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1st Report of the Informal Online Working Group on Marine Litter

UNEP/MAP
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1) BACKGROUND INTRODUCTION

Leading scientists and policymakers acknowledged recently in Athens that marine litter remained a "tremendous challenge" in almost all regions of the world, with clear impacts on marine ecosystems and estimates of overall financial damage of plastic to marine ecosystems standing at US$13 billion each year. Marine litter is one of the 8 environmental concerns considered by the UNEP/GPA for the protection of marine environment from land based sources and activities. The European Marine Strategy Framework Directive (2008/ 56/ EC) with a specific descriptor on ML, the adoption of the Honolulu strategy and Honolulu Commitment in 2011, and more recently, the particular emphasis on marine litter issues at the Rio+20 Summit 2012, is a clear indication of the high attention given to such issues at global level.

In the Mediterranean Sea, marine litter has been an issue of concern since the 1970s. The LBS Protocol of the Barcelona Convention recognized the importance of dealing with this problem and this basin was designated a Special Area for the purposes of Annex V of the MARPOL 73/78 Convention and the Mediterranean coastal States Parties to the MARPOL Annex V.

The findings and recommendations of the last assessment performed in 2009 (UNEP, 2009) led to the preparation of a Marine Litter strategic framework in the Mediterranean in 2012 in support to the regional action plan on marine litter management (ML RAP). COP 18 of the Barcelona convention adopted the MLRAP in 2013 to achieve the GES and targets on marine litter. The CORMON meeting on pollution and litter cluster held in Athens in May 2014 recommended establishing expert groups with an in-depth knowledge and access to available data on eutrophication, contaminants and marine litter. For each of the indicators dedicated to marine Litter (Descriptor 10), information is needed to deliver appropriate environmental assessment criteria and to provide scientific and technical basis for monitoring. The present document presents the results of the discussion held within the CORMON group of expert for Marine Litter.

2) OBJECTIVES

In the Decision on criteria and methodological standards on GES, ECAP identified 3 common indicators, one being on trial basis, for the environmental objective 10 (Marine Litter):

Common Indicator 16:	Trends in the amount of litter washed ashore and/or deposited on coastlines, including analysis of its composition, spatial distribution and, where possible, source
Common Indicator 17:	Trends in the amount of litter in the water column including microplastics and on the seafloor
Common Indicator 18 (Trial basis)*	Trends in the amount of litter ingested by or entangling marine organisms focusing on selected mammals, marine birds and turtles

** The latter common indicator related to ingested litter (Indicator 10.2.1. in Annex I of Decision IG. 21/3) is proposed to be analyzed by the CORMON groups as a common indicator on a trial basis and further develop it based on available data, best practices and possible sub-regional pilots.*

In order to support the implementation of the regional monitoring plan and support the ECAP management approach, the online expert group on ML is required to deliver environmental and background assessment criteria based on data availability. Based on the specific recommendations of the ECAP CORMON Pollution and Litter on EO 10 (UNEP(DEPI)/MED WG.394/7, Annex I), the expert group has to (i) address further differentiation of thresholds between heavily littered, moderately, and littered beach categories, if possible, based on available data, (ii) consider thresholds and baseline values for floating litter, litter on the sea floor and floating micro plastics in each of the four MEDPOL sub-regions, (iii) regarding litter in biota, to define thresholds and baseline values for litter digested by sea-turtles, recommended as the main approach of focus, while opportunistically considered for seabirds and marine mammals, (iv) agree on litter categories specified for the Mediterranean Sea, considering compatibility with protocols from MSFD and other European regional seas, and finally (v) to explain the reason for omitting entanglement of litter as a common indicator.

For this, the online group had to (i) agree on definitions (thresholds, baseline, assessment criteria, GES, etc.), (ii) review the available data on marine litter in the MED in relation with ECAP indicators (available data on beaches, at sea, of micro plastics and ingested litter), (iii) analyze data with consideration to geographical and temporal differences (mean values, basin differences, trends, etc.), and (iv) propose different scenario for thresholds and baseline values, based on various realistic parameters (mean values, minimum values, possible decrease vs time, etc.)

3) DEFINITIONS OF TERMS (BASIC UNDERSTANDING AND COMMON DEFINITIONS)

The wording of the ECAP leaves scope for interpretation of the terms used. This is added to the difficulties of a consistent and coherent application. This chapter will provide key concepts based on a glossary of terms (alphabetic order) that are relevant for a common understanding of the implementation of the RAP (baselines, Good Environmental Status, targets, etc.) and in use within the expert group:

Assessment: An assessment is a process by which information is collected and evaluated following agreed methods, rules and guidance. It is carried out from time to time to determine the level of available knowledge and to evaluate the environmental state. It produces a report which synthesizes and documents information and findings, and classifies the environmental status in relation to Good Environmental Status (GES).

Baseline A baseline is a description of environmental state at a specific point against which subsequent values of state are compared. It may refer to a specified level of an impact or a pressure and act as a reference against which limit can be set or trends for the assessment of GES. Baselines can be derived from reference conditions, initial assessment values, the present state or a potential/predicted state.

Degradation: Degradation is the reduction in the quality status of the ecosystem, or any part of it, compared to a more healthy state.

Descriptor: Ecosystem Approach **(**ECAP) provided a list of 'Descriptors' which constitute the basis for the assessment of GES. These descriptors are substantiated and further specified through indicators, criteria and methodological standards, based on specific characteristics determined by Member States. Marine Litter is the descriptor 10 of the ECAP.

Ecosystem approach: The main elements of the ecosystem approach can be described, as defined in the MEDPOL statement, as the comprehensive integrated management of human activities based on best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of the marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity.

Environmental Target: ECAP defines ‘environmental target’ as a 'qualitative or quantitative statement on the desired condition of the different components of marine waters in respect of each marine region or sub region. The main purpose of environmental targets is to guide progress towards achieving or maintaining GES. Targets can be of different nature, relating to desired conditions for state, impact and pressure and being operational for the implementation of concrete measures.

Good Environmental Status: In this document, GES describes the desired status of the environment and its elements, based on criteria and methodological standards set out in accordance with ECAP. 'GES boundary' is used to provide an expression for the deviation from the baseline or reference condition which marks the difference between a state that is acceptable and a state that is not acceptable. For descriptor 10 (Marine Litter) within ECAP, GES is when (i) Litter and its degradation products do not cause harm to marine life and damage to marine habitats, (ii) Litter and its degradation products present in, and entering into MED waters do not pose direct or indirect risks to human health, and (iii) when litter and its degradation products present in, and entering into MED waters do not lead to negative socio-economic impacts.

Impact: An impact is the environmental effect of a pressure resulting from human activities. It is permanent or temporary, and related to any type of harm (physical, chemical or biological) that is undesirable. It also includes the consequence for human welfare based on the use of the marine environment (socio economic impact).

Indicator: For the purposes of assessing environmental status, an indicator specifies the criteria and supports their assessment. For other purposes, "indicators" are understood in general as a scientific/technical assessment tool. An indicator consists of one parameter chosen to represent ('indicate') a certain situation or aspect and to simplify a complex reality and within ECAP, to support the determination of GES and assessment of the status of the marine environment.

Methodological standard: Methodological standards are understood as established scientific or technical methods for assessing and classifying environmental status. Methodological standards can include assessment tools, methods for aggregation, common elements (contaminants, species, habitats, etc.), criteria, descriptors or approaches to define scale.

Parameter / metric: A parameter is a measureable characteristic value (e.g. number, Density of Litter, concentration, etc.). Metric relates to the unit in which the parameter is measured (e.g. number of items/km2, total weight, etc.). Parameters and metrics for assessment of GES are part of the criteria and methodological standards.

Pressure: A pressure is the result from anthropogenic activities at source which acts directly or via pathways on physical, chemical or biological elements of the marine ecosystem. At particular levels of intensity, it has the potential to have a direct or indirect impact on any component of the ecosystem.

Reference state / Reference conditions
For assessment purposes, it is often necessary to define a reference level against which current and future state is compared. Reference state/condition describe the state of the environment (or a component) in which there is considered to be no, or very minor, disturbance from the pressures of human activities.

Reference points
This relates to values, which must be achieved or not exceeded respectively, in order to bring a pressure or impact to a level that achieves the environmental target and consequently allows the marine waters concerned to move towards GES.

Scale: The scale defines the spatial and temporal extent of ecosystem components, their assessment (descriptor/indicators) and good environmental status.

Specifications and standardized methods: Specifications are related to minimum requirements for the design of monitoring (e.g. minimum frequency, spatial resolution) and assessment to make monitoring and assessment results comparable. 'Standardized methods are related to methods for monitoring (e.g. for sampling, analysis, quality assurance) that include agreed standards (e.g. MEDPOL Monitoring protocols), agreed rules for the spatial and temporal aggregation and common quality control mechanisms.

State/status: State refers to the quality/condition of specific elements of the environment. The word 'status', as used in the context of Good Environmental Status or Environmental Quality Status, describe the 'state' of individual ecosystem elements, through use of particular criteria and methodological standards, to assign a 'status' classification (e.g. at GES, below GES). 'Status' can either be applied to the overall quality/condition of the marine environment, at the level of the individual descriptors of GES or at the level of individual functional groups, habitats, species or populations.

4) LITTER IN THE MEDITERRANEAN SEA WITH CONSIDERATION TO ECAP INDICATORS (background scientific information)

The Mediterranean Sea has been described as one of the most affected areas by marine litter in the world. Human activities generate considerable amounts of waste and quantities are increasing, although they vary between countries; some of the largest amounts of Municipal Solid Waste (MSW) are generated annually per person in the Mediterranean Sea (208 – 760 kg/Year, http://www.atlas.d-waste.com/). Plastic, which is the main litter component, has now become ubiquitous in the marine environment and comprises up to 95% of waste accumulated on shorelines, the ocean surface or sea floor. A majority of these materials (plastics) do not decompose or decompose slowly. This phenomenon can also be observed on the sea floor, where 90% of litter caught in benthic trawls is plastic (Galil et al., 1995; Galgani et al., 1995 & 2000; Ioakeimidis et al., 2014) and this figure can reach up to 100% on the sea surface. Surveys conducted to date show considerable spatial variability. Accumulation rates vary widely and are influenced by many factors, such as the presence of large cities, shore use, hydrodynamics and maritime activities. They are higher in enclosed seas such as the Mediterranean Sea with some of the highest densities of marine litter stranded on the sea floor, sometimes reaching over 100,000 items / km² (Galgani et al., 2000). Debris densities on the deep sea floor decreased between 1994 and 2009 in the Gulf of Lions (Galgani et al., 2011). Conversely, the abundance of debris in deep waters was found to increase over the years (Koutsodendris et al., 2008; Ioakeimidis et al., 2014).

In the Mediterranean and related to the sources, reports from Greece (Koutsodendris et al., 2008; Ioakeimidis et al., 2014) classify land-based sources (up to 69% of litter) and vessel-based sources (up to 26%) as the two predominant litter sources, depending on the area. In addition, litter items have variable floatability and hence variable dispersal potential.

