DeFishGear
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For a Litter-Free Adriatic and Ionian Coast and Sea

Methodology for Monitoring Marine Litter on the Sea Surface

Visual observation

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The IPA-Adriatic funded DeFishGear project aims to facilitate efforts for integrated planning to reduce the environmental impacts of litter-generating activities and ensure the sustainable management of the marine and coastal environment of the Adriatic-Ionian macroregion. The DeFishGear activities are implemented by a multi-disciplinary team comprising academia, research institutes, national and local authorities and NGOs from all seven countries of the Adriatic and Ionian Seas, reinforcing and strengthening cooperation and fostering joint and harmonized actions towards a litter-free Adriatic and Ionian Coast and Sea.

1.   Introduction

The following methodology on monitoring floating litter through visual observation by a dedicated surveyor on a vessel has been prepared based on the EU MSFD TG10 "Guidance on Monitoring of Marine Litter in European Seas (2013)" and the NOOA "Marine Debris Monitoring and Assessment: Recommendations for Monitoring Debris Trends in the Marine Environment (2013), taking into consideration the draft "UNEP/MAP MEDPOL Monitoring Guidance Document on Ecological Objective 10: Marine Litter (2014)".

2.   Site selection

The monitoring of floating marine litter by human observers is a methodology indicated for transects in selected areas. The selected areas should include:

- ✓ Low density areas (e.g. open sea);
- ✓ High density areas (e.g. close to ports);
- ✓ Other selected areas e.g. in estuaries, in the vicinity of cities, in local areas of touristic or commercial traffic.

Incoming currents from neighboring areas or outgoing currents should be considered.

3.   Survey area

The survey area is defined by the transect width and length. Typically a transect width of 10m is set. However, depending on the observation level of the surveyor for the predefined ship speed of 2knots (3.7km/h), the following transect widths might be used:

Table 1. *Observation width from different observation levels above the sea for a ship speed of 2knots.*

Observation level of the surveyor above the sea	Survey observation width (ship speed=2 knots)
1 m	6 m
3 m	8 m
6 m	10 m
10 m	15 m

The transect length will be determined from the latitude and longitude of the transect start and end points obtained by GPS. The same areas should be monitored for all surveys.

4.   Frequency and timing of surveys

At least two surveys, one in autumn and one in spring should be carried out.

The proposed survey periods are:
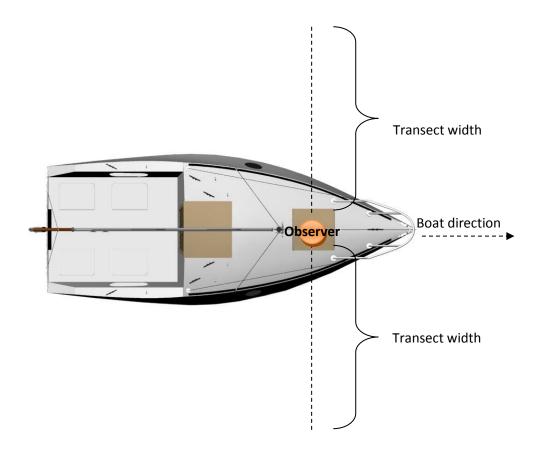
- ✓ Autumn: mid September-mid October
- ✓ Spring: April

Bearing in mind that the observation of floating debris is highly dependent on the observation conditions, in particular on the state of the sea and wind speed, partners should be flexible enough to take this into account and re-schedule the monitoring activity in order to have appropriate conditions. Ideally the visual observation protocol should be applied after a few days of calm sea, so that there is no bias by litter objects which have been mixed into the water column by recent storms or heavy seas. In addition, the wind speed should be less than 2 on the Beaufort scale.

5.   Visual observation considerations

The observation from boats should ensure the detection of litter items in the size range of 2.5 cm to 50 m. Therefore along with the observation transect width of 10 m, the speed of the boat should not be higher than 3knots. The observation, quantification and identification of floating litter items must be made by a dedicated observer who does not have other duties at the same time. The transect length should correspond approximately to 1 h of observation for each survey. The ideal location for observation is often the bow area of the boat. The observation direction must be perpendicular to the boat track (see figure below). The surveyor should conduct the survey from the glare-free side of the vessel and avoid the hours of the day when the sun is low on the horizon (sunrise and sunset), since visibility is not good enough due to glare and/or reflection.

