EMODnet Thematic Lot n°4 - Chemistry

EASME/EMFF/2018/1.3.1.8

Guidelines and formats for gathering and management of micro-litter data sets on a European scale (floating and sediment micro-litter). Version 0.2

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Guidelines and formats for gathering and management of micro-litter data sets on a European scale (floating and sediment micro-litter)

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History

Authors	Date	Comments	Version
M.E. Molina Jack, M. Vinci, F. Galgani, A. Giorgetti, G. Moncoiffe, M. Fichaut, R. Schlitzer, G. Hanke, D. Schaap, E. Partescano, M. Le Moigne	26/04/2021	Creation	0
M.E Molina Jack, M. Fichaut	29/06/2021	Correction of typos	0.1
M.E Molina Jack, E. Partescano, M. Vinci, A. Giorgetti	08/07/2021	Addition EDMED codes; information regarding vocabularies and parameters	0.2

When available, previous versions of the guidelines can be found in Ocean Best Practices repository at: https://search.oceanbestpractices.org/search?q=EMODnet,%2BChemistry,%2Bmicro-litter&fields=all

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1. Introduction

Since its third phase (dated 2016), EMODnet Chemistry's scope has been expanded with gathering data and developing access to data and data products for marine litter, including macro-objects as well as microparticles.

The descriptor 10 of the MSFD (European Commission 2017, 2008; Galgani et al, 2013) considers micro-litter as one of the elements in Criteria D10C2 "The composition, amount and spatial distribution of micro-litter on the coastline, in the surface layer of the water column, and in the seabed sediment, are at levels that do not cause harm to the coastal and marine environment". In the same line, RSCs have included micro-litter as a criterion of marine environmental status.

The principle of EMODnet Chemistry to face new litter topics is to analyze in detail the best practices already developed by consolidated communities, and then propose a format able to handle all the available information with a focus on the European and global perspective. For micro-litter, there are not yet coordinated efforts at regional or European scale. Considering this situation EMODNet Chemistry proposes to adopt the data gathering and data management approach as generally applied for marine data, i.e., populating metadata and data in the CDI Data Discovery and Access service using dedicated SeaDataNet data transport formats.

This document gives background information about micro-litter and in particular it provides description and examples of metadata and data formats for gathering and managing data sets of micro-litter collected on the sea surface and on the sediments on a European scale. It updates and extends the previous Proposal for gathering and managing data sets on marine micro-litter on a European scale (Galgani et al., 2019) only related to floating particles.

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2. Marine micro-litter

In order to establish micro-litter concentration baselines, properties and potential impacts on the environment, data and information on the amount, distribution and composition of micro particles in the marine environment are needed. Micro plastic is likely to be the most significant part of this. Micro particles of a range of common material types including glass, metal, plastic and paper litter are undoubtedly present in the environment but relative proportions of material types will be influenced by the physical conditions of the habitat sampled. For example, metal and glass micro-litter is not likely to be found at the sea surface.

When first described the term micro plastic was used to refer to truly microscopic particles in the region of 20 μm (micrometres 1 μm = 1 × 10−6 m) diameter (Thompson et al. 2004). Afterwards, the definition has been broadened to include all particles < 5 mm (Arthur et al. 2009). (Guidance on Monitoring of Marine Litter in European Seas, Galgani et al, 2013).

The MSFD Technical Sub-group on Marine Litter provided a summary table to describe the elements used to manage the micro-litter information, in the Guidance on Monitoring of Marine Litter in European Seas (2013).

Size	Record size of each item. Minimum resolution is to allocate in to bin sizes of 100 μm
Type	Plastic fragments, pellets, filaments, plastic films, foamed plastic, granules, and styrofoam
Shape	For pellets: cylindrical, disks, flat, ovoid, spheruloids; For fragments: rounded, subrounded, subangular, angular; For general- irregular, elongated, degraded, rough, and broken edges
Colour	Transparent, crystalline, white, clear-white-cream, red, orange, blue, opaque, black, grey, brown, green, pink, tan, yellow

CATEGORIES FOR MICROPARTICLES	
Material	**Description**
Plastic	Plastic fragments rounded
	Plastic fragments subrounded
	Plastic fragments subangular
	Plastic fragments angular
	cylindrical pellets
	disks pellets
	flat pellets
	ovoid pellets
	spheruloids pellets
	filaments
	plastic films
	foamed plastic
	granules
	styrofoam
Other	Other (glass, metal, tar)

Figure 1: Categories to describe microplastics appearance (extracted from Guidance on Monitoring of Marine Litter in European Seas, MSFD Technical Subgroup on Marine Litter, 2013)

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3. Floating micro-litter

EMODnet Chemistry data management proposal for floating micro-litter

Based upon a series of examples provided by IFREMER, CEFAS and the Italian Regional Environmental Agency, an exercise of analysis and potential mapping of micro-litter information to SeaDataNet CDI (Common Data Index) metadata format and to SeaDataNet ODV (Ocean Data View) data format was done during the previous EMODnet Chemistry phase (2016-2019). The MSFD Technical Subgroup on Marine Litter (TSG ML) reviewed the proposal and provided feedback for refinement that was followed to update the present document.

As a result of the initial analysis, EMODnet Chemistry concluded that it is possible to handle the floating micro-litter observation data sets with the SeaDataNet CDI/ODV formats. This implies that EMODnet Chemistry and additional SeaDataNet data providers are requested to gather and populate their already available micro-litter data in the CDI Data Discovery and Access service, this way building a European collection of metadata and data sets.

