an extension of activities of WG 38 for another year, with the objectives to:

- .1 Identify test-bed regions for future studies;
- .2 Employ dust/iron/phosphorus models with resolutions as high as possible;
- .3 Improve quantitative estimates of the geographical distribution of mineral fractions;
- .4 Assess, through re-analyses and case-studies, the oceanic input of minerals and the marine response provided by dust/Fe/P, utilizing ocean modelling, remote-sensing and in-situ observations; and
- .5 Elucidate environmental and climatic consequences.

5.4.5 A third meeting of WG 38 to address these issues was held in Malta (March 2011), gathering together the SDS-WAS and GESAMP scientific communities working on these issues. This meeting was in the form of a workshop entitled “WMO SDS-WAS/GESAMP Expert Workshop on Modelling and Observing the Impacts of Dust Transport and Deposition on Marine Productivity”. The workshop focussed on the three primary topics outlined below with the goal to provide advice as to how impacts of

dust transport on marine productivity can most profitably be addressed in the future activities of WMO and GESAMP. The three topics were:

- .1 Improving quantitative estimates of the geographical distribution of the transport and deposition of mineral matter and its content to the ocean;
- .2 Long-term assessment of mineral dust/Fe/P input to the ocean: In-situ observations and marine response utilizing coupled atmospheric transport and ocean biogeochemical modelling and remote-sensing; and
- .3 Specifying test-bed regions for joint studies of the transport and deposition to the ocean of mineral matter (Central Atlantic; North Pacific; Indian Ocean; Mediterranean; others), utilizing SDS-WAS transport modelling.

5.4.6 Three reports and recommendations from the Malta meeting were developed in these areas, to be shortly submitted to the WMO SDS-WAS community, and to be also included in the planned GESAMP Reports and Studies publication on WG 38 outcomes. The conclusions and recommendations from these three reports are summarized below:

Topic 1

- .1 Parameterizations of desert dust emission may need to be made more process-specific before improved future predictions can be made.
- .2 The impacts of human activities on vegetation and on soil crusts need to be included in models to understand the overall impact of humans on the dust cycle.
- .3 Understanding what controls the inter-annual changes in dust on different timescales is a key factor for identifying the role of meteorology.
- .4 What cannot be explained by climatology would indicate trends in anthropogenic sources and shifts in climate regimes.

Topic 2

- .5 Identify new taxonomic and functional (nitrogen-fixing and primary productivity) pico-plankton and micro-plankton groups for understanding surface ocean biogeochemical processes and model simulation in response to the atmospheric supply of iron.
- .6 Develop atmospheric chemistry-transport models utilizing a complex iron dissolution scheme that will allow better assessment of iron -solubility as a function of dust load, mineralogical composition, ambient atmospheric temperature and relative humidity, abundances of trace species (in particular acidic species) and cloud-processing.
- .7 Understand the marine response to the supply of soluble- iron during atmospheric processing of mineral dust vis-à-vis bio-available iron produced by *in-situ* leaching of mineral dust by surface sea water.
- .8 Utilize deposition fluxes based on sediments trap measurements, wherever possible, for providing additional evidence on the marine response to air-sea deposition of mineral dust.

.9 Compile published evidence on mineralogy of dust from source regions and promote in situ observations of size-resolved physical and mineralogical composition of soils.

.10 Particular focus should extend to understanding controls of dust sources and transport in the southern hemisphere, which are less well known than the major dust sources in the northern hemisphere.

.11 Develop long-term time-series observations away from dust source regions.

In addition, this group developed a very useful annotated bibliography of papers that addresses the impact of dust deposition on marine biogeochemistry.

Topic 3

.12 Proposed sampling sites for dust sources and transport: North Atlantic: Barbados, Bermuda, Miami, Izana, French Guiana and Iceland; South Atlantic: Falkland Islands; North Pacific: Midway; South Pacific: Norfolk and Chatham Islands; Indian Ocean: The Maldives; Southern Ocean: Cape Grim, Australia; Reunion Island, Marion Island and Prince Edward Island.

.13 There is an urgent need to improve estimates of dry deposition fluxes of mineral matter to the ocean, both in terms of observational and modelling work. This field does not appear to have advanced significantly in the last ~30 years, and the use of inadequate and highly uncertain parameterizations of dry deposition velocity is commonplace.

.14 Natural dust inputs may affect primary productivity and nitrogen fixation in certain ocean regions.

.15 Experiments designed to demonstrate the impact of such events on marine ecosystems pose some significant challenges. *In situ* experiments will be logistically difficult, requiring access to the study site by a relatively large number of researchers, potentially for many weeks at a time. Thus a large research vessel and/or easy access to a well-equipped marine laboratory will be required.

.16 The following questions should be addressed relative to iron solubility:

- What transformation processes in the atmosphere affect iron solubility[HN1]?
- Can we distinguish and quantify the relative importance of mineralogy, size and atmospheric chemical processing?
- What are the relative contributions of desert dust and combustion/anthropogenic aerosol to the soluble iron budget?
- Are there anthropogenic contributions to other key elements (e.g., contributions to the load of phosphorous observed in dust events due to the use and production of fertilizers)?

5.4.7 The Co-Chairman informed GESAMP that with the above activities the initial Terms of Reference of WG 38 had been completed. A final report of the Working Group activities will be published shortly as part of the GESAMP Reports and Studies Series. After the Malta meeting some thoughts have been

expressed that the issues presented and discussed above could provide a basis for publishing a scientific review article. WG 38 and SDS-WAS communities will be shortly consulted about this idea.

Discussions

5.4.8 The report by the Co-Chairman of WG 38 was followed by positive discussions and numerous questions on different reported scientific aspects.

5.4.9 Although WG 38 completed its Terms of Reference, the Co-Chairman reported his recent discussion with the WMO Secretariat on a possible continuation of WG 38 work related to atmospheric anthropogenic nitrogen deposition to the global marine environment. This study would include the following topics:

- .1 Update the geographical estimates of anthropogenic nitrogen deposition to the global ocean made in the Duce et al. (2008) paper in the journal *Science*, which were based on data from 2005 or earlier. This would utilize newer and more geographically distributed data on anthropogenic nitrogen concentrations over the global ocean and its deposition to the global ocean surface as well as improved models of atmospheric deposition and its impacts;
- .2 On the basis of .1, re-estimate the amount of additional CO₂ that could be drawn down from the atmosphere to the ocean as a result of the increased productivity in the ocean resulting from the additional anthropogenic nutrient nitrogen deposited. This would allow an update on the impact of the atmospheric nitrogen deposition and atmospheric radiative properties, relative to the 2008 paper in *Science*;
- .3 Provide a much more accurate estimate of the impact of atmospheric anthropogenic nitrogen deposition on the production of additional nitrous oxide in the ocean and its subsequent emission to the atmosphere. This was certainly one of the greatest uncertainties in the 2008 *Science* paper. This is very important to evaluate accurately, since N₂O is such a powerful greenhouse gas, and the emission of additional N₂O from the ocean will cancel to some extent the effects of the additional drawdown of CO₂ on the radiative properties of the atmosphere;
- .4 Evaluate the extent to which anthropogenic nitrogen delivered to the coastal zone via rivers, atmospheric deposition, etc., is transported to the open ocean, in which regions this may happen, and what its impact is there. In the 2008 *Science* paper it was assumed that all nitrogen delivered to the coastal zone was sequestered there

and did not reach the open ocean, but this may well not be true, and this is something that should be looked at more carefully; and

- .5 Make a much more detailed estimate of the impact of anthropogenic nitrogen in the area of the Northern Indian Ocean (Arabian Sea, Bay of Bengal) and the South China Sea, areas that are expected to show the greatest increase of anthropogenic nitrogen deposition over the next decade or so (according to the 2008 *Science* paper). These very important regions are also areas for which extensive new atmospheric data are now available compared with 5 years ago, and this should enable much more accurate estimates to be made.

5.4.10 WMO expressed interest to support such a study over the next 2-3 years with funding at a level provided over last three years (10-12,000 USD), if support from some other Sponsoring Organizations and from external funding sources would be secured as well. Discussion indicated that IMO should also support the study by 5-10,000 USD; other possible funding could be eventually provided from TWAP. The WMO Secretariat and the WG Co-Chairman will explore possibilities for continuation of the WG 38 activities.

5.4.11 GESAMP extended its appreciation to the Co-Chairmen and the working group members on these remarkable achievements.

Action taken by GESAMP

5.4.12 GESAMP took the following action:

- .1 It noted that WG 38 had completed the three tasks contained in its original (2007) Terms of Reference as well as additional tasks of the amended ToR (2010) on schedule and to the satisfaction of WMO;
- .2 It noted that WMO intended to continue sponsorship of a revised WG 38 with the intention of examining atmospheric nitrogen inputs to the oceans,
- .3 It agreed that the co-Chairman, Mr. Robert Duce would develop with WMO new ToR for this activity for approval by GESAMP, and
- .4 it noted that WMO and IMO would continue to sponsor WG 38.

5.5 Establishment of trends in global pollution in coastal environments (WG 39)

A report of the activities of WG 39 was given by Dr. Ana Carolina Ruiz-Fernández, Co-Chairperson of the Working Group.

Introduction and background

5.5.1 The main objective of this Working Group is to contribute to the reduction of stress in the coastal ecosystem by providing stakeholders, scientists and society in particular with an objective and global assessment of pollution trends during the last century in sensitive coastal ecosystems, through retrospective ecosystem analysis using well-dated environmental archives and time-series data wherever available. The main tasks to be carried out by the Working Group are i) to establish links with other organizations, ii) to revise existing methodologies on suitable environmental archives, dating methods, pollution indicators, analytical techniques and trend analysis, iii) to review existing data, including data quality, on a regional basis and iv) disseminate the Working Group activities. The main outputs of the Working Group would be reports on the proposed methodology and a synthesis of existing data. IAEA had originally presented this proposal for a new Working Group to GESAMP 35.

5.5.2 WG 39 was approved with initially executing Task 1 (bibliographic review, definitions, and methodologies) and Task 2 (Critical review of existing methodologies on suitable environmental archives, dating methods, pollution indicators, analytical techniques and trend analysis. In addition, review of existing data, including data quality) as proposed with the aim of presenting the outcome for peer review by GESAMP. (See the Terms of Reference in Annex VI to this report.) Follow-up activities could then be discussed and agreed in light of the outcome of this first phase.

5.5.3 The first meeting of WG 39 took place from 2-5 April 2011 at the IAEA Environment Laboratories in Monaco. A report on the main progress achieved during the meeting was presented by Co-Chairperson A. C. Ruiz-Fernández. The work methodology was defined, including a list of substrates, contaminants and other relevant information that were considered necessary to accomplish Tasks 1 and 2. The bibliographic review tasks were divided by region according to the Large Marine Ecosystems classification¹ and these regions were distributed among the group members. A bibliographic database was designed for classification of the literature that would be analyzed, and a first version of the database was developed during the meeting and would be tested within one month after release to the WG 39 members. The WG also agreed to do a basic toxicity evaluation of the data by using environmental quality standards

¹ Sherman, K. and Hempel, G. (Editors) 2008. The UNEP Large Marine Ecosystem Report: A perspective on changing conditions in LMEs of the world's Regional Seas. UNEP Regional Seas Report and Studies No. 182. United Nations Environment Programme. Nairobi, Kenya.

such as the NOAA-SQUIRTS by Buchman (2008), and to produce a scientific contribution to be submitted to a peer reviewed journal related to environmental management. Some members of GESAMP questioned whether a toxicity evaluation of this was within the terms of reference of WG 39.

Discussion

5.5.4 GESAMP members expressed their concern regarding the apparent departure observed between the activities developed during the meeting and the activities described in the ToR approved for WG 39 during GESAMP 37. Only Tasks 1 and 2 of the ToR had been approved and the WG should proceed accordingly. No additional funding is expected for carrying out Tasks 1 and 2.

With regards to funding for the originally proposed Tasks 3 to 5 (see GESAMP 37/5/6), additional funds would be needed and the WG 39 Co Chairs were encouraged to participate actively with IAEA in fundraising to ensure that the WG activities can be completed. The IOC Technical Secretary mentioned that a new GEF project related to the Large Marine Ecosystem Community of Practice might be useful for WG39 activities in the future. In order to promote the activities of the WG 39 among the LMEs participants, it was suggested that a WG 39 member (Mr. P. Alvarez) should present a poster and/or give a presentation about WG 39 objectives and planned activities at the IOC-IUCN-NOAA 13th LME Consultative Committee Meeting to be held in Paris in July 2011. The presentation would be prepared by A.C. Ruiz-Fernández with the collaboration of WG 39 members.

Action taken by GESAMP

5.5.5 GESAMP noted and confirmed the following:

- .1 WG 39 is only tasked with items 1 and 2 of the ToR at this time;
- .2 Additional funding for Tasks 1 and 2 beyond that provided by IAEA is not envisaged;
- .3 IAEA's continued willingness to seek additional funding for Tasks 3 to 5, i.e. for the main body of work; and
- .4 The preparation by the Co-Chairs of a work plan and presentation to facilitate fund-raising.

6 (A) CONTRIBUTION TO THE UN 'REGULAR PROCESS'

6A.1 It was recalled that based on the recommendations of the dedicated Ad Hoc Working Group of the Whole, the General Assembly adopted the Regular Process (RP) as a UN global mechanism for assessing the state of world's oceans on a regular basis (UNGA Resolution 60/30). The recommendations contained in UN Resolution 65/37 (adopted by the General Assembly in December 2010) addressed the following issues:

- .1 Setting of the deadline for the first integrated assessment under the 1st cycle of the RP as 2014;
- .2 Establishment of an Ad Hoc Working Group of the Whole of the General Assembly composed of all UN Member States that will be the body overseeing the implementation of the Regular Process;
- .3 The Invitation (through the Secretary General) to IOC, UNEP, IMO, FAO to provide scientific and technical support to the RP;
- .4 Establishment of a Group of Experts (appointed by Member States) to be an integral part of the Regular Process, that will prepare the assessment report and, as a first step, develop a set of options necessary to achieve the deadline of 2014;
- .5 Organization of the 1st meeting of the Ad Hoc Working Group of the Whole from 14-18 February 2011, where the set of options prepared by the Group of Experts would be discussed and agreed upon; and
- .6 Establishment of a UN Trust Fund to support the RP cycle and an invitation to Member States and other organizations to contribute to the Trust Fund and to make other contributions.

6A.2 GESAMP noted that the Division of Ocean Affairs and Law of the Sea of the UN Secretariat (UN-DOALOS) had been designated as the Secretariat of the Regular Process, with other competent UN agencies and programmes invited to give technical and scientific support. IMO, UNEP and UNESCO/IOC had already nominated focal points, and other agencies were expected to do so.

6A.3 It was also noted that the Group of Experts of the Regular Process had been appointed, with five experts from each of the UN regional groups (Africa, Asia, Eastern Europe, Latin America and the Caribbean, and Western Europe and Other) – though only one appointment had yet been made from Eastern Europe. The Group had elected Ms Lorna Inniss (Barbados) and Mr.

Alan Simcock (United Kingdom) as its coordinators. The working method suggested by the Group of Experts in the February 2011 set of options foresaw the following main steps:

- .1 Agreement of the outline of the First Integrated Assessment;
- .2 Agreement of a Guide for Authors (a draft of which was part of the February 2010 set of options);
- .3 Preparation of working papers on each of the issues identified under each chapter of the outline, in many cases with a series of regional working papers, with a later synthesis working paper based on them. These working papers would be produced by a Lead Drafter (or a team of Lead Drafters), commented on by a panel of consultors designated by the Group of Experts, and revised by the Lead Drafter(s);
- .4 Preparation of draft chapters on the basis of the working papers by Lead Drafter(s), with again comment by a panel of consultors and revision by the Lead Drafter(s);
- .5 Production of the first draft of the First Integrated Assessment by the Group of Experts, based upon the draft chapters;
- .6 Peer-review of the first draft by both national authorities and intergovernmental organisations, and by independent peer-reviewers for each chapter designated by the Group of Experts from among experts who have not previously been involved;
- .7 Revision by Chapter Editors (who would be either members of the Group of Experts or Lead Drafters) in the light of peer-review comments; and
- .8 Adoption of the final version by the Group of Experts.

6A.4 The February 2010 set of options proposed that the Lead Drafters, consultors and peer-reviewers would be selected by the Group of Experts from a pool of experts nominated by States and Intergovernmental Organisations (with the additional possibility that experts might be able to put themselves forward as consultors). The suggestion was made that, if a management and review mechanism was established, the "slate" selected by the Group of Experts should be subject to its approval. Discussion in February 2010 and subsequent comments from States suggested that many States think that there should be more control by States over this process.

6A.5 The Group of Experts convened at the February 2011 meeting of the Ad Hoc Working Group of the Whole suggested an outline for a global integrated assessment of the state of the marine environment, including socio-economic aspects, based in 7 Parts and 45 Chapters, but this is currently under discussion.

Action taken by GESAMP:

6A.6 GESAMP noted that the development of the Regular Process had thus been slow, but that it was now at the point where agreement should soon be reached on the major structural issues. The focus would then shift to organizing the proposed workshops and identifying the pool of collaborators and an assignment of roles, in preparation for finalizing the outline of the First Integrated Assessment, to be followed by producing the assessment itself.

6A.7 Even if many aspects of the Regular Process lacked are still under development at present (e.g. governance, funds, contents, etc.), it is expected that these issues will be resolved in the coming years. GESAMP, while noting that its offers to contribute to the Regular Process made both in 2009 and 2010 had not been taken on board, nonetheless, welcomed the RP and reiterated its availability, if requested, to contribute to it. In the spirit of being proactive, it was considered important that, subject to the availability of funds, a GESAMP representative should attend the next meeting in of the Ad Hoc Working Group of the Whole in New York (27-28 June 2011), but Group felt that in order to formalize its attendance, an invitation from DOALOS would be needed.

6 (B) GEF TRANSBOUNDARY WATER ASSESSMENT PROGRAMME (TWAP)

Introduction

6B.1 The ecosystem services provided by the world's water systems (groundwater aquifers, lake basins, river basins, large marine ecosystems and the open ocean) support the socioeconomic development and well-being of the world's population. Many of these systems extend across, or lie beyond, national boundaries, and are referred to as "transboundary waters". These systems, which cover most of the planet, continue to be impacted and degraded by multiple and complex human-induced and natural stresses that threaten the sustainability of these resources and, in turn, human survival and well-being. Further, management of transboundary waters is increasingly becoming constrained by limited availability of funds, resulting in the need for better prioritization of the allocations of limited financial resources.

6B.2 One of the major constraints to the effective management of transboundary waters is the lack of a systematic, periodic global comparative assessment of their changing conditions in response to changing stresses. To respond to these challenges and as a direct contribution to the UN Regular Process, IOC took a leading role in the preparatory phase of the GEF Transboundary Water Assessment Programme (TWAP), in developing an indicator based-methodology for assessing the conditions of the world's 64 LMEs and Open Ocean areas. To produce such

methodology and identify key environmental, socio-economic and governance indicators, IOC established two expert working groups on Large Marine Ecosystems (LME) and Open Ocean (OO) that met in February, June and July of 2010, with involvement of members of GESAMP. The methodologies were presented at three forums for discussion and validation. The final reports were delivered to GEF and UNEP in December 2010. It is expected that in 2011, GEF will fund the implementation of the TWAP Assessment which would be conducted from 2012 to 2014 through a partnership of more than 40 institutions. The assessment products of the TWAP would feed directly into the Regular Process cycle of work. IOC, in collaboration with UNEP, is expected to lead the implementation of these two marine components. Such an assessment has never before been undertaken for all transboundary waters.

6B.3 GESAMP was informed that the TWAP assessment would be based on so-called 'Level 1 indicators', providing a baseline assessment of major stressors and future impacts, and 'Level 2 indicators' which would provide a more in depth assessment of different key regions, e.g., Regional Seas. For the Open Oceans a more classic expert-based assessment would be applied, while for the LMEs, a more mechanistic indicator based assessment would be applied.

Discussion

6B.4 In considering GESAMP's potential involvement in the TWAP Full-Size Project, it was suggested to link up with the Open Oceans and LME working groups, in particular on issues related to pollution aspects in line with GESAMP Working Groups' on-going programmes, activities and relevant expertise (see Table 1 below).

Table 1: Potential indicators of pollution proposed by GESAMP for the TWAP assessment

Indicator	Open Ocean	LME	Remarks
Mercury	+	+	WG 37 (metals) and WG 38 (atmospheric inputs); this is not an WMO priority but might be facilitated by WG 38 when their work on nitrogen commences
Nutrients	+		WG 38 Nitrogen
Shipping density	+	+	With IMO
POP's in plastic pellets and marine mammals	+	+	WG 40 (microplastics) and biomagnification drafting group
Cadmium & Lead		+	WG 37 (metals)
Negative trends in dissolved oxygen		+	Hypoxia drafting group
Freshwater & sediment discharge		+	WG 39 using global NEWS model

6B.5 The Members expressed their concern as to the feasibility of developing some of the indicators, in particular the availability of data and its geographical spread. GESAMP requested

the relevant WG Chairmen to prepare a project plan and budget for this activity in the intersessional period. It could then advise IOC and UNEP as to what could be achieved within the available TWAP budgets, taking into account the in-kind contributions of the members and their respective working groups.

6B.6 GESAMP also considered that a meeting of part of the standing GESAMP Task Team to prepare for the TWAP assessment would be necessary in the autumn of 2011. UNEP was requested to consider whether this could be funded from the TWAP Project Preparation Grant.

6B.7 GESAMP recommended that the Chairman should contact both LME and Open Oceans TWAP working groups in order to clearly define GESAMP roles and responsibilities for the implementation of the TWAP/ Full-Size Project.

7 IDENTIFICATION OF NEW AND EMERGING ISSUES REGARDING THE DEGRADATION OF THE MARINE ENVIRONMENT OF RELEVANCE TO GOVERNMENTS AND SPONSORING ORGANIZATIONS

Introduction

7.1 The GESAMP agenda item entitled “New and Emerging Issues” has a long history and is intended to bring new topics related to the status of the marine environment to the attention of the Sponsoring Organizations. The Chairman summarised discussions from the informal Sunday meeting on this topic.

