



**PLANNING OF GESAMP ACTIVITIES:
SOURCES, FATE AND EFFECTS OF MICRO-PLASTICS IN THE MARINE ENVIRONMENT –
A GLOBAL ASSESSMENT**

Report of the GESAMP Microplastics Working Group (Working Group 40)

Background and introduction

1 It is widely recognised that marine debris can have significant ecological, social and economic impacts. Plastics form a large proportion of marine litter, and the widespread occurrence of macroscopic plastic debris and the direct impact this can have both on marine fauna and legitimate uses of the environment, sometimes remote from industrial or urban sources, has been well documented. In general, plastic debris comes in a wide variety of sizes and compositions and has been found throughout the world ocean, carried by ocean currents and biological vectors (e.g. stomach contents of fish, mammals and birds). Plastics degrade extremely slowly in the open ocean, partly due to UV absorption by seawater and relatively low temperatures. In recent years the existence of micro-plastics and their potential impact has received increasing attention. Micro-plastics have a range of compositions and can be demarcated by usage and source as: i) 'primary' particles, such as micro-plastic resin pellets used in the plastics industry, and in certain applications such as industrial abrasives and skin-care products; and, ii) 'secondary' micro-plastics resulting from the degradation and breakdown of larger items

2 The potential influence of micro-plastic particles on the transfer of pollutants was raised as an emerging issue within GESAMP, leading to the preparation of a scoping paper that was reviewed and approved at GESAMP 37 in Bangkok. Since then 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, an International Workshop on Plastic particles as a vector in transporting persistent, bio-accumulating and toxic substances in the oceans was hosted by UNESCO-IOC in Paris in June 2010 (GESAMP 2010).

3 One of the main recommendations of the Paris International Workshop was that there was a need for a global assessment to explore the extent to which micro-plastics represented a hazard to the marine environment. Subsequently GESAMP contributed to the UNEP Year Book 2011; the 2nd NOAA Scientific Workshop on Micro-plastics held in Tacoma, Washington, United States in October 2010; a special session at SETAC (Society for Environmental Toxicology and Chemistry) 2010; special sessions at PICES (North Pacific Marine Science Organisation) in 2010 and 2011; and, the 5th International Marine Debris Conference held in Honolulu, Hawaii, United States in March 2011.

4 The Terms of Reference and overall draft work programme for WG 40 were approved at GESAMP 38 in Monaco in May 2011. At this point the size of the available budget was unknown, and so the scope, size and time-scale of the potential WG 40 work programme was

uncertain. A period of consultation with additional non-UN sponsors allowed the work programme to be consolidated. GESAMP was very fortunate to attract support from NOAA and the plastics producers, as represented by PlasticsEurope and the American Chemistry Council (ACC), in addition to support from the UN Agencies UNESCO-IOC, IMO, UNIDO and UNEP.

Terms of Reference of Working Group 40 (as approved at GESAMP 38)

5 The Terms of Reference (ToR) approved at GESAMP 38 were as follows:

- i. Estimate rates of inputs of micro-plastic particles (e.g. resin pellets, abrasives, personal care products) and macro-plastics (including main polymer types) into the ocean; to include developing methodology, using monitoring data, identifying proxies (e.g. population centres, shipping routes, tourism revenues);
- ii. Review modelling of surface transport, distribution & areas of accumulation of plastics and micro-plastics, over a range of space- and time-scales;
- iii. Review processes (physical, chemical & biological) controlling the rate of fragmentation and degradation, including estimating long-term behaviour and estimate rate of production of 'secondary' micro-plastic fragments;
- iv. Review long-term modelling including fragmentation, seabed and water column distribution, informed by the results of ToR 3; and
- v. Review uptake by biota, physical biological impacts at a population level.

Membership of the Working Group

6 The current membership of WG 40, as of March 2012 stands at 16. This may be considered the 'Core Group' of Members. In addition, we anticipate involving 'associate members' who contribute to the work of the group without being funded out of the WG 40 budget. This reflects the wide range of scientific disciplines, and regional expertise, required to carry out an assessment of this nature.

