ICES WKMAL REPORT 2010

ICES ADVISORY COMMITTEE

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Report of the Joint MEDPOL/Black Sea/JRC/ICES Workshop on Marine Litter (WKMAL)

2–4 November 2010

ICES HQ, Denmark

ICES International Council for the Exploration of the Sea

CIEM Conseil International pour l'Exploration de la Mer

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Executive summary

The Joint MEDPOL/Blacksea/JRC/ICES Workshop on Marine Litter (WKMAL) was established as a follow-up to previous activities on marine litter in relation to the Marine Strategy Framework Directive, where Marine Litter is one of the descriptors. The workshop was chaired by Francois Galgani (France) and supported by Henna Piha (JRC).

The workshop considered the following points:

- Monitoring and experimental results
- The status of marine litter
- Identification of existing data on marine litter
- On-going data collection on marine litter
- Data needs for future assessment of marine litter
- Standards for recording marine litter
- Research needs
- Future ICES/MEDPOL/BSC activities on marine litter
- General discussion on good environmental status

From the discussion the following recommendations for future work emerged:

- Definition of scientific and technical basis for monitoring
- Harmonisation of classification of marine litter in relation to monitoring
- Identification of knowledge gaps and priority areas for research
- Definition of common and comparable monitoring approaches
- Development of scientific approaches to assess GES on a regional/European scale (sources and inputs as important indicators)
- Assessment of socio-economic harm (clean-up costs, litter related navigation accidents, costs to fisheries)
- ICES/MEDPOL/BSC involvement in research on marine litter, to prioritise and support scientifically the development of research programs.
- The need for a technical workshop to disseminate and inter-calibrate techniques amongst Member states for future monitoring.
- ICES should consider new activities on marine litter on the basis of identified scientific needs by the EC Technical Subgroup on Marine Litter or by regional institutions.

Opening of the meeting

The meeting agenda (Annex 2) was adopted and after a short presentation of participants (Annex 1) the meeting was introduced in the light of the Marine Strategy Framework Directive, where Marine Litter is one of the Descriptors, emphasising the need to structure and coordinate the scientific work at European level.

The Terms of Reference were the following:

a) Review the status of Marine Litter based on the work done by the Task Group on Marine Litter which provided scientific input to the European Commission for the Marine Strategy Framework Directive and the Commission decision on criteria on good environmental status under Article 9(3) of the MSFD.

b) Identify existing data on marine litter

c) Identify on-going data collection on marine litter

d) Describe data needs for future assessment of marine litter (taking into account the Commission Decision)

e) Consider standards for recording of marine litter

f) If relevant, prepare draft ToRs for a Study Group on marine Litter and propose a chair

Discussions

1 Round table: Scientific presentation of participants.

Francois Galgani presented monitoring results, mainly from the sea floor along the French coasts. The results stated the importance of understanding the links between circulation and identification of accumulation areas with some examples in the Mediterranean and in arctic areas. An important problem (including political aspects) is the transport of litter from one country to another.

George Kamizoulis explained that the first UNEP/MAP/IOC/FAO survey was organized in 1988 in Cyprus, Israel, Italy, Spain and Turkey within the Mediterranean context. In 1991 MED POL made a first preliminary assessment of marine litter and a new assessment was prepared in 1999. Main sources such as river runoff, tourist activities and coastal urban centres were identified. In 2003 WHO/EURO-MED POL prepared guidelines for the Management of coastal litter for the Mediterranean Region (not certain if this was really followed in any of the countries). A new assessment has been performed in 2006 based on rather scarce data & ad hoc surveys: From the various surveys, mainly in Northern countries, it was shown that most of the litter is from land-based sources rather than ships. Policy reforms are ongoing in many Mediterranean countries. Then, in January 2008, a draft strategy was prepared to minimize marine litter. It is proposed to be implemented through an action plan with activities both at national and regional level. This strategy, following a financial evaluation will be finalized and presented for adoption at the MOP by the end of 2011.