7.2 GESAMP discussed the need for a more efficient process for identifying new and emerging issues of potential interest. It was agreed that more use could be made of existing foresight initiatives, such as the UNEP foresight process for identifying emerging issues facilitated by ICSU-SCOPE (International Scientific Unions, Scientific Committee on Problems of the Environment; www.icsu-scope.org). This would allow Members to keep a watching brief in a more structured manner and raise emerging issues at appropriate intervals. It was also suggested that the NORMAN network for emerging pollutants (www.norman-eu.net) could be useful.

7.3 Following discussion, important items could be identified from the foresight process for inclusion in GESAMP New and Emerging issues four step process outlined at GESAMP 37 (R&S 81, paragraph 7.4). This starts with a proposal or initial paper to GESAMP which, if approved, is followed by a more detailed scoping paper describing the essence of the issue, the potential need for and scale and feasibility of an assessment, the identification of expert communities, and potential sources of funding. In the third step GESAMP may approve an international workshop to seek external advice and develop the issue further with a view to attracting the attention of the UN Sponsoring Organizations and other interested parties. Finally GESAMP, with the support of the UN Sponsoring Organizations, can launch a global assessment on the issue to advise makers and environmental managers.

7.4 It was recognized that a wide variety of external bodies could act as informal or formal partners in the foresight process, scoping activities or formal work programme. This might include providing financial or in-kind support. A schematic diagram illustrating the key steps and linkages in this process is shown in Fig 1 below.

7.6 Members were encouraged to prepare brief initial proposals to GESAMP if they so wished.

8 SCOPING ACTIVITIES

8.1 Correspondence Group on the Biomagnification of Contaminants in Marine Top Predators and its Ecological and Human Health Implications

8.1.1 The occupants of the upper levels of food-chains are generally the most vulnerable to anthropogenic disturbance; this includes the tendency to biomagnify Persistent Organic Pollutants (POPs) and metallo-organics such as methyl mercury through their food sources. The anthropogenic pressures exerted on top predators themselves, the importance of some as food sources and their potential human health impacts make this an important subject. GESAMP at its 37th Session in Bangkok (R&S 81, paragraphs 8.15-8.18), tasked a Correspondence Group to prepare a scoping paper on the topic of biomagnification in the marine environment (See Annex VIII).

8.1.2 It was considered that the issue of bio-magnification needs to be reviewed with respect to both its ecological as well as its human health implications. While marine pollution abates slowly in some developed regions, it is on the increase in other rapidly developing regions. The reservoirs of more recent Persistent Organic Pollutants (POP's) already in the environment are considered not yet to have reached some sensitive areas such as the Arctic, and further ecological impacts may occur as atmospheric and oceanic distribution continues.

8.1.3 The impacts of contaminated food on human health, changes in human diets and concerns for food security have increased the urgency of this issue, and an independent global assessment could help to inform policy makers in an objective manner. GESAMP considered that a global assessment of biomagnification would require a multi-stakeholder, multi-disciplinary approach and would need to build on the expertise of UN agencies such as WHO and FAO, and IGOs such as IWC, AMAP, OSPAR, HELCOM and CIESM.

8.1.4 A two step approach to an eventual assessment was recommended:

.1 The first step could be carried out independently. Biological indicators would be developed using data on common top predators (these could also feed into the TWAP process, see Section 6B). The development of indicators of biomagnification would be supported by a review of the process of biomagnification and the feasibility of its modelling. Finally, the ecological consequences of contaminant biomagnification would be addressed. Within the first phase biomagnifying organisms (e.g., fish, reptiles, marine mammals) would be prioritized using criteria

such as significance in human diets, lipid-richness and longevity, and broad representation geographically and numerically in surveys (i.e. data richness). The target chemicals would be taken initially from the updated Stockholm Convention Annex A and B lists of chemicals for elimination or restriction. Priority should be given to those with well-known toxicology and a preliminary selection could include MeHg, PCB, DDT and PFOS/A.

.2 In a second possibly overlapping phase, the implications of biomagnification for human health would be assessed. Substantially exposed human populations through biomagnified contaminants in the diet would be identified, with particular reference to source and scale including indigenous communities and small island states, as well as the public at large.

Action taken by GESAMP

8.1.5 GESAMP approved a scientific workshop in principle for Step 1. The Correspondence Group will provide a workshop proposal to GESAMP for intersessional review. GESAMP also approved exploratory talks with FAO and WHO in collaboration with CIESM to discuss Step 2. This could include CIESM sponsoring/hosting an introductory event, e.g., an initial meeting to discuss the human health implications with the agencies involved and how to handle them.

8.1.6 With regard to financial support, early dialogue with the Ocean Policy Research Foundation and the Nippon Foundation in Japan would be pursued as would efforts to secure EU funding.

8.2 Initiatives Related to Micro-Plastics and Related Contaminants

Introduction

8.2.1 Since its 37th meeting, GESAMP has been involved in a number of initiatives related to marine plastics, marine micro-plastics and associated contaminants that have been supported by several of the Sponsoring Organizations. Following approval by GESAMP 37, the most significant event was the organisation of an International Workshop on *Plastic particles as a vector in transporting persistent, bio-accumulating and toxic substances in the oceans*. The proceedings of this Workshop were subsequently published as GESAMP Reports and Studies No. 82 in 2010. Partly as a result of this effort, GESAMP was asked to contribute to one of three emerging topics selected for inclusion in the UNEP 2011 Year Book, i.e. plastics in the ocean, which was published in February 2011. GESAMP was also invited to contribute to the 2nd NOAA Scientific Workshop on Micro-plastics held in Tacoma, Washington, United States in October 2010. Furthermore that visit afforded an opportunity to attend the PICES 2011 Annual Science Meeting

and the North America SETAC meeting, both of which contained sessions with a micro-plastic focus. These events culminated in the 5th International Marine Debris Conference held in Honolulu, Hawaii, United States in March 2011 at which GESAMP was also represented.

8.2.2 Micro-plastics can be considered to have three primary sources: from the degradation of larger items of consumer plastic, from spillage or accidental release of resin pellets used in plastic manufacture, and from polymer grains and powders used for a range of industrial (e.g., casting molds, 'grit' blasting) or consumer (e.g., facial scrubs) purposes. Land-based sources are thought to provide the majority of inputs of plastics to the oceans, while shipping represents a significant source of plastic debris in some regions, despite the deliberate disposal of plastics at sea being prohibited under MARPOL Annex V. Other direct sources include fisheries and tourism. Riverine and wastewater inputs represent a very significant source in many regions. Despite recent attention, it is very difficult to quantify the absolute and relative quantities of plastic and micro-plastic particles entering the ocean. Material that becomes buried or deposited on the seafloor is inherently more difficult to monitor than material that accumulates on the shoreline.

GESAMP International Workshop on Plastic Particles as a Vector in Transporting Persistent, Bio-Accumulating and Toxic Substances in the Oceans, 28 - 30 June 2010, UNESCO-IOC, Paris

8.2.3 The Workshop was hosted by UNESCO-IOC with additional sponsorship from the EU and Sida. It brought together representatives from the plastics industry, environmental NGOs, policy, environmental management, UN Agencies and academia, from North and South America, the Caribbean, East Asia, Africa and Europe. This was reflected in the range of formal presentations and the content of several break-out sessions and panel discussions. The participants recognized the complexity of the problem and the need to adopt a multi-sectoral and multi-discipline approach to tackling the issue. The willingness and capacity to deal with waste varies very widely among different countries and regions. The participants agreed on a set of conclusions and recommendations with the intention to inform GESAMP and other bodies on practical ways forward.

8.2.4 General conclusions of the GESAMP Micro-plastics Workshop were:

- .1 There is very limited information on the quantities of micro-plastics entering the oceans, the processes and time-scales leading to their fragmentation, and the production of micro-plastics by industry;

- .2 There is limited information about the potential long-term hazards of micro-plastics either due to their physical or chemical properties (intrinsic and absorbed persistent, bio-accumulating and toxic substances);
- .3 There is a need for an assessment to follow on from UNEP's initial efforts and to collate the available scientific information and make recommendations that will be of use to the wide variety of policy, industry and societal organizations that have responsibility in this area;
- .4 Any assessment of micro-plastics must take full account of the overall marine debris and solid waste management problem arising from land and marine-based sources and activities; and
- .5 Micro-plastics should be included in new and existing programmes of monitoring in marine habitats, especially national programmes and those of Regional Seas bodies.

8.2.5 General recommendations of the GESAMP Micro-plastics Workshop were:

- .1 GESAMP should approach its Sponsoring Organizations, and other relevant bodies, with a request to consider sponsoring a GESAMP-led Working Group to conduct an assessment of micro-plastics in the coastal and open ocean;
- .2 The assessment should be complementary to, and embedded in, other assessments and initiatives tackling the problem of marine debris, including UNEP, UNEP Regional Seas, other regional bodies, and national and regional administrations such as NOAA and the EU. It should also feed into the UNGA Regular Process and the GEF/UNEP/IOC Transboundary Waters Assessment Programme; and
- .3 As an indicator of the impacts of litter on the marine environment, trends in the amount and composition of litter ingested by marine animals should be monitored.

8.2.6 Recommendations for research priorities / key research programmes were:

- .1 Basic mapping should be conducted of the pelagic and benthic environment to assess the global distribution, the form, and relative abundance of the different types of polymer;
- .2 Sources of plastics need to be prioritized, e.g., coastal and land-based sources, especially sewage treatment and riverine inputs as well as from shipping;
- .3 Given the predicted increasing inputs in the coming years, determine the long-term implications of micro-plastics, particularly with regard to the impact on marine organisms and accumulation along food chains;
- .4 Modelling oceanographic parameters is necessary to define micro-plastic movement, including oceanic currents, weather, tides, wind, etc., to predict the way plastics move away from point sources and where they re-accumulate. This information would also help to determine where to monitor;
- .5 The degree to which micro-plastics accumulate in the sediment and the role of oceanic cycling in transferring micro-plastics from the pelagic environment to the sediments should be investigated. Some plastics have a greater density than water, and the pattern of deposition and the local and regional distribution for a range of particle densities is unknown; and
- .6 The significant factors in the breakdown of plastics, e.g., ageing, UV, physical fragmentation, bio-degradation should be determined. Different plastics may be more durable and have different degradation behaviour depending on the environment (e.g., Fulmar stomach, coastal wave environment).

8.2.7 Recommendations for a global assessment should among other aspects focus on:

- .1 Developing methods for estimating the inputs of plastics to the oceans from land-based and maritime sources;
- .2 Clarifying rates of fragmentation and the production of (fragmented) micro-plastics;
- .3 Quantifying the amount of plastics and micro-plastics washed ashore, their composition, form, size and spatial distribution;

- .4 Determining the amount of plastics and micro-plastics in the water column and deposited on the sea floor in the coastal zone and the open ocean; and
- .5 Further exploration of the potential for the transfer of persistent, bio-accumulating and toxic substances from plastics to organisms and their biological effects.

UNEP Year Book 2011

8.2.8 GESAMP was asked by UNEP to chair the writing group preparing a section on ocean plastics, one of three emerging issues selected for inclusion in the UNEP 2011 Year Book. The writing workshop took place in Prague, the Czech Republic, in August 2010, sponsored by UNEP, and the draft text was prepared with the assistance of a science writer, four scientists and over 20 reviewers with a wide spectrum of interests and views. At the request of UNEP it focused on micro-plastics within the broader framework of waste management. The Year Book was launched at the UNEP Governing Council/Global Ministerial Environment Forum in Nairobi, Kenya, 21-26 February 2011 <http://www.unep.org/yearbook/2011/>

8.2.9 The UNEP Year Book process is supported by SCOPE (Scientific Committee on Problems of the Environment). SCOPE is interested in the plastics issue and, with permission from UNEP (Mr. Salif Diop), sent a draft version of the report to SCOR (Scientific Committee on Oceanic Research) (Mr. Ed Urban) to see whether SCOR would be interested in contributing to a project on the topic.

NOAA Second Research Workshop on Micro-plastics Debris, 5-6 November 2010, Tacoma, Washington, United States

8.2.10 The Workshop was hosted by the Center for Urban Waters in Tacoma. This Center has been working with NOAA on testing sampling and analytical protocols for marine micro-plastics. A wide range of scientific disciplines was represented and the inclusion of material scientists and polymer chemists was a considerable advantage when discussing the behaviour of micro-plastics in the environment. The Workshop also considered the development of a risk assessment framework: sources-stressors-habitat-effects-impacts. It is intended to publish the proceedings and the outcome of the Workshop will contribute to the development of the NOAA guidelines for sampling and analysis of micro-plastics. UNDP sponsored GESAMP's attendance at this Workshop.

PICES 2010 and SETAC 2010

8.2.11 GESAMP was invited to attend the Annual Science Meeting of PICES (North Pacific Marine Science Organization) which was held from (24 to 30 October 2010, in Portland Oregon United States;) and make a presentation to its Marine Environmental Quality Committee. UNDP sponsored GESAMP's attendance. There was considerable interest in taking forward several topics of common interest, and this led to the decision to hold a joint PICES-ICES-GESAMP special session on contaminants, including micro-plastics, at the 2011 meeting in the Russian Federation (<http://www.pices.int>). UNESCO-IOC has agreed to sponsor one GESAMP representative to attend that session.

8.2.12 The SETAC North America meeting (The Society of Environmental Toxicology and Chemistry) took place within the same time and place window as the PICES and NOAA meetings; therefore, it was decided to take advantage and attend the sessions of particular relevance to current GESAMP interests, with sponsorship from UNDP. This included the potential impacts of contaminants absorbed to micro-plastics. SETAC is considering setting up a special interest group on micro-plastics and the meeting provided a useful opportunity to discuss mutual interests with senior SETAC representatives. There is also an intention to propose a Pellston Workshop on the impacts of contaminants on micro-plastics (<http://www.setac.org/node/104>).

5th International Marine Debris Conference, 20-25 March 2011, Honolulu, United States

8.2.13 This major event attracted 440 participants from 38 countries. There were sessions on micro-plastics and the impacts of absorbed contaminants. Two outputs emerged that are likely to be referred to over the coming months and years: the Honolulu Strategy and the Honolulu Commitment. Further information about these and the conference programme and subsequent developments can be found at <http://www.5imdc.org/>. GESAMP was represented, sponsored by SIDA, and this afforded an opportunity to describe the Paris Workshop outcomes and take part in discussions about options for future programmes.

8.2.14 A STAP/GEF Side Event provided an opportunity for a more policy-related session, and this was followed by an informal meeting with UNEP, STAP, CBD and GESAMP represented. The main purpose was stated by Mr. Lev Neretin to be to help formulate recommendations to take to the GEF Council. There seems to be enthusiasm to re-consider litter in relation to the Convention on Biological Diversity and contaminants on micro-plastics in relation to discussions around the Stockholm Convention process on persistent organic pollutants.

8.2.15 The plastics industry used this Side Event to launch the Joint Declaration for Solutions on Marine Litter <http://www.plasticseurope.org/plastics-sustainability/marine-litter.aspx>.

Discussion and action taken by GESAMP

8.2.16 It is clear that there is global acceptance, across a wide range of sectors, organizations and individuals, of the need to tackle and reduce marine litter, especially plastics. There is agreement that the potential impacts of micro-plastics, and of the contaminants absorbed to micro-plastics, is poorly known and further research and monitoring are required to help reduce the uncertainties. There is a danger that a number of initiatives may be started that could duplicate efforts to address this problem. However, there does appear to be a widespread feeling in the wider community that GESAMP could play an important role in bringing together the relevant broad expertise, with a global perspective, to undertake a review of current knowledge of the behaviour of micro-plastics and recommend future directions.

8.2.17 GESAMP discussed a range of options in taking this forward. In particular, the Sponsoring Organizations were asked to indicate the degree to which they supported the setting up of a new Working Group, and the scope of the topics that could be covered. It was agreed that UNESCO-IOC and UNEP would jointly take the lead in sponsoring this activity, with UNIDO and IMO offering financial support. IAEA indicated their approval, particularly in relation to the potential use of radioactive tracers to quantify biological uptake of contaminants from plastics. A representative of Plastics Europe outlined the recent Declaration by the plastics industry to support efforts to reduce the quantity of plastic debris reaching the ocean. He indicated that Plastics Europe would, in principle, be willing to provide financial support for a new GESAMP Working Group. He also informed the meeting that Plastics Europe and the American Chemistry Council would be meeting shortly to discuss ways of taking forward the Declaration. The Members indicated their willingness to work with industry to tackle this important issue.

8.2.18 GESAMP took note of the recommendations of the Micro-plastics Workshop in discussing the potential terms of reference of the new Working Group and agreed these should be focussed on a limited number of critical topics, but viewed in the context of the overall marine debris and waste management problem. It was recognised that the work programme is likely to extend over several years and that it would be appropriate to separate it into several phases. These would be complementary but could be conducted either concurrently or sequentially, depending on the funding profile, the complexity of the issues, and the timing and results of related initiatives (e.g., NOAA, EU, UNEP Regional Seas, TWAP).

8.3 Correspondence Group on Environmental Quality Standards (EQS) to explore the possibility of global standards and to expand the GESAMP web site section on EQS

8.3.1 The Correspondence Group reported that some tables of EQS had been inadvertently removed from the GESAMP website and replaced by hyperlinks. It was agreed to replace the original tables for better readability and to generally update the EQS pages. One member volunteered to make a start with identifying additional EQS on the Stockholm Convention list of persistent organic pollutants. Finally, the Technical Secretary of IAEA kindly provided GESAMP with a large volume of EQS from various parts of the world including the Republic of Korea.

8.4 Correspondence Group on Disinfection By-products (see R&S 37, page 44).

8.4.1 This issue was deferred until GESAMP 39 in 2012 and two members offered to prepare a brief proposal.

8.5 Correspondence Group to further on endocrine disruption as a result of hypoxia in the marine environment.

8.5.1 A scoping paper entitled "Hypoxia: new insights on an old pressing environmental problem" prepared by Mr. Rudolf Wu was presented at GESAMP 37 in 2010, highlighting that hypoxia and anoxia caused by eutrophication are amongst the most pressing environmental problems in marine systems worldwide. The scoping paper is published in GESAMP Reports and Studies No.81, Annex VII.

Discussion

8.5.2 It was recalled that GESAMP 37 agreed to further develop this topic and to build support gradually through the medium of a workshop and that the ToR for the workshop would be developed intersessionally. This had been delayed due to GESAMP's full agenda in 2010/2011. However, GESAMP agreed to make every effort to organize this in the coming intersessional period. UNDP had offered to host such a workshop in New York and to help the Correspondence Group in identifying extra-budgetary funding. It is intended through the workshop to attract funding and connect with the appropriate bodies such as FAO, National Fisheries Authorities, and the World Fish Centre. It was also suggested to involve, if possible, WHO, the Global Partnership on Nutrient Management, ICES and IUCN.

9 SIDE EVENT “RADIOACTIVE CONTAMINATION OF THE MARINE ENVIRONMENT, WITH PARTICULAR REFERENCE TO THE FUKUSHIMA NUCLEAR ACCIDENT”

9.1 The workshop was organized by Mr. Jae Oh, Mr. Hartmut Nies and Ms. Maria Betti of the IAEA Environment Laboratories in Monaco, and took the form of 7 presentations (see below) given by scientists from Japan, IAEA-EL, Italy, France and Australia:

Hartmut Nies (IAEA): “Fukushima Nuclear Power Plants’ impact on the marine environment”

Yuichiro Kumamoto (Japan): “Monitoring activity in the marine environment of the Fukushima NPP area”

Mats Eriksson (IAEA): “The marine Fukushima ¹³¹I and ^{134,137}Cs source terms”

Emmanuel Bosc (IAEA and SIROCCO group): “Modelling results of the Fukushima release to the marine environment”

Roberta Delfanti (Italy): “The Fukushima fallout in the NW Mediterranean Sea”

Ronald Szymczak (Australia): “Ecological Risk Analysis of radioactive releases from the Fukushima Daiichi nuclear power plant (Japan) on marine biota”

Sabine Charmasson (France): “Marine monitoring and marine ecosystem vulnerability”

9.2 Several of these talks gave very recent observations and detailed information on the situation of the reactors, present levels and distribution of released radionuclides in nearby areas of the accident, modelling efforts to predict future radionuclide distributions in the medium- and long-term, and recent monitoring measurements in Europe and comparisons with levels there following the 1986 Chernobyl accident, and risk assessment analyses that could be applied in context of the Fukushima accident in Japan.

9.3 GESAMP found the workshop extremely informative and took note of this new information and all the activities designed to assess the present problem in the marine environment near Fukushima. The Group commended the efforts of all the participants at the workshop, and in particular IAEA-Environment Laboratories, to address the current problem which has generated so much concern worldwide.

10 DATE AND PLACE OF GESAMP 39

10.1 GESAMP accepted the kind offer of UNDP to host the 39th session of GESAMP at the UNDP Headquarters in New York from 15 to 20 April 2012. GESAMP welcomed this offer as confirmation of UNDP's status as Sponsoring Organization of GESAMP.

11 FUTURE WORK PROGRAMME

GESAMP Working Groups, correspondence groups and task teams

11.1 Evaluation of the hazards of harmful substances carried by ships

(Working Group 1)

Lead Agency: IMO

Co-sponsors: none

Chairperson: C. T. Bowmer

Members: S. le Floch, T. Höfer, D. James, W. Jiang, M. Morrissette, H. Saito, (two vacancies), N. Soutar (consultant)

Product: Hazard profiles of new substances & correspondence with the chemicals industry

Maintenance and update of 900 GESAMP hazard profiles

GESAMP Reports and Studies 64, 2nd edition

Planning: 49th Session in April 2012 at IMO in London

11.2 Review of applications for “Active Substances” to be used in ballast water management systems

(Working Group 34)

Lead Agency: IMO

Co-sponsors: none

Chairperson: J. Linders

Members: T. Borges, S. Gollasch, S. Hanayama, A. Dock, K. Rhie, F. Stuer-Lauridsen, D. Tongue, E. Oyewo, (3 vacancies), A. Craven (consultant)

Product: Evaluation of the risks to the environment, human health and the ships' crew from ballast water management systems

Planning: A minimum of four meetings are planned before GESAMP 39.