Co-Chairs:

Peter Kershaw – United Kingdom
Heather Leslie – Netherlands

Members:

Tony Andrady – United States
Joel Baker - United States
Virginia Garcia Rios – Mexico
Pablo Huidobra – Mexico
Angela Koehler – Germany
Kara Lavender law – United States
Nicolai Maximenko – United States
Oladele Osibanjo – Nigeria
Seba Sheavely – United States
Won Joon Shim – Korea
Hideshige Takada – Japan
Richard Thompson – United Kingdom
Alexander Turra – Brazil
R Venkatesan – India

Activities of the Working Group Inception Meeting

7 The main activity was the Inception Meeting, held in Paris from 13 to 15 March 2012, and hosted by UNESCO-IOC. It was attended by ten working group Members, representatives of sponsoring Agencies and a number of invited Observers (annex 1). Confirmation of the meeting dates was only possible about 3 weeks before the event, because of difficulties in finalising the contractual arrangements. This delay, combined with prior commitments, meant that the number of Members and Observers was fewer than had been intended. Despite the missing participants, the Inception Meeting proved to be a lively and challenging event, consisting of a number of invited presentations, break-out groups and feedback sessions. Edited versions of the presentations will be made available on-line and a summary of the discussions, conclusions and recommendations will be included in the Inception Report.

8 Three invited Members gave overviews of the current state of knowledge and knowledge gaps on: i) sources, distributions and trends of micro-plastics; ii) properties and degradation of polymers; and, iii) physical and chemical effects of micro-plastics. These were followed by several shorter presentations on related programmes (e.g. NOAA, Gulf of Mexico LME, UNEP, ACC/PE, NCEAS working group) before the meeting split into two break-out groups to consider the scope and approaches required to conduct an assessment: i) sources, distribution and trends; and, ii) properties and effects. Periods for discussion and feedback were included in the meeting timetable, with rapporteurs appointed to record the key points.

9 There was agreement on the need to set the assessment in a recognised assessment framework, and a number of options were described. This needed to be placed in an appropriate Road Map and a revised time-line for the work programme was recommended for approval by GESAMP 39 (annex 3). This was the consequence of the increased financial support since GESAMP 38, where a phased approach had been recommended, spreading the work of the group over four years. The increased support will allow all the ToRs to be initiated at the start. The meeting also questioned whether there was a need for an additional ToR, to consider how to address social and economic concerns, including public perceptions (annex 2). This reflected the perceived role of NGOs, the media and the public in raising the profile of micro-plastics as an issue that policy makers needed to address, without there necessarily being solid scientific evidence to justify this.

Future activities of the Working Group

10 The Inception Report will be circulated for comment and approval by WG 40, after which it will be placed on the GESAMP website and circulated to those on a distribution list, to be maintained by IMO and the Co-Chairs. The Report will include a detailed outline of roles, responsibilities, scope, expectations and intended outputs. A series of telephone-conferences will be held, to include those Members who were unable to attend the Inception Meeting. Options for setting up a remote office will be explored (e.g. Mendeley, GESAMP website) for maintaining working documents.

11 A second WG meeting will be held within 12 months, with the period 3 to 14 December 2012 being considered the preferred option at present. Additional 'associated members' will be identified as appropriate to cover gaps in expertise and regional coverage, and opportunities will be taken to link with related organisations and events. For example, an informal side event will take place at the 2012 SETAC Congress in Berlin, on 22 April 2012, in association with a special session on micro-plastics being co-convened by Courtney Arthur (NOAA), and several WG40 Members are expected to attend.

Action requested of GESAMP

12 GESAMP is invited to take note of this document and in particular consider and approve the proposed revisions to the Terms of Reference and the revised timeline (annexes 2 and 3).