A recent publication concerning Marine Litter in the Black Sea Region was presented by Violeta Velikova. In the Black Sea Region, the UNEP/IOC 2009 guidelines on sur-

vey and monitoring of marine litter have been suggested to be applied. Some information was given concerning surveys, mainly on beaches.

In the US (Sarah Morison) coastal and beach monitoring protocols have been developed, to be tested as scientifically based tools. Focus of activities is on marine debris that has negative impacts (net impacts, microplastics, risk assessment of microplastics, eroding landfills, prevention of damage effects after tsunamis or other emergencies). Future research will focus on degradation of plastics, changing fishing gear to more environmental protecting systems and remote sensing, even though it is unlikely that these techniques will be able to penetrate water. Collection of data, based on survey by official observers on fishing boats is also considered.

Jan van Franeker described monitoring of ingested litter by Fulmars as well as an experimental study in the Southern European waters (Azores, Canary islands, NW Mediterranean sea) using shearwater (*Corys sp.*) as a target species. Needs and constraints for an extrapolation to other areas were also discussed. Albatrosses would be the best to use for assessing harm.

Stefanie Werner explained that marine litter monitoring on beaches is in progress in Germany and will continue on a permanent basis in the North Sea and will also be extended to the Baltic Sea. A harmonised analytical method is under development for floating litter evaluation. Some experiments were performed, not on regular basis, for assessing litter on the sea floor in the German Bight. EcoQOs is planned to be further developed in the German FEA project and within OSPAR activities for trends in seabird ingestion of litter. Coordination/harmonisation of programs is under discussion.

Thomas Maes (CEFAS) presented the UK monitoring data of benthic marine litter, including details of bottom trawls and trials targeting floating litter in the water column. Different methods, techniques and possibilities (trawls, plankton nets, treatments of samples, extraction in sediments, polymer evaluation etc) were discussed. Further information was provided (Carly Brooks, Defra) on the UK beach litter monitoring. This is carried out by the Marine Conservation Society on 12 beaches around the UK using the new OSPAR protocol. The UK government (Defra) currently funds the Fishing for Litter initiative, and has funded a three year PhD on monitoring the spatial and temporal trends in microplastics. Future monitoring will be undertaken by Cefas in order to develop a suitable monitoring programme by 2014. The benthic monitoring will be expanded with a case study looking at marine litter in the water column. Defra have funded IMARES to look into the amount of plastics occurring in fulmars collected around the UK, with effort to extend the range of birds collected around the coastline. Defra also recently funded Richard Thompson to look at 'harm' in relation to microplastics.

Mary Meacle gave information on monitoring aspects of litter on beaches in Ireland (OSPAR protocol, 4 beaches, 2008 - 2009) and the start of "fishing for litter" experiments in Ireland. The majority of beach litter was found to come from Fishing Industry Sources.

Marine litter has been monitored on the Swedish west coast for 15 years where a problem concerning the sources of debris has been identified mainly in the NW area according to Lena Tingstrom. Some constraints concerning the important number of OSPAR categories for marine litter monitoring were discussed concluding with a need, at least for the SW part of Sweden, to develop a more feasible protocol to be used.

2 Review the status of Marine Litter based on the work done by the Task Group on Marine Litter which provided scientific input to the European Commission for the Marine Strategy Framework Directive and the Commission (draft) decision on criteria on good environmental status under Article 9(3) of the MSFD.

It was stated there will be some problems with regards to Descriptor 10 to define metrics to characterise GES. Harm/impact is difficult to prove and there will be a need for background knowledge on thresholds. The scientific issue should always be linked to human activities. Joint programming (COM & MS) could be a way to have a more coordinated approach. COM will not offer detailed methodologies for some of the descriptors (litter, noise), but these will be developed in the technical subgroup.

The position of ICES is under discussion but will clearly try to provide more support, especially on scientific aspects. Coordination between regions could also be seen to be a task in order to ensure consistency. A proposal under development for the open call for marine environment, in the FP7 "Science for society" was presented by J. Mira Veiga (EUCC). The idea is to develop a mechanism to bring together the different actors involved in marine litter related activities. In addition, organisation of debates/discussions, development of measures and environmental awareness ranging from exhibitions to schools will be another aspect of the implementation of the marine strategy.