11.3 Metals (formerly mercury) Working Group

(Working Group 37)

Lead Agency: UNEP

Co-sponsors: IAEA

Chairperson: H. Keenan

Members: B. Alo, J. Davee-Guimaraes, C. Davidson, T. Hennessey, M. Horvat, J. Hurley, J. Leaner, R. Mason, A. Songsasen, T. Tamiyasu, E. Vasileva. The members will be divided into two task teams.

Product: Preparation of GESAMP Reports and Studies No.86 on "Mercury in the Marine Environment".

Planning: Drafting and external peer review to be completed before GESAMP 39 - for consideration by GESAMP either intersessionally or at the 39th Session.

11.4 Atmospheric input of chemicals to the ocean Working Group

(Working Group 38)

Lead Agency: WMO

Co-sponsors: IMO, SCOR,

Chairpersons: R. Duce, P. Liss

Members: F. Dentener, K. Hunter, M. Kanakidou, N. Kubilay, N. Mahowald, G. Okin, J. Prospero, M. Sarin, V. Surapipith, I. Tegen, M. Uematsu, T. Zhu

Product: Three or four peer-reviewed papers in the scientific literature in the area of phosphorous, nitrogen, iron and organic matter deposition from the atmosphere to the oceans.

Preparation of GESAMP Reports and Studies No. 84 on "The Atmospheric Input of Chemicals to the Ocean"

ToR for a reconstituted Working Group 38 on the atmospheric input of Nitrogen to the ocean.

Planning: Drafting of Reports and Studies No.84 and external peer review to be completed before GESAMP 39 - for consideration by GESAMP, either inter-sessionally or at the 39th Session. ToR to be completed and approved by GESAMP inter-sessionally.

11.5 Global trends in pollution of coastal ecosystems: retrospective ecosystem assessment

(Working Group 39)

Lead Agency: IAEA

Co-sponsors: UNIDO

Chairpersons: A.C. Ruiz-Fernandez, F. Carvalho

Members: P. Alvarez-Torres, D. Dang, E. Nyarko, J. Sanchez-Cabeza, M. Sarin, J. Sericano, E. Sombrito, N. Theobald, A. Wagener

Product: Reports on work items 1 and 2

Planning: By GESAMP 39

11.6 Global assessment of (micro)-plastics

(Working Group 40)

Lead Agency: IOC, UNEP

Co-sponsors: IMO, UNIDO, IAEA, Plastics Europe

Chairperson: P. Kershaw

Members: L. Awosika, (other members to be invited)

Product: ToR and project plan

Planning: ToR intersessionally, WG report within 3 years (2014)

11.7 The standing Task Team on the UN Regular Process and TWAP

Lead Agency: IOC, UNEP

Co-Chairpersons: C. T. Bowmer, M. Huber

Members: WG Chairs (37, 38, 39, 40), plus Correspondence Group leaders (hypoxia, biomagnification)

Product: A work plan and budget for participation in the TWAP indicator-based assessment (2012-2014)

Planning: The Chairman of GESAMP to visit the TWAP team at UNESCO-IOC (June 2011)

The members to firm up on the selected indicators and the required in-kind and requested budgets for each indicator.

11.8 Correspondence Groups

The following activities will continue during the intersessional period:

- .1 Correspondence Group on Environmental Quality Standards (EQS) to explore the possibility of global standards and to continue to expand the GESAMP web site pages on EQS.

Lead: H. Keenan

Members: A-C. Ruiz Fernandez, E. Ajao, J. Oh and J. Linders

- .2 The Correspondence Group on Endocrine Disruption and Hypoxia will continue to develop plans to hold a workshop in the course of late 2011 or early 2012, including the identification of the necessary sources of funding. If no other opportunities arise, this could be held back to back with GESAMP 39 in New York, hosted by UNDP

Lead: R. Wu,

Members: E. Ajao, A-C Ruiz Fernandez, L-M Chou

- .3 The Correspondence Group on Biomagnification in Top Predators and its Ecological and Human Health Implications will, on the basis of the scoping paper provided (see Annex VIII), develop a) ToR and a programme for an international workshop on the ecological consequences of bioconcentration, b) prepare with CIESM a high level meeting with stakeholders on the human health issues of biomagnifications and c) establish contacts with FAO/WHO.

Lead: C. T. Bowmer

Members: E. Ajao, L-M Chou, T Höfer, R. Wu

- .4 The Correspondence Group on Disinfection By-products will prepare a brief proposal, which could after discussion at GESAMP 39 evolve into a scoping document. The issue is that based on the disinfection systems for ballast water to avoid bio-invasion of organisms, an additional amount of disinfection by-products will be discharged into the marine environment compared to the amounts discharged by cooling systems using disinfection as well.

Lead: J. Linders

Members: M. Huber, C. T. Bowmer

12 ANY OTHER BUSINESS

Peer Review of the “Draft initial integrated assessment of the Mediterranean Sea: fulfilling step 3 of the ecosystem approach process” for UNEP Mediterranean Assessment Plan (MAP)

12.1 The Chairman recalled that UNEP/DEPI/MAP had requested GESAMP to peer review the “Draft initial integrated assessment of the Mediterranean Sea: fulfilling step 3 of the ecosystem approach process”. It was noted that this peer review was in the process of completion. The report, which is one step towards an ecosystem approach to marine environmental management, provides a fascinating cross section of the status of the Mediterranean Sea, an area of great contrasts in terms of development and consequent pressures on the marine environment.

12.2 It was noted that the Peer Review Team had been assembled from GESAMP Members and several additional scientists. It was also noted that the Team had provided numerous and substantial comments and that these would need to be largely addressed before GESAMP could agree to the finalization of the assessment. Nevertheless, GESAMP would not hold up its release if UNEP/MAP had not fully implemented the comments. It was further noted that UNEP/MAP had provided funds for the services undertaken.

Peer review of the GloBallast Partnerships report: Establishing Equivalency in the Performance Testing and Compliance Monitoring of Emerging Alternative Ballast Water Management Systems

12.3 In introducing document GESAMP 38/12, the Chairman recalled that on 8 February 2010, GEF-UNDP-IMO GloBallast Partnerships requested GESAMP to peer review the abovementioned report which had been prepared by two technical consultants. GESAMP’s Executive Committee approved this peer review activity at GESAMP 37. It was noted that the report was again reviewed

by a Task Team consisting of GESAMP members as well as external specialists in shipping, ballast water treatment and its effects. The team, through the Chairman of GESAMP, provided their review to GloBallast partnerships with its findings on 2 July 2010 and recommended substantial improvements and additions to the report.

12.4 In subsequent discussions with GloBallast Partnerships and IMO, it became apparent that a different approach would be needed to complete the report and to take care of GESAMP's comments. At the recommendation of GESAMP, GloBallast Partnerships contracted Mr. Rick Boelens, a former member of GESAMP, as a technical editor to add the missing summary sections to the report and to comprehensively address GESAMP's comments on risk assessment.

Action by GESAMP

12.5 Having noted that the document had been completely overhauled and that IMO would take care of any remaining editorial matters, GESAMP approved the report on "Establishing equivalency in the performance testing and compliance monitoring of emerging alternative ballast water management systems (EABWMS)". GESAMP also agreed to its publication later this year as GloBallast Partnerships Monograph 20 and GESAMP Reports and Studies No.83, in recognition of GESAMP's input to the report. This report is intended to stimulate discussion at IMO's Marine Environmental Protection Committee regarding novel systems which avoid the use of biocides to disinfect ships ballast water and prevent the transport of non-indigenous species.

13 ELECTION OF CHAIRPERSONS

13.1 The Group unanimously:

- .1 Re-elected Mr. Tim. Bowmer as the Chairman of GESAMP for the intersessional period and sessions 39 and 40 of GESAMP
- .2 Re-elected Mr. Peter Kershaw as 1st Vice-Chairman for the intersessional period and session 39 of GESAMP; and
- .3 Elected Mr. Manmohan Sarin as 2nd Vice-Chairman for the intersessional period and session 39 of GESAMP.

13.2 The Group, wholeheartedly endorsed the decision by ExCom to offer Mr. Lawrence Awosika, former Vice Chairman, the honorary title of GESAMP Member Emeritus in recognition of his long-standing contribution to the work of GESAMP, a title which Mr. Awosika accepted with appreciation.

14 CONSIDERATION AND ADOPTION OF THE REPORT OF GESAMP 38

14.1 The report of the thirty-eighth session of GESAMP was considered and approved by correspondence.

15 CLOSURE OF THE SESSION

15.1 The Chairman of GESAMP, Mr. Tim Bowmer, closed the thirty-eighth session of GESAMP on Friday, 13 May 2011 at 15:00 hrs.

ANNEX I

AGENDA

38th session of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) to be held at the IAEA Environment Laboratories, Monaco, from 9 to 13 May 2011

Sunday, 8 May, 13:30 – 17:30 p.m. (closed sessions)

- 1 Informal meeting of GESAMP members
- 2 First meeting of the Executive Committee of GESAMP (ExCom)

Monday, 9 May

Opening of the session

- 1 Adoption of the agenda
- 2 Report of the Chairperson of GESAMP
- 3 Report of the Administrative Secretary of GESAMP
- 4 GESAMP Office matters
- 5 Planning of GESAMP activities:
 - .1 Evaluation of the hazards of harmful substances carried by ships (WG 1: IMO leading)
 - .2 Review of applications for 'active substances' to be used in ballast water management systems (WG 34: IMO leading)
 - .3 Expanded scientific review of mercury and its compounds and threats to the marine environment (WG 37: UNEP leading)

Tuesday, 10 May

- .4 Atmospheric input of chemicals to the ocean (WG 38: WMO leading)
- .5 Establishment of trends in global pollution in coastal environments (WG 39: IAEA leading)
- 6 Contributions to the UN Regular Process/GEF Transboundary Water Assessment Programme

Wednesday, 11 May

- 7 Identification of new and emerging issues regarding the degradation of the marine environment of relevance to governments and sponsoring organizations

- 8 Scoping activities
- Microplastics
 - Hypoxia
 - Biomagnification
 - By-products

Thursday, 12 May

- 9 GESAMP Side Event: "Radioactive contamination of the marine environment, with particular reference to the Fukushima nuclear accident"

Friday, 13 May, 09.00 to 12.00 a.m.

- 10 Date and place of GESAMP 39
- 11 Future work programme
- 12 Any other business
- 13 Election of chairpersons
- 14 Consideration and adoption of the report of GESAMP 38
- 15 Closure of the session

Friday, 13 May, p.m. (closed session)

Second meeting of the Executive Committee of GESAMP (ExCom)

ANNEX II

LIST OF DOCUMENTS

GESAMP 38/1	Admin. Secretary	Provisional Agenda
GESAMP 38/1/1	Admin. Secretary	Annotations to the Provisional Agenda
GESAMP 38/2	The Chairman	Report of the Chairman of GESAMP
GESAMP 38/3	Admin. Secretary	Report of the Administrative Secretary of GESAMP
GESAMP 38/4	GESAMP Office	GESAMP Office Matters, GESAMP Pool of Experts
GESAMP 38/5	Chairman of WG 38	Planning of GESAMP Activities: Atmospheric Input of Pollutants to the Oceans
GESAMP 38/5/1	Chairman of WG 1	Planning of GESAMP Activities: Evaluation of the Hazards of Harmful Substances Carried by Ships
GESAMP 38/5/2	Report of Working Group 34	Planning of GESAMP Activities: Review of Applications for 'Active Substances' to be used in Ballast Water Management Systems
GESAMP 38/5/3	Chairperson of WG 37	Planning of GESAMP Activities: Expanded Scientific Review of Metals (Formerly Mercury) in the Marine Environment
GESAMP 38/5/4	Report of Working Group 39	Planning of GESAMP Activities: Global Trends in Pollution of Coastal ecosystems
GESAMP 38/6/A	Joint Coordinator, Group of Experts of the Regular Process	Contributions to the UN Regular Process
GESAMP 38/6/B	UNEP	Contribution to the GEF Transboundary Waters Assessment Programme, GEF TWAP Medium Size Project
GESAMP 38/8/1	Chairman of GESAMP	Biomagnification of Contaminants in Marine Top Predators and its Ecological and Human Health Implications
GESAMP 38/9	IAEA	Workshop on 'Radioactive Contamination of the Marine Environment, with Particular Reference to the Fukushima Nuclear Accident'
GESAMP 38/12	Chairman of GESAMP	Any Other Business, Peer Review of the GloBallast Partnerships Report: Establishing Equivalency in the Performance Testing and Compliance Monitoring of Emerging Alternative Ballast Water Management Systems

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ANNEX IV

ACTIVITIES AND ACHIEVEMENT BY THE SPONSORING ORGANIZATIONS OF GESAMP DURING THE INTERSESSIONAL PERIOD

This document provides a summary of the Organizations' achievements since GESAMP 37 (February 2010) from IMO, IAEA, IOC/UNESCO, UNDP, UNEP, UNIDO, UN-DOALOS and WMO.

IMO

Moving towards regulation of ocean fertilization under the London Convention and Protocol (LC/LP)

As reported to previous sessions of GESAMP, the governing bodies under the London Convention and Protocol started regulating ocean fertilization activities in 2008 (resolution LC-LP.1 (2008)) by declaring that "given the present state of knowledge, ocean fertilization activities other than legitimate scientific research should not be allowed". In 2010 they completed the "Assessment Framework for Scientific Research Involving Ocean Fertilization" (resolution LC-LP.2 (2010)), which had been developed since May 2007 and as a requirement under resolution LC-LP.1 (2008). This Assessment Framework guides Parties as to how proposals they receive for ocean fertilization research should be assessed and provides criteria for an initial assessment of such proposals and detailed steps for completion of an environmental assessment, including risk management and monitoring.

Work will continue in 2011 and 2012 on giving the regulation of these activities a stronger basis in international environmental law, with an overall aim to "establish a global, transparent and effective control and regulatory mechanism for ocean fertilization activities and other activities that fall within the scope of LC and LP and have the potential to cause harm to the marine environment" (See also paragraph 46 below).

CO₂ sequestration in sub-seabed geological formations

In 2010 a work plan with timelines was adopted to conduct the review of the 2007 CO₂ Sequestration Guidelines in light of the 2009 amendments to LP Article 6 under resolution LP.3(4), allowing the use of transboundary sub-seabed geological formations for sequestration purposes. This review has begun in 2011 and is aimed at completion in 2012. The LC/LP Scientific Groups at their recent meeting (11–15 April 2011, Tallinn, Estonia) devoted their, off-the-record "Science Day" discussions to the topic of "Methodologies for monitoring of CO₂ in the oceans".

Co-operation between UNEP and the London Convention and Protocol

The governing bodies, in reviewing progress on co-operation with UNEP-GPA regarding "riverine and sub-sea disposal of tailings and associated wastes from mining operations", agreed to continue their efforts to determine the type and extent of this issue, as well as the associated environmental controls in place, due to the fact that only a limited number of replies had been received from Parties and non-Parties to the two questionnaires distributed in 2010. The overall aim of this joint activity remains the preparation of a policy decision at a future session, and possibly the development, from a regulatory perspective, of a general guidance document.

"Monitoring and Assessment Project" in relation to sea disposal activities

The governing bodies were informed of the progress with the "Monitoring and Assessment Project in relation to sea disposal activities", launched in October 2009. The objective of the project is to assess the experiences of Parties with implementation of the "Revised Guidelines for the assessment of wastes or other matter that may be considered for dumping" in relation to the field monitoring activities they should undertake to verify the hypothesized impacts on the marine

environment of licensed dumping operations. In discussing the report entitled "Review of reported field monitoring activities under LC and LP and development of an LC/LP monitoring database", the governing bodies: (1) noted the substantial reporting deficiencies under LC/LP regarding field monitoring; (2) reaffirmed that LP Article 9.4.1 created a clear mandatory obligation to report on field monitoring as per LP Article 9.1.3; and (3) agreed to give first priority to the development of a clear, concise and simplified field monitoring reporting format compared with the one in use since 1979.

For further information on the activities under the London Convention and Protocol visit: <http://www.londonprotocol.imo.org>.

Implementation of the Anti-Fouling Systems Convention: Guidelines for survey and certification of anti-fouling systems on ships

The IMO Anti-Fouling Systems (AFS) Convention entered into force on 17 September 2008. As a consequence of this new regime, existing organo-tin-based anti-fouling systems on ships would have to be replaced or over-coated in the near future. To date, the Convention has 50 Parties, representing 78.70% of the world's gross tonnage. Standardized adherence to the guidelines of the AFS Convention is required for its effective implementation and enforcement, however, in order to achieve this, all the interested stakeholders require a clear understanding of the process of the surveys, and of issuance and endorsement of the certificates. Therefore, in October 2010, MEPC 61 adopted the "2010 Guidelines for survey and certification of anti-fouling systems on ships" by resolution MEPC.195(61).

Implementation of the Ballast Water Management Convention: guidance to ensure safe handling and storage of chemicals to treat ballast water

Work continued in preparation for the entry into force of the 2004 Ballast Water Management Convention (BWM) aimed to prevent, minimize and ultimately eliminate the transfer of harmful aquatic organisms and pathogens through the control and management of ships' Ballast Water and Sediments. In October 2010, MEPC 61 approved both the "Framework for determining when a Basic Approval granted to one ballast water management system may be applied to another system that uses the same Active Substance or Preparation", and the "Guidance document for Administrations on the Type Approval process for ballast water management systems in accordance with Guidelines (G8)". It also agreed to grant final approval to ten additional ballast water management systems, bringing the total number to 18. To date, ten systems have been type approved by the relevant Administrations being now commercially available. However, it was noted that a number of challenges are yet to be addressed in relation to some special types of ships, in particular seagoing unmanned barges, semi-submersibles and heavy lift crane vessels. See the report of WG 34 (GESAMP 38/5/1) for further information on assessment of ballast water management technologies.

Ship recycling

The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 (HK-SRC), was open for signature until 31 August 2010. France, Italy, Netherlands, Turkey and Saint Kitts & Nevis have signed the Convention, subject to ratification. To encourage accession to the Convention, MEPC 59 adopted, in 2009, the "Guidelines for the Development of the Inventory of Hazardous Materials". Work is continuing on three further documents: (1) guidelines for safe and environmentally sound ship recycling; (2) guidelines for the development of the Ship Recycling Plan; and (3) guidelines for the authorization of Ship Recycling Facilities, all aimed at completion by MEPC 62 in July 2011.

Implementation of the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC), and the Protocol on Preparedness Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances (OPRC-HNS Protocol)

Manuals and guidance documents

The Guidance document on the identification and observation of spilled oil and the revised Manual on oil pollution prevention were approved by MEPC 61 in October 2010. Moreover, the following manuals and guidelines were finalized by the OPRC-HNS Technical Group: (1) the Operational guide on the use of sorbents, (2) Oil spill waste management decision support tool, (3) Guideline for oil spill response in fast currents, and (4) Joint IMO/IPIECA Guidance on sensitivity mapping for oil spills. These documents will be submitted to MEPC 62 for approval.

IMO support to Oil Spill Conferences

IMO is a regular contributor to the triennial conference series on management of marine and inland oil spills. In April 2010 IMO contributed to the Asia-Pacific's International Oil Spill Prevention & Preparedness Conference (Spillcon) in Melbourne, Australia. This four-day conference included a three-day plenary session covering a range of prevention and preparedness topics, as well as a review of several case studies (e.g. the Pacific Adventurer incident). IMO contributed to the conference through the organization of a one-day Bunker Convention Workshop for the South Pacific Regional Environment Programme (SPREP) countries, in collaboration with the Australian Maritime Safety Administration (AMSA) (for more information visit: <https://www.spillcon.com/>). Moreover, in March 2011, IMO and the World Maritime University (WMU) organized the WMU/IMO Conference on Oil Spill Risk Management, Preparedness, Response and Contingency Planning in the Shipping and Offshore Industries, in Malmö, Sweden.

Support and assistance to Member States in response to the Gulf of Mexico platform incident

Following the Macondo Deepwater Horizon incident, which occurred in the Gulf of Mexico on 20 April 2010, IMO received requests for international assistance from two countries: the Bahamas and Cuba. In response to these requests, IMO was able to mobilize expert teams to assist the respective national authorities in both countries by: (1) identifying the level of risk of oil coming ashore; (2) assessing each country's capacity to respond, in the face of any potential impacts from the incident; and (3) reviewing bilateral and multilateral agreements, should additional assistance be urgently required. The reports of both missions were finalized and the Bahamas' technical advisory mission report is posted to the RAC/REMPEITC-Caribe website at: <http://www.cep.unep.org/racrempeitc>.

Major Projects

GEF/IBRD/IMO Marine Electronic Highway (MEH) Demonstration Project

Progress can be reported on both major components of the MEH Demonstration Project:

- 1 the hydrographic survey activity relating to the survey of a portion of the upper Traffic Separation Scheme (TSS) of the Straits of Malacca and Singapore covering 621.3 square kilometres, was completed in March 2011 and the data generated will be used to provide a better understanding of the sand wave phenomenon in the Straits; and
- 2 the MEH Data Centre IT System, in Batam, Indonesia, received an IT system as part of the Project and the data Centre is expected to be operational by June 2011.

GEF-UNDP-IMO GloBallast Partnerships

Since 2008, IMO has been implementing the GloBallast Partnerships Project with as aim to assist developing countries to reduce the risk of aquatic bio-invasions mediated by ships' ballast water and sediments. This project expands and builds on a successfully completed GEF-UNDP-IMO pilot project (GloBallast Project) and supports the implementation of the BWM Convention (See also paragraphs 20 above and 65 below).

Since GESAMP 37 significant progress has been achieved at the national and regional level in terms of policy and regulatory harmonization. The GloBallast Partnerships Project was extended to late 2014, and a joint initiative was instigated with the European Bank for Reconstruction and Development (EBRD) to support training in East European countries. Moreover, the 5th International Conference and Exhibition in BWM was held from 2 to 4 November 2010 in Singapore, back to back with the 2nd global meeting of test facilities for Ballast Water Treatment Systems. In addition, a number of activities were carried out under the Global Industry Alliance (GIA) for marine bio-security to support the shipping industry's efforts to comply with the BWM Convention.