4.1 ECAP indicator 16 (beaches)

Strandline surveys, cleaning and regular surveys at sea are gradually being organized in many Mediterranean countries in the aim of providing information on temporal and spatial distribution. The various strategies based on the measurement of quantities or fluxes have been adopted for data collection purposes. However, most surveys are conducted by NGOs with a focus on cleaning and public awareness. Standing stock evaluations of beach litter reflect the long-term balance between inputs, land-based sources or stranding, and outputs from export, burial, degradation and cleanups. Recording the rate at which litter accumulates on beaches through regular surveys is currently the most commonly-used approach for assessing long-term accumulation patterns and cycles.

The majority of studies performed to date have demonstrated densities in the 1 item/m2 range (Table 3) but showing a high variability in the density of litter depending the use or characteristics of each beach. Plastic accounts for a large proportion of the litter found on beaches in many areas, although other specific types of plastic are widely-found in certain areas, according to type (Styrofoam, manmade pieces of wood) or use (fishing gear).

Four categories of items seem to be most prominent on the beaches in the northern part of the Mediterranean: Sanitary items (mostly cotton bud sticks: foremost item found in ARCADIS 2014), cigarette butts and cigar tips (29-37% of items found; Öko-Institut 2012, UNEP 2009 and UNEP/MAP 2008), packaging items and bottles/caps (third category in ARCADIS 2014, around 20-25% in Öko-Institut 2012, UNEP 2009 and UNEP/MAP 2008) and Fishing gears (UNEP/MAP 2013), must be considered to be of importance as well.

Table 1: Composition/ sources of marine litter in the Mediterranean (After Interwies et al., 2013)

Source (Literature)	**Items/Consistency (beaches; top five)**	**Type of material**	**Sources**
ARCADIS 2014; Barcelona)	- Cotton bud sticks - Plastic/polystyrene pieces - Crisp/sweets/chips - Other sanitary items - Charcoal (201 items) Ports: 1: Crisp/sweets packets and lolly sticks 2: cigarette butts 3: cotton bud sticks	Beaches: Plastics: 50% by volume: 80% (Barcelona Provincial Government, cited in ARCADIS) Ports: 29% plastics, 22% wood, 21% organic matter	Recreational & tourism:40% Households(combined):40% Coastal tourism: 32,3% Toilet/sanitary: 26,2% household: 11,2% Waste collection: 6% Recreational: 5,6%
Öko-Institut (2012; figures mainly from UNEP 2009)	-Cigarette butts: 29,1% - Caps/lids: 6,7% - Beverage cans: 6,3% - Beverage bottles (glass): 5,5% - Cigarette lighters: 5,2%	Beaches: 37-80% plastics Floating: 60-83% plastics Sea-floor: 36-90% plastics	Recreational/shoreline activities: >50% , Increase in tourism season
UNEP/MAP (cited in ARCADIS 2014)	-Cigarette butts/filters: 27% -Cigar Tips: 10% -Plastic bottles: 9,8% Plastic - bags: 8,5% - Aluminum cans: 7,6%	Floating: 83% plastics	
Ocean Conservancy/ICC 2002-2006 (cited in UNEP/MAP 2008)			Beach litter: recreational activities: 52% Smoking-related activities: 40% waterways activities: 5%

JRC IES (2011)		Beach:83% plastics/polystyrene	

For ICC (2014) , cigarette butts, plastic bags, fishing equipment and food & beverage packaging are the most commonly-found items, accounting for over 80% of litter stranded on beaches (Ocean Conservancy).

Table 2: Top ten items by country (International Coastal Cleanup, ICC, 2014)

	Total items									
	cigarette butts	**food wrappers**	**plastic bottles**	**bottles caps**	**straws/ stirrers**	**grocery bags (plastic)**	**glass bottles**	**other plastic bags**	**paper bags**	**cans (metal)**
Croatia	2478	156	34	139	0	133	55	119	58	36
Egypt	1	3	64	29	1	24	53	10		9
Greece	64473	3479	6373	8398	7364	2083	1535	1845	1285	3652
Italy	0	0	7	1	0	13	46	1	0	15
Malta	0	24	36	64	21	0	11	5	0	0
Slovenia	1857	408	272	493	504	92	60	141	13	188
Spain	22995	2614	4276	6780	16661	3795	1541	2551	1046	2295
Turkey	6313	112	233	586	173	210	142	34	34	210
Total number	98117	6796	11295	16490	24724	6350	3443	4706	2436	6405

Number of items / mile										
	cigarette butts	**food wrappers**	**plastic bottles**	**bottles caps**	**straws/ stirrers**	**grocery bags**	**glass bottles**	**other plastic bags**	**paper bags**	**cans (metal)**
Croatia	0	3	1	2	0	2	1	2	1	1
Egypt	0	0	1	0	0	0	1	0	0	0
Greece	1089	59	108	142	124	35	26	31	22	62
Italy	0	0	0	0	0	0	1	0	0	0
Malta	0	0	1	1	0	0	0	0	0	0
Slovenia	31	7	5	8	9	2	1	2	0	3
Spain	388	44	72	115	281	64	26	43	18	39
Turkey	107	2	4	10	3	4	2	1	1	4
number /mile (Mean)	202	14	24	35	52	13	7	10	5	14

Items found indicate a predominance of land-based litter, stemming mostly from recreational/tourism activities (40% in ARCADIS, 2014, >50% in Öko-Institut, 2012 and Ocean Conservancy/ICC 2002-

2006). Household-related waste, including sanitary waste, is also of great relevance (40% in ARCADIS 2014); the amount of litter originating from recreational/tourism activities greatly increases during and after the tourism season. Smoking related wastes in general seems to be a significant problem in the Mediterranean, as several surveys suggest (UNEP 2009; UNEP/MAP 2008). Also, the fishing industry is of significance (UNEP/MAP 2013), as well as shipping (the latter especially off the African coast).

Small fragments measuring less than 2.5 cm (Galgani et al., 2011), also referred to as meso particles or meso debris (versus macro debris), are often buried and may not be targeted by cleanup campaigns or monitoring surveys. Stranding fluxes are therefore difficult to assess and a decrease in litter amounts at sea will only serve to slow stranding rates. Small items can comprise a large proportion of the debris found on beaches and very high densities have been found in some areas.

4.2 ECAP indicator 17

4.2.1 Floating litter

Floating debris comprises the mobile fraction of debris in the marine environment as it is less dense than seawater. However, the buoyancy and density of plastics may change during their stay in the sea due to weathering and biofouling (Barnes et al., 2009). Polymers comprise the majority of floating marine debris, with figures reaching up to 100%. Although polymers are resistant to biological or chemical degradation processes, they can be physically degraded into smaller fragments and hence turn into micro litter, defined as measuring less than 5 mm.

They can also be transported by currents until they sink to the sea floor, be deposited on the shore or degraded over time. Although anthropogenic debris floating in worldwide oceans was reported decades ago, the existence of Floating Marine Debris accumulation zones in oceanic gyres has now gained worldwide attention. However, there are no permanent gyres in the Mediterranean Sea and local drivers may largely affect litter distribution (CIESM, Workshop N°46, 2014).

Visual assessment approaches include the use of research vessels, marine mammal surveys, commercial shipping carriers and dedicated litter observations. Aerial surveys are now being employed for larger items. Although the basic principle of floating debris monitoring through visual observation is very simple, as for beaches, few datasets are available for the comparable assessment of debris abundance and monitoring is only performed occasionally (Table 3).

The reported quantities of floating marine debris items larger than 2 cm range from 0 to over 600 per square kilometer. Floating debris was quantified during marine mammal observation cruises in the northern Mediterranean Sea, in a 100 x 200 km offshore area between Marseille and Nice and in the Corsican channel. A maximum density of 55 items/km² was found, with a clearly-discernible spatial variability relating to residual circulation and a Liguro-Provencal current vein routing debris to the West (Gerigny et al., 2012).

In the Ligurian Sea, data was collected through ship-based visual observations in 1997 and 2000. 15-25 items/km² were found in 1997, with a decrease to 1.5 – 3 items in 2000 (Aliani and Molcard, 2003). Voluntary observations in the Mediterranean Sea reported litter concentrations of 2.1 items/km², with plastic materials representing 83% and higher concentrations in coastal areas (Helmepa, in UNEP, 2011). Finally, high debris densities were found locally such as in the Adriatic Sea or in the Algerian basin, at up to 195 items/km2 (for 25 in the Mediterranean sea, Suaria and Aliani, 2014, Zambianchi et al., 2014).

Modelling oceanographic currents using input scenarios based on population densities and major shipping lines can help identify pathways and accumulation areas, thus enabling source attribution and the localization of areas harboring high litter concentrations (Maximenko et al., 2012). A 30-year circulation model using various input scenarios showed the accumulation of floating debris in ocean gyres and closed seas such as the Mediterranean Sea (Lebreton et al., 2012). Modelling is also used to predict the pathways and impacts of large debris quantities introduced through natural extreme events, runoffs (e.g. the discharge located in Saida, Lebanon) and trans border transportation (Zambianchi et al.,2014).

4.2.2 Sea floor

Deep sea surveys are of major importance, as most litter comprises high-density materials and hence sinks. Even low-density polymers, such as polyethylene and polypropylene, may sink under the weight of fouling. General strategies for the investigation of seabed debris are similar to those used to assess the abundance and type of benthic species. Although floating debris, such as that found in the highly publicized ‘‘gyres” and/or convergence zones, has attracted public attention, debris accumulating on the sea floor can potentially impact benthic habitats and organisms. 47 studies were conducted between 2000 and 2013, but, until recently, very few covered extensive geographic areas or considerable depths. The Mediterranean Sea is a special case, as its shelves are not extensive and its deep sea environments can be influenced by the presence of coastal canyons. The geographical distribution of plastic debris is highly impacted by hydrodynamics, geomorphology and human factors. Continental shelves are proven accumulation zones, but they often gather smaller concentrations of debris than canyons: debris is washed offshore by currents associated with offshore winds and river plumes.

Only few studies have focused on debris located at depths of over 500 m in the Mediterranean (Galil, 1995; Galgani et al., 1996, 2000, 2004; Pham et al., 2014; Ramirez-Llodra et al., 2013) (table 3).
Galgani et al. (2000) observed decreasing trends in deep sea pollution over time off the European coast, with extremely variable distribution and debris aggregation in submarine canyons. Using a deep sea remote operated vehicle (ROV), video surveys in submarine canyons (Galgani et al., 1996, Pham et al., 2014) concluded that submarine canyons may act as a conduit for the transport of marine debris into the deep sea. Higher bottom densities are also found in particular areas, such as around rocks and wrecks, and in depressions and channels. In some areas, local water movements carry debris away from the coast to accumulate in high sedimentation zones. The distal deltas of rivers may also fan out into deeper waters, creating high accumulation areas.

A wide variety of human activities, such as fishing, urban development and tourism, contribute to the patterns of seabed debris distribution. Fishing debris, including ghost nets, prevails in commercial fishing zones and can constitute high percentages of total litter. More generally, accumulation trends in the deep sea are of particular concern, as plastic longevity increases in deep waters as most polymers degrade slowly in areas devoid of light and with lower oxygen content.