The SeaDataNet CDI metadata format provides an ISO19115 – ISO19139 based index (metadatabase) to individual data sets (such as samples, timeseries, profiles, trajectories, etc), using the SeaDataNet (NERC Vocabulary Server) Common Vocabularies and the EDMO (European Directory of Marine Organisations) and EDMED (European Directory of Marine Environmental Datasets) directories. The SeaDataNet CDI format is INSPIRE compliant.

In order to clearly identify the group of floating micro-litter datasets to be used for **MSFD assessment purposes**, a specific **EDMED** code has been created:

MSFD Microlitter Monitoring in water bodies: **https://edmed.seadatanet.org/report/7123/**.

Data centers must include, in the field EDMED reference of the CDI, the information regarding this EDMED when they prepare datasets that will be considered for MSFD evaluation purposes.

The SeaDataNet ODV format is an ASCII format to handle profile, time series and trajectory data. The file is built with the following elements:

- Metadata columns
- Primary variable data columns (one column for the value plus one for the qualifying flag)
- Data columns — two columns per variable (value and flag)

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The SeaDataNet ODV data format can be used directly in the Ocean Data View (ODV), fundamental data analysis and visualisation software.

In addition, a variant named "bio-ODV" has been specifically built by SeaDataNet to manage biological data (taxonomies) which have thee parameter values as rows instead of columns. For floating micro-litter data, this format structure has been considered more suitable, and thus must be used to manage the floating micro-litter information.

Therefore, a "Floating micro-litter ODV format" (L24 vocabulary term="MODV") was developed. It slightly differs from the common bio-ODV one, since it includes additional mandatory fields, in addition to the ODV default ones. The "Floating micro-litter ODV format" file for micro-litter datasets contains the following features:

- A set of ODV mandatory (ODV default) fields like: cruise, station, type, position...(green fields)
- A set of ODV additional fields to describe marine micro-litter:
    - mandatory in ODV micro-litter: fields will be always present in ODV file and always filled (orange fields)
    - additional/optional: fields might be empty or not present (light orange fields)

List of fields for the proposed micro-litter ODV format:

Label/column header	Conceptid	Use	Comments
Cruise		mandatory (ODV Default)	
Station		mandatory (ODV Default)	
Type		mandatory (ODV Default)	The suggestion is to use type "B". From manual: 'B' for bottle profile data. For time series and trajectories set to 'B' for small (<250) row groups
YYYY-MM-DDThh:mm:ss.sss		mandatory (ODV Default)	Start date/time. Format must be adapted to the date value (for example YYYY-MM-DDThh:mm is second are not available)
Longitude [degrees_east]		mandatory (ODV Default)	start point coordinates.
Latitude [degrees_north]		mandatory (ODV Default)	start point coordinates.

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LOCAL_CDI_ID		mandatory (ODV Default)	
EDMO_code		mandatory (ODV Default)	EDMO_CODE of the data centre distributing the data (the one connected to the CDI service)
Bot. Depth [m]		mandatory (ODV Default)	Field empty if no data
MinimumObservationDepth [m]	MINWDIST	mandatory in ODV micro-litter	
MaximumObservationDepth [m]	MAXWDIST	mandatory in ODV micro-litter	
SampleID:INDEXED_TEXT	SAMPID01	mandatory in ODV micro-litter	
SamplingEffort [Km or L]	LENTRACK/VOLWBSMP	mandatory in ODV micro-litter	The amount of effort expended during an Event. It can be the survey distance from the beginning point in kilometres or a filtered volume in litres
Net_opening [cm]	MTHWDTH1	mandatory in ODV micro-litter	Net opening of the instruments used. This information is needed for the calculation of the covered surface in cm.(e.g. diameter of the Ocean Pack RACE filtering "cakes" or bongo/manta net opening)
Mesh_size [micrometres]	MSHSIZE1	mandatory in ODV micro-litter	Mesh size of the filtering surface (e.g. manta or bongo net, filtering "cakes" of OceanPack RACE,...) in µm
Microlitter_Type:INDEXED_TEXT	MLITTYPW	mandatory in ODV micro-litter	Type of the item (H01 SDN vocabulary)
Microlitter_Size:INDEXED_TEXT	MLITSIZW	mandatory in ODV micro-litter	Size classes (H03 SDN vocabulary)
Microlitter_Count [Dimensionless]	MLITCNTW	mandatory in ODV micro-litter	Number of items collected. It's the official mandate from MSFD to provide the count of collected microplastics
EventEndDateTime [YYYY-MM-DDThh:mm:ss.sss]	ENDX8601	additional/optional	End date/time
EventEndLongitude [degrees_east]	ENDXXLON	additional/optional	End point coordinates. Either End Lat/Lon or SamplingEffort are mandatory.