In addition to the above, a joint GIA-GloBallast-GESAMP report on "Establishing Equivalency in the Performance Testing and Compliance Monitoring of Emerging Alternative Ballast Water Management Systems: A Technical Review" has been prepared and is currently in the final stages of being published as a joint Globallast Monograph/GESAMP Reports & Studies (No. 83).

Amendments to MARPOL Annex I: inclusion of a new chapter 9 on special requirements for the use or carriage of oils in the Antarctic area

MEPC 60 adopted the amendments to MARPOL Annex I for inclusion of a new chapter 9 on special requirements for the use or carriage of oils in the Antarctic area which should enter into force on 1 August 2011. These new regulations establish a ban on the use or carriage as cargo of heavy grade oils, while making an exception for search-and-rescue and salvage vessels, and determine that cleaning of tanks/piping if heavy grade oil was carried previously is not required, while again making an exception for SAR and salvage vessels.

Amendments to MARPOL Annex III: regulations for the prevention of pollution by harmful substances carried by sea in packaged form

MEPC 61 adopted amendments to MARPOL Annex III. These amendments were necessary to revise the current criteria defining 'marine pollutants' with the overall aim to bring them in line with recent revisions to the Globally Harmonized System (GHS) for identifying environmentally hazardous substances and for revising certain documentation provisions in the Annex, as well as to align them with proposed amendments to the SOLAS regulation VII/4. The revised MARPOL Annex III should enter into force on 1 January 2014 in order to align it with the planned timing for the next amendments to the International Maritime Dangerous Goods Code.

Amendments to MARPOL Annex IV (Sewage)

MEPC 61 approved an amendment to MARPOL Annex IV, at the proposal of the Baltic Sea States, by which the 'Special Areas' concept is incorporated and a ban is established on the discharge of sewage from passenger ships within those areas, except when complying with new strict standards for nutrient concentration in the effluent of sewage treatment plants on ships. Prior to the amendments, ships have been able to discharge sewage into port reception facilities in Baltic Sea ports.

Review of MARPOL Annex V (Garbage)

In 2009 MEPC 59 launched a comprehensive review of MARPOL Annex V Regulations for the prevention of pollution by garbage from ships and the associated Revised Guidelines for the implementation of MARPOL Annex V. Draft amendments have been prepared to MARPOL Annex V addressing the following issues: (1) definitions; (2) general prohibition on discharge of garbage into the sea; (3) waste minimization on board; (4) loss of fishing gear; (5) availability of port reception facilities; (6) management of cargo residues, including hold washings; (7) and other technical amendments. MEPC 61 approved these amendments and MEPC 62 will now consider

the formal adoption of the amendments and the associated Revised Guidelines for the implementation of MARPOL Annex V.

Prevention of air pollution from ships, MARPOL Annex VI

MEPC 60 adopted amendments to MARPOL Annex VI to designate the coastal waters of the United States, including parts of Hawaii, Canada and France (Saint-Pierre-et-Miquelon) as an Emission Control Area for NO_x and SO_x (North American Emission Control Area). These amendments are expected to enter into force on 1 August 2011 where, during the first twelve months after entry into force of the amendments, ships operating in these areas are exempted from SO_x requirements.

MEPC 61 approved amendments to MARPOL Annex VI to designate the coasts of the Commonwealth of Puerto Rico and the United States Virgin Islands as an Emission Control Area for NO_x and SO_x with a view to formal adoption at MEPC 62 in July 2011. Furthermore, MEPC 61, recognizing the need to prepare for the required review regarding timing and procedure, agreed to establish the Correspondence Group on Assessment of Availability of Fuel Oil under MARPOL Annex VI. Also, MEPC 61 adopted the 2010 Guidelines for monitoring the worldwide average sulphur content of residual fuel oils supplied for use on board ships to expand the monitoring programme to all petroleum types covered by MARPOL Annex VI.

Energy Efficiency & Greenhouse Gas Measures: Technical and operational measures to promote energy efficiency and-Market Based Measures

Following the dissemination of a package of interim and voluntary technical and operational measures to promote the energy efficiency of international shipping, draft regulatory text was finalized at MEPC 61 for the following measures: Energy Efficiency Design Index (EEDI); Ship Energy Efficiency Management Plan (SEEMP). MEPC 62 will now consider the formal adoption of these amendments to MARPOL Annex VI.

MEPC 59 agreed, by majority, that a market-based mechanism was needed as part of a comprehensive package of measures for effective regulation of GHG emissions from international shipping. At MEPC 60, the Expert Group on Feasibility Study and Impact Assessment of possible Market Based Measures (MBM-EG) was established and analysed ten proposals for targeted GHG reductions, through either in-sector emission reductions from shipping or out-of-sector emissions reductions through the collection of funds to be used for mitigation activities in other sectors, that would contribute towards the overall goal of reducing global GHG emissions. Furthermore, in March 2011, an intersessional working group meeting was held in London with the view to advising MEPC as to what market-based mechanism to bring forward as a possible mandatory IMO instrument.

IAEA

Coordinated Research Project (CRP) “Applications of Radiotracer and Radio-assay Technologies to Seafood Safety Assessment”

Within the IAEA Coordinated Research Project (CPR) framework a collective dataset was prepared of quality-assured measurements of contaminants in selected seafood of value to developing countries. These data were used in the recent Cd risk assessment for CODEX ALIMENTARIUS. They contribute to the overall picture on occurrence which then feeds into the exposure assessment. The Joint FAO/WHO Expert Committee on Food Additives (JECFA) and/or related expert committee assessments of seafood contaminants based on the CRP data provided, are expected to lead to the potential establishment of Codex maximum levels in seafood, and the facilitation of greater export in seafood particularly from developing to developed countries (further

information on this CPR is available at: www-crp.iaea.org/html/rifa-search-crpbycrp.asp and www-naweb.iaea.org/nafa/fep/public/fep-nl-12-2.pdf .

Harmful Algal Blooms

Areas of partnership were identified by IAEA and NOAA. Further to this, in November 2011, these two agencies signed a Practical Agreement with the view to formalising the existing collaboration on the provision of technical assistance to member states for the mitigation of Harmful Algal Blooms socio-economic impacts.

Ocean Acidification

The Workshop entitled “Bridging the Gap between Ocean Acidification Impacts and Economic Valuation” was held at Oceanographic Museum, in Monaco, from 16 to 18 November 2011. The overall aim of the workshop was to enhance the dialogue between environmental science and economics with regard to ocean acidification. The scientists and socio- economists, from several international and national organisations, attended this important meeting (further information on this event is available at www.iaea.org/monaco/page.php?page=2251).

Provision of reference products for the marine environment and laboratory performance support

A total of 4 regional proficiency tests have been carried out, involving more than 50 member states. For the most reported analytes, the percentage of accepted values ranges from 80-100%. Three characterization campaigns with the expert laboratories from 26 member states were organised in order to characterise marine candidate reference materials for radionuclides, trace elements and organic pollutants respectively. To date, around 530 new units of reference materials are available for distribution, such as biota sample IAEA 452 (trace elements and methyl mercury), sea water IAEA - 418 (I-129) and mussel sample IAEA - 437 (radionuclides).

IOC of UNESCO

The UN Regular Process for global reporting and assessment of the state of the marine environment, including socio-economic aspects²

In 2009, the Ad Hoc Working Group of the Whole (AHWG) met for the first time and established to recommend a course of action to the United Nations General Assembly (UNGA) and agreed on the objectives and scope of the UN Regular Process. In February 2011, AHWG met for the third time: although the meeting made some progress, it did not fully achieve what it set out to do (i.e. endorsing the options proposed by the Group of Experts and establishing a Bureau). A few issues on the agenda are still pending (e.g., Guidance and a toolkit for the organization of the regional workshops). These items will be dealt with at the next meeting of AHWG in June 2011 and will need to be approved (further information and documents related to the Regular Process can be found at http://www.un.org/Depts/los/global_reporting/global_reporting.htm). For further information see also paragraph 9 above and the report on the UN Regular Process under agenda item 6A of this session.

IOC has supported the UN Regular Process through technical and financial support to the Group of Experts and through the organization of a regional meeting, in October 2010, with the aim to discuss regional cooperation under the Regular Process. Three members of the Group of Experts were invited to participate.

² The Assessment of Assessments (AoA) report and its Summary in six UN languages are available at <http://www.ungaregular-process.org>.

Transboundary Waters Assessment Programme (TWAP)

From 2009 to 2011 the IOC in partnership with UNEP and several other organizations, executed a GEF-funded Medium-Size Project (MSP) as a precursor to a Transboundary Waters Assessment Programme (TWAP). The IOC coordinated the LMEs and Open Ocean components of TWAP, and established two Working Groups (WGs) consisting of experts and institutional partners for development of the assessment methodologies for these two water systems. Each WG held two (partly joint) meetings (3 to 5 February 2010, at UNESCO Headquarters in Paris, France; and 21 to 23 June 2010, at GRID-Arendal, Norway). GESAMP, which was a key member of these two WGs, participated in the second meeting and contributed to the methodology for assessment of marine pollution. A sixth WG consisting of representatives of the five water system WGs focused on interlinkages between water systems and data and information management for TWAP.

A Full-Size GEF Project is currently being developed for the first assessment, which will be a baseline global assessment expected to be carried out between 2012 and 2014. Periodic assessments would then be sustained in the future through the partnership of agencies and organizations with the required data sets and expertise. GESAMP is considered a crucial institutional partner in TWAP for assessment of LMEs and Open Ocean areas. It is expected that the outcomes of TWAP would be directly applicable to the needs of the UN Regular Process and its requirement for harmonized assessment methodologies, as well as to other global (such as the UNEP GEO) and regional assessment processes. For further information, see also the separate report on TWAP under agenda item 6B of this session.

Joint action with ICES on nutrient standards

Comparability and traceability of nutrient data in the world's oceans are fundamental issues in marine science, and particularly for studies of global change. An IOC-ICES Study Group on Nutrients Standards (SGONS) will undertake specific tasks to develop Reference Materials for Nutrients in Seawater (RMNS) and measurement protocols to improve the comparability and traceability of nutrient data. The oceanography community has been continuing to improve comparability of nutrient data in many ways, including international inter-comparison exercises and development of nutrient reference materials.

SGONS met at the UNESCO Headquarters in Paris, France, from 22 to 23 March 2010 and focused on its ongoing activities and future international collaborations to establish global comparability of the nutrient data from the world's oceans. Thirty-two participants from 11 countries attended the meeting and their discussions included: (1) developing and establishing RMNS, collaborating with producers of currently available RMNS; (2) the background and history of SGONS and the international nutrients scale system (INSS); (3) progress with the production and certification of RMNS materials; and (4) the nutrient analysis chapter for the updated repeat hydrography manual.

In particular, the results obtained with RMNS solutions used on the P6 reoccupation cruise (2009 to 2010), by the Scripps Institute of Oceanography, showed that considerable improvement could be made in the internal comparability of the data by referencing it to the RMNS results and related good comparability with the previous P6 cruise in 2003. The meeting strongly endorsed the idea of a ship board workshop to take place between 2013 and 2014, during which major groups would carry out a full inter-comparison of all procedures including analytical methods on board a research ship.

The global stability test of RMNS is carried out by ten core laboratories of SGONS, started in 2009 and it will continue for two more years. It also was agreed to set up an international steering committee to plan the next inter-laboratory comparison study in 2011, which will extend the study to about 70 laboratories working globally on deep sea hydrography.

Joint action with ICES and IMO on Ballast and other Ship Vectors

The ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors (WGBOSV) critically reviews and reports on the status of shipping vector research with an emphasis on new developments in ballast water treatment technology, risk assessment, ballast water sampling devices, and selection of ballast water exchange zones to contribute to guidelines currently in preparation by IMO, and to address areas of specific interest, (e.g., chemical contaminants and microbiology in ballast water and sediment). WGBOSV met from 8 to 10 March 2010 in Hamburg, Germany, and its report is available at: www.ices.dk.

Ocean Fertilization

The IOC Secretariat, jointly with the International Surface Ocean Lower Atmosphere Study Project (SOLAS), finalized a summary for policymakers on ocean fertilization which was published in January 2011. The summary was prepared in response to a request from the IOC Member States. The summary considers the practicalities, opportunities and threats associated with large-scale ocean fertilization. These activities are controversial, and have attracted scientific and public criticism. The Convention on Biological Diversity (CBD) decided in 2008 to ban all ocean fertilization activities in non-coastal waters until there was stronger scientific justification, assessed through a global regulatory mechanism (See also paragraphs 13 and 14 above).

Nitrogen

The IOC has adopted a work plan for an integrated focus on coastal research. The main activity, named Nutrient Export from Watersheds 2 User Scenario Evaluation (NEWS2USE), aims to address the need for more quantitative analysis of impacts of nutrient loading and changing nutrient stoichiometry in coastal ecosystems. It will explore relationships between nutrient inputs, coastal chlorophyll, the occurrence of harmful algal blooms (HABs) and hypoxia, and related effects on coastal fish and fisheries, with the ultimate goal of developing novel datasets and innovative, predictive models, which will be shared with stakeholders.

NEWS2USE is part of IOC's input to the Global Partnership on Nutrient Management (GPNM). The GPNM which is coordinated by UNEP/GPA is a global partnership of scientists, policy makers, the private sector, NGOs and international organizations to address the growing problem of nutrient over-enrichment. NEWS2USE is closely related to a GEF full scale project proposal entitled "Global foundations for reducing nutrient enrichment and oxygen depletion from land-based pollution, in support of the Global Nutrient Cycle" which has been submitted to the GEF. An updated and revised plan for NEWS2USE will be presented to the IOC Assembly in June 2011.

Plastics and micro-plastics

A Workshop on plastics and micro-plastics was held at UNESCO Headquarters in Paris, France, from 28 to 30 June 2010, as part of GESAMP's remit to advise its sponsoring agencies (IMO, FAO, UNESCO-IOC, UNIDO, WMO, IAEA, UN, UNEP, and UNDP) on 'new and emerging issues' in relation to the degradation for the marine environment. The invited participants represented the scientific community, the chemicals industry and policy makers, as well as regional bodies and developing as well as developed Countries. See for the outcome of this Workshop the separate report under agenda item 8 of this session.

UNDP

Marine and Ocean Activities/Achievements

UNDP-GEF International Waters (IW) projects supported the implementation of governance reforms and stress reduction measures to: (1) address depleted fisheries in the Western and Central Pacific Ocean, Caspian Sea, and Benguela Current LME; (2) reduce nutrient pollution to the Rio de la Plata/Maritime Front and the seas of East Asia; (3) apply integrated approaches to coastal area management in East Asia; and (4) reduce risks from invasive species from ship ballast water (See also paragraphs 26 and 27 above).

UNDP-GEF IW foundational capacity building projects in the Yellow Sea LME, Guinea Current LME, Agulhas/Somali Current LMEs, Caribbean Sea LME and W. Indian Ocean Seamounts reported progress in development and adoption of their Transboundary Diagnostic Analyses (TDA) and/or Strategic Action Programmes (SAP). SAPs represent multi-country commitments to legal, policy and institutional reforms to address agreed priority transboundary environmental and marine resource concerns. In addition, the UNDP-GEF IW demonstration projects tested innovative financial, technical, policy, economic and other mechanisms to reduce coastal nutrient pollution to Havana Bays, and applied integrated approaches to watershed and coastal area management in the Caribbean and Pacific Small Island Developing States.

The UNDP-GEF IW capacity development and knowledge management projects helped: strengthen municipal wastewater management capacities in SIDS and African coastal countries; identify and disseminate best practices in nutrient management; codify and transfer GEF International Waters and other experience and best practice in putting in place effective transboundary legal and institutional frameworks; promote GEF-wide portfolio learning in marine, coastal and island states through the Coral Triangle Initiative IW:LEARN project.

More progress was made in strengthening and/or operationalizing five existing and/or emerging shared oceans governance institutions (commissions and Secretariats) including the Western and Central Pacific Fisheries Commission, PEMSEA Resource Facility, Caspian Convention Secretariat, Interim Guinea Current Commission, and the Benguela Current Commission. These projects also made important progress towards financial and institutional sustainability.

New UNDP-GEF IW foundational capacity building projects were implemented in the Humboldt Current LME, Sulu-Sulawesi Sea LME, and Timor/Arafura Sea. These projects aim to support the multi-country preparation of Transboundary Diagnostic Analyses and Strategic Action Programmes for each of these shared marine systems over the next 2-3 years. For more information visit: www.undp.org/gef/portfolio/iw.html.

UNEP

UNEP's Marine and Coastal Strategy³

The Marine and Coastal Strategy was endorsed by the UNEP Senior Management Team in early 2010 with the aim to guide and implement ecosystem-based management principles and solutions in programmes and projects across the Organization. Its four themes – Ecosystems for Human Well-being; Land-Ocean Connections; Reconciling Use and Conservation; Vulnerable People and Places – facilitate collaborative work across the thematic sub-programmes of the Medium Term Strategy. It builds upon and is implemented through existing platforms such as the Regional Seas Programme, the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA), Small Island Developing States (SIDS), the Barbados Plan of Action, and other fora and platforms.

The Marine and Coastal Strategy has been mainstreamed into UNEP's Programme of Work for the period 2010 to 2011 across a number of focus areas. SIDS are among the

³ <http://www.unep.org>

beneficiaries of this project given the unique challenges and high levels of vulnerability to changes. There are currently several projects in the Programme of Work that contribute to the implementation of the Marine and Coastal Strategy, but due to the scope of this document only a few are listed here.

Under the Ecosystem Management project entitled “Integration of Sustainable Ecosystems Management in National Development Processes”, the GPA Coordination Office is working with national governments to better reflect land-based sources of marine pollution in national policies and with UNEP Regional Offices and UNDP and other in-country agencies to ensure a ‘One-UN’ and a ‘One-UNEP’ approach.

Under the Hazardous Substances project entitled “Managing Harmful Substance and Hazardous Waste through the Global Programme of Action in support of Regional Seas Agreements”, the GPA Coordination Office is advancing the multi-stakeholder ‘Global Partnership on Nutrient Management (GPNM)’ and addressing the challenges of marine litter. The GPNM will provide a web-based platform, presenting information on major emission sources and impacts, cross-media transfer of nutrients, environmental costs of over-enrichment, and providing identifications and analyses of impacts in coastal areas and LMEs. The GPNM is currently focusing on consolidating and expanding the range of participants, and capturing/developing tools and best practices on a web-based platform. It is a key initiative in the implementation of the GPA (See also paragraphs 48 above and 64 below).

The project entitled “Support for Building Resilience of Vulnerable Ecosystems” will assist developing countries to maintain the resilience of ecosystems that are most vulnerable to climate change, and maximize ecosystem services for adaptation. It will develop and implement technical, policy and financial interventions, including piloting adaptation projects in “hotspots”, targeting four types of ecosystems: mountains, river basins, dry lands and low-lying coasts including SIDS. Implementation of this project will contribute to the first phase of the UNEP Flagship project on “Ecosystem-based Adaptation.”

Interagency Collaboration

UNEP is one of the regular members of UN-Oceans, an informal collaborating mechanism within the UN system for agencies working on oceans and coastal issues. Aspects of UNEP’s work under UN-Oceans include: Collaborating with FAO on the development of a UN Oceans Atlas; Working as a partner to establish a UN-Oceans display at the upcoming Yeosu Oceans Expo in the Republic of Korea in 2012; Participation in the UN-Oceans task force on Marine Protected Areas and Area Based Management.

Collaboration has also been initiated between UNEP and FAO to address environmental impacts of fisheries. Achieving a viable balance between human use of marine living resources and conservation of marine biodiversity and habitats is essential to secure long-term ecosystem service delivery, including healthy and productive fish populations. A new study has been prepared by UNEP and FAO in collaboration with CBD and IUCN Fisheries Expert Group, synthesizing current knowledge and possible ways forward to address impacts of destructive fishing practices on marine biodiversity and habitats. The effort aims to support policy and development of ecosystem-based management guidance and instruments to reduce destructive fisheries impacts on biodiversity and habitats.

UNEP is also working with a number of partners to facilitate regional collaboration on cross-sectoral environmental management and resource use in open oceans and areas beyond national jurisdiction (ABNJ), notably between Regional Seas Conventions & Action Plans (RSCAPs), Regional Fisheries Management Organisations (RFMOs) and other relevant bodies. New tools and integrated approaches are emerging to assist protection of the marine environment and management of living marine resources in ABNJs consistent with international law, based on science and precaution. This process has led to the development of a policy paper entitled: ‘Modalities for Advancing Cross-sectoral Cooperation in Managing ABNJ’, prepared by an

interdisciplinary group of experts, covering fisheries, conservation, ocean management and governance, incl. legal disciplines. The paper summarizes global/regional developments relevant to biodiversity conservation and ecosystem management, and highlights challenges, opportunities and modalities for moving ahead in the Ecosystem Approach in the high seas (for further information see http://www.unep.org/regionalseas/globalmeetings/default_ie.asp; 12th Annual Meeting of Regional Seas, 20-22 Sept. 2010, Bergen, Norway).

