



Methodology for monitoring marine litter

on beaches & in beach sediments

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KEY LEGISLATIVE FRAMEWORKS RELATED TO MARINE LITTER MONITORING

KEY LEGISLATIVE FRAMEWORKS

EU

Marine Strategy Framework Directive Plastics Strategy Single-Use Plastics Directive Barcelona Convention Ecosystem Approach Regional Plan for Marine Litter Management in the Mediterranean



TECHNICAL GROUP ON MARINE LITTER





A MAJOR RECENT POLICY ADVANCE...



THE JOINT LIST OF LITTER CATEGORIES

European Commission JRC TECHNICAL REPORTS A Joint List of Litter Categories for Marine Macrolitter Monitoring Manual for the application of the classification system Fleet, D., Vlachogianni, T., Hanke, G. MSFD Technical Group on Marine Litter 2021 EUR 30348 EN

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WHAT IS MONITORING

Monitoring is a **long term**, **standardized** measurement, observation, evaluation and reporting of the environment in order **to define status** and **trends**.

Marine litter monitoring aims to provide information on the **types**, **quantities**, **distribution** and **impacts** of marine debris; to **identify the sources** of marine debris; and to **assess the effectiveness of management measures** to address the issue.



MARINE LITTER MONITORING ON BEACHES | KEY ELEMENTS





SITE SELECTION



Photos: Thomais Vlachogianni

Site location	Site features		
 ✓ In the vicinity of ports or harbors; ✓ In the vicinity of river mouths; ✓ In the vicinity of coastal urban areas; ✓ In the vicinity of tourists destinations; 	 ✓ Having a minimum length of 100 m; ✓ Low to moderate slope; ✓ Clear access to sea; ✓ Accessible to survey teams throughout the year; ✓ Ideally the site should not be subject to cleaning activities; ✓ Survey activities passing no threat to 		
 ✓ In relatively remote areas. 	endangered or protected species.		



FREQUENCY AND TIMING OF SURVEYS







Photo: Thomais Vlachogianni

A **sampling unit** is defined as a fixed section of a beach covering the whole area from the strandline to the back of the beach. Within this methodology one sampling unit is used: **100-metres stretch from the strandline to the back of the beach**.

 The back of the beach needs to be explicitly identified using coastal features such as the presence of vegetation, dunes, cliff base, road, fence or other anthropogenic structures such as seawalls



 Two (2) sections of a 100-metre stretch on the same beach should be monitored, separated at least by a distance of 50m.

THE SAMPLING UNIT | HOW TO SELECT ITS LOCATION?





Photo: Thomais Vlachogianni

HEAVILY LITTERED BEACHES | WHAT TO DO?



SIZE LIMITS SURVEYED



Source: S. Lippiatt, S. Opfer, C Arthur. Marine Debris Monitoring and Assessment. NOAA Technical Memorandum NOS-OR&R-46, (2013).

- ✓ There are no upper size limits to litter recorded on beaches.
- Litter items with a lower limit of 2.5 cm in the longest dimension are monitored, ensuring the inclusion of caps & lids and cigarette butts.



Coordinated
 Harmonized
 Harmonized
 Comparable
 Reliable

EMA



Interpreting small pieces of litter in a harmonized way

- ✓ Pieces of litter that are recognizable e.g. as a shopping bag (G3) should be registered as such.
- ✓ Pieces of materials that are not recognizable as an item e.g. plastic and/or polystyrene pieces should be counted according to their size (G75-G83).

ADITIONAL CONSIDERATIONS

The amount and type of litter found on the beaches can be influenced by different circumstances. To ensure that data will be analyzed and interpreted properly these circumstances must be recorded. Indicative examples of such circumstances include: events that may lead to unusual types and/or amounts of litter (e.g. shipping container losses, overflows in sewage treatment systems, etc.); difficult weather conditions (e.g. heavy winds or rain, etc.); replenishment of the beach; etc.

- All litter items should be removed from the beach during the survey.
- Larger items that cannot be removed (safely) by the surveyors should be marked, with for example paint spray (which meets environmental friendly standards) so that they will not be counted again at the next survey.
- The litter collected should be disposed of properly. Regional or national regulations and arrangements should be followed. If these do not exist local municipalities should be informed.