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EventEndLatitude [degrees_north]	ENDXXLAT	additional/optional	End point coordinates. Either End Lat/Lon or distance are mandatory.
Microlitter_Weight [g]	MLDWWD01	additional/optional	Weight of the collected items, not mandatory Information in grams
Microlitter_Shape:INDEXED_TEXT	MLITSHPW	additional/optional	Shape of the item (H02 SDN vocabulary)
Microlitter_Color:INDEXED_TEXT	MLITCOLW	additional/optional	Colour classes (H04 SDN vocabulary)
Microlitter_Transparency:INDEXED_TEXT	MLITROPW	additional/optional	Transparency classes (H06 SDN vocabulary)
Microlitter_Polymer_type:INDEXED_TEXT	MLITPOLW	additional/optional	Polymer type of the micro-litter (H05 SDN vocabulary)
WMO_Sea_State [Dimensionless]	WMOCSSXX	additional/optional	Sea conditions following the Douglas scale
Wind_direction [degT]	EWDAZZ01	additional/optional	Direction relative to true north from which the wind is blowing
Wind_speed [m/s]	EWSBZZ01	additional/optional	Sustained speed of the wind (distance moved per unit time by a parcel of air) parallel to the ground at a given place and time.
Sampling_protocol	SAMPPROT	additional/optional	The name of, reference to, or description of the method or protocol used to produce the sample

The file format is quite flexible and other parameters (e.g. P01 BODC Parameter Usage Vocabulary) can be added to include more information in the reporting, if available. If the additional information is not properly coded with the existing vocabulary terms or cannot fit in the format structure, a request can be sent to info@emodnet-chemistry.eu to be considered.

The description of the specific terms that have been implemented in the SDN vocabularies for micro-litter is available on the dedicated section of this guidelines.

A complete updated example that illustrates how floating micro-litter observations can be described with the CDI metadata format and the "Floating micro-litter ODV format" sample file can be found at: https://doi.org/10.6092/18ba5288-cea8-4af2-867f-9f4813265af2.

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4. Micro-litter in sediment

Monitoring programs have started to implement the protocols to collect data of micro-litter in sediments, both on the coastline and in seabed. However, the techniques to sample micro-litter in sediments are still heterogeneous and not widespread (GESAMP, 2019; ICES WGML REPORT 2018). The most common approach is to extract plastic particles from sediment using a density separation based on the difference in density between plastic and sediment particles, but the techniques to achieve it can differ.

As already stated by GESAMP (GESAMP, 2019 and 2016), the main problem related to the different protocols is that the abundances are reported in different units (volume, surface, dry weight, wet weight) which are often not comparable, or the conversion is at least not straightforward.

In addition, the characteristics of micro-litter (type, shape, condition and colour) may indicate the source, thus the collections of these information are very relevant (GESAMP 2016). However, the analysis of the different protocols shows that the characterization of micro-litter between protocols is different.

Similarly to the floating matrix, EMODnet Chemistry proposes to adopt, also for micr-litter in sediments, the data gathering and data management approach as generally applied for marine data, i.e. populating metadata and data in the CDI Data Discovery and Access service using a dedicated SeaDataNet data transport format. The proposal is detailed in the following section.

EMODnet Chemistry data management proposal for micro-litter in sediment

For micro-litter in sediment data, metadata can be described with SeaDataNet CDI metadata format (using L24 vocabulary term="SODV" to indicate "Sediment micro-litter ODV format").

In order to clearly identify the group of micro-litter in sediment datasets that might be used for **MSFD assessment purposes**, a specific **EDMED** code has been created:

MSFD Microlitter Monitoring in sediment: **https://edmed.seadatanet.org/report/7121/**

Data centers must include this EDMED code in the dedicated CDI field when they prepare datasets that will be considered for MSFD evaluation purposes.

A comparison between the SeaDataNet "Floating micro-litter ODV format" adopted for floating micro-litter and the regular ODV format adopted for chemical measurements in sediment revealed that the regular SeaDataNet ODV format is suitable to manage micro-

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litter in sediment (using SDN standard vocabularies for micro-litter) thanks to the following considerations:

- All the mandatory ODV default fields can be easily filled
- The samples of micro-litter in sediment can be compared to the samples of contaminants in sediment when the primary variable is depth below seabed (P01:COREDIST)
- The data of micro-litter in sediment is punctual data (not a trajectory), therefore it is not comparable to floating micro-litter. There are a number of mandatory fields in the specific "Floating micro-litter ODV format" (net opening, mesh size,…) that are specific for floating micro-litter surveys and it is not possible to fill them in the case of sediment data
- Not all the additional/optional litter ODV fields can be filled

The conclusion is that the extension of the regular ODV format coded with L24 vocabulary term="SODV" is suitable to manage micro-litter in sediments using the standard vocabularies for micro-litter.

List of fields for the proposed ODV file for the micro-litter in sediment:

Label/column header	Conceptid	Use	Comments
Cruise		**metadata/mandatory (ODV Default)**	
Station		**metadata/mandatory (ODV Default)**	
Type		**metadata/mandatory (ODV Default)**	The suggestion is to use type "B". From manual: 'B' for bottle profile data. For time series and trajectories set to 'B' for small (<250) row groups
YYYY-MM-DDThh:mm:ss.sss		**metadata/mandatory (ODV Default)**	Start date/time. Format must be adapted to the date value (for example YYYY-MM-DDThh:mm is second are not available)
Longitude [degrees_east]		**metadata/mandatory (ODV Default)**	point coordinates.
Latitude [degrees_north]		**metadata/mandatory (ODV Default)**	point coordinates.