ANNEX 1

**PARTICIPANTS AT THE INCEPTION MEETING
(GESAMP WG 40)**

The Inception Meeting was held from 13 to 15 March, 2012, at the UNESCO-IOC Headquarters, Paris, France.

WG 40 Co-Chairs:

Peter Kershaw – United Kingdom
Heather Leslie – Netherlands

WG 40 Members:

Tony Andrady – United States
Joel Baker - United States
Virginia Garcia Rios – Mexico
Angela Koehler – Germany
Kara Lavender law – United States
Won Joon Shim – Republic of Korea
Richard Thompson – United Kingdom
Alexander Turra – Brazil

Observers and other participants:

Michael Angelidis – UNEP/MAP
Julian Barbieri – UNESCO-IOC
Keith Christman – American Chemistry Council
Roberto Gomez – PlasticsEurope
Mar Gonzalez – OECD
Tessa Goverse – UNEP
Edward Kleverlaan – IMO
Luis Valdez – UNESCO-IOC
Leo de Vrees – EU DG Environment

ANNEX 2

PROPOSED REVISIONS TO THE TERMS OF REFERENCE

The proposed revisions to the Terms of Reference (ToR) were suggested following a discussion at the Inception Meeting of the need to distinguish *Assessments* from *Reviews*, and will be presented for approval at GESAMP 39:

- i. ~~Estimate~~ **Assess** rates of inputs of micro-plastic particles (e.g. resin pellets, abrasives, personal care products) and macro-plastics (including main polymer types) into the ocean; to include developing methodology, using monitoring data, identifying proxies (e.g. population centres, shipping routes, tourism revenues);
- ii. Review **and assess** modelling of surface transport, distribution & areas of accumulation of plastics and micro-plastics, over a range of space- and time-scales;
- iii. Review **and assess** processes (physical, chemical & biological) controlling the rate of fragmentation and degradation, including estimating long-term behaviour and estimate rate of production of 'secondary' micro-plastic fragments;
- iv. Review **and assess** long-term modeling including fragmentation, seabed and water column distribution, informed by the results of ToR 3; and
- v. Review **and assess** uptake by biota, physical biological impacts at a population level.

Additional ToR:

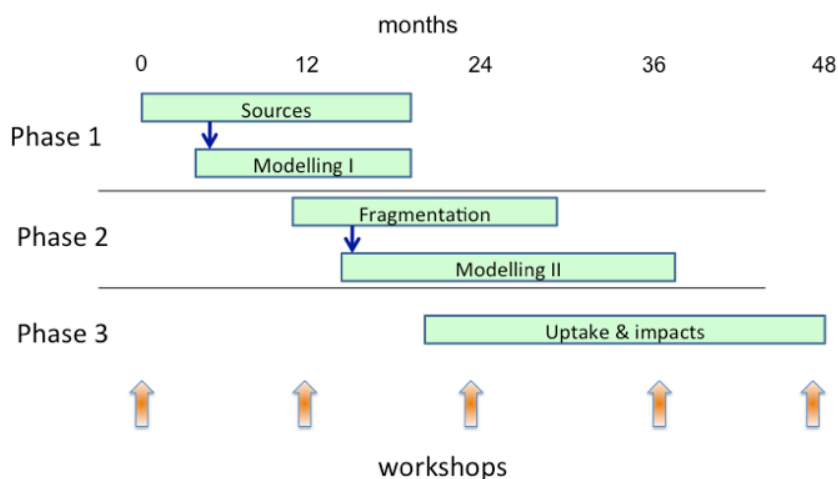
- vi. ***Assess the need to incorporate social/welfare aspects, including public perceptions***

ANNEX 3

PROPOSED REVISED TIMETABLE

The original timetable envisaged a phased introduction of the Terms of Reference (ToR), in part reflecting uncertainties in the available budget. It is proposed to initiate all ToRs at the inception, given the increased funding available. In addition this will help to integrate the results of the WG 40.

WG40 – original time-frame



WG40 – potential time-frame