Technology support and capacity building

Reflecting its Marine and Coastal Strategy, UNEP has continued or initiated numerous activities aimed at building capacity in the integrated management of marine and coastal ecosystems. Current and recent training courses and guidance documents include:

- 1 A new UNEP training resource on marine and coastal ecosystem-based management for Regional Seas' focal points and national planners and decision-makers across regions has been developed. It serves as a 'primer' on Ecosystem-Based Management (EBM), introducing key principles and their use in planning and decision-making. The guide provides references to more specific technical manuals that exist on specific topics;
- 2 A comprehensive global analysis and guidance document on good practices in governance of Marine Protected Areas (MPA) has been developed in partnership with experts, planners and local managers. The work is underpinned by 20 case studies representing a range of issues and different settings from different parts of the world (for further information visit: www.unep.org/ecosystemmanagement, UNEP Technical Report, entitled "Governing Marine Protected Areas—Getting the Balance Right");
- 3 UNEP, jointly with the Marine Conservation Biology Institute (MCBI) and the National Oceanographic Atmospheric Administration (NOAA) in the United States, have initiated an effort to strengthen the surveillance and enforcement of remote marine managed areas. Initial results include technical guidance on cost-effective surveillance options. A paper on technical options has been developed, which reviews simple, cost-effective methods and current and new technologies for surveillance of remote marine areas to support future enforcement of management (visit: www.mcbi.org/what/what_pdfs/SERMA.pdf, Brooke SD, Lim TY, and Ardron JA. (2010), Surveillance and enforcement of remote maritime areas, Paper 1: surveillance technical options MCBI);
- 4 The publication entitled "Foundations for Sustainable Nutrient Management" is a product of the GPNM, mentioned in paragraphs 48 and 53 above. This highlights the nutrient management conundrum (i.e. ensuring food security while preventing eutrophic deltas and marine dead zones). It illustrates what is important, what works, and who needs to be persuaded in shaping effective nutrient management. It provides a platform for further collaborative efforts to build capacity, develop technology and to share solutions (for further information visit: www.unep.org/ecosystemmanagement);
- 5 In a bid to address the challenge of managing wastewater in coastal cities, the GPA Coordination Office in collaboration with UNESCO-IHE Institute for Water Education developed a training manual on 'Improving Municipal Wastewater Management for Coastal Cities' for municipal managers. The training was developed in the framework of the UN-DOALOS Train-Sea-Coast (TSC) programme. To date, this programme has trained managers from 67 countries worldwide, 15 of which are SIDS. The training aimed at increasing the skills and knowledge of municipal staff in objective-oriented planning, as well as providing a platform for knowledge exchange and networking;

- 6 The “Regional Network in Marine Science and Technology for the Caribbean: the Know-why Network” project seeks to implement the Protocol concerning pollution from land-based sources and activities to the Cartagena Convention, in particular, the obligations on monitoring and assessment and development of information systems and reporting;
- 7 The development of the East Asian Seas (EAS) Knowledge Base has been achieved through collaboration between the UNEP Coordinating Body for the Seas of East Asia (COBSEA) and the Tropical Marine Science Institute (TMSI), National University of Singapore. It aims to serve as a one-stop-shop for accessing data and information on coastal and marine environments in the region at both regional and national levels;
- 8 In partnership with GPA Coordination Office, the Regional Office for North America (UNEP-RONA) has worked with NOAA to organize the 5th International Marine Debris Conference in Honolulu (Hawaii) United States, from 20 to 25 March 2011. The conference brought together participants from around the world to address the issue of marine debris globally and identify solutions locally to improve overall ecosystem health and biological diversity dependent on it. The conference provided a forum for sharing research results, innovative approaches, and solutions from around the globe;
- 9 The COBSEA Secretariat, like several other Regional Seas’ Secretariats, has developed the Regional Action Plan on Marine Litter (RAP-MALI) with the aim of improving the quality of marine and coastal environments of the East Asian Seas by addressing the issue of marine litter through regional cooperation and partnerships. This Secretariat envisages addressing the problem of marine litter through awareness, prevention and mitigation measures in countries of the region also in order to strengthen their management, monitoring, assessment and reporting capacities. With the view to building capacity and raising public awareness, under this regional action plan, a series of practical guidelines were developed and workshops were organized for the North West Pacific Action Plan (NOWPAP) member states;
- 10 Moreover, the UNEP Secretariat to NOWPAP has developed guidelines for practical use by member states, training courses, desk-top and field exercises. The purpose of these guidelines is to build the capacity of national experts working in close collaboration with other regional projects/organizations (i.e. WESTPAC of UNESCO/IOC, COBSEA, PICES, PEMSEA and YSLME). In this regard, a training course on remote sensing data analysis and oil spill response exercises has been organized for this region and guidelines have been produced for the response to oil spills and to combat and assess eutrophication;
- 11 In East Asia, the Green Fins Programme continues to advocate environmentally-friendly diving to dive operators and divers. This is essential in a region (Thailand, Indonesia, Philippines and Malaysia) that is home to nearly 80% of global coral species. With limited resources, this programme has achieved the expansion of the network of environmentally-friendly dive operators and divers. This programme mainly involves coral reef monitoring and management; and
- 12 UNEP has also supported the development of the Climate Proof Guide. This guide outlines a “four-stepped” approach to help coastal managers consider the potential impacts of climate change on their projects (For further information visit the MFF webpage, and to download your copy at www.mangrovesforthefuture.org).

Small Island Developing States (SIDS) are particularly vulnerable to the degradation of coastal and marine ecosystems. International cooperation towards strengthening their adaptive resilience to address such vulnerability is urgently needed. To address SIDS specifically, UNEP has developed a policy paper on Thematic Priority Areas for UNEP's support to the Sustainable Development of SIDS, aligned to the Bali Strategic Plan for Technology Support and Capacity-building, that mainstreams the Mauritius Strategy for the further implementation of the Programme of Action for the sustainable development of SIDS into UNEP's programme of work, and sets out priority outcomes to be achieved (For more information on the Mauritius Strategy visit: <http://www.un.org/en/ga/president/65/issues/sids.shtml>);

In September 2010, the High-level Meeting on the 5-Year Review of the Implementation of the Mauritius Strategy (MSI+5) took place during the 65th session of the UN General Assembly. UNEP supported the preparatory process towards the MSI+5 at its national, regional and global levels and developed several programmes, projects and activities for SIDS in the following thematic fields: climate change and sea-level rise; natural and environment disasters; management of waste; coastal and marine resources; freshwater resources; land resources, energy resources; tourism resources, biodiversity resources. For more details on the different programmes, projects and activities, see document UNEP/GC.25/6 under UNEP at http://www.sidsnet.org/msi_5/agency_donor.shtml.

National Strategies for the Sustainable Management of Marine and Coastal Ecosystems

Under the auspices of the GPA⁴, UNEP continues to support and provide technical advice to national authorities on the development of National Programmes of Action for the Protection of the Marine Environment from Land-based Activities (NPAAs). These help to mainstream the protection of marine and coastal ecosystems into national or local development policies and plans. In this context, UNEP has provided technical support to several countries for projects on ecosystem-based management (EBM).

Moreover, UNEP has also contributed to the implementation of spatial planning through the following recent and current projects:

- 1 the coastal projects under the new 'Spain-UNEP Partnership for the LifeWeb Initiative' which aims to establish new, and improve the effectiveness of existing, Marine Protected Areas (MPAs);
- 2 broad-scale marine spatial planning, which aims to develop a comprehensive management of critical marine ecosystems and migratory corridors to protect endangered species and their sensitive habitats, along with regional key ecosystems (i.e. two species of whales in the Southeast & Northeast Pacific and the Wider Caribbean; sea turtles in West Africa, across Senegal, Guinea-Bissau, Cape Verde, Sierra Leone; critical monk seal habitats in Mauritania; mangrove ecosystem in Guinea-Bissau); and
- 3 the project 'Spatial Planning in the Coastal Zone – Disaster Prevention and Sustainable Development', funded by the Swedish Government, which is being implemented by COBSEA. This project focuses on spatial planning in coastal areas with an overall goal to prevent and reduce the impacts of natural disasters and to promote sustainable development.

Early Warning and Assessment

⁴ <http://www.unep.org/depi/MarineCoastalEcosystems/tabid/6391/Default.aspx>

UNEP, in partnership with other organizations and UN specialized agencies, has undertaken, continued or initiated the development of numerous early warning and assessments projects. Recent activities resulting from these projects include:

- 1 UNEP, in partnership with the Regional Seas Conventions and Action Plans, undertook the development of the Marine Biodiversity Assessment and Outlook Series of assessments. These 19 regional reports provided a perspective into the current state of marine biodiversity in the areas covered by the Regional Seas Conventions and Action Plans through a series of pressure, state and response indicators. This series of assessments emphasizes the need to support ongoing efforts at the UN Regular Process (for more information visit: <http://www.marinebiodiversityseries.org/reports/2-global-synthesis-report.html>);
- 2 In 2009, the Mediterranean Action Plan (MAP) conducted a preliminary study, and produced a document, on the State of Environment and Development Report in the Mediterranean. This document provides an initial integrated assessment of the state of the Mediterranean Sea, including a summary of the current state of the Mediterranean environment and its marine resources and is an attempt to identify gaps in the current knowledge. This report is a useful first step towards a comprehensive integrated assessment of the state of the Mediterranean Sea, and towards the implementation of an Ecosystem Approach (EA) in this area where considerable efforts are still required in order to minimize and manage more effectively the anthropogenic causes of pressure. This report has recently been peer-reviewed by GESAMP at the request of UNEP-MAP;
- 3 UNEP produced the Emerging Issues Bulletin series to raise awareness of emerging environmental issues among policy makers, managers, the civil society and other stakeholders. For instance, the ocean acidification bulletin is designed to bridge the gap between science, technology and policy, communicating in non-technical language so as to improve and widen the understanding of emerging issues and their potential policy implications; and
- 4 NOWPAP produced the first “State of the Marine Environment Report” (SOMER) for the region and has begun work on a second SOMER.
- 5 During the GESAMP 37 session, UNEP presented two proposals to GESAMP resulting in the re-direction of the activities of WG 37 as follows: A GESAMP Task Team was established under WG 37 to fill the identified scientific data and information gaps on anthropogenic sources, releases and possible measures to control the releases of mercury. This work provided by GESAMP would assist UNEP with the preparation, by 2013, of a binding international agreement to protect the environment from releases of mercury and its compounds. The mercury Task Team of the Working Group delivered a preliminary report in August 2010 and a final report will be presented in 2011. A second Task Team under WG 37 was established to close known scientific information gaps on lead and cadmium. This information was to be integrated into UNEP’s publication “Reviews of Scientific Information on Lead and Cadmium” by August 2010, a report that is intended to inform policy makers on the need for global action in relation to these metals.

Third Intergovernmental Review of the Global Programme of Action

Adopted by the international community in 1995, the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) has been one of UNEP’s most visible marine and coastal initiatives for the past 15 years. The GPA requires governments to regularly review their own activities and the nature and extent of their multilateral cooperation,

and also the “further development and adjustment” of the GPA itself, taking “into account regular assessments of the state of the marine environment.” This is achieved through periodic intergovernmental reviews. The second Intergovernmental Review (IGR2) was held in Beijing in 2006 and adopted the GPA work programme for the period 2007-2011. Based on traditional timing of IGR meetings, the third Intergovernmental Review (IGR3) is tentatively scheduled for January 2012. UNEP plans to use IGR3 to strengthen and build strategic partnerships on coastal and marine protection.

UNIDO

The UNIDO COAST project aims at reducing the impact of land-based tourism activities on coastal waters and operates in Cameroon, Gambia, Ghana, Kenya, Nigeria, Mozambique, Senegal, Seychelles and Tanzania. Achievements of the project in 2010 included capacity building at the local level on the UNWTO tool for sustainable tourism for the eradication of poverty. Baseline information was collected and training capacity needs have been identified with all the project partners. Planned activities for the forthcoming months are the introduction to Environmental Management Systems for tourism operators, eco-tourism development and work on Reef Management.

In 2010, the Gulf of Mexico Large Marine Ecosystem project conducted a preliminary identification of biodiversity hot spots and nutrient over-enrichment and contaminant sources, flows and levels as part of its Transboundary Diagnostic Analysis. The project has also developed strategies and actions to reduce and control pollution from upper watersheds to the Gulf of Mexico and conducted an evaluation of environmental impacts of transboundary pollution. In addition to the original scope of activities, the project played an important role in facilitating communication between Mexico and the United States in response to the Macondo Deepwater Horizon incident in the Gulf of Mexico. The flexibility of the project team enabled it to play a key role in facilitating information for decision makers, and in advising the Government of Mexico on further analysis of the ocean and the importance of an immediate baseline study.

UN-DOALOS

Activities of UN DOALOS, Office of Legal Affairs, relevant to the work of GESAMP

DOALOS acts as the Secretariat of the 1982 United Nations Convention on the Law of the Sea (UNCLOS) which sets out the legal framework within which all activities in the oceans and seas must be carried out. UNCLOS is of strategic importance as the basis for national, regional and global action and cooperation in the marine sector. The section below provides information on relevant developments that have occurred under the ambit of the General Assembly and the mandate of DOALOS, since March 2010.

United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea. The 11th meeting of the Informal Consultative Process met from 21 to 25 June 2010 and focused its discussions on “Capacity-building in ocean affairs and the law of the sea, including marine science”. Discussions were facilitated by the report of the Secretary-General on oceans and the law of the sea (A/65/69). The outcome of the meeting is available in document A/65/164 (see <http://daccessdds.ny.un.org/doc/UNDOC/GEN/N10/462/32/PDF/N1046232.pdf?OpenElement>) and was reflected as appropriate, in General Assembly resolution 65/37, section II.

Regular process for global reporting and assessment of the state of the marine environment, including socio-economic aspects. Following the second meeting of the Ad Hoc Working Group of the Whole (August – September 2010), the General Assembly established an

Ad Hoc Working Group of the Whole to guide and oversee the Regular Process. Further to that, the Assembly also established a Group of Experts (GoE), which was mandated to prepare a set of options for achieving the target of 2014 for the preparation of the first integrated assessment of the marine environment. The GoE also prepared information material on steps for capacity building. In February 2011, the Ad Hoc Working Group of the Whole, met once more to consider, inter alia, the documents prepared by the GoE and the terms of reference for a management and review mechanism, now referred to as a "bureau". For further information see also paragraph 37 below and the separate submission under agenda item 6A of this session.

Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction. The fourth meeting will be convened in New York from 31 May to 3 June 2011 and will consider, inter alia, issues related to the legal regime of marine genetic resources beyond areas of national jurisdiction, marine protected areas and environmental impact assessment (further information, including reporting material from the Secretary General (A/66/70) will be posted on the Division's website at <http://www.un.org/Depts/los/biodiversityworkinggroup/biodiversityworkinggroup.htm>).

World Oceans Day. In 2009 the General Assembly designated 8 June as World Oceans Day. On 8 June 2010, the United Nations observed for the second time the United Nations World Oceans Day under the theme "Our oceans: opportunities and challenges." To reflect preparations for Rio+20 in 2012, the theme for 2011 will be "Our oceans: greening our future". Further information on this event will be available at http://www.un.org/Depts/los/reference_files/worldoceansday.htm).

Moreover, DOALOS, with the assistance of experts, prepared the following United Nations publications: (1) "Law of the Sea - Marine Scientific Research: A revised guide to the implementation of the relevant provisions of the United Nations Convention on the Law of the Sea" (<https://unp.un.org/Details.aspx?pid=21429>); and (2) "Ecosystem Approaches to the Management of Ocean-Related Activities: Training Manual" (<https://unp.un.org/Details.aspx?pid=21428>).

WMO

World Weather Climate Programme (WCRP)

To evaluate further the oceans' capacity to absorb and store carbon, there is a need to develop a reliable physical and biogeochemical description of the world oceans. There are several WCRP research projects, or projects in which WCRP participate, such as [CLIVAR](#) (WCRP), [SOLAS](#) ([IGBP](#), [SCOR](#), WCRP, and [CACGP](#)), and [IMBER](#) ([IGBP](#) and [SCOR](#)), the [Ocean Carbon Coordination Project](#) ([IOC](#), [SOLAS](#), [IMBER](#), [CLIVAR](#)). Also contributing is the [ESSP Global Carbon Project](#), which develops and issues assessments of the current geographical and temporal distributions of the major components and fluxes in the global carbon cycle.

For all numerical climate predictions on time scales from several months to years and out to decades, there is a need to represent the initial observed state of the atmosphere and oceans to the optimal extent possible for any particular application. Two past WCRP experiments (the Tropical Ocean Global Atmosphere, [TOGA](#), project and the World Ocean Circulation Experiment, [WOCE](#)) enabled better understanding of ocean circulation and its interactions with the atmosphere. [TOGA](#), in particular, helped to improve predictions of the El Niño/Southern Oscillation and exploit this predictability in a variety of seasonal predictions. WOCE provided an unprecedented snapshot of the global ocean circulation.

Availability of satellite observations, global deployment of the autonomous floating Argo buoys, successful demonstration of the capability to assimilate ocean information under the framework of the [Global Ocean Data Assimilation Experiment](#) (GODAE), and increasing accuracy of pioneering ocean data syntheses by [CLIVAR](#) are enabling better observations and understanding of the role of the ocean in climate variability and change and the prospects for climate prediction across a variety of timescales. In order to exploit the predictability of the coupled climate system, it is imperative to correctly represent in models the fluxes of momentum, heat, moisture, gases and particles between ocean and atmosphere, to which [SOLAS](#), [CLIVAR](#) and [GEWEX](#) contribute, and to cover gaps in global ocean observations including areas covered by sea ice. This last challenge is being addressed by the WCRP, for further information on this issue [CliC](#) on project and its partners. Further information on World Weather Climate Programme (WCRP) is available at www.wcrp-climate.org/.

Marine Meteorology and Oceanography Programme (MMOP)

Main Long-term Objectives

The long-term objectives of MMOP are:

- 1 To enhance the provision of marine meteorological and oceanographic services by Members in support of the safety of life and property at sea and in coastal areas. Based on an integrated observing and data management system, the MMOP is to contribute to sustainable marine environment and coastal area management including risk management for ocean-based economic, commercial and industrial activities; and to coordinate and enhance the provision of the data, information, products and services required to support climate research and the detection and prediction of climate variability; and
- 2 To manage the evolution of an effective and efficient programme through the selective incorporation of advances in meteorological and oceanographic science and technology; and to work to ensure that all countries have the capacity to benefit from and contribute to these advances, and to contribute to the implementation of the programme in general.

Purpose and Scope

The MMOP seeks to coordinate, and develop and recommend standards and procedures, for a fully integrated marine observing, data management and services system that uses state-of-the-art technologies and capabilities. The Programme aims to maximize the benefits to Members in the projects, programmes and activities that it coordinates in their interest and that of the global marine community in general. Thus the scope of MMOP is defined in responding to the evolving needs of all users of marine data and products, and includes an outreach programme to enhance the national capacity of all maritime countries –safety at sea has remained the priority, while other applications such as coastal area management, disaster risk reduction, and climate services has become increasingly important.

Governance

The overall technical guidance and governance for MMOP is provided by the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), jointly sponsored by WMO and the Intergovernmental Oceanographic Commission (IOC) of UNESCO.

Programme Structure

The MMOP is implemented primarily through JCOMM, which is structured into three Programme Areas and a number of cross-cutting activities, aimed at improving overall marine and ocean service delivery capacities of Members:

- 1 Services and Forecasting Systems Programme Area, including maritime safety services, marine pollution emergency response, sea ice, waves and storm surges, ocean forecasting systems, and a range of marine climate services;
- 2 Observations Programme Area, involving an integrated global marine meteorological and oceanographic observing system;
- 3 Data Management Programme Area, coordinating and providing standards and best practices in the management of marine meteorological and oceanographic data, as a contribution to WIGOS/WIS;
- 4 Capacity Development and Outreach, to enhance the capacity of all Members to contribute to and benefit from the data and services delivered under MMOP;
- 5 Satellite Data Requirements, to determine the detailed requirements for satellite and other remote sensing ocean data in the delivery of marine and ocean services; and
- 6 International coordination, within the UN system, with other intergovernmental and non-governmental organizations, with the marine user community, and with the private sector in general.

Further information on Marine Meteorology and Oceanography Programme (MMOP) is available at www.wmo.int/oceans.

Areas of coordination with IMO

WMO, in collaboration with the IMO, established the IMO/WMO World-Wide Met-ocean Information and Warning Service (WWMIWS), to complement the existing IMO/International Hydrographic Organization (IHO) World-Wide Navigational Warning Services (WWNWS). The coordinated initiative by WMO, IMO and the IHO aims at expanding the Global Maritime Distress and Safety System (GMDSS) into the Arctic waters, with the commitment by the Environment Canada, Norwegian Meteorological Institute and Roshydromet (Russian Federation) to serve as Issuing Services for the new Arctic METAREAs. The GMDSS for the Arctic region should be fully implemented by 2010/11,

WHO has recognised the need for improved marine meteorological services for international navigation, including for the Arctic region, and the organization has reiterated its support for a vigorous training and capacity-building programme in marine meteorology, with special focus on GMDSS WWMIWS and on the role and responsibilities of issuing Services as METAREA Coordinators.

Atmospheric deposition

The atmospheric deposition of chemicals remains a major environmental issue in several parts of the world due to concerns over the environment acidification, eutrophication, trace metal deposition, ecosystem health, biogeochemical cycling, and global climate change. The Global Ocean, impacted by this deposition, is of continuous concern for WMO. The Global Atmospheric Watch (GAW) Measurement study, under GAW Atmospheric Deposition Programme, has been actively collecting data on precipitation chemistry and wet deposition, worldwide.

To date, the GAW Atmospheric Deposition Programme has focused largely on major ions. The number of official GAW precipitation chemistry measurement sites which provided data for the

global assessment still remains insufficient in South America, Africa, Asia, and Oceania. Although trace metals and organics (including pesticides) are included in the GAW suite of desirable measurements, they have not been measured at many sites, and the present quality assurance activities for trace metals have been managed through the EMEP programme. An assessment of the need for trace metal measurements will be revisited when financial and scientific considerations warrant additional attention. Similar assessments are envisioned for organics, including pesticides.

WMO is currently finalizing this year the global assessment of precipitation chemistry and deposition [Vet et al., in preparation], a huge effort went into integrating observed and model-simulated data. In a joint activity of GAW and GESAMP, observed and model-simulated data were integrated in a global assessment of atmospheric chemical input to the oceans.

Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS)

The World Meteorological Organization (WMO) has taken the lead with international partners to develop and implement a Sand and Dust Storm Warning Advisory and Assessment System. This system provides an operational structure for dealing with a very diverse community anchored by a well established WMO system of research, observations, numerical weather and climate prediction and service delivery. The dust storms observations, forecasts and assessment, are very useful for many fields of science, since the input of mineral aerosol to the open ocean represents a major nutrient contribution. Based on such interest, a close collaboration has been established between SDS-WAS and GESAMP, resulting in the organizing of the recent joint SDS-WAS/GESAMP Workshop (Malta, March 2011) entitled "The Atmospheric Input of Chemicals to the Ocean".