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LOCAL_CDI_ID		**metadata/mandatory (ODV Default)**	
EDMO_code		**metadata/mandatory (ODV Default)**	EDMO_CODE of the data centre distributing the data (the one connected to the CDI service)
Bot. Depth [m]		**metadata/mandatory (ODV Default)**	Field empty if no data
Depth below surface of the bed [m]	COREDIST	**primary variable/mandatory (ODV default)**	The depth of the sampling point below the seafloor
Minimum depth below surface of the bed	MINCDIST	**strongly recommended**	The distance between the top of a core sample and the seabed.
Maximum depth below surface of the bed	MAXCDIST	**strongly recommended**	The distance between the base of a core sample and the seabed. For an unsegmented core with its top coincident with the bed this is equivalent to the core length.
SampleID:INDEXED _TEXT	SAMPID01	**Strongly recommended when available**	Sample identification.
SamplingEffort [m² or kg...]	AREABEDS/ NEWCXX02/ PEWCXX02/ VOLSEDSM	**mandatory**	The amount of sampled sediment. It can be the survey area in m2, the wet weight (ww) of the sample in kg, the dry weight (dw) of sediment in kg or the volume in litres
Proportion_sand_size_particles [%]	SANDZZZZ	additional/optional	The proportion of sand-size particles in the sample
Proportion_clay_size_particles [%]	CLAYZZZZ	additional/optional	The proportion of clay-size particles in the sample
Proportion_organic_mater [%]	STTMLIBS	additional/optional	Concentration of total organic matter in the sample
Proportion_sylt_size_particles [%]	SYLTZZZZ	additional/optional	The proportion of sylt-size particles in the sample
Water_sample_content [%]	WCWTDRXX	additional/optional	Water content in the sample. Allows comparability between dw/ww samples

![EMODnet logo]

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Microlitter_Type:INDEXED_TEXT	MLITTYPS	**mandatory**	Type of micro-litter (H01)
Microlitter_Count [Dimensionless]	MLITCNTS	**mandatory**	Number of items collected. It's the official mandate from MSFD to provide the count of collected microplastics
Microlitter_Weight [g]	MLDWSD01	additional/optional	Weight of the collected items, not mandatory Information in grams
Microlitter_Size:INDEXED_TEXT	MLITSIZS	**mandatory**	Size classes (H03 SDN vocabulary)
Microlitter_Shape:INDEXED_TEXT	MLITSHPS	additional/optional	Shape of the item (H02 SDN vocabulary)
Microlitter_Color:INDEXED_TEXT	MLITCOLS	additional/optional	Colour classes (H04 SDN vocabulary)
Microlitter_Transparency:INDEXED_TEXT	MLITROPS	additional/optional	Transparency classes (H06 SDN vocabulary)
Microlitter_Polymer_type:INDEXED_TEXT	MLITPOLS	additional/optional	Polymer type of the micro-litter (H05 SDN vocabulary)

The "depth" variable represents a depth INSIDE the seabed and should be indicated as "COREDIST" which is the distance of a sensor or sampling point below the floor of a water body (Fig. 16). The preferred unit for COREDIST is "m (= meters)".

– COREDIST = 0 in case of surface sediment data

– COREDIST ≠ 0 when samples are taken below the seafloor (ex. Depth of sample A, B,…, Fig. 2 in core cut into sections and depth of the sample in the unsegmented core, Fig.)

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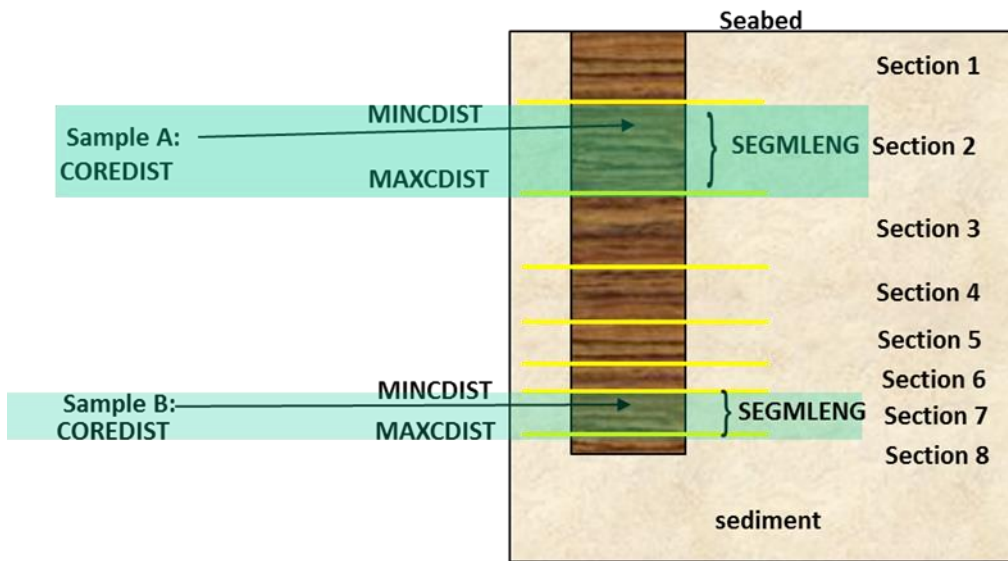
Figure 2. Example of core cut into sections
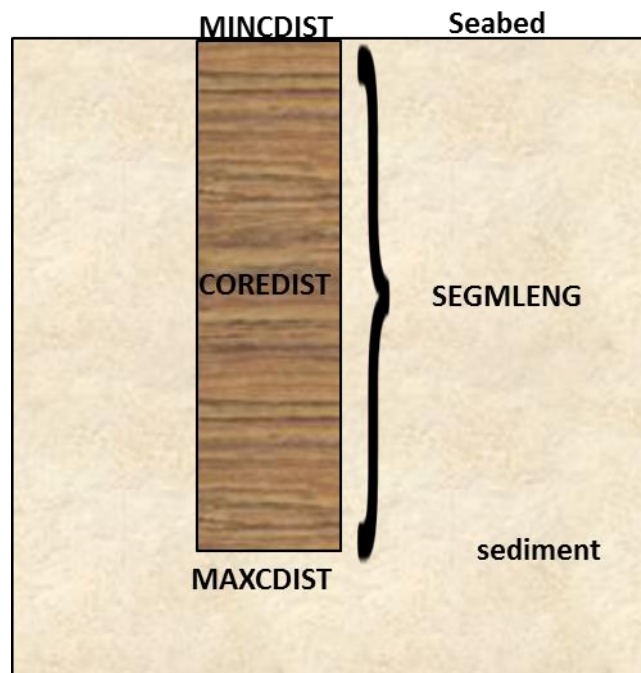
Figure 3. Example of unsegmented core