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DATA COLLECTION AND DATA PROCESSING



Photo: Thomais Vlachogianni

THE JOINT LIST HIERARCHICAL STRUCTURE

Level 5



THE USE CATEGORIES

Type-code	Name		The second	
ag_	agriculture related			
aq_	aquaculture related			
cl_	clothing			- Andrews
co_	building & construction related	E.		
fc_	food consumption related			
fi_	fisheries related	al and the		
hy_	personal hygiene and care related	d is a set of the set		
md_	medical related			
nn_	undefined use			
re_	recreation related	Harmonized	Comparable	Reliable
sm_	smoking related	data	data	data
vk_	vehicle related			
hu_	hunting related			



English 😡

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Online Photo Catalogue of the Joint List of Litter Categories

Example images to support the monitoring of macro litter in different environmental matrices

This online photo catalogue provides guidance for the attribution of macro litter to specific categories in order to enable a harmonized monitoring data acquisition, which allows detailed data analysis. It is based on the Joint List of Litter Categories. A Joint List of Litter Categories for Marine Macrolitter Monitoring

Cho	oose a litter ty	Please choo	ose a litter category	~			
Show 10 entries					Search:	Search:	
JC No.	J_Code (Type_Code	\$UP/Fishing \$	Name \$	Definition	image i	
1	J1	pl_fc_sxp_	SUP	Plastic 4/8-pack yokes & six-pack rings	Four or six-pack rings or yokes ar set of connected plastic rings that used in multi-packs of drinks, particularly of drinks cans, to hold cans together.	e a are the	
3	J3	pl_nn_bag_cabg_	SUP	Plastic shopping/carrier/grocery bags	Shopping bags are medium-sized bags, typically around 10-20 litres volume (though much larger versi exist, especially for non-grocery shopping), that are used by shopp to carry home their purchases. Shopping bags can be made with unsists of clastics	in ons pers	



https://mcc.jrc.ec europa.eu/main/ photecatalogue.p y?N=41&0=457& cat=all Items that easily break or get entangled and are weathered must be sorted and classified on-site to avoid errors.

To record the items one-by-one, a quick method is to use slashes signs on the litter items recording sheet: in the example, it will be easy to count the items by 5, at the end of the survey).

•To speed up the survey, the items can be first grouped in categories according to the Joint List and then to be counted together.

•Arranging the litter types on the field list according to the most frequent items found can facilitate the recording of the litter items found.

•To ensure that the sampling unit's entire area is sampled and no parts are left out, small flags moved along the beach during the survey can be used to mark subsections.

•Field forms should be entered into a database or digital storage medium (e.g. a spreadsheet) within 3 days after the field surveys. This will ensure a good recollection of the litter observations and field conditions.

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- Collect a minimum of 3 samples along three transects vertical to the high tide line. Make sure the area between the two high tide lines is surveyed. Mark the sampling unit (30 x 30 cm or 50 x 50 cm or 1x1 m) using the measuring tape or a quadrat and record the GPS coordinates of each unit. Collect the top 3-5 cm of sediment using a metal shovel or similar. <u>Note the</u> volume of the sample.
- In case only the large microplastics (1-5 mm) will be separated, sieving of sediment samples *in situ* through two metallic sieves with 1mm and 5mm mesh size is an effective method of reducing the sample volume. During sieving, remove large or non-plastic items, e.g. shells, leaves, twigs, etc. If the beach sediments are wet and difficult to pass through the 1mm sieve, store the samples in glass jars or zip-lock bags and take them to the laboratory. Dry the sediment samples in the oven and complete the sieving.

• Litter size limits to be surveyed

• Since particles larger than 2.5 cm are collected in the macro-litter surveys, it is interesting to count also the meso-litter particles that are larger than 5mm and smaller than 2.5cm. Take the opportunity to count the meso-plastics in the material retained on the 5mm sieve.

The size of particles may differ between studies; however, the widely accepted size categories are the following: 5mm-2.5cm (mesoplastics), 1mm-5mm (large microplastics), 1µm-1mm (small microplastics), and <1µm (nanoplastics) (GESAMP, 2019). Concerning the separation of microplastics from sediment, which is the most important step of the analysis, sieving is implemented for large microplastics (1-5mm) while floatation is used for small microplastics (<1mm) due to density

 In the framework of Plastic Busters MPAs project, it was decided to separate only the large microplastics (1-5mm) as the floatation of the small microplastics is a rather demanding procedure, which should be carried out in the laboratory under specific conditions to avoid air-born contamination. All steps must be conducted using 100% cotton lab coats and precautions are to be taken to avoid cross-contamination (e.g. airborne fibres).

The visual characterization of the type of microplastics is made on the basis of the following categories: (1) pellet, (2) fragment (granule, flake), (3) fibre, (4) film, (5) rope and filaments, (6) microbeads, (7) Styrofoam (expanded polystyrene-PS), (8) rubber.

- The most common **colours** identified are the following: (1) black, (2) blue, (3) white, (4) transparent, (5) red, (6) green, (7) multicolour, (8) other.
- For the identification of the **polymer type** it is recommended to use ATR-FTIR spectrometer or Raman spectroscopy.



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THANK YOU FOR YOUR ATTENTION!

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