The abundance of plastic debris is very location-dependent, with mean values ranging from 0 to over 7,700 items per km^2 (table 3). Mediterranean sites tend to show the highest densities, due to the combination of a populated coastline, coastal shipping, limited tidal flows and a closed basin, with exchanges limited to the Gibraltar strait. In general, bottom debris tends to become trapped in areas with low circulation, where sediments accumulate.

Counts from 7 surveys and 295 samples in the Mediterranean Sea (2,500,000 km^2, worldatlas.com) indicate an average density of 179 plastic items/km2 for all compartments, including shelves, slopes, canyons and deep sea plains, in line with trawl data on 3 sites described by Pham et al., 2014. On the basis of this data, we can assume that 525,615,958 (# 0.5 billion) litter items are currently lying on the sea floor.

4.2.3 Microplastics

In addition to large debris, there is growing concern with regards to micro particles measuring less than 5 mm and particles measuring as little as 1 µm have already been identified (Thompson et al., 2004). Most, but not all micro particles consist of micro plastics. The abundance and global distribution of micro plastics in oceans has increased steadily in recent decades (Cole et al., 2011). Micro plastics comprise a very heterogeneous group, varying in size, shape, color, chemical composition, density and other characteristics. They can be subdivided by use and source as (i) 'primary' micro plastics, produced either for indirect use as precursors (virgin resin pellets) for the production of polymer consumer products, or for direct use, such as in cosmetics, scrubs and abrasives and (ii) 'secondary' micro plastics, resulting from the breakdown of larger plastic materials into increasingly small fragments. This is the result of a combination of mechanisms, including photo, biological, mechanical and chemical degradation.

To date, only a limited number of global surveys have been performed in the aim of quantifying micro plastic distribution. The majority of existing surveys is localized and concentrated on specific areas around the world, such as regional seas, gyres or the poles. Most of these studies focus on sampling the sea surface and/or water column and intertidal sediments (Hidalgo-Ruz et al. 2012). Mean sea surface plastic were found in concentrations up to 330,000 particles / km^2 in the California current system, with 334,000 particles / km^2 in some stations in the North Pacific and 115,000 particles / km^2 in the NW Mediterranean Sea (maximum 890,000 particles) (Collignon et al., 2012; Moore et al. 2001; Cole et al. 2011). The highest micro plastic concentrations in sediment (Claessens et al., 2011) were found in beach and harbour sediments, with concentrations of up to 391 micro plastics/kg of dry sediment in a harbor sediment sample from the southern North Sea (Belgium). Similarly, a beach survey on the Mediterranean island of Malta revealed an abundance of pellets on all of the studied beaches (Turner and Holmes, in Cole et al. 2011), with the highest concentrations reaching 1,000 pellets/m2 along the high-tide mark. Finally, on Kea Island in the South Aegean Sea, microplastics abundance reached the 977 items/m^2 with a highly variable abundance of virgin pellets (7-560 pellets/m^2) (Kaberi et al., 2013). Micro plastic pollution has also spread throughout the world's seas and oceans, into sediment and even the deep Mediterranean Sea (Van Cauwenberghe et al., 2013).

Time trends relating to the composition and abundance of micro plastics are scarce. However, available long-term trend data suggests various patterns in micro plastic concentrations. A decade ago, Thompson (2004) revealed a significant increase in plastic particle abundance over time. More recent evidence indicates that micro plastic concentrations in the North Pacific Subtropical Gyre have increased in the last four decades (Goldstein et al. 2012), whereas no changes have been observed on the surface of the North Atlantic gyre over a 20-year period (Lavender Law et al., 2010).

Table 3: Comparison of mean litter densities from recent data (from 2000) in the Mediterranean Sea. Intervals of values are given in parentheses.

Location	Habitat	Date	Sampling	Depth	Density (min-max)	% plastics	References
Slovenia	Beaches	2007	3 beaches, 150 m-2 per transect	0	12158/km	64	Palatinus, 2009
Balearic	Beaches	2005	32 beaches	0	36000/ km (high season)	75 (46% cigarette butts)	Martinez et al., 2009
France /Marseille	Beaches	2011-2012	10 beaches (30 in winter)	0	0,076 m-3/day/100m (stranding rates)	80-94	MerTerre 2013 - (www.mer-terre.org)
Turkey	Beaches	2008-2009	10 beaches	0	0.085 to 5.058 items m2	91	Topçu et al., 2013
Spain	Beaches	2013-2015	12 beaches, 100m transects, 4 surveys/year	0	11-2263 items/100 m (2013) 27-1955 items/100 m (2014) 33-2209 items/100 m (2015 winter)	66% (2013) 62% (2014) 67% (2015, winter)	Ministerio de Agricultura, Alimentación y Medio Ambiente (webpage)
Spain-Mediterranean Sea	Beaches	2013-2014	27 beaches	0	11-2273 items / 100 m	48.6%	MARNOBA Project
Croatia (Mjet island)	Beaches	2007	NA	0	NA	80	Cukrov & Kwokal, 2010
Mediterranean sea (15 countries)	Beaches	2002-2006	Beaches	0	NA	>60	ICC, in UNEP, 2011
Greece	Beaches	2006-2007	80 Beaches	0	NA	43% (2006) 51% (2007)	Kordella et al., 2013
Greece (Ionian sea)	Beaches	2014-2015	4	0	208 /100m (35-405) 175 / 15 days/ 100m		Defishgear (2015), in prep.
Med Countries (10)	Beaches	2014	95 km	0	680 items/ 100m		ICC report (2014)
Spain (Murcia)	Micro plastics Beach	2012	1 Beach	0	2245 microplastics/m2	100	http://surf-and-clean.com/microplasticos/
Spain (Malaga)	Micro plastics Beach	2014	1 Beach	0	123-308 microplastics/100 ml 847-2071 microplastics/kg	100	CEDEX, 2014
France	Micro plastics Beach	2011	15 beaches	0	2920 microplastics/m2 (10cmm layer, 0-	100	Klosterman et al., 2012

Location	Habitat	Date	Sampling	Depth	Density (min-max)	% plastics	References
					8000)		
Greece	Micro plastics Beach	2012	12 beaches	0	10-977 items/m2 (2-4 mm) 20-1218 items/m2 (1-2 mm)	100	Kaberi et al., 2013
Ligurian coast	Floating	1997-2000	Visual	surface	1.5-25/ km²	nd	Aliani and Molcart, 2011
North western	Floating	2013	Waveglider	0-4,5m	40,5/ km²	100	Galgani et al., 2013 (CIESM)
Slovenia	Floating	2011	Visual	Surface	1.98 /km2	90	Vlachogianni & Kalampokis, 2014
Adriatic/ Greek waters	Floating	Since 2008	Visual	Surface	5.66 /km2		Vlachogianni & Kalampokis, 2014
North western	Floating	2006-2008	Visual	surface	3,13 / km²	85	Gerigny et al., 2012 and Unpublished data (Ecoocean.org)
Greece	Floating		Visual	Surface	2.1 items/km²	83	HELMEPA (Greece) in UNEP, 2011
Western, Ionian and Adriatic seas	floating	2013	Visual	Surface	6.9 items/km² (0-117)	95.6	Suaria and Aliani (2015)
NW Mediterranean	Floating /Micro plastics	2010	40 samples/Manta/330µm mesh	Surface	115000 / km²	> 90%	Collignon et al., 2012
West Sardinia	Floating /Micro plastics	2012	30 samples/Manta/500µm mesh	Surface	150 000 items/ km² (extrapolated from volumes)		Andrea /Lucia et al., 2014
Malta	Shelf	2005	Trawl (44 hauls, 20 mm mesh)	50-700	102	47	Misfud et al., 2013
Sicily/ Tunisian channel	Shelf	1995	Trawl (fishermen)	0-200 m	401/km²	75	Cannizarro et al. (1995)
Adriatic Sea	Shelf	1997	12 hauls (trawling, 20 mm mesh)	0-200 m	378 +/- 251 / km²	69,5	Galgani et al., 2000
Northern & central Adriatic	Shelf	2005-2010	trawl trawling	0-200m	5-34 kg/ km²	NA	From Vlachogianni & Kalampokis, 2014
Montenegro	Shelf/ slopes	2009	trawling	48 - 746 m	6-59% of total catches	NA	Petrovic & marcovic, 2013
Slovenia	Shallow waters	2013	diving	0-25m	Na	55	From Vlachogianni & Kalampokis, 2014

Location	Habitat	Date	Sampling	Depth	Density (min-max)	% plastics	References
France-Mediterranean	Seabed, slopes	2009	17 canyons, 101 ROV dives,	80-700m	3.01 /km survey (0-12)	12 (0-100)	Fabri et al., 2013
Tyrrhenian sea	Seabed, Fishing grounds	2009	6 x 1.5 ha samples , trawl, 10mm mesh	40-80m	5960±3023/ km²	76	Sanchez et al., 2013
Spain-Mediterranean	Seabed, Fishing grounds	2009	Trawling (fishermen)	40-80m	4424±3743/ km²	NA	Sanchez et al., 2013
Mediterranean sea	Seabed, Bathyal/abyssal	2007-2010	292 tows, Otter/Agassiz trawl, 12 mm mesh	900-3000m	0.02- 3264.6 kg/ ·km² (including clinkers)	nd	Eva-Ramirez 2013
Turkey/ Levantine basin,	Seabed, Bottom/Bathyal	2012	32 hauls (trawl, 24 mm mesh)	200-800m	290 litter (3264.6 kg·) /km²	81.1	Güven et al., 2013
Turkey/ North eastern basin,	Shelf	2010-2012	132 hauls (2.5kts)	20-180	72(1-585 kg)/ hour	73	Eryasar et al., 2014
Mediterranean, Southern France	Shelves & canyons	1994-2009 (16 years study)	90 sites (trawls, 0.045 km2/tow)	0-800 m	76-146/ km² (0-2540)	29.5 -74	Galgani et al. 2000 & unpublished data
Greece	Shelf	Before 2004	59 sites	30-200	4900 /km²	55.5	Katsanevakis & Katsarou (2004)
Greece	Shelf	2000-2003	54 hauls (trawl, 1,5 mm mesh)	30-200	72–437 / km²	55,9	Koutsodendris et al. (2008)
Greece	Seabed (fishing ground)	2013	69 hauls (50mm mesh)	50-350	1211±594 items/km2 (Saronikos Gulf)	95,0±11,9 (Saronikos Gulf)	Ioakeimidis et al., 2014
Levantine basin (Cyprus)	Seabed (fishing ground)	2013	9 hauls (50mm mesh)	60-420	24±28 items/km2	67,4±7,7	Ioakeimidis et al., 2014
Black sea (Constanta bay)	Seabed (fishing ground)	2013	16 hauls (20mm mesh)	30-60	291±237 items/km2	45,2±4,8	Ioakeimidis et al., 2014

Location	Habitat	Date	Sampling	Depth	Density (min-max)	% plastics	References
Italy (North Thyrrenian)	Shelf	2010-2011	69 dives (26 areas, 6.03 km2)	30-300	90 debris items/ km² (0- 160)	92% (89% from fishing)	Angiolillo et al. (2015)

4.3 ECAP indicator 18

Marine litter can affect marine organisms in a multitude of ways, either through physical damage such as entanglement or through indirect health effects such as after ingestion. Direct damage and entanglement pose serious threats to wildlife such as sea turtles, marine mammals, fish and invertebrates, as well as birds, which can be trapped or strangled in the debris (Gregory, 2009). In 2012, 663 species have been identified as possibly affected by marine litter (CBD, 2012).