As a general rule:

COREDIST = MINCDIST + (MAXCDIST-MINCDIST)/2

and SEGMLENG = MAXCDIST – MINCDIST

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The following table contains the several terms used to describe the depth of the sediment samples:

Entryterm	ConceptID	Definition	
Depth below surface of the bed	COREDIST	The distance of a sensor or sampling point below the floor of a water body	Mandatory
Minimum depth below surface of the bed	MINCDIST	The distance between the top of a core sample and the seabed.	Strongly recommended
Maximum depth below surface of the bed	MAXCDIST	The distance between the base of a core sample and the seabed. For an unsegmented core with its top coincident with the bed this is equivalent to the core length.	Strongly recommended
Sample length	SEGMLENG	The physical length of a sample upon which measurements have been made	Optional

Table 1: List of P01 terms and definitions for "depth" parameters.

The information of depth of the seafloor should be added in the metadata "Bot.Depth" (9th column in SDN ODV format, see Tab. 2).

Table 2: Template for SDN ODV dataset of sediment profile for micro-litter.

In addition, the specific information about sediment sampling is necessary:

1. The instrument information would be needed and provided by the L22 SeaVoX Device Catalogue
2. Sampled sediment characteristics might be provided when recorded through the corresponding P01s (% sand, % silt, % clay, %organic matter).

The following table contains a non-exhaustive list of terms used to describe the sample:

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Preferred label	ConceptID	Definition	
Proportion of particles (sand size-fraction) in sediment	SANDZZZZ	Proportion of particles in a sediment sample that are in the Wentworth sand size fraction (size between 63um and 2mm)	Optional
Proportion of particles (clay size-fraction) in sediment	CLAYZZZZ	Proportion of particles in a sediment sample that are in the Wentworth clay size fraction (size less than 4um)	Optional
Proportion of particles (silt size-fraction) in sediment	SYLTZZZZ	Proportion of particles in a sediment sample that are in the Wentworth silt size fraction (size between 4 and 63um)	Optional
Concentration of total organic matter plus carbonates per unit dry weight of sediment by gravimetric determination of loss on ignition	STTMLIBS	The percentage by weight of the sample lost at very high (>900C) temperatures for durations guaranteed to decompose inorganic carbonates.	Optional

3. The base of the measurement (weight, volume, area) or sampling effort shall be provided using the appropriate P01s (from P02=SAMP -sampling parameters-). The following table provides a list of suitable terms:

Preferred label	ConceptID	Definition	
Area sampled of the bed	AREABEDS	The area of the seabed or shore observed or sampled, such as the area of a box core	It is mandatory to provide at least one
Wet weight of sample	NEWCXX02	The weight of the sample as collected	It is mandatory to provide at least one
Dry weight of sample	PEWCXX02	The weight of a sample after all water has been removed.	It is mandatory to provide at least one

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Volume sampled of sediment	VOLSEDSM	The volume of sediment used for an analysis or an observation	It is mandatory to provide at least one

In order to allow comparability:
- – the % of water is necessary for the reporting in wet/dry weight of sediment
- – in case of sampled volume, dry weight of the sampled volume should be provided
- – in case of sampled area, the sampled volume and weight might be provided to allow comparability

Other parameters (P01s) can be added to include additional information for the reporting if available such as the weight of the micro-litter or the sampling protocol (SAMPPROT) to describe the technique to prepare/analyse the sample.

If the sampling protocols require additional parameters that are not available in the vocabularies or other format extensions allowing a complete data reporting, a request can be sent to info@emodnet-chemistry.eu to be considered.

The description of the specific vocabularies that have been implemented for micro-litter is available on the dedicated section of these guidelines and on-line at the link https://vocab.seadatanet.org/search.

A complete updated example that illustrates how micro-litter in sediment observations can be described in the CDI metadata format and ODV data format can be found at: https://doi.org/10.6092/a306cc44-b463-48e7-9540-cb9992ba30d9

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5. Micro-litter in SeaDataNet Common Vocabularies

A series of specific standard vocabularies or standard terms related to micro-litter have been added to SeaDataNet NVS (NERC Vocabulary Server) Common Vocabularies to describe the micro-litter found at sea and in the sediment. The terms in the vocabularies are based on acknowledged protocols and can be further expanded according to the requirements of the consolidated initiatives (the motivated request can be sent to info@emodnet-chemistry.eu). Micro-litter vocabularies are already compliant with existing ICES vocabularies for micro-litter.

As an example, the terms included in the different vocabularies at the time of the release of thes guidelines are described below. For completeness, it is recommended to check the updated versions available on-line at https://vocab.seadatanet.org/search or https://www.bodc.ac.uk/resources/vocabularies/vocabulary_search/.

L24 SeaDataNet Data Transport Formats (https://vocab.seadatanet.org/v_bodc_vocab_v2/search.asp?lib=L24) was extended with Floating micro-litter ODV format and Sediment micro-litter ODV format.