3 Identify existing data on marine litter

Tables 1 and 2 summarise the monitoring operations existing amongst the different countries/Institutions/ areas.

TIME PERIOD	TYPE OF DATA	TYPE OF SAMPLE	COUNTRY	AREA	CONVENTION LINK	ESTABLISHED
4 times a year	Micro, beach litter	Beach	Sweden	6 stations (beaches) + all other beaches (non-OSPAR)	OSPAR (west coast of Sweden)	2002
variable	Beach litter	Beaches	Mediterranean	unknown	MEDPOL/BC	unknown
Unknown	Sea Turtles	ingestion	Cyprus	unknown	MEDPOL	unknown
4 times a year	litter	Beach	Ireland	4 beaches	OSPAR	
	Estuarine and Coastal Surveys		Ireland		NGO/EPA	
4 times a year	Beach litter	Beach	UK	12	DEFRA	
continously	Micro-plastics	CPR	UK	Number of routes	SAHFOS	
irregular	litter	Beach	France (Atlantic)	2 beaches	OSPAR	
		Micro-plastics, beach litter	Trawl, beach	Belgium		2004-2009
	Standard proc.	Beach	Netherlands	4 beaches	OSPAR + irregular procedure	
		Birds(Fulmar)	Netherlands			Since 2002
		Birds (fulmar)	Denmark		NGO s	North sea
		Litter	Germany	4 beaches	OSPAR	
		Aerial	Germany			
2 times	litter (12-28 types)	Coast/beach	Bulgaria/Rumania	3 beaches in Bulgaria, 8 beaches in Romania	NGO's	Black Sea, no micro-plastics, since 1996
		beached	Beach	Baltic	WWF	1998-2005

Table 1: Available sets of data concerning litter on beaches and organisms

Survey	ICES Divisions	Litter information	Time series
Cefas NS & Celtic Sea	IV & VIIefgh	Yes	1992–2009
Denmark - NS	IV	No	
Fr-IBTS - NS	IV	Yes	1998 / 2010
Fr-CGFS	IVc – VIId	Yes	1998 / 2010
Fr-Evhoe	VIIejgh - VIIIab	Yes	1994 / 1998 / 2010
Germany – NS	IV	No	
Ireland – IGFS	VIa – VIIbjgh	Yes	?
Netherlands – NS	IV	No	
Norhtern Ireland Irish Sea	VIIa	Yes	2009/2010
Norway – NS	IV	No	
Portugal – IXa	IXa	Yes	2006–2009
Scotland - VIa	VIab	No	
Scotland – NS	IV	No	
Sp-Arsa GC	IXaS	Yes	1997–2009
Sp-NGFS	VIIIc – IXa	Yes	1992–2009
Sp-PGFS	IXaM	Yes	2001–2009

Table 2: Litter surveys on the sea floor in OSPAR region (From ICES IBTSWG REPORT 2010)

In the Mediterranean, the MEDITS program is based on standardised procedures and cover shelves for Spain, France, Italy and Greece. France is collecting data on a regular basis.