“Ghost fishing”, whereby lost or abandoned fishing gear continues to catch fish and cause direct harm and mortality to marine organisms (Brown and Macfayden, 2007). Moreover, “Ghost gear” can persist in the environment for a long time because they are usually made of synthetic fibers that are not bio-degradable. Debris can come into the Mediterranean Sea from the Atlantic Ocean floating via the Strait of Gibraltar, but the majority of litter is of terrestrial origin (MSFD TS-ML, 2011; Galgani et al. 2013). The most lightweight (mainly plastics) float on the sea surface and are driven by the convergence of currents and eventually accumulate in gyres, while heavier (glass, metal, hard plastic items, etc.) collect on the bottom (Galgani et al. 2000, Barnes et al. 2009, Mifsud et al. 2013). More than 62 millions of debris items are estimated floating in the Mediterranean (Suaria and Aliani, 2014).

Biota indicators play an important role, as they provide indications of possible harm. At the same time, current protocols and methods have varying degrees of maturity. Pilot-scale monitoring is therefore an important step towards monitoring litter harm in terms of determining baselines and/or adapting the strategy to local areas. Litter affects marine life at various organizational levels and its impact varies according to the target species or population, environmental conditions and the considered region or country.

The concept of harm itself is not obvious, as no acceptable units of measure have been defined. Moreover, proven harm may not be useful for monitoring purposes. For example, entanglement has been highlighted as having one of the most harmful impacts on marine organisms. Organisms may however continue to travel over considerable distances after becoming entangled in ropes, net and lines, hence transforming active fishing gear into marine debris. As a consequence, monitoring criteria only refer to ingested litter, due to difficulties in distinguishing between entanglement in litter and active fishing gear. The current difficulties in interpreting data, together with the low reported numbers of entangled beached animals and problems associated with large-scale harm assessment due to the rarity of stranding, mean this approach can only usefully be applied to specific areas and on the basis of national decisions (Galgani et al., 2013). Research may contribute to the development of new, more specific entanglement indicators. For example, seabird nests can be used to facilitate litter-related entanglement monitoring, as the litter found there cannot originate from active fishing gear (Votier et al., 2011).

Beyond the direct impact on survival, debris ingestion causes sub-lethal effects related, for example, to the decrease of natural food inside stomach and therefore the amount of absorbed nutrients, or the ingestion of toxic substances adsorbed on or released directly from the plastic (Gregory 2009).They may act as endocrine disruptors and therefore can compromise the fitness of individuals (Teuten et al., 2009; Rochman et al., 2013; 2014).

More than 180 marine species have been documented to absorb plastic debris, among these different species of sea birds (Van Franeker et al. 2011), fish (Boerger et al., 2010) and marine mammals (de Stefanis et al. 2013), including plankton species (Fossi et al., 2012, de Lucia et al., 2014). Species that can be considered for monitoring of marine litter, must meet a number of basic requirements, like (i) sample availability (adequate numbers of individuals over a wider span of time and space, without dedicated killing of individuals but beached animals, by-catch victims or harvested species) , (ii) Regular plastic consumption (high frequency and amounts of plastic over time in stomachs), and (iii) feeding habits (stomach contents should only reflect the marine environment). Six of the world's 7 species of sea turtles have been found to ingest debris, with the exception of the flatback sea turtle (Natator depressus) (Schuyler et al. 2014). All six are listed as globally vulnerable or endangered (IUCN 2013). Few single species can actually provide full coverage of all Mediterranean sea and the sea turtle *Caretta caretta* has been shown to be the best candidate species.

4.3.1 Sea turtles

The loggerhead sea turtle (*Caretta caretta*, Linnaeus, 1758) is the most abundant chelonian in the Mediterranean (Camedda et al., 2014; Casale and Margaritoulis, 2010; Margaritoulis et al., 2003). Sea turtles may ingest plastic bags mistaken for jellyfishes (Mrosovsky,1981; Mrosovsky et al., 2009; Plotkin et al., 1993) when they feed in neritic and pelagic habitats. Plastic fragments and other anthropogenic materials may be directly responsible for the obstruction of digestive tracts (Bugoni et al., 2001; Di Bello et al., 2006) and the death of sea turtles (Bjorndal et al., 1994). Furthermore, long retention times of plastic debris in the intestine may cause the releasing of toxic chemicals (e.g. phthalates, PCBs) that may act as endocrine disruptors and therefore can compromise the fitness of individuals (Teuten et al., 2009).
The loggerhead turtle is adopted worldwide as bio-indicator of environmental conditions as the pollution contamination (Foti et al., 2009; Keller et al., 2006). This species, which is listed on the Convention on International Trade in Endangered Species (CITES), has been classified worldwide as "endangered" (IUCN, 2013) and considered as a "priority" species according to the Habitat Directive of the European Union.

During 2012, an Italian task group (ISPRA, IAMC-CNR Oristano, SZN "Anton Dohrn" Napoli, University of Siena, University of Padova, ARPA Toscana) proposed the loggerhead turtle as a target-indicator species for the evaluation of ingested macro litter in an experimental protocol specific for the Mediterranean Sea (Matiddi et al., 2011; MSFD TS-ML, 2013).

Litter in Biota protocol, implemented and adapted to the Mediterranean sea, has been included in "Monitoring Guidance for Marine Litter in European Seas", reference report by the Joint Research Centre of the European Commission (MSFD TS-ML, 2013).

Its extended spatial distribution in the Mediterranean Sea (Casale and Margaritoulis, 2010, Oliver, 2014; Darmon et al., 2014), and the regular occurrence of human waste in the stomach contents (Tomas et al., 2002; Lazar and Gracan 2011; De Lucia et al., 2012; Bentivegna et al., 2013; Travaglini et al., 2013; Camedda et al. 2013; 2014) are interesting criteria for the use of this species as assessment and monitoring tool for marine litter in biota.

Sea turtle species have different lifestyles at various stages of their lives; they can frequent disparate areas feeding on epipelagic or benthic prey in oceanic and neritic zones.
At the early stage of their life individuals probably are mainly inactive, driven by the currents in the oceanic area, after this they gradually begin to swim against the tide reaching shallow water , then adults start to use the sea bottom and the water column as feeding compartment (Casale et al. 2008, Lazar et al. 2010). Adult loggerheads have been found to show fidelity to their neritic feeding grounds which may be the same ones they recruited to as juveniles (Casale et al., 2012), for these reasons they are likely to ingest waste in different habitat types during their lives.

The transition to the pelagic stage to the neritic one, occurs at different range sizes, but below 40 cm Curved Carapace Length (CCL) are usually considered juveniles (Cardona et al., 2005; Casale et al., 2008; Lazar et al., 2008; Campani et al., 2013) and the neritic area is probably selected depending on the proximity to the oceanic area frequented before (Casale et al. 2007).

Some studies in which stranded turtles were analyzed report that smaller oceanic turtles are more likely to ingest debris than larger turtles (Plotkin & Amos 1990; Schuyler et al. 2012). This means young oceanic turtles may be more at risk from debris ingestion than older benthic-feeding turtles, not only, they are more likely to ingest debris, but their relatively small, thinner digestive systems will be more vulnerable to impaction by and perforation from the debris (Schuyler et al. 2012).

Different result has been found in Mediterranean Sea where adult specimens of loggerhead showed higher values of marine litter if compared with the juvenile (Campani et., al., 2013).

Even though loggerhead sea turtles, in particular adult individuals, are able to discriminate colors to find food (Bartol and Musick, 2003), and avoid biting non-preferred preys (Swimmer et al., 2005), Camedda et al., (2014) showed that both, adults and juveniles of *C. caretta* ingested plastic materials “preyed” on the sea surface and in the water column.

The hypothesis that loggerheads have a low feeding discrimination also received support from Hoarau et al., 2014, they demonstrated that loggerhead collects heterogeneous types of materials in terms of shape and colors, some of which debris was not similar to any prey species.

Sea turtles are a migratory species and have an average swimming speed of about 1,2Km per hour, below 0.5km per hour at foraging sites, satellite telemetry studies indicated that sea turtles are able to travel long distances, quantified in dozens kilometers per day (Bentivegna, 2002; Bentivegna et al., 2007; Luschi et al., 2006; Schofield et al., 2010; Tucker, 2010; Varo-Cruz et al., 2013).

Seasonal migrations (north/south) probably due to temperature change are known from the north-western Atlantic (Musick and Limpus 1997), but do not seem to be a general pattern for all populations (Limpus and Limpus 2001). Hochscheid et al. (2005, 2007) observed that loggerhead turtles in the Mediterranean can undergo a state of dormancy to overcome the cold season, without the need of migrating to warmer areas.

Large quantities of debris can remain in the gut for months (Lutz, 1990) and pass through their entire digestive tract without causing any lethal damage.
The loggerhead sea turtle, *Caretta caretta*, demonstrates great tolerance of anthropogenic debris ingestion and the species is generally able to defecate these items (Balazs, 1985; Casale et al., 2008; Frick et al., 2009)

Camedda et al., 2014 observed that sea turtles in the Sardinia rescue centre, released anthropogenic materials in the feces for longer than a month of hospitalization, even if most of the litter was expelled within the first 2 weeks. Studies about transit time of substances in gastro-intestinal tracts of loggerhead sea turtles demonstrated that materials (as polyethylene spheres) are expelled in about 10 days (Valente et al., 2008). Therefore, they conclude that considering the mean distance covered in 10 days by *C. caretta*, the litter defecated during the hospitalization into the tanks is likely to be a sample of debris present around Sardinia (Camedda et al., 2014).

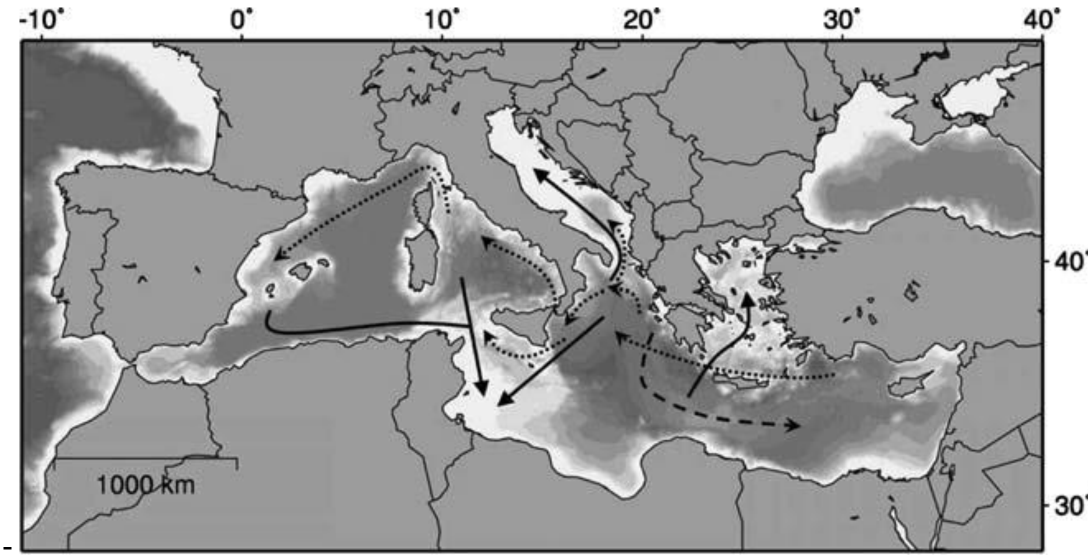

Fig. 2: A hypothetical pattern of frequented areas and movements of *Caretta caretta*. *Dashed lines* link natal sites and oceanic habitats (the *bold dashed line* considers a hypothetical oceanic habitat in the eastern Mediterranean). *Continuous lines* link oceanic and neritic habitats. *Lines* just link different areas and should not be necessarily considered as specific routes (Casale et al., 2007).