Preferred label	ConceptID	Definition
Floating micro-litter ODV format	MODV	A variant of the Biological ODV format to enable Data Centers to exchange floating microlitter data using the SeaDataNet infrastructure. It contains all the required elements to describe the floating microlitter observation.
Sediment micro-litter ODV format	SODV	A variant of the ODV ASCII format to enable Data Centers to exchange microlitter in sediments data using the SeaDataNet infrastructure. It contains all the elements required to describe microlitter in sediments.

P02 SeaDataNet Parameter Discovery Vocabulary (https://vocab.seadatanet.org/v_bodc_vocab_v2/search.asp?lib=P02) was extended with Micro-litter in water bodies and Micro-litter in the sediment.

Preferred label	ConceptID	Definition
Micro-litter in sediments	UMLS	Parameters describing the abundance and nature of microscopic particles of man-made materials and in particular microplastics present in the sediment

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Micro-litter in water bodies	UMLW	Parameters describing the abundance and nature of microscopic particles of man-made materials and in particular microplastics present in any body of fresh or salt water.

P01 BODC Parameter Usage Vocabulary
(https://vocab.seadatanet.org/v_bodc_vocab_v2/search.asp?lib=P01) was extended with the necessary terms to describe Type of micro-litter particles, Count of micro-litter particles, Size class of micro-litter particles, Shape of micro-litter particles, Colour class of micro-litter particles, Transparency class of micro-litter particles, Micro-litter polymer types, Weight of micro-litter particles, Width of sample collector, Size of sample collector (mesh) and WMO Sea State.

Preferred label	ConceptID	Definition
Type class of micro-litter particles in the sediment by categorisation using EMODnet chemistry reporting protocol	MLITTYPS	Text categorisation of the type of micro-litter particles observed in a sediment sample within categories defined in the EMODnet chemistry micro-litter reporting protocol
Type class of micro-litter particles in the water body by categorisation using EMODnet chemistry reporting protocol	MLITTYPW	Text categorisation of the type of micro-litter particles observed in a water sample within categories defined in the EMODnet chemistry micro-litter reporting protocol
Count of micro-litter particles in the sediment by categorisation using EMODnet chemistry reporting protocol	MLITCNTS	Number of items classified as micro-litter counted in a sediment sample within categories defined in the EMODnet chemistry micro-litter reporting protocol
Count of micro-litter particles in the water body by categorisation using EMODnet chemistry reporting protocol	MLITCNTW	Number of items classified as micro-litter counted in a water sample within categories defined in the EMODnet chemistry micro-litter reporting protocol
Size class of micro-litter particles in the sediment by categorisation using EMODnet chemistry reporting protocol	MLITSIZS	Text categorisation of the size class of micro-litter particles observed in a sediment sample within categories defined in the EMODnet chemistry micro-litter reporting protocol
Size class of micro-litter particles in the water body by categorisation using EMODnet chemistry reporting protocol	MLITSIZW	Text categorisation of the size class of micro-litter particles observed in a water sample within categories defined in the EMODnet chemistry micro-litter reporting protocol
Shape class of micro-litter particles in the sediment by categorisation using	MLITSHPS	Controlled vocabulary defining the terms that may be used for micro-litter polymer types in the EMODnet Chemistry data reporting system

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EMODnet chemistry reporting protocol		
Shape class of micro-litter particles in the water body by categorisation using EMODnet chemistry reporting protocol	MLITSHPW	Text categorisation of the shape of micro-litter particles observed in a water sample within categories defined in the EMODnet chemistry micro-litter reporting protocol
Colour class of micro-litter particles in the sediment by categorisation using EMODnet chemistry reporting protocol	MLITCOLS	Text categorisation of the colour of micro-litter particles observed in a sediment sample within categories defined in the EMODnet chemistry micro-litter reporting protocol
Colour class of micro-litter particles in the water body by categorisation using EMODnet chemistry reporting protocol	MLITCOLW	Text categorisation of the colour of micro-litter particles observed in a water sample within categories defined in the EMODnet chemistry micro-litter reporting protocol
Transparency class of micro-litter particles in the water body by categorisation using EMODnet chemistry reporting protocol	MLITROPW	Text categorisation qualifying the transparency of micro-litter particles observed in a water sample using categories defined in the EMODnet chemistry micro-litter reporting protocol
Transparency class of micro-litter particles in the sediment by categorisation using EMODnet chemistry reporting protocol	MLITROPS	Text categorisation qualifying the transparency of micro-litter particles observed in a sediment sample using categories defined in the EMODnet chemistry micro-litter reporting protocol
Polymer type of micro-litter particles in the sediment by categorisation using EMODnet chemistry reporting protocol	MLITPOLS	Text categorisation of the type of plastic polymer of micro-litter particles observed in a sediment sample using categories defined in the EMODnet chemistry micro-litter reporting protocol
Polymer type of micro-litter particles in the water body by categorisation using EMODnet chemistry reporting protocol	MLITPOLW	Text categorisation of the type of plastic polymer of micro-litter particles observed in a water sample within categories defined in the EMODnet chemistry micro-litter reporting protocol
Dry weight of micro-litter particles collected from the sediment by categorisation using EMODnet chemistry reporting protocol	MLDWSD01	The weight after drying of items classified as micro-litter counted in a sediment sample within categories defined in the EMODnet chemistry micro-litter reporting protocol
Dry weight of micro-litter particles collected from the water body by categorisation using EMODnet chemistry reporting protocol	MLDWWD01	The weight after drying of items classified as micro-litter counted in a water sample within categories defined in the EMODnet chemistry micro-litter reporting protocol
Size of sample collector (mesh) {mesh size}	MSHSIZE1	The average dimension of the holes in the mesh of a sample collecting device such as a plankton net or a trawl.
Width of sample collector (aperture) {mouth width}	MTHWDTH1	The horizontal dimension of the mouth opening of a sample collecting device such as a plankton net or a trawl.
Sea state on the water body by visual estimation and conversion to WMO code using table 3700	WMOCSSXX	Visual observation using WMO code table 3700