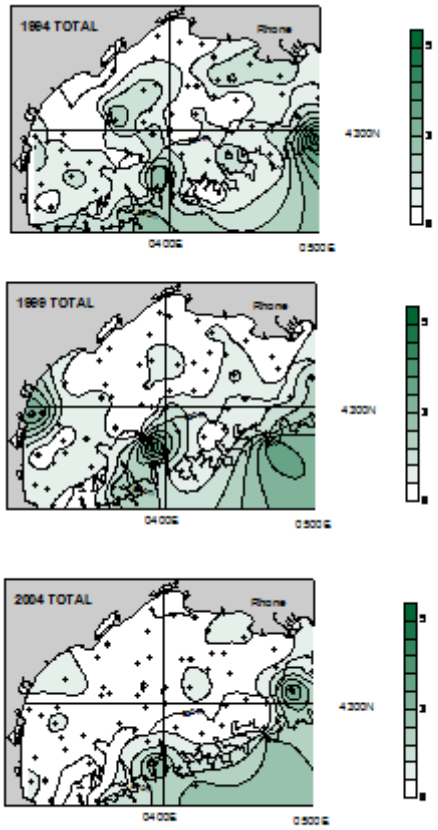

Figure 1. An example of ten years monitoring of litter in the Gulf of Lion (MEDITS cruise, Mediterranean, France). Data on litter are monitored since 1994 on 85 stations in the gulf of Lion and Corsica (16 years time series).

Some specific operations were described. All countries perform annual clean-ups and in some cases inventories in marine litter are prepared. However, they are often made randomly and there is no information about the quality of data. "Clean up the Mediterranean" sometimes includes monitoring, but usually not. SPA (Spatially Protected Areas, regional activity centre SPARAC in Tunis) may provide more data from the Mediterranean. Some trawling experiments were performed by Spain, Greece and Italy, but not on a regular basis.

Ongoing experiments are providing some data on the distribution of litter on the sea floor, including some overlapping activities (France and UK in the Channel) and available data in some countries coming from experiments conducted by others (Netherlands, Belgium, France, Irish seas covered by IBTS cruises).

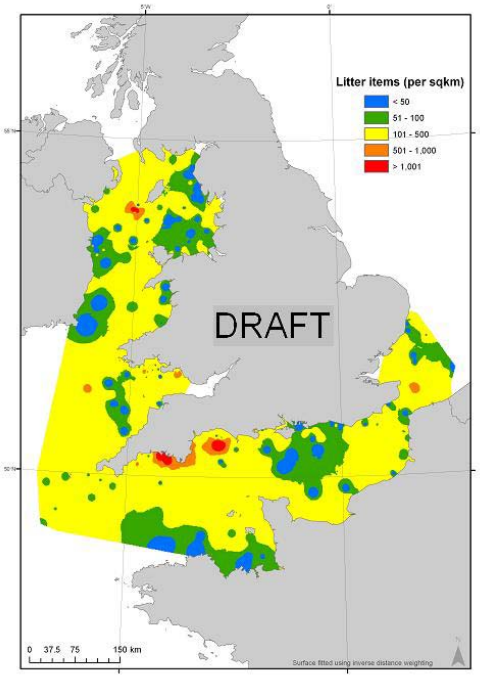

Figure 2: Example of litter Survey around UK (Draft) covering the Channel and the Irish Sea (Data and draft map by CEFAS)

In addition to regular monitoring and NGO's activities, data for the evaluation of the GES are available from research experiments. Some data are available for microplastics (Malta, France, Ireland, UK, Belgium, Sweden) but not on a regular basis. Data on sea floor were also collected in the German Bight (AWI), in Italy (ISPRA) and some experimental research was conducted on birds from the Southern areas of Europe (Azores, Canary Islands, Portugal, Malta).

4 On-going data collection on marine litter (taking into account the Commission Decision)

Ongoing data collections on marine litter were described for different countries (Sweden, Ireland), as well as projects (Continuous Plankton Recorder) and initiatives (OSPAR beach surveys and Fulmar project).

Experiments and/or considerations are planned in developing monitoring including litter based assessment on a voluntary "human sensor approach"(Finland), microplastics (Ireland, research plan in UK and Netherlands), litter on the sea floor (Sweden) and ingested litter (discussions ongoing on seals in Sweden and UK; extension of Fulmar monitoring in Ireland, UK and France). Methods are also being considered emphasising automatic systems (photos of the sea surface from JRC as an example) and modelling with 3D models to be developed for litter (hydro sedimentary models, models available for oil slicks, plankton and/or dissemination of eggs and larvae). The role of rivers as sources of marine litter has been discussed. In the North Sea it is not known how much litter comes from rivers. In France studies have been conducted which have shown that there are great differences between rivers depending on the intensity of fluxes (long distance transportation for large rivers) and seasons (increased inputs in summer).