Transect width

Boat direction

Observer

Transect width

6. Litter size limits and classes to be surveyed

Litter items in the size range of 2.5 cm (in the longest dimension) to 50 cm should be monitored and reported. However, it is recommended to record items larger than 50cm in order to understand the relevance of larger than 50cm items in the statistical evaluation of data. Given that visual observation will not permit the exact measuring of object sizes, the following size range classes should be reported for each recorded litter item:

  A. 2.5 cm-5 cm
  B. 5 cm-10 cm
  C. 10 cm-20 cm
  D. 20 cm-30 cm
  E. 30 cm-50 cm
  F. > 50 cm

7. Identification of litter

All items observed on the survey area should be entered on the 'Floating Litter Monitoring Sheet'. On the sheet, each type of item is given a unique identification number. Data should be entered on the sheet while being observed. The identification and correct categorization of litter items should be facilitated by the 'Photo Guide'.

Unknown litter or items that are not on the survey sheet should be noted in the appropriate "other item box". A short description of the item should then be included on the survey sheet. If possible, digital photos should be taken of unknown items so that they can be identified later and, if necessary, be added to the survey sheet.

Furthermore, the occurrence of groups of floating litter items should be recorded along with their location as these could provide useful information with regards to accumulation areas. Ideally, each item in the group should be identified and recorded.

8. Quantification of litter

The unit in which litter will be assessed on the sea surface will be 'number of items' and it will be expressed as counts of litter items per square kilometer (litter items/km^2). In order to compute the exact surveyed area, GPS coordinates must be recorded regularly (every min) to obtain an accurate measurement of the travelled transect. A handheld GPS unit might be handy in this respect.

9. Equipment/Consumables

The following items are necessary to carry out floating litter surveys:

  ✓ Digital camera;
  ✓ Binoculars;
  ✓ Hand-held GPS unit;
  ✓ Extra batteries (ideally rechargeable batteries);
  ✓ Clipboard for the surveyor;
  ✓ Recording sheets (printed on waterproof paper);
  ✓ Pencils;
  ✓ First aid kit (to include sunscreen, bug spray, drinking water).

10. References

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Monitoring Marine Litter (Macro) on the Water Surface Data Sheet

Location name	
Location ID	
Country	
Surveyor Name	
e-mail address	
Date of survey	

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VESSEL CHARACTERISTICS

Vessel name		Name of the vessel
Type of vessel		Type e.g. research, fishing, hired, regular ferry etc.
Vessel length and weight			Length of the vessel (metres) Gross weight of the vessel (tonnes)

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VISUAL SURVEY TRANSECT DETAILS

Latitude/longitude start			Recorded as nnn.nnnnn degrees at the start of the sample unit
Latitude/longitude end			Recorded as nnn.nnnnn degrees at the end of the sample unit
Coordinates system			Datum and coordinate system employed
Vessel speed			Average ship speed in knots
Observation height			Observation elevation above the sea
Distance covered			Total distance covered by the transect (m)
Time start/end			Time over which the survey took place
Surface covered			Area covered by the vessel (km^2)

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ENVIRONMENTAL PARAMETERS - OBSERVATION DETAILS

Wind speed		*Recorded in (Beaufort)*
Wind direction	☐ N ☐ E ☐ S ☐ W	*Tick more than one boxes e.g. for SE wind*
Sea surface salinity		*Expressed in $^{0}/_{00}$ when reporting*
Viewing quality			*Good/Moderate/Poor ; in the latter two case state cause (e.g. fog)*
Sea state		*Expressed in accordance with the Douglas Sea Scale (0-9)*

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SITE CHARACTERISTICS

Nearest river name		*Name of nearest river*
Nearest river distance		*Distance to the nearest natural input (river or stream) (kilometers)*
Nearest river position	☐N ☐E ☐S ☐W	*Position of river mouth in relation to survey area*
Nearest major fishery		*Name of the nearest major fishery (named by type)*
Nearest major fishery distance		*Distance to the nearest major fishery (kilometers)*
Nearest major fishery position	☐N ☐E ☐S ☐W	*Position of the nearest major fishery in relation to survey area*
Nearest town		*Name of nearest town*
Nearest town distance		*Distance to the nearest town (kilometers)*
Nearest town position	☐N ☐E ☐S ☐W	*Position of the nearest town in relation to survey area*