SDS-WAS mission is to develop, refine and provide products to the global community useful in reducing the adverse impacts of sand and dust storms and to assess impacts of the SDS process on society and nature. The SDS activities are realized through a partnership established at regional levels. Currently, there are two geographical activities node, the Regional Node Northern Africa - Middle East – Europe, and the Asian Node. The SDS-WAS activities are realizing following the Science and Implementation plan 2012-2015 recently formally approved by WMO. Further information on this issue can be accessed at www.wmo.int/sdswas .

ANNEX V

STATEMENT TO THE 'INFORMAL CONSULTATIVE PROCESS' MEETING, HELD IN NEW YORK FROM 20 TO 24 JUNE 2011

GESAMP **“Science for Sustainable Oceans”**

1 GESAMP, the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection is an inter-agency body responding to requests for scientific advice from nine UN Sponsoring Organizations: UN, UNEP, UNESCO-IOC, IMO, WMO, FAO, IAEA, UNIDO and UNDP. As an interagency activity involving almost every UN-Oceans member agency, GESAMP is a ‘flagship’ initiative within the UN-Oceans coordination and cooperation agenda.

2 Two decades ago, GESAMP responded to an invitation of the UNCED Secretariat to comment on the role of science in the protection and sustainable development of the marine environment. Many of GESAMP’s inputs were subsequently reflected in Agenda 21, Chapter 17, for example on topics such as knowledge gaps and research needs, needs for scientific capacity building in many geographic areas, the need for integrated management of marine and coastal areas, underlying principles and a scientific strategy for marine environmental protection, and pollution from land-based sources. Nearly all of GESAMP’s work in the past two decades can be seen as strengthening the scientific basis for implementing Chapter 17 and the Plan of Implementation of the World Summit on Sustainable Development. The lead-up to Rio+20 provides an opportune moment to reflect on GESAMP’s contributions, and more importantly on how GESAMP can continue to contribute in the years ahead.

The scientific basis for integrated management, sustainable development, and ocean governance

3 GESAMP’s mission, defined by its Sponsoring Organizations in 2005, is “*to provide authoritative, independent, interdisciplinary scientific advice to organizations and Governments to support the protection and sustainable use of the marine environment*”. Thus, Programme Area A of Chapter 17, integrated management and sustainable development of coastal and marine areas, lies at the heart of GESAMP’s mandate. To that end, GESAMP’s products since 1992 have included work on topics such as integrated coastal management, the monitoring and assessment of external pressures on coastal areas, the development of environmental indicators, and the sustainable development of coastal aquaculture, all areas identified for action in Chapter 17.

4 GESAMP has also contributed over the last 20 years to the scientific basis for marine environmental protection in relation to both land- and sea-based activities. GESAMP’s 2001 report “*Protecting the Oceans from Land-based Activities*” was prepared to support the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA). It presented a detailed global assessment of marine environmental problems associated with land-based activities, strategies and measures for their mitigation, and priorities for action. GESAMP’s conclusions were presented to the First Intergovernmental Review of the GPA. GESAMP’s Working Group on metals is currently finalizing an assessment of mercury in the marine environment, prepared as a contribution to UNEP’s development of an international convention on mercury, and has also contributed to international processes related to lead and cadmium. GESAMP’s Working Group on atmospheric inputs of chemicals to the ocean is finalizing a report on nutrient inputs for WMO, and has commenced a more detailed study of atmospheric inputs of anthropogenic nitrogen.

5 Throughout the past 20 years GESAMP’s Working Group on the Evaluation of Hazards of Substances Carried by Ships has continued to provide detailed profiles of the hazards to the environment and human health of bulk liquid chemicals carried by ships at the request of IMO. The GESAMP Hazard Profiles are used to define the conditions for carriage of bulk chemicals under the MARPOL Annex II and the International Bulk Chemicals code. Through this work GESAMP makes a major contribution to the international regime governing chemicals transport that was endorsed in Chapter 17 of Agenda 21, as well as the assessment of chemical risks and harmonized classification system called for in Chapter 19. GESAMP’s work on protection of the marine environment from sea-based activities also includes estimation of quantities of oil entering the marine environment from sea-based activities and ongoing reviews of environmental and

human health risks of systems that use biocides to treat ships' ballast water to reduce the transport of invasive marine species. This work is a direct input to IMO's Ballast Water Management Convention. GESAMP is also soon to jointly release a report with the GEF-UNDP-IMO GloBallast Partnerships project on performance testing and compliance monitoring of alternative ballast water management systems. The atmospheric inputs Working Group recently completed an assessment of the potential contributions of atmospheric emissions from ships and coastal pollution sources to ocean acidification in areas of heavy shipping traffic.

Improved monitoring and assessment

6 A common theme in Chapter 17 is the need for improved monitoring and assessment of the marine environment, and monitoring and assessment are a major part of GESAMP's mandate. Since Rio, GESAMP has fulfilled this mandate by preparing assessments such as the previously mentioned global assessment of land-based activities and "*A Sea of Troubles*", a global summary for policy makers. GESAMP has played an active role throughout the development of the UNGA Regular Process. Most recently, GESAMP contributed to the first phase of the Regular Process, the Assessment of Assessments, through a review of assessments and related studies of pollution in the open ocean and also through peer review of the Assessment of Assessments report. GESAMP remains ready to continue to contribute to the Regular Process if requested. GESAMP is also a partner in the GEF Transboundary Waters Assessment Programme (TWAP). It contributed to developing the assessment methodology for open oceans and Large Marine Ecosystems, and expects to participate in the full TWAP in the event it is approved for financing. In addition to conducting or participating in assessments, GESAMP has provided specific technical guidance on approaches to indicators, monitoring, and assessment.

7 Chapter 17 recognized that in many parts of the world a lack of monitoring data on the marine environment is an impediment to sound management. Marine environmental monitoring programmes and capacity have widely improved in the years since Rio, but a lack of data, particularly data on long-term trends, still leads to critical uncertainties in many places. Chapter 17 identified scientific reviews of available databases, the development and validation of methodologies, and assessments of marine environmental status and trends as important actions to reduce such uncertainties. GESAMP has contributed in all of these areas in recent years. Most recently, GESAMP has established a working group to assess long-term trends in coastal pollution on the basis of natural archives recorded in sediments, corals, and other repositories. This work will commence with a review of available databases around the world and the validation and harmonization of methodologies, with the ultimate aim of using the information for a global assessment of global trends in coastal pollution over the last one or two centuries.

Emerging issues

8 A range of issues affecting the marine and coastal environment has arisen since UNCED, and need to be addressed in the context of environmental protection and sustainable development. One of GESAMP's roles is to call new and emerging issues to the attention of its Sponsoring Organizations and Governments. GESAMP discusses such issues at its regular annual meetings, and sometimes establishes correspondence groups to further review an issue, ascertain relevant scientific activities already underway, and in some cases determine the appropriate scope and partners for a GESAMP study. Most recently, such a process culminated in the establishment of a new Working Group on inputs, levels, distribution, and fate of micro-plastics in the ocean, and potentially the role of micro-plastics as a pathway for persistent toxic substances into marine food webs. GESAMP also has active correspondence groups on biomagnification of persistent toxic substances in top predators, the potential role of increasing hypoxia in endocrine disruption (in collaboration with UNDP), and, finally, on marine environmental quality criteria. Recognizing the importance of keeping watch on emerging issues of potential concern, GESAMP is developing a more comprehensive and structured process for identifying new and emerging issues in partnership with other organizations and activities.

Coordination and cooperation

9 Chapter 17 emphasized the need for coordination and cooperation at all levels and across stakeholder groups. In recent years, GESAMP has been increasingly proactive in engaging and establishing partnerships with external bodies and processes. Examples of this that have already been mentioned are GESAMP's cooperation with GloBallast, the UNGA Regular Process, GEF-TWAP, and the Mediterranean Science Commission (CIESM), which is a partner in GESAMP's work on biomagnification in top predators. GESAMP also recognizes the need to engage the private sector and, for example, has partnered with the plastics industry for its work on micro-plastics.

10 GESAMP continues to work at a mostly global level, but also recognizes the need to engage at the regional level to make GESAMP's products and advice more relevant and support the capacity building required for effective management of oceans and coastal areas. In 2007, GESAMP convened a workshop with regional organizations from around the world to share information on regional activities, discuss ways to make GESAMP's work more useful and relevant at the regional level, and build networks with and among regional activities. This regional engagement has continued. GESAMP's 2008 annual meeting was hosted by the Interim Guinea Current Commission, for example, and its 2010 meeting by the Coordinating Body on the Seas of East Asia (COBSEA). In 2011, GESAMP provided a detailed peer review of the Mediterranean Action Plan's initial integrated assessment of the Mediterranean Sea. GESAMP will continue to seek opportunities to support and cooperate with regional activities for marine environmental protection.

11 In summary, over the past two decades GESAMP's work has supported the scientific basis for implementing Agenda 21 and contributed broadly to international processes for improved ocean governance. GESAMP has maintained an active watch to bring emerging issues to the attention of the international community, and where appropriate to address them. GESAMP has an active future work programme on a range of marine environmental issues, and is expanding its partnerships with other organizations and processes to operate more effectively. In the coming years, GESAMP looks forward to continuing to provide "*Science for Sustainable Oceans*" to international organizations and Governments.

ANNEX VI

TERMS OF REFERENCES FOR CURRENT GESAMP WORKING GROUPS

The Terms of Reference for each of the currently active Working Groups are reproduced below, with the information on administrative arrangements, background and context, etc.

Working Group 1: GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships (EHS)

The Terms of Reference of the GESAMP EHS Working Group, as given by GESAMP at its 6th session in Geneva (1974), were amended at its 8th session in Rome (1976). At that time, the rationale for hazard evaluation specified for the Working Group was laid down in GESAMP IV/19/Supp. 1; this was replaced in 1982 by GESAMP Reports and Studies No. 17, which was in turn superseded by GESAMP Reports and Studies No.35 in 1989. As approved by GESAMP at its 28th session in 1998, the procedure described in GESAMP Reports and Studies No. 64 (2001), replaced all previous versions. GESAMP, at its 38th session in Monaco (2011), agreed to amend the Terms of Reference, as follows, to meet IMO's requirements under the revised MARPOL Annex II with regard to human health and safety issues associated with chemicals on board ships:

“To examine and evaluate data and to provide such other advice as may be requested, particularly by IMO, for evaluating the hazards to the environment and human health of harmful substances carried by ships, in accordance with the rationale approved by GESAMP for this purpose,” where ‘rationale’ is understood to mean GESAMP Reports and Studies No.64.

Working Group 34: Review of applications for ‘Active Substances’ to be used in Ballast Water Management Systems

Terms of Reference approved intersessionally by GESAMP in November 2005 are:

- 1 Consideration of development of necessary methodologies and information requirements in accordance with G9* for consideration by MEPC 56.
- 2 For Basic Approval, the Group should review the comprehensive proposal submitted by the Member of the Organization along with any additional data submitted as well as other relevant information available to the Group and report to the Organization. In particular, the Group should undertake:
 - .1 Scientific evaluation of the data-set in the proposal for approval (see paragraphs 4.2, 6.1, 8.1.2.3, 8.1.2.4 of G9);
 - .2 Scientific evaluation of the assessment report contained in the proposal for approval (see paragraph 4.3.1 of G9);
 - .3 Scientific evaluation of the risks to the ship and personnel to include consideration of the storage, handling and application of the active substance (see paragraph 6.3 of G9);

* G9 stands equivalent for MEPC 53/2/1 annex, as amended: Procedure for approval of ballast water management systems that make use of Active Substances (G9).

- .4 Scientific evaluation of any further information submitted (see paragraph 8.1.2.6 of G9);
 - .5 Scientific review of the risk characterization and analysis contained in the proposal for approval (see paragraph 5.3 of G9);
 - .6 Scientific recommendations on whether the proposal has demonstrated a potential for unreasonable risk to the environment, human health, property or resources (see paragraph 8.1.2.8 of G9); and
 - .7 Preparation of a Report addressing the above-mentioned aspects for consideration by MEPC (see paragraph 8.1.2.10 of G9).
- 3 For Final Approval, the Group should review the discharge testing (field) data and confirm that the residual toxicity of the discharge conforms to the evaluation undertaken for Basic Approval and that the previous evaluation of the risks to the ship and personnel including consideration of the storage, handling and application of the active substance remains valid. The evaluation will be reported to MEPC (see paragraph 8.2 of G9).
 - 4 The Group shall keep confidential all data, the disclosure of which would undermine protection of the commercial interests of the applicant, including intellectual property.

Working Group 37: Metals in the marine environment

Under the direction of GESAMP in general and the Chairperson of the Task Team in particular, the Task Team will:

- 1 Undertake a scientific review of mercury and its compounds, advise GESAMP on relevant issues and problems relating to management of mercury and its compounds in the marine environment;
- 2 Identify areas of existing or potential concern relating to mercury pollution and determine appropriate actions that the Task Team might undertake (with and without funding requirements);
- 3 Respond to requests for advice from GESAMP or other appropriate intergovernmental bodies;
- 4 Undertake studies, with corresponding reporting, as requested by GESAMP or as deemed appropriate by the Task Team itself;
- 5 Provide an annual report to GESAMP on its activities and views in relation to its mandate; and
- 6 liaise with other groups (such as MATFRP and AMAP) as deemed necessary.

Objectives for the Task Team Assisting in filling some of the Identified Data and Information Gaps of the Reviews of Scientific Information on Lead and Cadmium are:

- 1 To become a member of an already existing UNEP working group on lead and cadmium;

- 2 To produce two short reports on lead and cadmium that will help UNEP to fill data and information gaps identified in the Reviews of scientific information on lead and cadmium; and
- 3 To participate in the process of finalization of the Reviews with a view to informing discussions on the need for global action in relation to lead and cadmium.

Working Group 38: Atmospheric Input of Chemicals to the Ocean

GESAMP 38 acknowledged that WG 38 completed the three tasks assigned to it in 2008 and furthermore agreed that, at the request of WMO, WG 38 should be continued with the intention of examining atmospheric nitrogen inputs to the ocean. New Terms of Reference will be developed, intersessionally, for this activity for approval by GESAMP.

Working Group 39: Global Trends in Pollution of Coastal Ecosystems

Terms of Reference approved by GESAMP 37 in February 2010 are:

- 1 Bibliographic review, definitions, methodologies:
 - .1 Categorize all bibliographical review on environmental pollution temporal records, both sediment column and spatial temporal series by LME, evaluate quality of data;
 - .2 Generate a table with the information classified by contaminant origin (organic, inorganic), toxicity, and geographical distribution;
 - .3 Generate a database with the sources and link to data on SQL format or similar (example MORS);
- 2 Critical review of existing methodologies on suitable environmental archives, dating methods, pollution indicators, analytical techniques and trend analysis. Review existing data, including data quality:
 - .1 Distribute by coordinator a working hypothesis for the methodology to critically evaluate the database gathered in Task 1;
 - .2 Distribute by coordinator specific tasks to WG and GoE participating in the meeting;
 - .3 Generate a draft and report on the evaluation, methodologies, and quality of data.

Working Group 40: Sources, fate and effects micro-plastics in the marine environment

The draft Terms of Reference for this new Working Group are as follows:

1st Phase – (potential sponsors: UNIDO, IMO, UNEP, PlasticsEurope and American Chemistry Council):

- .1 Estimate rates of inputs of micro-plastics (resin pellets, abrasives, personal care products) and plastics (including main polymer types); involves developing methodology, using monitoring data, identifying proxies (e.g. population centres, shipping routes, tourism revenues) – [UN HABITAT, EUROSTAT, US EPA, NOAA]; and
- .2 Modelling of transport, distribution & areas of accumulation.

2nd Phase – (potential sponsors: IOC, UNIDO, IMO, UNEP, PlasticsEurope and American Chemistry Council):

- .3 Processes (physical, chemical & biological) controlling the rate of fragmentation and degradation, including estimating long-term behaviour;
- .4 Modelling continues using results of ToR 3.

3rd Phase – (potential sponsors: IOC, UNEP, IAEA, PlasticsEurope and American Chemistry Council):

- .5 Uptake by biota and biological impacts.

This work programme is envisaged to take place over several years, and has been divided into three main phases accordingly, with an indication of which Agencies are likely to be associated with each phase.

ANNEX VII

TEMPLATE FOR NEW GESAMP WORKING GROUPS

BACKGROUND & CONTEXT

- **The subject:** Brief general background on subject of the study.
- **The issue/problem:** Why the subject is of concern or interest to the international community from the perspective of marine environmental protection.
- **The need:** Why a GESAMP study is needed (e.g., synthesis of scattered information, assessment of environmental status/impacts, development of new methodologies, establishment of standards or guidelines, identify requirements for research, monitoring, management, and/or policy development).

TERMS OF REFERENCE

- Specific, concrete, point-by-point tasks to be carried out by the WG, and/or specific information to be included in the report.
- Defined scope: what will and won't be done.
- Not open-ended: focus on a specific product to be produced (usually a report).
- If additional tasks are envisioned they may be identified as future work for the WG, but the TOR should focus on the specific task being proposed.
- Identify expertise required for the WG

WORK PLAN

- Work methods (usually meetings and intersessional work/correspondence)
- Provisional timeline, including:
 - Meeting dates
 - Milestones (drafts, reviews, revisions, etc.)
 - Deliverables and delivery date (usually publication of a report)
- Provisions for peer review
- Provisions for publication, dissemination and outreach (PR)

ADMINISTRATIVE ARRANGEMENTS

- Sponsors
- Budget & funding
- WG Chairperson(s) & members if available at time of proposal
- Technical secretary for the WG

ANNEX VIII

SCOPING PAPER

BIOMAGNIFICATION OF CONTAMINANTS IN MARINE TOP PREDATORS AND ITS ECOLOGICAL AND HUMAN HEALTH IMPLICATIONS

Submitted by Tim Bowmer, Chairman of GESAMP

Introduction

1 The occupants of the upper levels of food-chains are generally the most vulnerable to anthropogenic disturbance. This includes the tendency to biomagnify Persistent Organic Pollutants (POPs) from their food sources. GESAMP at its 37th Session in Bangkok (R&S 81, paragraphs 8.15-8.18), tasked a correspondence group with preparing a scoping paper on the topic of bioconcentration in the marine environment. It was considered that the issue of biomagnification needs to be reviewed with respect to both its ecological as well as its human health implications. The correspondence group was requested to report back to GESAMP in the intersessional period, so that this issue could be further explored by the members in advance of its 38th Session in 2011.

2 A scoping paper is the second step, following on from a short proposal, in the GESAMP New and Emerging Issues process and should cover: the need for, the scale and the feasibility of assessing the issue, as well as identify expert communities and potential sources of funding. The purpose of this document is therefore to look at the foregoing aspects. The following statement was the initial starting point of GESAMP:

“It is well established that many persistent pollutants can be transferred up food chains, leading to biomagnification at higher trophic levels, in particular in top predators. Many coastal communities are dependent for a high proportion of their protein on the consumption of seafood, and this can result in increased ingestion of persistent, bioaccumulation and toxic substances. For example, in Arctic communities this has led to indigenous peoples reliant on marine-food sources having relatively high body burdens of PBT’s, and has caused health concerns for lactating women.”

3 GESAMP advised that the following aspects should be considered:

- A global scope including all ocean and coastal regions;
- Potential impacts on ecosystems;
- Impact on human health;
- Existing regional and other assessment building blocks;
- Chemical substances of importance, including mercury, POPs as defined under the Stockholm Convention, persistent toxic substances as defined under other relevant conventions (e.g. tributyltin), and identified PBTs (EU and Canada);
- Distinction between bioaccumulation and biomagnification should be borne in mind;
- Practical considerations of what can be achieved by GESAMP; and
- Identification of potential partners.

4 The intention of GESAMPs New and Emerging Issues process, in line with its mandate for the UN sponsoring agencies is to evaluate the need for an assessment to explore new or developing issues in the protection of the marine environment. In this scoping paper, the ecological and human health implications of biomagnification are placed in the context of multiple pressures from other sources. In this respect GESAMP may wish to comment and provide further guidance on the exact scope and provide terms of reference. This paper is intended as a first draft for refinement and improvement.

1. Definitions of biomagnification

5 The late John Gray, who retired as a member of GESAMP in 1996, provided a review of biomagnification as an ecological process and gave the following definitions (Gray, 2002):

- *“the process where xenobiotic substances are transferred from food to an organism resulting in higher concentrations compared with the source”*. This may or may not apply at each subsequent level in a food chain;
- *“the increase in concentration between trophic levels, if the biomagnifications factor (concentration in predator/concentration in prey) >1, then the compound is biomagnified”*

6 He commented that this latter definition would also include contaminants accumulated from the water phase. In practise, it is probably difficult, if not impossible, to distinguish between the two, as in the field, we generally measure an integrated accumulation in a given trophic level from all sources. Gray (2002) concluded that:

- biomagnification is not a universal rule in marine ecosystems; metals are fairly easily eliminated from organisms and do not accumulate⁵, noting that of the metals studied, only organic Hg⁶ showed evidence of bio-magnifications;
- the most likely reason for greater concentrations at higher trophic levels (up to fish) is that of passive uptake by diffusion through body surfaces including gills, with elimination rates decreasing with increased body size; and
- organisms that have aerial respiration (e.g. sea-birds, reptiles and marine mammals) must take in contaminants via food rather than their body surface and are likely to show biomagnification.

7 This latter statement may need some further consideration, as contaminants in water may indeed partition into the tissues of marine organisms, including mammals over every thin or unprotected surface, e.g. orifices such as the buccal cavity and the component bioconcentration from water therefore cannot be ruled out even in organisms receiving a significant dietary body burden.

8 Organic chemicals are accumulated from water into the fatty tissues of an organism by partitioning across unprotected membranes (gills, etc). Likewise, chemicals in digested food will be absorbed across the gut lining of the organism into the blood stream. Their degree of partitioning into and retention in the tissues depends on their hydrophobic/lipophilic behaviour. This can be estimated from the octanol-water partitioning coefficient, using a theoretical framework such as EPIwin (US-EPA). Hydrophobic substances such as Poly-Chlorinated Biphenyls (PCBs) will preferentially partition into fat. It should be borne in mind that ‘fat’ also includes the phospholipid

⁵ Rand et al. (1995): **bioconcentration** is defined as the uptake of a chemical by an organism directly from the abiotic environment resulting in a higher concentration within the organism, while **bioaccumulation** is defined as the uptake of a chemical by an organism from the abiotic and/or biotic (food) environment, that is from all sources.