![EMODnet logo](European Marine Observation and Data Network)

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Additional vocabularies needed to describe the P01 terms were added as specified below:

Preferred label	Concept ID	Definition
EMODnet micro-litter types	H01	Controlled vocabulary defining the terms that may be used for micro-litter types in the EMODnet Chemistry data reporting system.
EMODnet micro-litter shapes	H02	Controlled vocabulary defining the terms that may be used for micro-litter shape in the EMODnet Chemistry data reporting system.
EMODnet micro-litter size classes	H03	Controlled vocabulary defining the terms that may be used for micro-litter size classes in the EMODnet Chemistry data reporting system.
EMODnet micro-litter colour classes	H04	Controlled vocabulary defining the terms that may be used for micro-litter colour classes in the EMODnet Chemistry data reporting system.
EMODnet micro-litter polymer type	H05	Controlled vocabulary defining the terms that may be used for micro-litter polymer types in the EMODnet Chemistry data reporting system.
EMODnet micro-litter transparency classes	H06	Controlled vocabulary defining the terms that may be used for micro-litter particle transparency categories in the EMODnet Chemistry data reporting format.
World Meteorological Organisation sea states	C39	International sea state scale classifying the state of the sea (wind sea) based on visual observations; also referred to as the Douglas sea state scale.

A non-exhaustive list of terms of the above-mentioned vocabularies are presented below but please, consult the updated version through the links given above to have the newest terms.

EMODnet Micro-litter type H01:

Preferred label	ConceptID	Definition
Micro-plastic items	H0100001	A generic term for any kind of micro-litter item made of any kind of plastic material.
Micro-plastic fragments	H0100002	Irregularly-shaped plastic micro-litter particles with broken off edges that may be rounded or angular.
Micro-plastic pellets	H0100003	Regularly-shaped plastic micro-litter particles.
Micro-plastic filaments	H0100004	Slender thread-like plastic micro-litter particles.
Micro-plastic films	H0100005	Micro-litter particles derived from plastic sheets or thin plastic films.

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Micro-plastic styrofoam	H0100006	Micro-litter particles of styrofoam.
non-plastic man-made micro-particles (e.g. glass, metal, tar)	H0100007	A generic term for any kind of micro-litter item that is not made of plastic.
non-plastic filaments (natural fibres, rubber)	H0100008	Filaments of non-plastic material such as natural fibres or rubber that are present in micro-litter samples.

EMODnet Micro-litter shape H02:

Preferred label	ConceptID	Definition
rounded	H0200001	Micro-litter particles with rounded off edges (e.g. by erosion).
subrounded	H0200002	Micro-litter particles with partly rounded off edges.
subangular	H0200003	Micro-litter particles with smooth angle edges.
angular	H0200004	Micro-litter particles with sharp angle edges.
flat	H0200005	Micro-litter particles with a broad level or regular surface that is wider than it is high.
cylindrical	H0200006	Micro-litter particles with a regular cylinder-like shape.
discoid	H0200007	Micro-litter particles with a regular disc-like shape.
ovoid	H0200008	Micro-litter particles with a regular oval-like shape.
spheroid	H0200009	Micro-litter particles with a regular sphere-like shape.
Other/unclassified	H0200010	Micro-litter particles with an undertermined or unclassified shape.

EMODnet Micro-litter size-class H03:

Preferred label	ConceptID	Definition
less than 20 microns	H0300001	Micro-litter particles that pass through a 20-micrometre mesh screen.
20 to 200 microns	H0300002	Micro-litter particles that pass through a 200-micrometre mesh screen but are retained by a 20-micrometre mesh.
less than 200 microns	H0300003	Micro-litter particles that pass through a 200-micrometre mesh screen.
200 to 300 microns	H0300004	Micro-litter particles that pass through a 300-micrometre mesh screen but are retained by a 200-micrometre mesh.

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300 microns to 1 millimetre	H0300005	Micro-litter particles that pass through a 1-millimetre mesh screen but are retained by a 300-micrometre mesh.
1 to 2 millimetres	H0300006	Micro-litter particles that pass through a 2-millimetre mesh screen but are retained by a 1-millimetre mesh (e.g. Manta net mesh size).
2 to 5 millimetres	H0300007	Micro-litter particles that pass through a 5-millimetre mesh screen but are retained by a 2-millimetre mesh.
1 to 5 millimetres	H0300008	Micro-litter particles that pass through a 5-millimetre mesh screen but are retained by a 1-millimetre mesh (e.g. Manta net mesh size); the size of the particles makes visual inspection possible.
5 to 25 millimetres	H0300009	Particles greater than the micro-litter upper size range of 5 millimetre and up to 25 millimetres that are counted alongside micro-litter particles.
300 microns to 5 millimetres	H0300010	Micro-litter particles that pass through a 5-millimetre mesh screen but are retained by a 300-micrometre mesh.
100 to 500 microns	H0300011	Micro-litter particles that pass through a 500-micrometre mesh screen but are retained by a 100-micrometre mesh.