Nothing is done on a regular basis in the Mediterranean apart from litter on the sea floor in France. Some NGOs are doing clean-ups and some ad hoc monitoring. Some of the operations are conducted in collaboration with MEDPOL but data is not collected in a structured manner. Information was given from the US on the role of institutions to disseminate information. Most states do not prioritise marine litter on their coastal issues. In the US, only Hawaii and Alaska consider it as a major issue but still not so on developing regular monitoring.

5 Data needs for future assessment of marine litter/good GES (taking into account the Commission Decision)

From the discussions the following conclusions emerged:

- The number of beaches monitored will have to be extended (France, UK, MEDPOL) or maintained (Ireland).
- More experiments on microplastics on beaches will be needed (Sweden, France).
- Coordination at national level is expected (Sweden)
- Initiatives for the identification of sources (e.g. read barcodes if present) should be developed.
- Considerable effort is needed on studying the role of rivers for inputs (Netherlands, France)
- For microplastics it will be necessary to select sites, both at sea and in sediments.
- There are huge spatial variations, without negative impacts demonstrated (UK), but considering microplastics are absorbing substances, a monitoring strategy must carefully define sites and protocols to precise which type of removal and prevention measures could be needed. Monitoring must be started in some countries (France, Denmark, Sweden, Germany)
- Studies on storm waters retention of litter in sewage plants and their environmental effects must be developed.
- A way to assure better monitoring of litter is that this issue becomes part of national monitoring programmes through development of relevant policy (Black Sea Commission).
- Due to special conditions in layers below 200m in the Black Sea (annoxic conditions), it would be interesting to know how litter on the sea floor degrades and if there are accumulation areas. Besides, horizontal water transport is very active in the Black Sea and this must be considered as an important transboundary problem which needs specific assessment (how much litter is coming from neighbouring countries). Studies on marine litter washed back to the coast from the sea floor accumulations should be undertaken.
- To help the member states, prioritisation must be done with regard to the approaches used (JRC). This would assure that MS will initiate marine monitoring. It should be considered if deep sea areas may not be important with regard to reaching good ecological status except in the Mediterranean sea were these areas are strongly affected by coastal pollutions.
- High standards should be set for monitoring.
- There is a need for socio-economic aspects of litter and waste management to be considered, which are not only linked to marine environment.

6 Consider standards for recording marine litter

A presentation was given by Neil Holdsworth from ICES Data Centre. Marine litter is not really dealt with in the Data Centre. The roles of EIONET/WISE-marine (state of environment and reporting obligations included here), EMODNET and regional solutions were described.

EMODNET (European Marine Observation and Data Network) is a common architecture collecting existing data (DG ENV, DG MARE main players). Different pilot projects are looking at biology, physics, chemistry etc. Some of these thematic assembly groups (chemistry and biology) are specifically aimed at serving the MSFD but marine litter is not included in any of these groups, hence for litter data should be collected on a regional scale. However, it is possible that in the future EMODNET would coordinate MS data and could facilitate MS in numerous reporting requirements. It will be a collection of portals being able to transport data even if they do not hold the data per se.

With the EC's Marine Strategy Framework Directive (MSFD), there is a need and growing interest in monitoring of marine litter in European waters, and in sources of information and/or on-going surveys that could provide a time series to monitor marine litter. Bottom trawl surveys such as those coordinated in the IBTSWG. WGBIFS or WGBEAM in the Atlantic/Baltic area and the MEDITS project in the Mediterranean are seen as a good possible sources to assess the amount of marine litter on the seabed with consistent methodology.

With this aim the IBTSWG has been contacted to find out if marine litter information has already been collected and to study the possibility of collecting this information in a standardized way (Table 2). It was the opinion that the OSPAR or UNEP/IOC classification of marine litter in general-broad groups could be used as a first approach. Categories will include: Plastic, paper and cardboard, wood (manmade), metal, glass and ceramics, cloth (textile) and rubber. Additional and separate counts for fishing gears (or aquaculture related items) also need to be considered.