⁶ Organic mercury is mercury that has formed compounds with carbon.

membranes of cells as well storage tissues for either food reserves or for insulation of an organism against the cold.

9 In practice, when talking about biomagnification, we are probably only really sure of relative bioaccumulation in most cases studied. Some further consideration of the methodology of estimating biomagnification may be useful.

2. Availability of bioaccumulation data

10 Any assessment of biomagnification will depend on the availability of geographically well spread data-series covering important species of top predators and containing sufficient time series to detect trends. The literature on contaminant residues in various groups of mammals is extensive but generally patchy in terms of species coverage for specific pollutants.

11 Aguilar et al. (2002) studied pollutant concentrations in four marine mammal species: the bottlenose dolphin, the harbour porpoise, the fin whale and the harbor seal, selecting these particular species because the available surveys covered a relatively wide geographical range. They occupy very distinct trophic niches, displaying distinct ecological habits, home range sizes and sites, as well as habitat utilization and movement patterns. Their pollutant loads are highly variable and, therefore, geographical patterns cannot be derived from comparisons between several species, but only from intra-specific variation. This is seen as an important principle in evaluating any datasets from the scientific literature.

12 The above authors noted the following geographical distribution:

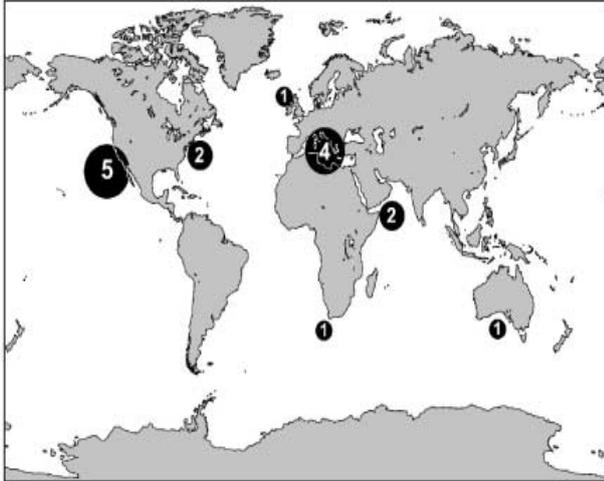
- marine mammals from the temperate fringe of the northern hemisphere, particularly fish eating species inhabiting the mid-latitudes of Europe and North America, display the greatest DDT and PCB loads;
- extremely high concentrations of organo-chlorines found in Mediterranean Sea populations, an observation which is further confirmed by studies on other species in the region;
- the western coast of the United States, particularly California, showed similar or even higher concentrations of DDTs although those of PCBs were somewhat lower; and
- although less polluted than the above, other areas located along heavily urbanized and/or industrialized coastlines such as, the North Sea, the Caribbean Sea and the waters around Japan also showed relatively high levels of organo-chlorines.

13 There can be vast differences in the exposure of any given population and species of marine mammal to POPs and subsequent bioaccumulation into their tissues. This is mediated amongst others things by: ambient concentrations in water over time, place in the food chain and choice/availability of prey, body fat content, body mass, reproductive state, metabolic capacity, etc. To this can be added migratory pattern and that of prey species.

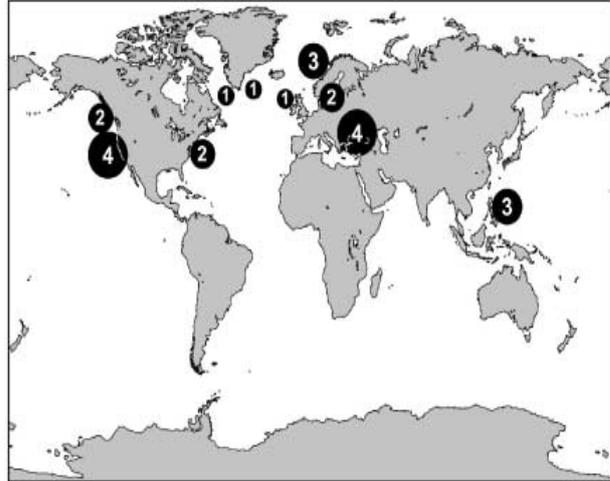
14 Aguilar et al. (2002), first provided a global overview₁ of DDT and PCB levels in bottlenose dolphin, harbor porpoise, fin whale and harbour seals. Their data covered mainly Europe and North America. An example of a marine mammal indicator using four species is given in Figure 1 below for \sum PCBs.

DDT

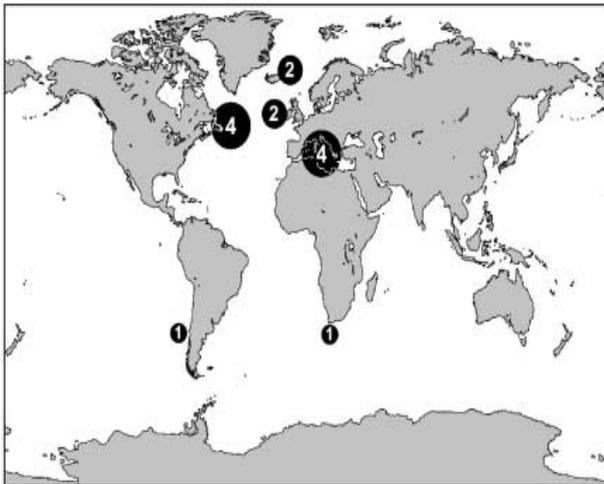
BOTTLENOSE DOLPHIN



HARBOUR PORPOISE



FIN WHALE



HARBOUR SEAL

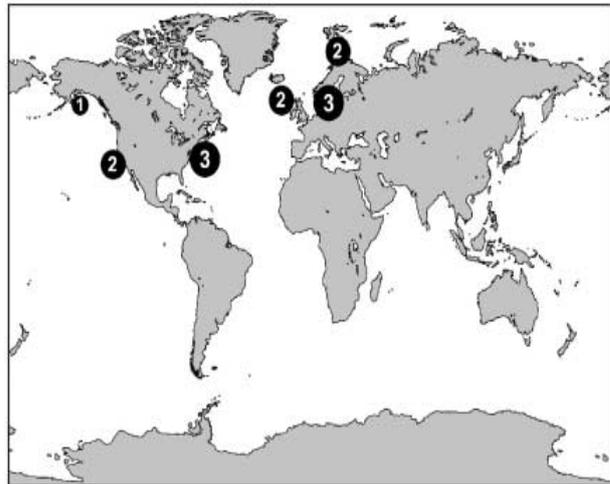


Fig. 1. Aguilar et al (2002). Relative PCB blubber concentration of selected marine mammal species. Bottlenose dolphin: 1, <10 mg/kg; 2, 10–30 mg/kg; 3, 30–100 mg/kg; 4, 100–500 mg/kg; 5, >500 mg/kg. Harbour porpoise: 1, <5 mg/kg; 2, 5–12 mg/kg; 3, 12–25 mg/kg; 4, 25–50 mg/kg; 5, >50 mg/kg. Fin whale: 1, <1 mg/kg; 2, 1–2.5 mg/kg; 3, 2.5–5 mg/kg; 4, 5–10 mg/kg; 5, >10 mg/kg. Harbour seal: 1, <2 mg/kg; 2, 2–5 mg/kg; 3, 5–10 mg/kg; 4, 10–20 mg/kg; 5, >20 mg/kg. (Aguilar et al. 2002).

15 Since their survey, as the International Whaling Commission's annual State of the Cetacean Environment Reports (SOCER⁷) clearly show, POPs in marine mammals have increasingly been the target of monitoring programmes. It is also evident that 'coverage' has improved somewhat in the intervening decade; a few examples are provided below:

- spatial (e.g. Karuppiyah et al. 2005, PCB, DDT and HCH in porpoise and dolphin from India; Borrell et al. 2007, DDT and HCH in monk seals from W Africa, etc.);
- temporal (e.g. Law et al. 2010, PCB trends in harbour porpoises from 1991-2005 from the UK; Castrillon, et al., 2010, PCB and DDT in striped dolphin from the Mediterranean – 1988 to 2009, Leboef et al. 2007, PCBs, DDT and HCH in beluga whales, 1987-2002

⁷ International Whaling Commission, Annual State of the Cetacean Environment Reports (IWC-SOCER); http://www.iwcoffice.org/sci_com/socer.htm). These summarize relevant scientific literature not only for cetaceans but for marine mammals in general and some prey species.

in the St. Lawrence estuary, Canada). Time series measurement of some POPs in specific marine mammals, particularly cetaceans have demonstrated that trends in chemicals can change very clearly, e.g. the appearance and rapid rise of more recent chemicals groups such as PBDEs (Ross, et al. 2009);

- fauna (Sonne et al. 2010 on body burdens of POPs and biomarkers of health in polar bears); and
- chemical coverage: the most frequently examined are PCBs and DDT. However, recent studies have looked at PBDE's (Ross et al. 2009), organotins (Dorneles et al. 2008) and Poly Fluorinated Acids (PFA's; e.g. Bossi et al. 2005), amongst many other substances.

3. Contaminants which are likely to biomagnify

16 With an estimated 30,000 to 100,000 chemicals in commercial production, the choice of potentially bioaccumulating chemicals is large. Therefore, criteria such as production/emission volume, environmental fate and hazard to human health and the environment are generally used to prioritize chemicals for regulation. In general the chemicals which undergo biomagnification will be:

- highly persistent (DT50s in environmental compartments on the scale of months to years);
- they may be chronically toxic to biota;
- bio-accumulating, i.e. lipophilic (log octanol/water partitioning coefficient generally but not always >6); and
- often semi-volatile.

17 So the chemicals which are the greatest cause of concern are those which are not only persistent, toxic and bio-accumulating but also subject to long-range transport, as listed in the recently expanded Stockholm Convention Annex A and B substances (See Table 1). The contaminants considered by any assessment of biomagnification should be limited to those which truly biomagnify, when the data has been corrected for lipid content. Many, but by no means all, of the contaminants which are known or suspected to biomagnify are listed on the Stockholm Convention's annexes for restriction or phase-out and this provides a good starting point.

18 The numbers of new POP's being found in top predators, such as marine mammals in the Arctic Ocean, is still increasing despite earlier bans on substances such as PCB's, etc. It can take decades for POPs to reach pristine areas such as the arctic. This delayed effect means that the impact of risk management measures in remote regions (e.g. the Stockholm Convention which entered into force in 2004), is as yet unknown. OSPAR (2010) expects pressure on biota from long-range atmospheric transport of contaminants to increase in their Arctic sub-region.

Table 1 Stockholm Convention: Persistent Organic Pollutants		
Nine chemicals were added to the Stockholm Convention Annexes in 2010		
Annex A (for elimination):	Annex B (for restriction):	Annex C (unintentional production):
<ul style="list-style-type: none"> • aldrin • chlordane • chlordecone • DDT • dieldrin • endrin • heptachlor • hexabromobiphenyl • tetra, penta, hexa and heptabromodiphenyl ethers • hexachlorobenzene • alpha & beta hexachlorocyclohexane • lindane • mirex • pentachlorobenzene • toxaphene • polychlorinated dibenzo-p-dioxins (PCDD), polychlorinated dibenzofurans (PCDF), • polychlorinated biphenyls (PCB). 	<ul style="list-style-type: none"> • DDT, • perfluorooctane sulfonic acid, its salts (PFOS), • perfluorooctane sulfonyl fluoride 	<ul style="list-style-type: none"> • polychlorinated dibenzo-p-dioxins (PCDD), • polychlorinated dibenzofurans (PCDF), • hexachlorobenzene (HCB), • polychlorinated biphenyls (PCB)
Chemicals currently proposed for listing under the convention		
<ul style="list-style-type: none"> • Short-chained chlorinated paraffins • Endosulfan • Hexabromocyclododecane 		

19 The geographical distribution of useful data can be expected to be widespread in the Northern hemisphere and the Mediterranean region, but it will be far patchier elsewhere. All chemicals of concern can be expected to have geographical coverage problems and, time series can be expected to be fragmentary. It has always been a concern to sustain monitoring programmes for long enough to obtain adequate time-series data. The chemicals with the best coverage outside the relatively data rich areas are as follows, in order of potential data richness: mercury, DDT, and PCBs and PAHs and then the rest much less frequently.

4. Top predators

20 This scoping paper focuses on marine top predators (tertiary or ultimate consumers), which may comprise fish, reptiles, seabirds and marine mammals; the biological scope is thus very broad. Hansen et al. (2008) noted that marine food webs may be long, involving several trophic levels, unlike the terrestrial environment where the connections tend to be a shorter. Where human health is concerned, consumption of intermediate predators, such as salmon and tuna, may be just as important as top predators and should not be ruled out, merely because they are not at the very top of their food-chain.

21 While many of the predators of concern to such an assessment are marine and fish eating, other top predators may also take their prey on land or form the seas margins (e.g. polar bears,

leopard seals and killer whales) and may feed substantially on other mammals. Fig. 2 illustrates the complexity of such food webs and consideration therefore needs to be given to understanding them in order to be able to identify classes of top predators on a global scale.

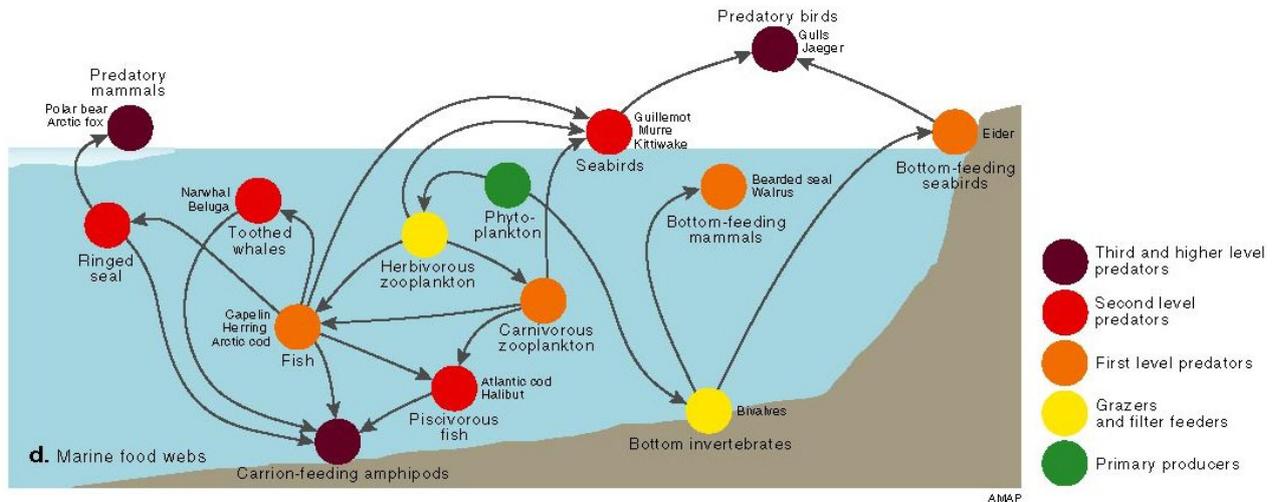


Fig. 2. Model arctic marine food web, incorporating several three to six level food chains, starting with primary producers (phytoplankton), grazers (herbivorous zooplankton) and several further levels of consumer (e.g. carnivorous zooplankton, fish, ringed seal, polar bear) - from Arctic Monitoring & Assessment Programme.

22 Many of the top predators which would be considered by such an assessment are already subject to other anthropogenic pressures, often quite severely, e.g. overfishing and by-catch in the case of fish and dolphins respectively, ingestion of plastics in the case of seabirds, loss of habitat in the case of marine reptiles, in addition to seal culls for fur and meat or to protect fisheries, so-called scientific whaling and the effects of climate change, to name but a few. Biomagnification is thus one of many anthropogenic pressures and a key issue of such an assessment would be to determine its relevance and relative impact.

The top predators of concern could be identified using such criteria as:

- structure of their food webs;
- geographical spread of the species;
- prevalence in human diet (global and local);
- population status; and
- level of legal protection, e.g. IWC status etc.

4.1 Fisheries

23 The history of contaminant residue measurement in fisheries products goes back many decades and has a voluminous literature. The tuna family forms a useful example of a predatory fish species, one that is very important economically and a significant source of food. According to FAO, their global production (extraction) has increased continuously from less than 0.6 million tonnes in 1950 to above 6 million tonnes today. The so-called 'principal market' tuna species are landed around the world and are traded and processed on a global scale. Most catches of the principal market species (see below, 67% of total catch) are taken from the Pacific (70.2% of the total catch of principal market tuna species in 2008), with the Indian Ocean contributing much more (20.4% in 2008) than the Atlantic and the Mediterranean (9.5% in 2008). Approximate contributions of individual principal market tuna species to the 2008 total catch were: Albacore,

4.7%; Atlantic bluefin tuna, >1%; Bigeye tuna, 9.6%; Pacific bluefin tuna, <1%; Southern bluefin tuna, <1%; Skipjack tuna 57.5%; yellowfin tuna 27.1%. These statistics indicate major fisheries pressure and decline on some species such as bluefin tuna. Knowledge of historical contaminant levels of important species such as skipjack and yellowfin tuna will contribute greatly to an understanding of intermediate predators with a wide human consumption. Other fish species may have widely differing position in their food webs and in their consumption patterns. As part of an assessment, fisheries will require considerable effort to unravel in this context.

24 The fisheries aspects of any assessment of bioconcentration should be carefully researched and constructed in an objective manner. The assessment should consider not only indigenous human populations consuming a high proportion of local resources but also the most import human food species groups which potentially expose large populations to contaminants, as well as their associated positive and negative health issues. The support of FAO would be essential to the success of this aspect of an assessment.

4.2 Whaling and fisheries by-catch

25 Whales are captured for food on a much reduced but nevertheless still significant scale since the International Whaling Commission ban on commercial whaling commenced in the 1980's. The species of whale which are consumed following capture by indigenous human populations are generally known. Dolphin drive-fishing has been recorded in the Solomon Islands, the Faroe Islands, Peru and Japan. Certainly, the numbers caught under licence from IWC for research purposes are also well known. Fig. 3 below summarises the samples taken and data collected during the recent Japanese NW Pacific research whaling campaign for just one species: Minke whale.

26 Dolphins have been a by-catch of tuna and other fisheries for many years, with mortalities in the hundreds of thousands reported up to the 1970's for the US purse seine tuna fishery. Recent improvements in equipment have apparently reduced the numbers caught to ca. 1500 per year. No information is available as to any exploitation for commercial purposes of such a large by-catch.

II-5. Biological data – common minke whale – coastal component off Kushiro

DB Data and sample	Number of whales		
	Male	Female	Total
* Sampling date	182	72	254
* Sampling location	182	72	254
* Body length	182	72	254
* Body proportion	182	72	254
Skull (length and breadth)	181	72	253
Body scar record	182	72	254
Parasites, external occurrence record	182	72	254
Parasites, internal occurrence record	-	-	-
* Sex	182	72	254
* Body weight	182	72	254
* Organ weights	11	3	14
* Blubber thickness	182	72	254
* Girth	182	72	254
* Maturity stage	182	72	254
Corpora albicantia and lutea (number)	-	72	72
* Lactation condition	-	72	72
* Testis weight	182	-	182
* Stomach contents (IWS format)	182	72	254
* Stomach contents weights	182	72	254
* Main prey species in stomach contents	182	72	254
* Freshness of stomach contents	182	72	254
Foetus, number	-	72	72
Foetus, sex	-	—	4
Foetus, body length	-	—	4
Foetus, body weight	-	—	4
Ear plug	181	71	252
* PCB concentrations (blubber)	-	-	-
* Total Hg levels (liver)	46	-	46
* Total Hg, methyl Hg and Se levels (liver)	-	-	-
* Total Hg, methyl Hg and Se levels (kidney)	-	-	-
* Total Hg, methyl Hg and Se levels (muscle)	-	-	-
* Mitochondrial DNA control region sequences	181	72	253
* Nuclear DNA microsatellite (16 loci)	182	71	253

Fig 3. From IWC (2010). Biological data including contaminants sampled from 254 minke whales during the JARPN II Japanese research whaling programme.

27 With the uncertainties that lie ahead for whale conservation in general, any assessment should recognise the population status and degree of legal protection afforded to potential or actual food species; ***smaller cetaceans are not protected by IWC regulation and the estimation of standing stocks remains a difficult issue.***

5. Environmental health

28 Many studies of contaminant body burdens in top predators have made a link, most often by implication with the health of the individual and the population. However, evidence of cause and effect is generally lacking. Letcher et al. (2010, AMAP assessment; see also Muir and de Wit 2010), reported that:

“there are now effects data for populations of several top trophic level species, including seabirds (e.g., glaucous gull, polar bears, polar (Arctic) fox and Arctic char as well as semi-captive studies on sled dogs. The indications of effects of organohalogen exposure are largely based on correlations between biomarker endpoints (e.g., immune and endocrine endpoints, pathological changes in tissues, reproductive and developmental effects) and tissue residue levels of e.g., PCBs, DDTs, CHLs, PBDEs and in a few cases PFCAs and PFSA. While cause and effect cannot be assessed for such studies, semi-field studies

with captive Greenland sled dogs have demonstrated that cohorts exposed to contaminated West Greenland minke whale blubber versus control (commercial pork fat) diets showed changes in immune and endocrine endpoints. Also, performance studies mimicking environmentally relevant PCB concentrations in Arctic char have demonstrated biological effects as a result of the PCB exposure.”

29 Recent studies, such as Sonne et al. 2010, seem to be making headway in understanding the effects of such body-burdens on the health of the organism (in this case, polar bears). They reported that:

“Evidence for multiple organo-halogen and mercury induced sub-clinical health effects were found in East Greenland and Svalbard polar bears and except for bone density reductions; these were successfully supported by controlled studies of West Greenland sledge dogs and Norwegian Arctic foxes. The underlying mechanisms for these effects were thought to be via disruptions of neuro-endocrine loops as well as direct cellular toxicity”,

and presented a tentative mechanism of effects (see Fig 4. Below).