Population size of this town		*No of inhabitants*
Additional features of the town	☐ Residential ☐ Tourist ☐ Residential & tourist	☐ Winter ☐ Spring ☐ Summer ☐ Autumn	*Indicate the main characteristic of the town, residential or touristic town; in case of the later indicate the high season peak*
Name of the nearest beach		*Name of the nearest beach*
Distance to nearest beach		*Distance to the closest coastline* *(kilometers)*
Position of the nearest coast	☐N ☐E☐S ☐W	*Position of the closest coastline in relation to survey area*
Nearest shipping lane distance		*Distance to the nearest shipping lane (kilometers)*
Estimated traffic density		*Recorded in number of ships/year*
Vessel type		*Indicate the type of vessels that mainly use it e.g. merchant ships, etc.*
Position of the shipping lane	☐N ☐E☐S ☐W	*Position of shipping lane in relation to survey area*
Name of the nearest harbor		*Name of nearest harbor*
Distance to nearest harbor		*Distance to the closest harbor* *(kilometers)*
Harbor position	☐N ☐E☐S ☐W	*Position of the nearest harbor in relation to survey area*
Type of harbor		*Based on the types of vessels visiting the harbor*
Size of harbor		*Record the number of ships that reach the harbor per year*
Nearest discharge of waste water distance		*Distance to the closest waste water discharge point(kilometers)*
Position of nearest discharge point	☐N ☐E☐S ☐W	*Position of nearest discharge points in relation to survey area*
Type of waste water discharge	☐Industrial ☐Municipal ☐Other	*Indicate type of waste water discharged*

TYPE OF MATERIAL

ARTIFICIAL POLYMER MATERIALS	RUBBER	CLOTH/TEXTILE	PAPER/CARDBOARD	PROCESSED/WORKED WOOD	METAL

Code	Item
ARTIFICIAL POLYMER MATERIALS	
G2	Bags
G6	Bottles
G18	Crates and containers / baskets
G38	Cover / packaging
G39	Gloves
G45	Mussel nets / Oyester nets
G48	Synthetic rope
G51	Fishing net
G57	Fish boxes - plastic
G58	Fish boxes - expanded polystyrene
G63	Buoys
G67	Sheets, indus. packaging, plastic sheeting
G74	Foam packaging/insulation/polyurethane
G79	Plastic pieces 2.5cm ><50 cm
G80	Plastic pieces >50 cm
G82	Polystyrene pieces 2.5cm ><50 cm
G83	Polystyrene pieces >50 cm
G94	Table cloth
G123	Polyurethane granules <5mm
G124	Other plastic/polystyrene items (identifiable)
RUBBER	
G125	Balloons and balloon sticks
G126	Balls
G127	Rubber boots
G128	Tyres and belts
G134	Other rubber pieces
CLOTH/TEXTILE	
G135	Clothing (clothes, shoes)
G141	Carpet & Furnishing
G142	Rope, string and nets
G143	Sails, canvas
G145	Other textiles (incl. rags)
PAPER/CARDBOARD	
G148	Cardboard (boxes & fragments)
G149	Paper packaging
G154	Newspapers & magazines
G158	Other paper items
PROCESSED/WORKED WOOD	
G160	Pallets
G162	Crates
G168	Wood boards
G169	Beams / Dunnage
G173	Other (specify)
METAL	
G175	Cans (beverage)
G182	Fishing related (weights, hooks, sinkers, lures)
G191	Wire, wire mesh, barbed wire
G192	Barrels
G197	Other (metal)

SIZE

CLASSES

G. 2.5cm-5cm
H. 5cm-10cm
I. 10cm-20cm
J. 20cm-30cm
K. 30cm-50cm
L. >50cm

ADDITIONAL INFO

In case of the occurrence of group of items, please record herewith the occurrence, the location (coordinates) and the type of litter items (G1, G2, G3, ….) observed

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