Despite loggerhead is able to ingest any kind of waste, plastic items seems to be significant more than other kind of marine litter. Different studies in the Mediterranean Sea (Tomas et al., 2002; Casale et al., 2008; Lazar and Gracˇan,2011; Campani et al., 2013, Camedda et al., 2014), in the Atlantic Ocean (Plotkin et al.,1993; Bugoni et al., 2001; Frick et al., 2009) in the Pacific Ocean (Parker et al., 2005; Boyle and Limpus, 2008) and in the Indian Oceans (Hoarau et al., 2014), demonstrated that plastic is the most frequently ingested anthropogenic debris. Schuyler et al. (2013) recently showed that plastic was the most widely reported debris item ingested by all sea turtles in analyzing 37 studies published on debris ingestion by sea turtles.

It is common idea that more plastic items are ingested by loggerheads because of their resemblance of natural preys in oceanic waters and their opportunistic habit of feeding on items floating at or near the surface but it is also well known that plastic is the main waste at sea all around the world. Plastic is the primary type of debris found in marine and coastal environments (Derraik 2002), and plastics are the most common form of debris ingested by wildlife (Mrosovsky et al. 2009; van Franeker et al. 2011; Schuyler et al. 2012). In the OSPAR Fulmar EcoQO indicator only plastic items are considered, but all the categories of marine litter are recorded.

In Camedda et al., (2014) litter found in the stranded sea turtles was compared with those excreted by hospitalized ones, analysis of categories showed homogeneity in relation of the total abundance, weight and composition among alive and dead turtles. Hoarau et al., 2014 found that the number, weight, volume and mean length of debris were higher in gut content of deceased loggerheads than in fecal samples of live turtles, but not significantly.
According to Scuyler et al., (2013) lavage or fecal analyses underestimate debris ingestion because only a small subset of the gastrointestinal tract is sampled. Seminoff et al. (2002) found 1.9% of 101 lavaged turtles had ingested debris: 41 of these turtles were kept in a tank and their feces collected. Of these, 19% excreted debris, 10 times the amount found through lavage. Seven turtles from the same population died and their stomach contents were analyzed; 2 had ingested debris.

4.3.2 Other species

There is a potential for using litter Ingested by other species as indicator of harm. In the North Sea, an indicator is available, which expresses the impact of marine litter (OSPAR EcoQO). It measures ingested litter in Northern Fulmar and it is used to assess temporal trends, regional differences and compliance with a set target for acceptable ecological quality in the North Sea area (Van Franeker et al., 2011). However alternative tools are needed for the Mediterranean Sea. On the basis of available information, bird species of interest for monitoring such as shearwaters have limited distribution indicating local interest. The protocol proposed by TSG-ML which can be used for seabirds in general, may be then applied in parts of the Mediterranean.

Alternative species may also be considered. This may be the case for some fish species (Boops sp. for example, Deudero et al., in CIESM, 2014) or invertebrates such as echinoderms of mollusks. Such indicators need however more research and interpretation may be restricted to the effects of micro plastics only. Ingestion of litter by a wide range of whales and dolphins is also known, Although known rates of incidences of ingested litter are generally low to justify a standard ECAP monitoring recommendation at this point,

Table 4: Ingestion rate of Litter in Mediterranean Sea turtles. Size is given in shell length.

Area	Date	size	Individuals/ deads	With ingested litter (%)	live individuals	With ingested litter (%)	Total	With litter (%)	References
Sardinia(E&W)	2008-2012	21-73	30	20	91	12	121	14,04	Camedda et al., 2013
Tuscany	2010-2011	29-73	31	71			31	71	Campani et al., 2013
Adriatic	2011-2004	25-79	54	35,2			54	35,2	Lazar & Gracan, 2011
Spain	nd	34-69	54	79,6			54	79,6	Tomas et al., 2012
Lampedusa	2001-2005	25-80	47	51,5	33	44,7	79	48,1	Casale et al., 2008
Malta	1988	20-69			99	20,2	99	20,2	Grammentz, 1988
France	2011-2012	nc	2	0	54	24	56	19,6	Dell'Amico & Gambaiani, 2012
France	2003-2008		20	36			20	36	Claro & Hubert, 2011
Balearic islands	2002-2004	36-57	19	37,5			19	37,5	Revelles et al., 2007
Linosa	2006-2007	26,7-69					32	93,5	Botteon et al., 2012
Italy/Spain (Murcia)	2001-2011				155	50	155	50	Casini et al., 2012

5) MONITORING and ASSESSMENT CRITERIA

Monitoring is an important part of any management strategy as no strategy can be evaluated without monitoring data. The relative success of different tactics cannot also be determined and finally, monitoring is also necessary for the setting of targets.

When defining the aims and objectives of monitoring, ECAP will address measurements as an assessment of whether GES has been achieved or maintained, whether environmental status is improving, and what progress has been made towards achieving environmental targets. Without some degree of information on trends and amounts across all compartments, a risk-based approach to litter monitoring and measures is impossible. In the Mediterranean Sea, Contracting parties must draw up their monitoring programmes in a coherent manner by ensuring monitoring methods are consistent across the region. This will facilitate the comparison of monitoring results and take into account relevant trans-boundary impacts and features.

As major future decisions within the Mediterranean Action Plan on ML will be based on measures, monitoring efforts should be shouldered by quality control/quality assurance (training, inter-comparisons, use of reference material for microplastics, etc.) to assist survey teams. Protocols have been defined for the three ECAP indicators, considering standard list of categories of litter items in order to enable the comparison of results between countries and environmental compartments. Items may be attributed to a given source e.g. fisheries, shipping etc., or a given form of interaction (ingestion), hence facilitating identification of the main sources of marine litter pollution and the potential harm caused by litter. This will enable a more target-orientated implementation of measures. Site selection strategies will focus on both sites with specific characteristics and sites chosen randomly in order to facilitate extrapolations. Sampling/analysis/reporting will need to be coordinated on a sub basin scale, e.g. Northwestern Mediterranean, Adriatic, Ionian, Aegean and Levantine seas. Data handling and reporting for the ECAP must be considered however at regional (Mediterranean) level and based on an online, Mediterranean-wide data collection system.

For the specific case of sampling the stranded turtles that are widely distributed and may migrate over long distances, taking into account the characteristics of the sampling area, locally but also on a basin/sub basin level, will assist in creating a large-scale monitoring network and database enabling the understanding of Tran boundary issues.

Both UNEP/ MEDPOL and MSFD have produced monitoring protocols of interest for the Mediterranean, focusing on beach, sea floor and floating litter, microplastics, litter in biota and micro-litter in biota. Beach litter is the most detailed indicator for marine litter inflow and therefore the most mature indicator and the one for which most data is available.

There is currently no accepted Mediterranean or sub regional baseline against which to measure progress towards Good Environmental Status. The monitoring programmes required by MLRP to be implemented should thus provide such a comprehensive baseline.
Due to the poor differences between the Mediterranean sub regions in terms of litter densities, the unequal spread of available data-sets, and because some countries belong to two or more sub regions (Italy, Greece), the online expert group recommends that common baselines for the various EIs (beaches, sea surface, sea floor, microplastics, ingested litter) must be considered at the level of the entire basin (Mediterranean Sea) rather than at the sub regional level.

It must be recognized that accumulation of beach litter may occur, and that beach litter will be more representative of land-based sources than that which is deposited far offshore. By monitoring, some

indications on litter inflow can be established, in particular for urban beaches and those geographically under the influence of specific activities and discharges such as around river mouths.
For beaches, protocols may favor the description and quantification of marine litter in a very detailed way in terms of material and nature of items present. They can then provide information on sources and the effectiveness of management and reduction measures. Wherever a single litter type is sufficiently present in the observed marine litter composition, anti-littering measures dedicated to this specific litter item will have some effect, ranging from a couple of percentage points or more on the total number of beach litter items found.

This shows that beyond taking general policy measures on waste recycling (e.g. general recycling targets for some materials) a significant effect can be expected from specific measures on specific items. Then, the option of considering top items (top 15 for example, figure 3), especially on beaches, for baselines, targets and measures appears as the most efficient strategy.

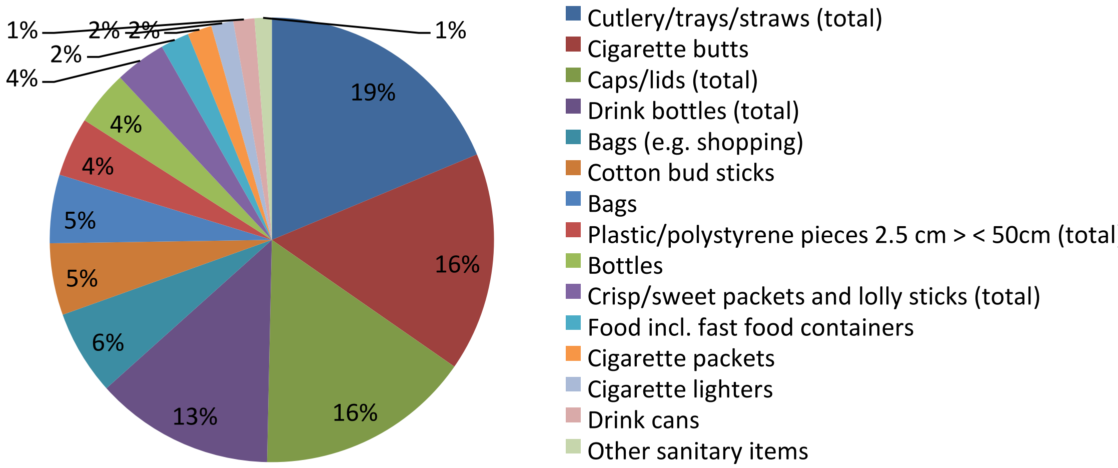

Figure 3: Top 15 items by percentage found on Mediterranean beaches (after Arcadis, 2014)

Nevertheless, in terms of management, litter categories stranded on beaches that are individually targeted by reduction plans (cigarette butts, plastic bags, cotton buds, etc.) will need specific baselines and targets to be defined in order to prevent loss of information and to better evaluate the effectiveness of the reduction measures.