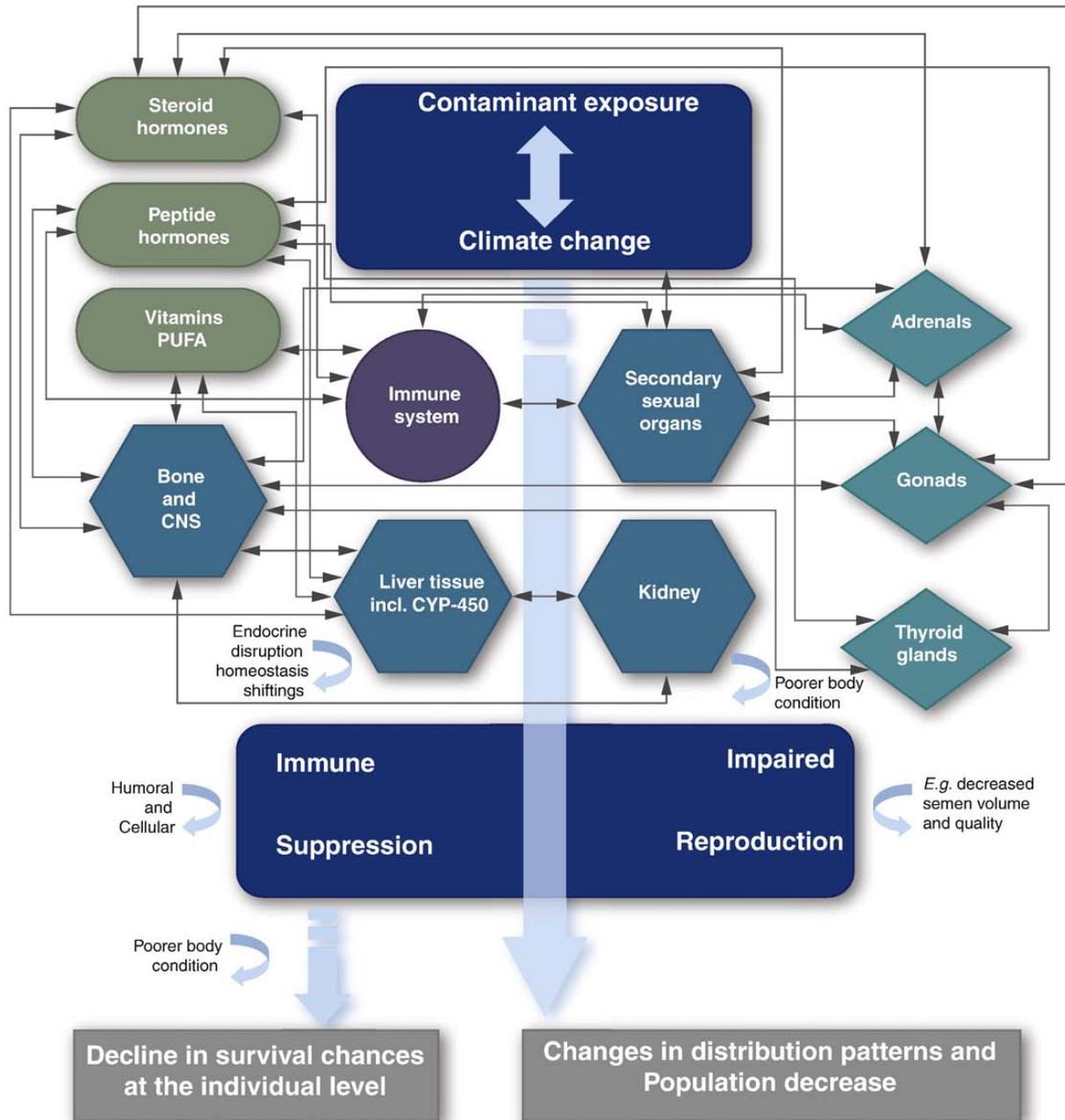


Fig. 4. From Sonne et al. (2010): Patho-physiological diagram showing some of the underlying contaminant and climate change related stress mechanisms in polar bears and predator model species at the individual and population level. The various organs, systems and endocrine/homeostatic parameters are arranged in separate squared circles and boxes. Some of the endocrine feed-back loops included in the hypothalamic–hypophysis–target organ axis, cellular mechanisms and biochemistry are represented by lines and arrows. PUFA = Poly unsaturated fatty acids (e.g. n3-FA).

30 Mass stranding and deaths in marine mammals have been periodically reported; often contaminants are implicated as a cause of disease but the findings are often inconclusive. Castrillon et al. (2007) reported that PCB and DDT levels do not appear to have enhanced the mortality of striped dolphins (*Stenella coeruleoalba*) in the 2007 Mediterranean epizootic, as contaminant levels were far lower than in a previous epizootic in 1990. On the other hand, very recent research (Winans et al. 2011) in mice has demonstrated that early life exposure to the dioxin TCDD an ubiquitous pollutant, which represents a category of agents that activate the aryl hydrocarbon receptor (AhR) may play a role in developmental regulation. Developmental activation of AhR led to persistent alterations in the immune response in adult mice to influenza A

virus as a prototypical human pathogen. Such developments may in the near future shed light on the health of marine mammal populations in general. The linking of contaminant burdens to actual effects should be one of the main focuses of an assessment of biomagnification.

6. Human health

6.1 *Global consumption of fisheries products*

31 FAO maintains detailed statistics on world fisheries product consumption. Some small island states, such as Tokelau (a territory of New Zealand, population 1400) and the Cayman Islands (a territory of the UK, population 55,000) have diets comprised almost totally of fisheries products. More generally, small island states have levels of fisheries product consumption above 20% of total protein intake per capita. Greenland and Iceland have similarly high levels to this group. Thailand, Cambodia and The Philippines all consume between 15 and 20%. Japan and the Republic of Korea stand out among developed countries as fisheries product consumers with 22.6 and 17.1% respectively of total protein from fisheries products. The USA (4.7), Japan (3.9), China (2.9), Spain (2.1), Germany (1.9) France (1.9) and Korea (1.8) are the largest importers of fish in the world (FAO 2007, millions of tonnes live weight). China, with only a modest 7.2% of protein coming from fisheries, products is by far and away the largest consumer. As part of a global assessment, much more detailed fisheries data would be required on upper food and web key top predators, their levels of contamination and their significance in human diets. Some of the potential pitfalls are illustrated by the two examples below.

32 To illustrate that this area is not without its controversies, Hites et al. (2004) received substantial criticism from FAO (see <http://www.fao.org/fishery/topic/14815/en>) for their study of 14 chlorinated organic compounds in farmed and wild salmon. The study revealed that all the substances tested were present in higher concentrations in farmed salmon than wild salmon. This applied in particular to fish produced on European farms. Although the levels found were consistent with results from earlier surveys and official controls, the researchers concluded that consumers should limit their consumption of farmed salmon and suggested that to avoid additional increase of cancer risk; one should restrict consumption to one portion of farmed salmon every two months. Food control and health authorities pointed out that the study did not raise new food safety issues as the levels were consistent with results from other surveys and official controls. They encouraged consumers to continue eating salmon and other fish, the health benefits of which had been proven beyond all doubt in over 5 000 scientific studies. Unfortunately, the Hites et al. (2004) study had already alarmed the consuming public, and retail orders of farmed fish fell by 20–30 percent in countries such as Ireland, Norway and Scotland.

33 Crepet et al (2005) presented an updated assessment of human exposure in France to methyl mercury through the consumption of fish and fishery products (using probabilistic modelling), and proposed several management scenarios which could reduce this exposure through changes to fish contamination levels or fish consumption patterns. Levels exceeded the revised fixed provisional tolerable weekly intake (PTWI) for methyl mercury of 1.6 µg/week/kg of body weight, established by the Joint FAO/WHO Expert Committee on Food Additives in 2003. The results focussed on at-risk groups such as young children and women of childbearing age. According to the pattern of fish consumption (e.g. predatory fish only or consumption of predatory and non-predatory fish), the results suggested that strategies to diminish methyl mercury exposure by reducing the amount of predatory fish consumed would be more efficient in significantly decreasing the probability of exceeding the PTWI than the implementation of international standards.

6.2 *Whale products*

34 Indigenous whaling takes place in Greenland, Norway, the Faroes Islands and one or two other locations mainly for local consumption. However, it is very difficult to separate local market from wider commercial enterprise. The Whale and Dolphin Conservation Society (WDCS, 2010)

provides an important insight into the commercial development of modern whaling under the IWC ban on whaling, entitled "*Reinventing the whale: the whaling industry's development of new applications for whale oil and other products in pharmaceuticals, health supplements and animal feed*". If there is any doubt that the topic of biomagnification has the potential to be controversial, then, it is recommended to read the above report in combination with the International Whaling Commissions (IWC) 2nd workshop report which reviews the scientific value of the Japanese Governments N W Pacific research whaling programme.

35 There have been official investigations into the impact on human health of whale meat in the diet, amongst others in the Faroe Islands. Any assessment of biomagnification will need to address the issue of whale meat contamination, human consumption and health impacts from whatever source in a balanced and objective manner. In this respect, the support and expertise of the IWC will be essential.

6.3 Health of indigenous populations

36 Where assessments of the health of populations dependent on fish for a substantial part of their diet are available, they present a complex picture of competing pressures. The conclusions of the AMAP (2009) assessment, entitled "*Human health in the Arctic*" can be briefly summarized as follows:

- health disparities between indigenous and non-indigenous populations and between population groups in different Arctic regions continue to be significant;
- levels of legacy POPs in human tissues are declining in many regions of the circumpolar Arctic. New sources and patterns are being seen in Arctic Russia;
- levels of mercury in human tissues are declining in several Arctic regions. Inuit continue to have the highest exposure levels of mercury in the Arctic and most often exceed blood guidelines;
- new evidence indicates that POPs, mercury, and lead can affect the health of people and especially children at lower levels of exposure than previously thought;
- climate change may increase the mobilization of POPs and mercury, and lead to higher releases of contaminants within the Arctic;
- several emerging compounds have recently been detected in the Arctic and in human tissues and have not been adequately evaluated [PBDEs, PFOS, PFOA];
- traditional foods are an important source of nutrients for many Arctic residents. These foods are also the main source of exposure to contaminants. Dietary advice should take into account contaminant concentrations in local foods in order to reduce the exposure level;
- imported store-bought foods have lower contaminant levels, but many of these foods commonly consumed in the Arctic tend to be high in saturated fats and sugars. An increasing proportion of the Arctic population is consuming unhealthy imported foods;
- lifestyles in much of the circumpolar region are changing. Unhealthy choices can worsen general health and exacerbate responses to contaminant exposures.

37 This recent assessment describes trends in POP's and human health for one unique region in which indigenous populations are still dependent on marine products in their diets and coincidentally a region to which many POPs which undergo long-range atmospheric transport tend

to be transported to. Such studies will form an important component of any health impact assessment as a result of bioconcentration.

7. Relationship to Global assessment programmes

38 Any assessment of this topic should be designed in such a way as to feed directly into higher level global assessment efforts. There are currently two global programmes for regular assessment of the global environment:

- .1 the UN General Assembly ‘*Regular Process for global reporting and assessment of the state of the marine environment, including socio-economic aspects*’ (in short, the UNRP), including its key features, the necessary institutional arrangements and financing and to specify the objective and scope of its first assessment cycle (2010 – 2014) approved under Resolution A/64/71 in 2009. The UNRP was preceded by the Assessment of Assessments and
- .2 methodology for assessment of Large Marine Ecosystems (LMEs) was developed under the Global Environment Facility (GEF) medium size project (MSP) ‘*Development of the Methodology and Arrangements for the GEF Transboundary Waters Assessment Programme (TWAP)*’. The TWAP project arose out of the need for a systematic and scientifically-robust methodology and institutional arrangements for assessing the changing conditions of transboundary water systems (groundwater aquifers, lakes/reservoirs, river basins, LMEs, and open ocean areas) resulting from human and natural causes.

Productivity	Fish & Fisheries	Pollution & Ecosystem health	Socio-economics
<ul style="list-style-type: none"> • Primary productivity • Chlorophyll <i>a</i> • Sea surface temperature 	<ul style="list-style-type: none"> • Reported landings • Value of reported landings • MTI and FiB • Ecological Footprint of Fisheries • Stock-status catch plots 	<ul style="list-style-type: none"> • Mercury • Nutrients • PoPs (Plastic resin pellets) • Shipping density • Seamounts at risk • Change in Protected Area coverage • Change in extent of mangrove habitat • Reefs at Risk Index • Deltas at Risk Index 	<ul style="list-style-type: none"> • % GDP fisheries • % GDP international tourism • Urban and rural populations living within 10 m coastal elevation • HDI • Deaths per 100,000 caused by climate related natural disasters

39 For each indicator, the following is described: relevance, methodology and data availability, and institutions/experts involved in developing the indicator. More detailed descriptions of the indicators are included in an annex.

8. Conclusions with regard to an assessment of bioconcentration in top predators

The need

40 This initial literature search and brief review did not turn up any existing global assessment or even a recent broad scientific review of biomagnification as a whole. However, some specific aspects have been the subject of recent reviews, often restricted to a specific region or to one or a few species. As sketched in the foregoing chapters, an approach involving: knowledge of food webs and trophic position, contaminant levels in widespread species, ecological effects and human health impact will of necessity lead to a broad assessment. There have been several recent and high quality regional assessments, which cover some aspects of this issue. And which form a logical starting point, e.g. AMAP.

41 While pollution abates slowly in some developed countries, the reservoirs of more recent POP's are considered not yet to have reached some sensitive areas such as the Arctic. The massive industrialization of China, India and S.E. Asia in general, the shift in diets and scarcity of food resources all make this issue more urgent than ever before.

42 The anthropogenic pressures exerted on top predators, the importance of some as food sources and their potential human health impacts as accumulators of contaminants make this an important subject. A global assessment could inform policy makers of issues surrounding the management and conservation of top predators in a genuinely new way.

The scale and feasibility,

43 Information on this topic is contained in a vast scientific literature across several disciplines (fisheries, marine mammal and seabird research, epidemiology and human health impact assessment) and is badly in need of summary and review. Ideally, some fresh regional summaries of data would be required in a preparatory phase. Such a potentially large assessment would need to be carefully planned in modules based on expert communities globally and budgeted accordingly. With the scientific community publishing new studies at a rapid rate, an assessment which may take three to four years to complete should be able to summarise the global state of bioconcentration in important top predators in a relatively comprehensive way. In this respect, inclusion of such an indicator in global assessment programmes such as IOC/UNEP/GEFs Transboundary Waters Assessment Programme would provide an extra stimulus.

44 Of the brief given by GESAMP in section 1, only one aspect has not been considered here, that of the potential impact of biomagnification on ecosystems. Narrowing the focus to the status of and impact on upper food-web and top predators as opposed to the impact on whole ecosystems was felt to make the topic more manageable. Nonetheless, should clear impacts on ecosystems be reported in the literature and assessment landscape, then these should not be ignored.

Potential sources of funding

45 UN agencies, EU, NOAA, GEF.

Expert communities and sources of information

A global assessment of biomagnification would require a multi-stakeholder, multi-disciplinary approach and would need to build on the expertise of UN agencies such as WHO and FAO, IGOs such as the IWC, AMAP, OSPAR and CIESM to name but a few.

IWC - The International Whaling Commission: produces a State of the Cetacean marine Environment Report each year since 2003, in which new publications on whales are briefly reviewed. It provides a useful thematic overview of relevant literature for whales and dolphins.

The Encyclopedia of Marine Mammals, Second edition, 2009; Eds. W.F. Perrin, B Wuersig and J.G.M. Thewissen, Academic Press/Elsevier, 1316p. This provides a good overview of the biology of a wide range of cetacean and pinniped species as well as the issues surrounding their management and protection.

OSPAR and other supporting Quality Status Report assessments:

- Status and trend of marine chemical pollution. OSPAR Commission, London, 2009. Publication 395/2009.
- Towards the cessation target: Emissions, discharges and losses of OSPAR chemicals identified for priority action. OSPAR Commission, London, 2008. Publication 354/2008.
- Trends and concentrations of selected hazardous substances in marine sediments and biota. CEMP assessment report 2008/2009. OSPAR Commission, London, 2009. Publication 390/2009.
- Trends in atmospheric concentrations and deposition of nitrogen and selected hazardous substances to the OSPAR maritime area. OSPAR Commission, London, 2009. Publication 447/2009.
- Atmospheric deposition of selected heavy metals and persistent organic pollutants to the OSPAR maritime area (1990–2005). OSPAR Commission, London, 2008. Publication 375/2008.
- Trends in waterborne inputs. Assessment of riverine inputs and direct discharges of nutrients and selected hazardous substances to the OSPAR maritime area in 1990–2006. OSPAR Commission, London, 2009. Publication 448/2009.
- Losses of contaminants from ships' coatings and anodes. A study relating to the Netherlands Continental Shelf and the North Sea. OSPAR Commission, London, 2009. Publication 462/2009.
- ICES assessment of data on fish diseases in the OSPAR maritime area. ICES Advice 2009, Book 1, section 1.5.5.10. 11 pp.

Arctic Monitoring & Assessment Programme (AMAP, <http://www.amap.no/>) member countries: Canada, Denmark (Greenland), Finland, Iceland, Norway, Russian Federation, Sweden, USA. The AMAP 2009 series of assessments on contaminants forms a valuable resource.

International Whaling Commission, 2009 REPORT OF THE EXPERT WORKSHOP TO REVIEW THE ONGOING JARPN II PROGRAMME (Japanese Research Whaling Programme)

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ANNEX IX**GESAMP REPORTS AND STUDIES**

The following reports and studies have been published so far. They are available from the GESAMP website: <http://gesamp.org>

1. Report of the seventh session, London, 24-30 April 1975. (1975). Rep. Stud. GESAMP, (1):pag.var. Available also in French, Spanish and Russian
2. Review of harmful substances. (1976). Rep. Stud. GESAMP, (2):80 p.
3. Scientific criteria for the selection of sites for dumping of wastes into the sea. (1975). Rep. Stud. GESAMP, (3):21 p. Available also in French, Spanish and Russian
4. Report of the eighth session, Rome, 21-27 April 1976. (1976). Rep. Stud. GESAMP, (4):pag.var. Available also in French and Russian
5. Principles for developing coastal water quality criteria. (1976). Rep. Stud. GESAMP, (5):23 p.
6. Impact of oil on the marine environment. (1977). Rep. Stud. GESAMP, (6):250 p.
7. Scientific aspects of pollution arising from the exploration and exploitation of the seabed. (1977). Rep. Stud. GESAMP, (7):37 p.
8. Report of the ninth session, New York, 7-11 March 1977. (1977). Rep. Stud. GESAMP, (8):33 p. Available also in French and Russian
9. Report of the tenth session, Paris, 29 May - 2 June 1978. (1978). Rep. Stud. GESAMP, (9):pag.var. Available also in French, Spanish and Russian
10. Report of the eleventh session, Dubrovnik, 25-29 February 1980. (1980). Rep. Stud. GESAMP, (10):pag.var. Available also in French and Spanish
11. Marine Pollution implications of coastal area development. (1980). Rep. Stud. GESAMP, (11):114 p.
12. Monitoring biological variables related to marine pollution. (1980). Rep. Stud. GESAMP, (12):22 p. Available also in Russian
13. Interchange of pollutants between the atmosphere and the oceans. (1980). Rep. Stud. GESAMP, (13):55 p.
14. Report of the twelfth session, Geneva, 22-29 October 1981. (1981). Rep. Stud. GESAMP, (14):pag.var. Available also in French, Spanish and Russian
15. The review of the health of the oceans. (1982). Rep. Stud. GESAMP, (15):108 p.
16. Scientific criteria for the selection of waste disposal sites at sea. (1982). Rep. Stud. GESAMP, (16):60 p.
17. The evaluation of the hazards of harmful substances carried by ships. (1982). Rep. Stud. GESAMP, (17):pag.var.

18. Report of the thirteenth session, Geneva, 28 February - 4 March 1983. (1983). Rep. Stud. GESAMP, (18):50 p. Available also in French, Spanish and Russian
19. An oceanographic model for the dispersion of wastes disposed of in the deep sea. (1983). Rep. Stud. GESAMP, (19):182 p.
20. Marine pollution implications of ocean energy development. (1984). Rep. Stud. GESAMP, (20):44 p.
21. Report of the fourteenth session, Vienna, 26-30 March 1984. (1984). Rep. Stud. GESAMP, (21):42 p. Available also in French, Spanish and Russian
22. Review of potentially harmful substances. Cadmium, lead and tin. (1985). Rep. Stud. GESAMP, (22):114 p.
23. Interchange of pollutants between the atmosphere and the oceans (part II). (1985). Rep. Stud. GESAMP, (23):55 p.
24. Thermal discharges in the marine environment. (1984). Rep. Stud. GESAMP, (24):44 p.
25. Report of the fifteenth session, New York, 25-29 March 1985. (1985). Rep. Stud. GESAMP, (25):49 p. Available also in French, Spanish and Russian
26. Atmospheric transport of contaminants into the Mediterranean region. (1985). Rep. Stud. GESAMP, (26):53 p.
27. Report of the sixteenth session, London, 17-21 March 1986. (1986). Rep. Stud. GESAMP, (27):74 p. Available also in French, Spanish and Russian
28. Review of potentially harmful substances. Arsenic, mercury and selenium. (1986). Rep. Stud. GESAMP, (28):172 p.
29. Review of potentially harmful substances. Organosilicon compounds (silanes and siloxanes). (1986). Published as UNEP Reg. Seas Rep. Stud., (78):24 p.
30. Environmental capacity. An approach to marine pollution prevention. (1986). Rep. Stud. GESAMP, (30):49 p.
31. Report of the seventeenth session, Rome, 30 March - 3 April 1987. (1987). Rep. Stud. GESAMP, (31):36 p. Available also in French, Spanish and Russian
32. Land-sea boundary flux of contaminants: contributions from rivers. (1987). Rep. Stud. GESAMP, (32):172 p.
33. Report on the eighteenth session, Paris, 11-15 April 1988. (1988). Rep. Stud. GESAMP, (33):56 p. Available also in French, Spanish and Russian
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