The approach proposed would be to fill in one form per haul to collect the data on the number/weight of each category in the catches. The same approach may be extended to other European areas.

Other questions were addressed by WKMAL:

- The use of weight/number in assessing the amount of litter.
- The inclusion of special categories for fishing related litter.
- The exclusion of items coming from natural events such as trees washed out to the sea by rivers

Further information on how to store the information and exchange formats would be required to ensure the affectivity of the sampling and the exploitation of the information collected at the European scale.

The working group considered that the proposal developed in the IBTSWG would be applied in the other marine regions as well. Harmonisation of protocols must be considered within regions but also between beaches and litter at sea. UNEPs classification will be a general frame but will not apply systematically, due to general costs. Microplastics could be looked at separately. It was then proposed to limit the categories to 8-10, agreeing on existing protocols with possible subcategories as detailed as possible to fit with existing protocols on beaches (OSPAR, UNEP, Black Sea Commis-

sion, HELCOM) and facilitating the aggregation of existing data so that already available information is not lost and the old data could be back traced from the new categories. There was a general agreement on using the same protocols in every country from the simple (required from all and enabling surveys done by volunteers) to more detailed, advanced monitoring. The following categories were retained:

1) Plastic
2) Paper and cardboard
3) Wood (industrial)
4) Metal
5) Glass and ceramics
6) Cloth
7) Rubber
8) Miscellaneous
9) 2 additional categories should be included:
10) Fishing gears (or aquaculture related items)
11) Medicines related litter. This suggested category should be restricted to beach evaluations.

MSFD GES Technical sub group on marine litter will then consider the question of categories with a specific task on the issue, considering data to fulfil the MSFD requirements. Harmonisation of beach litter and litter in the sea will be considered. Weight evaluation of litter in each category will be suggested on a regular basis. Litter of natural origin (trees, wood, leaves etc.) will not be considered.

ICES Data Centre stated in the discussion that the IBTS is possibly conducting another stomach survey and suggests plastics to be included. This was agreed by participants.

7 Research needs and prioritisation.

Research needs were already identified in the TG 10 report: Factors influencing the localisation of litter at sea, the degradation process, the ecological impact on marine organisms, the socio economic impact, novel methods and automated monitoring devices including large scale surveys of litter and dose response studies.

Some specific issues were discussed such as the research on biodegradability of litter, containers drifting at sea, economic costs, boat relicts, automated analyses to facilitate monitoring and oceanic scales evaluations, the development of metrics for the evaluation of harm and the source identification (backtracking, identification of polymers, fingerprinting etc.).

Sources of funding were discussed with a general presentation from DG Env and different sources available (FP7, Interreg etc.) were identified.

8 Future ICES/MEDPOL/Black Sea Commission activities on marine litter

An intention with this work group was to see if there would be a need to start a more permanent group within ICES on marine litter while at the same time a GES technical subgroup (GES TSG) will help the EC and MS to implement the MSFD. Differences will exist between a group organised by ICES and the GES TSG. The latter is an expert group (nominated by MS) that advises EC only on the MSFD implementation process. This will be done for a 1 year period. ICES is working on scientific issues in WGs for longer periods. Besides, ICES will be able to consider specific needs and requests and could then coordinate activities in that direction.

It was agreed that ICES will decide on the need for a scientific Working Group after questions addressed by the GES TSG and it was proposed to DG ENV to have ICES link to the group (like EEA) to follow the work. After discussions, it was also agreed on the need for a technical workshop on microplastics to disseminate and intercalibrate techniques amongst Member states on a common basis for future monitoring.

9 General Discussion on GES (concepts and reality)

Definition and evaluation of Good Environmental Status is a key point in the MSFD process. This will need an evaluation of harms/impacts to support the definition of targets. For marine litter a general approach on operational targets will be more efficient than working on thresholds.