Local, countries or sub regional differences regarding some items (Cotton bud sticks, cigarette butts, etc.) are frequently found as marine litter distribution varies from one area to another. This is in large part due to the differences in behavior and waste collection/treatment systems between different regions/countries. The outcome of general waste policy measures and the outcome of specific marine litter item measures are then difficult to add up.

However, advantages of this approach are (i) the regional baseline, (iii) the connection with well-established indicators, (iv) the possible consideration of operational targets to address the specific sources, linked directly to measures, and (v) the possible consideration of operational targets that reflect prevention.

For other ECAP indicators than beaches (surface, sea floor, microplastics), and because mixing has occurred at sea before they are deposited, ingested of floating, the relation with sources will be more difficult to understand. More general trends will be of interest when following changes in the environment and the consideration of main categories of litter only may be sufficient to monitor the state of the environment. Except for micro-plastics, some specific sources however will have to be considered, such as those corresponding to fishing activities, tourism or health related debris as this type of debris may relate to specific sources, specific targets and specific reduction measures.

Regarding sea turtles, more studies are needed to better understand biological constraints (table 8) and some questions are still to be precised before defining a GES and a target for marine debris ingested by sea turtles. Trend seems to be more convenient than a target value. Beside, rate of decrease will have to be considered more "in depth" and discussed. Some/local specificity, (ii) the possible targeting of specific items that will facilitate consideration of more robust statistical additional questions will have to be considered such as the consideration of samples (size classes, stranded/live). Then, the basic question for defining a baseline will be to consider minimum, mean or a maximum value. We understand that data must be considered at sub regional level only because of stranding rates of sea turtles and local migrations meaning significance at a larger scale than just a beach only. Then, the baseline and targets may be defined at a regional level (Mediterranean) but reporting should be at a sub-regional level (western basin, Adriatic…) to address the sub regional differences.

6) SUMMARY OF PROPOSED BASELINES

Following scientific and technical considerations cited above, The CORMON group propose the following baselines levels

Indicator	minimum value	maximum value	mean value	Proposed baseline
16. beaches (items/100 m)	11	3600	920	450-1400
17. Floating litter(items/km2)	0	195	3.9	3-5
17. sea floor(items/km2)	0	7700	179	130-230
17 Microplastics (items/km2)	0	892000	115000	80000-130000
18 (Sea Turtles)				
Affected turtles (%)	14%	92.5%	45.9%	40-60%
Ingested litter(g)	0	14	1.37	1-3

Table 5: Proposed baselines for monitoring marine litter in the Mediterranean Sea

7) LITTER CATEGORIES IN THE MEDITERRANEAN SEA

Taking into account that some of the litter found in the Mediterranean should be generated in other seas, it is quite important to harmonize as far as possible the monitoring programs with other Regional Seas Conventions (e.g. OSPAR).

Taking as basis the Master List produced by the TSG-ML, each Region should adapt the whole list including the more frequent items in order to produce a shorter list, more useful and practical for the field work.

For the case of the beach litter monitoring, the Master List contains a total number of 165 different items (with associate code), distributed in the following categories:

- Artificial polymer materials (plastics/polystyrene).
- Rubber.
- Cloth/Textile.
- Paper/Cardboard.
- Processed/worked wood.
- Metal.
- Glass/Ceramics.

This high number could elevate the time consumed in the field work. In the case of the OSPAR Convention and after revision in 2009, the list contains only 115 different items (and currently it is under revision with the aim to adapt it as far as possible to the TSG-ML Master List).

the online expert group suggests that the CORMON working group should agree on a reduced list (desirably close to that in use in the others RSC), which would include the items more frequently found on the Mediterranean beaches, avoiding those that are found rarely. Moreover, the lists of litter categories considered in countries having monitoring programs dedicated to two RSC (e.g. Turkey, France or Spain) would need harmonization. For this, the MSFD derived MEDPOL list is now compatible with other RSC lists of beach litter categories. Minor changes have been suggested by the online expert group (Table 6). With regards to the MSFD form, it is proposed to merge some types of beach litter (e.g. different types of drink bottles or different types of caps/lids and rings, etc.), split glass and ceramic items categories, consider the sanitary and medical wastes as a separate category and not to include several specific items that have not appeared in the running MED monitoring programmes (e.g. Spanish Monitoring Program on beach marine litter, implemented from 2013 in the Mediterranean).

Table 6: Main changes in the MSFD form for the MEDPOL harmonization with others RSC

Item ID	Changes proposed	Rational
G7/G8	Merge both categories	Same source, similar impact
G21/G24	Merge the 4 categories	Similar impact. Very difficult to distinguish in the field
G27	Included in the paper/cardboard class	In coherence with others RSC
G30/G31	Merge both categories	Same source
G34/G35	Merge both categories	Same source
G45	Include also plastic stoppers	Same source (mariculture)
G57/G58	Merge both categories	Same source
G62/G63	Merge both categories	Similar source. Difficult to distinguish
G91	Not included in others RSC but interesting	Specific problems related with the water treatment plants.
G95	Included in the sanitary class	In coherence with others RSC
G96	Included in the sanitary class	In coherence with others RSC
G97	Included in the sanitary class	In coherence with others RSC
G99	Included in the medical waste class	In coherence with others RSC
G100	Included in the medical waste class	In coherence with others RSC

G 101	Included in a specific class	In coherence with others RSC
Some artificial polymer items	Not included as specific items. It should to be counted in the other plastic items category	Very scarce in the existing MED monitoring programs and in coherence with others RSC
G133	Included in the sanitary class	In coherence with others RSC
Several rubber items	Not included as specific items. It should to be counted in the other rubber items category	Very scarce in the existing MED monitoring programs and in coherence with others RSC
G144	Included in the sanitary class	In coherence with others RSC
Several textile items	Not included as specific items. It should to be counted in the other textile items category	Very scarce in the existing MED monitoring programs and in coherence with others RSC
Several paper/cardboard items	Not included as specific items. It should to be counted in the other paper/cardboard items category	Very scarce in the existing MED monitoring programs and in coherence with others RSC
G160/G161	Merge both categories	Similar source. Difficult to distinguish
Several wood items	Not included as specific items. It should to be counted in the other wood items categories according its size	Very scarce in the existing MED monitoring programs and in coherence with others RSC
Several metallic items	Not included as specific items. It should to be counted in the other metal items categories according its size	Very scarce in the existing MED monitoring programs and in coherence with others RSC
Items on glass/ceramic classes	Distinguish	Different source
G208	Not included in others RSC but interesting	Specific problems related with the use of the beach
G98	Not included in others RSC but interesting	Very slow degradation time

Annex 2 includes the MEDPOL Form (MSFD derived and OSPAR compatible) for 100 m stretches to be considered for beach monitoring in the Mediterranean Sea.

Other different issue to be discussed regards the Lower size Limit of litter items, If lower size limits are not set, the lower limit will be determined by the possibility of detection by the naked eye and depends on the visual perception (eyesight) of the individual surveyors and on the conspicuousness of the litter items, which in turn depends on their size, color and form. As some identifiable items included in the Master List are smaller than 2.5 cm (e.g. some caps and lids and cigarette filters) and as the protocol includes a size class <2.5cm for plastic and polystyrene pieces (item ID G 75), beside a minimum lower limit at 0.5 cm (upper size of microlitter), the on line group proposes to use for surveys a minimum lower limit at 0.5 cm.

8) CONSIDERATIONS FOR THE PROPOSITION OF TARGETS

Environmental targets are qualitative or quantitative statement on the desired condition of the different components of marine waters. They are important for management and, within ECAP, they will enable to (i) link the aim of achieving Good Environmental Status (GES) to the measures and effort needed to achieve GES, (ii) measure progress towards achieving the objective by means of associated indicator(s) ,

(iii) to assess the success or failure of measures to prevent marine litter from entering the seas and to support management and stakeholder awareness (Interwies et al., 2013).

The definition of targets is a political choice that can be based on levels of acceptance and levels of ambition in the transition towards a good environmental status in the marine environment. As discussed during the conference of Berlin (2013, http://www.marine-litter-conference-berlin.info/) target setting undergoes an iterative process, starting from a conceptual understanding of the desired condition and the change that is required to achieve it. Broad based targets (maintain level of Marine litter, reduce the amount of litter at sea, etc.) and "trend-based" targets (e.g. reduce the amount of litter transported by rivers, decrease the number of visible litter items on beaches) are possible options. Typically broad targets will have many advantages such as a common concern enabling harmonized actions, political commitment, coordinated actions and cooperation. Another approach would be to provide some flexibility in the extent of reductions towards a common goal. For example, for a target to reduce the amount of litter per square meter of beach, contracting parties and possibly Regional Seas might have different quantitative goals. This could reflect their different starting points on this. Our current lack of knowledge with regards to metrics to be used is such that absolute targets are difficult to set; as a result, many Contracting Parties are formulating trend targets instead. The design of most protocols enables regional adaptation and the discrimination of litter items; they are therefore likely to detect changes in litter types and enable a proper assessment of the various measures implemented.

Table 7: Overview of potential aspects to set targets on marine litter (derived from Interwies et al., 2013)

	Examples
Location of marine litter	• Beach - washed ashore, or deposited through human activity (e.g. tourism) • Water column • Floating (water surface) • Sea bed • Marine life (plastic ingested, entanglements)
Composition/ Type	• Plastic bags • Cigarette butts • Caps/lids • Plastic bottles • Consumption packaging • Sanitary waste • Cotton buds • Ghost nets and abandoned traps • Micro-particles
Sources & pathways of marine litter	• Sewers and rivers • Beach and shoreline • Landfills • Ship-based litter

Sectors	• Fisheries • Recreation and Tourism • Waste producers • Industry (e.g. virgin pellets)
Measures	• Reduce urban waste production (the "4R" measures) • Improved waste collection of land-based sources/sectors • Improved collection of ship-based waste in the port reception facilities • Improved waste water treatment • Behavioural change (reduce consumer littering) • Inspection at sea

These kinds of knowledge gaps lead to problems when trying to determine the relative importance of different sources and pathways globally and regionally, which are important for devising management strategies and tactics. The old dictum states that what can't be measured can't be managed (CMS, 2014). Subsequently they lead to difficulties in setting quantitative targets on marine litter at any level, whether global, regional or by sector.

It may be possible to circumvent some of these issues by using trend targets and 'operational' measures. In December 2013, the Contracting Parties of the Barcelona Convention adopted the Regional Action Plan on Marine Litter Management in the Mediterranean. No specific quantitative targets are defined in the document, except the general objectives of the Plan, which are:

a) Prevent and reduce to the minimum marine litter pollution in the Mediterranean and its impact on ecosystem services, habitats, species in particular the endangered species, public health and safety;
b) Remove to the extent possible already existent marine litter by using environmentally respectful methods;
c) Enhance knowledge on marine litter; and
d) Achieve that the management of marine litter in the Mediterranean is performed in accordance with accepted international standards and approaches as well as those of relevant regional organizations and as appropriate in harmony with programmes and measures applied in other seas.

The Action Plan describes also some strategic, operational objectives and lists a series of prevention measures (following the Waste Hierarchy) and remediation measures that should be considered and implemented by the CPs to the extent possible and within a specific time-frame.