EMODnet Micro-litter colour-class H04:

Preferred label	ConceptID	Definition
BLACK/GREY	H0400001	Color class BLACK/GREY for describing micro-litter items.
BLUE/GREEN	H0400002	Color class BLUE/GREEN for describing micro-litter items.
BROWN/TAN	H0400003	Color class BROWN/TAN for describing micro-litter items.
WHITE/CREAM	H0400004	Color class WHITE/CREAM for describing micro-litter items.
YELLOW	H0400005	Color class YELLOW for describing micro-litter items.
ORANGE/PINK/RED	H0400006	Color class ORANGE/PINK/RED for describing micro-litter items.
COLOURLESS	H0400009	Color class COLOURLESS for describing micro-litter items.
MULTICOLOUR	H0400008	Color class MULTICOLOUR for describing micro-litter items.

EMODnet Micro-litter transparency-class H06:

Preferred label	ConceptID	Definition
opaque	H06AA002	Term that qualifies micro-litter particles that do not allow the light to travel through them.

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	H06AA001	Term that qualifies micro-litter particles that allow light to travel through them either almost unaltered (transparent) or with some diffraction (translucent, translucid or semitransparent).
transparent/translucent		

EMODnet Micro-litter polymer types H05:

Preferred label	ConceptID	Definition
polyethylene	H0500001	not available
polypropylene	H0500002	not available
polystyrene	H0500003	not available
polyamide (nylon)	H0500004	not available
polyester	H0500005	not available
acrylic	H0500006	not available
polyoxymethylene	H0500007	not available
polyvinyl alcohol	H0500008	not available
polyvinylchloride	H0500009	not available
polymethylacrylate	H0500010	not available
polyethylene terephthalate	H0500011	not available
alkyd	H0500012	not available
polyurethane	H0500013	not available

C39 Vocabulary: World Meteorological Organisation sea states

ConceptID	Preferred label	Definition
0	calm (glassy)	The surface of the water body is absolutely flat corresponding to a significant wave height of zero
1	calm (rippled)	The surface of the water body has undulations corresponding to a significant wave height of 0 - 0.10 metres
2	smooth	The surface of the water body has undulations corresponding to a significant wave height of 0.10 - 0.50 metres
3	slight	The surface of the water body has undulations corresponding to a significant wave height of 0.50 - 1.25 metres

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4	moderate	The surface of the water body has undulations corresponding to a significant wave height of 1.25 - 2.50 metres
5	rough	The surface of the water body has undulations corresponding to a significant wave height of 2.50 - 4.00 metres
6	very rough	The surface of the water body has undulations corresponding to a significant wave height of 4.00 - 6.00 metres
7	high	The surface of the water body has undulations corresponding to a significant wave height of 6.00 - 9.00 metres
8	very high	The surface of the water body has undulations corresponding to a significant wave height of 9.00 - 14.00 metres
9	phenomenal	The surface of the water body has undulations corresponding to a significant wave height in excess of 14.00 metres

The information related to the instrument is coded using the vocabulary L05 in the CDI and the more specific L22 in the ODV. Some examples of the terms are presented below but please, consult the updated version through the links given above to have the newest and suitable terms.

L05 vocabulary: SeaDataNet device categories

Preferred label	ConceptID	Definition
Neuston net	69	A fine-meshed net designed to collect samples living within a few centimetres of the sea surface. Samples microzooplankton, mesozooplankton, nekton and microplastics
Plankton nets	22	A fine-meshed net designed to collect small size organisms, aggregates, or litter in the water column including for example microzooplankton, mesozooplankton, nekton, microplastic or other litter.
Sieves and filters	84	Devices that separate solid particles larger than a particular size from a sample collected by another device that is a suspension of solid particles in a liquid or gas.
Sediment grabs	50	A device that collects a sample of surface sediment including manually deployed equipment like a shovel or bucket.

L22 vocabulary: SeaVox Device Catalogue

Preferred label	ConceptID	Definition

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Bongo net	NETT0176	A generic term for a plankton net designed with double circular (ring, hoop or drum) mouth pieces; with further specifications either unknown or described elsewhere in the supporting metadata.
Manta net	NETT0177	A generic term for a net system designed for sampling the surface of the ocean. Based on the original design by Brown and Cheng 1981, it has a single rectangular mouth piece and a pair of wings that ride the sea surface; further specifications are either unknown or described elsewhere in the supporting metadata.
SubCtech OceanPack RACE 5th generation {FerryBox} combined pCO2 analyser and microplastics sampler	TOOL1377	A flow-through system packaged into a mobile manifold that was designed for underway monitoring on sailing yachts involved in the Volvo Ocean Race 2017-18. Each unit was fitted with a dedicated LI-COR LI-840x pCO2 analyser and a microplastics sampler built by MOLDAENKE and SubCtech. The overall unit featured a data logger, de-bubbler and water supply and was capable of integrating auxiliary sensors (e.g. thermosalinograph, fluorometry etc.). The pCO2 analyser measures CO_2 and H_2O using a silicone flat membrane equilibrator and non-dispersive infrared detection (dual wavelength). Samples for microplastics were captured using stainless steel filter cakes. Overall accuracy of the pCO2 analyser is < 1% with a resolution of 0.01 ppm CO_2 and 0.001 ppt H_2O.
Van Veen grab	TOOL0653	A simple clam-shell sediment grab penetrating approximately 20cm with a typical sampling area of 0.1m2 (but grab sizes can vary). On descent two levers with buckets at their ends are spread like open scissors that unlock on hitting the seabed. When pulled upwards the two buckets close and grab a sample. This is subject to more disturbance than by Craib or box corers.

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