The outcome of an OSPAR workshop (ICG-ML) was presented. The opinion was that downward trends are necessary, except for microplastic litter, which should not increase but does not need to decrease. Often trends lead to discussion on statistical significance. Annual checks will be included so that measures will be taken. Some evaluation are undated and it will be difficult to attain objectives by 2020 (EcoQO).

Objectives, decided by MS, will be discussed by GES TSG from a technical point of view as they are linked to the monitoring requirements. UK proposed to cover a number of alternatives to show how GES could be achieved.

Discussion was opened on how evaluation of GES will take into account different indicators. Litter is one of the descriptors as it is considered important (DG Env).

Some questions were addressed whether harm should be defined separately for each indicator. It was suggested to split the indicators into pressure indicators and state indicators (German position). It is also being discussed whether there should be a light system for the implementation of MSFD.

10 Recommendations

1) Define scientific and technical basis for monitoring: Standardisation of protocols for surveys (OSPAR/MEDPOL/BSC/HELCOM for beaches; IBTS related surveys/MEDITS etc. for sea floor evaluation; aerial survey method by Herr 2009 for floating litter, UNEP/IOC guidelines for monitoring marine litter for beaches, floating litter, sea floor, target species for ingested litter and define standard protocol for microplastics)

2) Harmonisation in categorizing litter for beaches, floating and sea floor (7 main basic categories + fishing gears and medicine derived litter + subcategories for detailed studies)

3) Define knowledge gaps and priority areas for research: Automisation of procedures and methods. Develop new approaches (cell sorters and/or granulometers, aerial surveys, ultrasounds for stomach content, etc.), understanding transport of litter (models and concentration areas), evaluate degradation at sea

4) Define common and comparable monitoring approaches, definition of basic protocols. Pertinence of actual approaches (microplastic at sea or in sediments)

5) Develop scientific approaches to assess GES on a regional/European scale considering evaluation of sources and inputs as important indicators.

6) Research will need to include the improvement of knowledge concerning impacts on marine life (affected species, species used as indicators, the normalisation of methods and the determination of thresholds).

7) Assess socio-economic harm (costs for cleaning, navigation related accidents, costs to fisheries) will need to define indicators.

8) Consider ICES/MEDPOL/BSC to be involved in research on marine litter, to prioritise and support scientifically the development of research programs concerning marine litter (workshops on specific marine litter issues, intercalibration exercises etc.).

9) The group concluded it was needed to organise a technical workshop to disseminate and intercalibrate techniques amongst Member states on a common basis for future monitoring.

10) Consider new ICES activities on marine litter after evaluation of scientific needs by the GES TSG or regional institutions in the context of the MSFD.

Annex 1: List of participants

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Annex 2: Agenda

Tuesday 02/11

09.00: Welcome and Logistic introduction to ICES (Francois/ Almuth Janisch)

09.15: Meeting presentation: Objectives (Claus/ Georg/ Francois), adoption of the agenda

09.30: Round table: Each participants will present its activities/results/interests (5 min /each)

10.45: Coffee break

11.15: Round table (end)

12.45: Lunch break

13.45: Review the status of Marine Litter based on the work done by the Task Group on Marine Litter which provided scientific input to the European Commission for the Marine Strategy Framework Directive and the Commission (draft) decision on criteria on good environmental status under Article 9(3) of the MSFD.

14.45: Coffee Break

15.15: Identify existing data on marine litter

Wednesday 03/11

09.00: Identify on-going data collection on marine litter

10.30: Coffee break

10.45: Describe data needs for future assessment of marine litter (in relation to the Commission Decision on Marine Strategy Framework Directive)

11.45. Consider standards for recording of marine litter (ICES Data Centre)

12:30. Lunch Break

13.30: Research needs (in relation to the Commission Decision on marine litter)

15.45: Coffee Break

16.15: Possible continued work within the ICES framework

16.45: General Discussion on GES (concepts and reality)

Thursday 04/11

09.00: Recommendations for research and monitoring (in relation to the Commission Decision on marine litter)

10.30: coffee break

10.45: Reporting

12.15: General conclusions

12.30: End of Meeting