It may be adequate to encourage the establishment of both "state" and "pressure" targets and indicators, as complementary in defining and monitoring the presence of marine litter and the impact of policy responses. Well-formulated "pressure" targets and indicators can better reflect the effectiveness of specific operational objectives.

The lack of consistent and harmonized data is mentioned by some Contracting Parties to be able to define adequate and appropriate targets. It is clear that there is more data on beach debris than for debris in the water column, even though there is not so much information available in Mediterranean marine waters to set quantitative thresholds related to the reduction of marine litter stranded on beaches.

Quantitative reduction targets for beach/floating/ seabed litter and microplastics should nevertheless be considered. It may be proposed that the goal of a general measurable and significant reduction of marine litter by 2020 be adopted in the first instance. It must be noted, in this respect, that if higher targets are set, and appropriate measures are instituted to meet the targets, it will be easier to determine, through monitoring, that a change has indeed occurred, than if weak targets had been set. For example, It may not be technically possible to measure a slight (few %) change that could just reflect a "background noise". The extent of the monitoring that would be required to have sufficient confidence that such a modest target had been met would make it more expensive to determine than would be the case for a more ambitious target.

Moreover, an apparent failure to achieve a modest target may be cited by some as evidence that more ambitious targets are not feasible, and should not be pursued (CMS 2014).
Within the context of various management schemes, some contracting parties have proposed or plan to set targets as follow (See Arcadis, 2014):

- To reduce litter from beaches based on a five year moving average;
- Negative annual trend in beach litter;
- Reduction in litter on sea surface, water column and seabed;
- Litter proved to be harmful to marine organisms reduced towards zero over the long term;
- Entanglement and strangulation reduced towards a minimum;
- Less than X% of sea turtles having more than Xg of plastic in their stomachs;
- Various targets regarding better waste collection in coastal regions;
- Reduced inflow from rivers and sewers;
- Targets dedicated to education, as related to changes in behaviour (littering, etc.).

There is quite a wide diversity of targets that may be defined by CPs, in terms of nature, ambition and measurability, even between neighboring countries. Most countries involved in reduction plans have defined targets as a reduction in the overall amount of litter present in the marine environment or in any of its compartments (coast, seafloor, water column) or biota. In the Mediterranean, France opted for a "Significantly reduce the amount of waste in the marine environment" for instance when Spain established targets regarding the special category of marine litter originating from fisheries on both beaches and the sea floor. With regards to the implementation of actions, Italy and Spain, for example, are supporting respectively "an increasing effort in collecting waste on the sea-bed" and "the Improvement of knowledge on the characteristics and impacts of marine litter, including their origin and dispersion". Concerning time frames, few countries are considering deadlines, such as Achievement by 2020 (Spain) , Reduction or no increase in marine litter originating from fisheries in relation to the reference levels established in 2012 (Spain), Reduction of waste in coast, water column and seafloor between 2012 and 2020 (Slovenia) and reduction of Microplastics beyond the levels of 2011/2012 (Slovenia).

Where CPs are hesitant about establishing quantitative state targets, pressure/operational-oriented targets can complement their efforts, as they refer to human processes and activities which are easier to monitor and influence. As some CPs have done in other management plans, formulating a sub-set of targets for specific sources of marine litter (e.g. litter generated by fisheries) or even particular types of items (e.g. reduce the average occurrence of the top identifiable items found on reference beaches) should facilitate breaking down such a complex issue into more quantifiable and complementary elements.

Most Contracting Parties may use beach litter as an indicator to assess the reduction of marine litter or directly relate beach litter to a target formulated. This is quite positive, as it reflects the intention to implement beach litter monitoring programmes widely in the Mediterranean. If done in line with the common MEDPOL protocol, it will constitute a cost-effective methodology and a critical step towards a harmonized and comparable monitoring approach across the region. CPs should look for further specification and harmonization in terms of how trends and reductions are to be determined (time scales for example) and have comparable reference periods. This may enable comparability and for this reason, the remaining countries should be encouraged to consider beach litter as a common indicator to be adopted.

The setting of marine debris targets will encourage the implementation of monitoring programs. Different types of targets are relevant to different types of information gaps: at-sea targets for improving the state of information about abundance, operational targets such as estuarine monitoring for improving information on pathway, source and regional differences; and targets related to impacts on wildlife improving information in that regard. There are quite a large set of factors affecting the quantities and distribution of marine litter in a certain area and variables that affect its transport, accumulation and fragmentation processes are yet to be fully understood. It can be therefore very challenging to detect clear reduction trends in the amount of litter present in the sea that can be associated to the implementation of measures in a particular area.

A proposal of a headline reduction target for marine litter on beaches was proposed by Arcadis (2014), based on (i) the targets already in use at the level of Europe, Contracting Parties or UNEP/regional seas, (ii) the expectations of the general public and the stakeholders concerning an effective marine litter policy, (iii) the analyzed occurrence of key marine litter types, loopholes and pathways retrieved from 343 recent beach screenings in the four European regional seas, (iv) the modelled impact on marine litter of the different policy options, and (v) the assessed impact on marine litter that dedicated policy measures for specific litter items could have.

In September 2014, the European Commission in their Communication 2014/398 "*Towards a circular economy: A zero waste programme for Europe*", adopted this proposal, formulated as follows:

An aspirational target of reducing marine litter by 30 % by 2020 for the ten most common types of litter found on beaches, as well as for fishing gear found at sea, with the list adapted to each of the four marine regions in the EU.

It is formulated for 2020, compared to 2015, applying the screening method from the technical guidance documents on monitoring of marine Litter and excluding fragmented or undefinable litter items.

As stated by Arcadis (2014) for European regional seas, measures targeting cigarette butts have resulted in reductions of total number of beach litter items of up to 18%, reductions in plastic carrier bags of up to 13%, bottle caps up to 7%, cotton buds up to 2% and deposit refund systems for beverage packaging up to 12%, depending on the specificities of the regional sea concerned. The level of ambition of the proposed target remains high as depending on the litter management policies from Contracting Parties and may not fit for indicator EI 17. Floating litter may be transported from one country/ sub basin to another, and sea bed litter is accumulating for long period, with low degradation rates. Moreover, sources of microplastics cannot be distinguished by uses, etc., and it will be difficult to relate targets with measures.

We propose then more accessible targets, considering however the proposed baselines (see chapter 5 and 6) that may be optimized after 2015 first results from monitoring to be started in 2015. Targets may focus on the total amount of marine litter first with some specific targets on individual items when impacts of reduction measures must be evaluated. For floating and sea floor litter, a significant decrease will enable to overcome the constraints of diffuses and uncontrolled sources (Tran boundary movements, influence of currents) and permanent accumulation processes on sea floor. Ingested litter in sea turtles will then focus on the number of affected animals and the amount of ingested debris by number or weight.

Finally, with regards to strategy and technical or scientific considerations, the propositions for practical environmental targets in the context of ECAP may be summarized in the following table 8:

Table 8

ECAP INDICATORS	TYPE OF TARGET	MINIMUM	MAXIMUM	RECOMMENDATION	REMARK
BEACHES (EI16)	% decrease	significant	30	20% by 2025	Not 100% marine pollution
FLOATING LITTER (EI 17)	% decrease	-	-	Statistically Significant	sources are difficult to control (trans border movements)
SEA FLOOR LITTER (EI 17)	% decrease	stable	10% in 5 years	Statistically Significant	15% in 15 years is possible
MICROPLASTICS (EI 17)	% decrease	-	-	Statistically Significant	sources are difficult to control (trans border movements)
INGESTED LITTER (EI 18)					Movements of litter and Animals to be considered
Number of turtles with ingested litter (%)	% decrease in the rate of affected animals	-	-	Statistically Significant	
Amount of ingested litter	% decrease in quantity of ingested weight(g)	-	-	Statistically Significant	

9) GAP & RESEARCH NEEDS (with regards to assessment criteria)

Accumulation rates vary widely in the Mediterranean Sea and are subject to factors such as adjacent urban activities, shore and coastal uses, winds and currents, leading to floating, beach and sea floor accumulation areas. Additional basic information is still required on sources, inputs, degradation processes and fluxes before a correct global debris assessment can be provided. Furthermore, anthropogenic inputs may change and sources may shift between tourism, fishing, shipping and marine industry, etc. More research towards a clear evidence base is necessary to ensure efficient policy decisions. For this purpose, and in view of the considerable variations in methodologies across regions and investigators, more valuable and comparable data could be obtained by standardizing our approaches. In terms of distribution and quantities, the overall balance between increased waste and plastic production, reduction measures and quantities found on the surface and shorelines has not been assessed to date, hence indicating the possible accumulation of large quantities, the locations of which have yet to be discovered. We clearly need to understand litter distribution better in order to accurately assess its impact.

An important aspect of litter research to be established is the evaluation of links between hydrodynamic factors. This will give a better understanding of transport dynamics and accumulation zones. Further development and improvement of modelling tools must be considered for the evaluation and identification of both the sources and fate of litter in the marine environment. Comprehensive models should define source regions of interest and accumulation zones. Likewise, backtrack simulations should be initiated at those locations where monitoring data are collected.

The project STAGES (http://www.stagesproject.eu) stated that a better understanding about rates of degradation of litter in the environment is needed. At present the lower limit of detection for plastic particles is around 1µm. It seems likely that even smaller particles of litter (nanoparticles) may exist, however we need to develop appropriate methodology to quantify these. We also need a better understanding of the potential sink/types and habitat where this material is most likely to accumulate as the knowledge of the accumulation and environmental consequence of microplastic/nanoplastics particles is relatively limited. For monitoring of microparticles, lower limits for collection is recommended from the group at 330µm and must be agreed by CPs.

Repeatability, optimization, robustness and reliability of monitoring methods will require further research to develop rapid interpretation of litter data. The present methods applied are a good tool for mapping litter distribution as a way of identifying litter sources, but need to be further developed before they can be used for monitoring purposes.

Interwies et al., (2013) listed the following gaps as the most important in the Mediterranean Sea:

- Amounts and composition, and transport, origin and impacts of marine litter on the sea floor (especially in the deep sea) and in the water column (floating litter).
- Impacts and amounts of micro-particles.
- Socio-economic impacts of marine litter.
- Amounts and impact of abandoned/lost fishing gear.
- Importance of shipping activities for the generation of marine litter.
- Evaluation of riverine inputs to support reduction measures.

For ingestion of litter by sea turtles, a more precise definition of target (GES) and the identification of Parameters/biological constraints and possible bias sources (see table 9) when defining GES are the priority research needs. Work on other "sentinel" species is also important as it may provide additional protocols supporting the measurement of impacts, especially for microplastics. Finally, the use of new approaches and the development of new metrics to assess entanglement of marine organisms specifically by Marine Litter may open new perspectives in the context of monitoring. As an example, guidelines are currently being developed for litter in seabird nest structures and the associated entanglement in litter in nest structures. Some species tend to incorporate marine litter in their nests, which may result in entanglement. (Votier et al., 2011). Even with some research needed to define behaviours, breeding seasons and the types of litter brought into seabird nests, species such as shags (*Phalacrocorax aristotelis*) is promising with regards to monitoring of the Mediterranean Sea. The species is very common throughout the Mediterranean and nests on coastal areas in most European and North African countries, together with the Black Sea coast.

Table 9: Parameters/biological constraints and possible bias sources to be considered when defining a GES target on marine debris ingested by sea turtles, and knowledge gaps identified (Claro et al., Workshop on GES for sea turtles, Marseille, 13 October 2014).

Parameter/ biological constraints	considerations	Possible bias	Possible solutions
Sex	Possible differences in ingestion level between individuals depending on their sex and reproductive status (e.g. before or after nesting in females / etc.)	Influence of sex on level of debris ingestion not identified in the literature	Evaluate impact of sex on litter ingestion
size (CCL)/ stage of development/ population	According to their population of origin (Atlantic/Mediterranean), size at which individuals are benthic/pelagic feeders may differ (differences in growth features) as well as the level of ingestion (feeding needs growing with size, debris less abundant at the sea bottom)	The value of the indicator may be biased by the structure and origin of the “population” sampled in a given region	Interpretation of data must consider juveniles (CCL<40cm)* and adults separately
Habitat	Depending on their developmental stage, habitat use and resources availability, individuals may use neritic, oceanic foraging habitats or both (debris less abundant at the sea bottom)	The value of the indicator may be biased by the habitat used by the turtles sampled in a given region	Interpretation of data must consider juveniles (CCL<40cm)* and adults separately
health status	Possible differences in ingestion between individuals which died suddenly (collision or bycatch), and stranded turtles	Possible biased values for beached turtles which have been ill for a long time before stranding and have excreted all their digestive content	Samples with empty digestive tract not to be considered
movement capacity/ duration of digestive transit	Since turtles have a high movement capacity and duration of digestive transit may vary according to several factors, debris could have been ingested outside Mediterranean waters; however sea turtles may stay one month or more in a same developmental/ foraging area	Possible bias of interpretation if analysis performed at a wrong scale	More data needed

**CCL= Curved Carapace Length*

10) RECOMMENDATIONS

The following table 10 is providing the recommendations as agreed by the expert group on marine litter

TOPIC	DRAFT RECOMMENDATIONS
	SCIENTIFIC and TECHNICAL BASIS OF MONITORING
SCALE	**Common baselines** for the various EI (16, 17, 18) must be considered at the level of the entire basin (Mediterranean) rather than sub regional level
RESEARCH	Need to **define an adapted protocol for microplastics in sediments**
RESEARCH	Research to **support the development of an indicator dedicated to entanglement**
BASELINES/TARGETS	**Consider specific baselines and targets** for Litter categories that are individually targeted by reduction plans or measures by contracting parties (cigarette butts, plastic bags, cotton buds, etc)
CATEGORIES	**Consider the reduction of the number of categories** in MEDPOL monitoring protocol
CATEGORIES	**Adapt MEDPOL master list**, MSFD derived, to harmonize with other RSC
MONITORING	**Needs for adjustement of the monitoring guidance** (more compatible definitions and wording , list of items/categories)
MONITORING	**Harmonization** of the CORMON Report (this report) with the ECAP monitoring guidance for Marine Litter
	SUPPORT
MONITORING	**Consider the relevance of ML for monitoring marine pollution** (lower costs, possible harmonization, easy protocols) , especially on beaches, when compared with other approaches (e.g. analysis of contaminants)
MONITORING	**Support evaluation/adjustments of baselines/targets** on the basis of the first monitoring results
MONITORING	Improve knowledge on experimental indicator EI 18, **Support capacity building and monitoring experiment on sea turtles at a pilot scale**
QUALITY ASSURANCE	As the Mediterranean Action Plan on ML is based on measures and monitoring **efforts should be shouldered by quality control/quality assurance** (training, inter-comparisons, use of reference material for microplastics, etc.) to assist survey teams.
DATA MANAGEMENT	**Data base is to be organised** for the collection of data
CORMON	Support a **specific expert group** for long term developments of activities dedicated to Marine Litter, trends analysis and analysis of data from countries (art 11 of the MLRP)
CORMON	Consider **capacity building** in long term, in support of the MLRP (training, intercalibrations, etc.)

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ANNEX I
Acronyms

CP(s)	Contracting Party (Parties).
EcoQO	Ecological Quality Objectives.
GES	Good Environmental Status.
IUU fishing	Illegal, unreported and unregulated fishing activities.
MEDPOL	Program for the Assessment and Control of Pollution in the Mediterranean Region
MSFD	Marine Strategy Framework Directive.
RAP(s)	Regional Actions Plan(s).
RSC(s)	Regional Sea Convention(s).
TSG ML	Technical Subgroup on Marine Litter.
UNEP/MAP	UNEP Mediterranean Action Plan.

ANNEX II
MEDPOL Form for 100 m beach monitoring and comments for its amendment

Mediterranean Action Plan

MARINE LITTER BEACH MONITORING PROGRAM
100 metres stretch survey form

ID	PLASTIC/POLYSTYRENE	Nº units
G1	4/6-pack yokes, six-pack rings	
G3	Shopping bags incl. pieces	
G4	Small plastic bags, e.g. freezer bags incl. pieces	
G5	Plastic bag collective role; what remains from rip-off plastic bags	
G7/G8	Drink bottles	
G9	Cleaner bottles & containers	
G10	Food containers incl. fast food containers	
G11	Beach use related cosmetic bottles and containers, e.g. Sunblocks	
G14	Engine oil bottles & containers <50 cm	
G15	Engine oil bottles & containers >50 cm	
G16	Jerry cans (square plastic containers with handle)	
G17	Injection gun containers (including nozzles)	
G13	Other bottles & containers	
G18	Crates and containers / baskets	
G19	Car parts	
G21/24	Plastic caps and lids (including rings from bottle caps/lids)	
G26	Cigarette lighters	
G28	Pens and pen lids	
G29	Combs/hair brushes/sunglasses	
G30/31	Crisps packets/sweets wrappers/ Lolly sticks	
G32	Toys and party poppers	

ID	PLASTIC/POLYSTYRENE	Nº units
G33	Cups and cup lids	
G34/35	Cutlery and trays/Straws and stirrers	
G36	Fertiliser/animal feed bags	
G37	Mesh vegetable bags	
G40	Gloves (washing up)	
G41	Gloves (industrial/professional rubber gloves)	
G42	Crab/lobster pots and tops	
G43	Tags (fishing and industry)	
G44	Octopus pots	
G45	Mussels nets, Oyster nets including plastic stoppers	
G46	Oyster trays (round from oyster cultures)	
G47	Plastic sheeting from mussel culture (Tahitians)	
G49	Rope (diameter more than 1cm)	
G50	String and cord (diameter less than 1 cm)	
G53	Nets and pieces of net < 50 cm	
G54	Nets and pieces of net > 50 cm	
G56	Tangled nets/cord	
G57/58	Fish boxes - plastic or polystyrene	
G59	Fishing line/monofilament (angling)	
G60	Light sticks (tubes with fluid) incl. Packaging	
G62/63	Floats for fishing nets/ Buoys	
G65	Buckets	
G66	Strapping bands	
G67	Sheets, industrial packaging, plastic sheeting	
G68	Fibre glass/fragments	
G69	Hard hats/Helmets	
G70	Shotgun cartridges	
G71	Shoes/sandals	

ID	PLASTIC/POLYSTYRENE	Nº units
G73	Foam sponge	
G75	Plastic/polystyrene pieces 0 - 2.5 cm	
G76	Plastic/polystyrene pieces 2.5 cm - 50 cm	
G77	Plastic/polystyrene pieces > 50 cm	
G91	Biomass holder from sewage treatment plants	
G124	Other plastic/polystyrene items (identifiable) including fragments	
Please specify the items included in G124		
ID	**RUBBER**	**Nº units**
G125	Balloons and balloon sticks	
G127	Rubber boots	
G128	Tyres and belts	
G134	Other rubber pieces	
Please specify the items included in G134		
ID	**CLOTH**	Nº units
G137	Clothing / rags (clothing, hats, towels)	
G138	Shoes and sandals (e.g. Leather, cloth)	
G141	Carpet & Furnishing	
G140	Sacking (hessian)	
G145	Other textiles (incl. rags)	
Please specify the items included in G145		
ID	**PAPER / CARDBOARD**	Nº units
G147	Paper bags	
G148	Cardboard (boxes & fragments)	
G150	Cartons/Tetrapack Milk	
G151	Cartons/Tetrapack (others)	

G152	Cigarette packets	
ID	**PAPER / CARDBOARD**	Nº units
G27	Cigarette butts and filters	
G153	Cups, food trays, food wrappers, drink containers	
G154	Newspapers & magazines	
G158	Other paper items, including fragments	
Please specify the items included in G158		
ID	**PROCESSED / WORKED WOOD**	Nº units
G159	Corks	
G160/161	Pallets / Processed timber	
G162	Crates	
G163	Crab/lobster pots	
G164	Fish boxes	
G165	Ice-cream sticks, chip forks, chopsticks, toothpicks	
G166	Paint brushes	
G171	Other wood < 50 cm	
Please specify the items included in G171		
G172	Other wood > 50 cm	
Please specify the items included in G172		
ID	**METAL**	Nº units
G174	Aerosol/Spray cans industry	
G175	Cans (beverage)	
G176	Cans (food)	
G177	Foil wrappers, aluminium foil	
G178	Bottle caps, lids & pull tabs	
G179	Disposable BBQ's	

G180	Appliances (refrigerators, washers, etc.)	
ID	**METAL**	Nº units
G182	Fishing related (weights, sinkers, lures, hooks)	
G184	Lobster/crab pots	
G186	Industrial scrap	
G187	Drums, e.g. oil	
G190	Paint tins	
G191	Wire, wire mesh, barbed wire	
G198	Other metal pieces < 50 cm	
Please specify the items included in G198		
G199	Other metal pieces > 50 cm	
Please specify the items included in G199		
ID	**GLASS**	Nº units
G200	Bottles incl. pieces	
G202	Light bulbs	
G208	Glass fragments >2.5cm	
G210a	Other glass items	
Please specify the items included in G210a		
ID	**CERAMICS**	Nº units
G204	Construction material (brick, cement, pipes)	
G207	Octopus pots	
G208	Ceramic fragments >2.5cm	
G210b	Other ceramics items	
Please specify the items included in G210b		

ID	SANITARY WASTE	Nº units
G95	Cotton bud sticks	
G96	Sanitary towels/panty liners/backing strips	
G97	Toilet fresheners	
G98	Diapers/nappies	
G133	Condoms (incl. packaging)	
G144	Tampons and tampon applicators	
--	Other sanitary waste	
Please specify the other sanitary items		
ID	**MEDICAL WASTE**	**Nº units**
G99	Syringes/needles	
G100	Medical/Pharmaceuticals containers/tubes	
G211	Other medical items (swabs, bandaging, adhesive plaster etc.)	
Please specify the items included in G211		
ID	**FAECES**	**Nº units**
G101	Dog faeces bag	
ID	**PARAFFIN/WAX PIECES**	**Nº units**
G213	Paraffin/Wax	
Presence of industrial pellets?		YES ☐ NO ☐
Presence of oil tars?		YES ☐ NO ☐
ADDITIONAL COMMENTS		