



**DeFishGear**  
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The Adriatic Coast and Sea – Litter Free

## Methodology for Monitoring Marine Litter on the Sea Surface

Visual observation



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The 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 Sea. 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 Sea, reinforcing and strengthening cooperation and fostering joint and harmonized actions towards a litter-free Adriatic.

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## 1. Introduction

The following methodology has been prepared based on the EU MSFD TG10 “Guidance on Monitoring of Marine Litter in European Seas (2013)” and the NOAA “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 short transects in selected areas. In the Adriatic Sea, a region with very little information about floating marine litter abundance, it is advisable to start by surveys in different areas in order to understand the variability of litter distribution. 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. The transect width to be used is that of 10m, however depending on the observation level of the surveyor for the predefined ship speed of 2knots (3.7km/h) of the DeFishGear floating litter monitoring activities 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	Observation width (ship speed=2knots)
1m	6m
3m	8m
6m	10m
10m	15m

The transect length will be determined from latitude and longitude of 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 in autumn and spring should be carried out within the scope of the DeFishGear project (Sep 2014-Jul 2015).

The proposed surveys periods are:

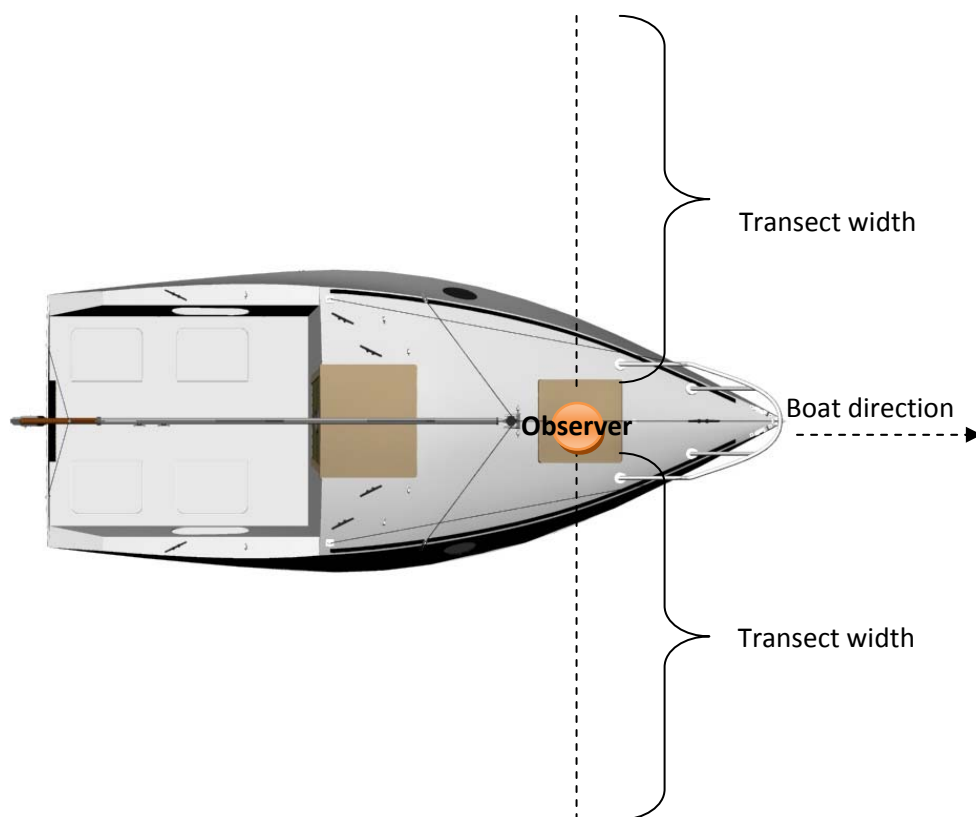
- ✓ Autumn 2014: mid September-mid October
- ✓ Spring 2015: April

Bearing in mind that the observation of floating debris is much depended on the observation conditions, in particular on the sea state and wind speed, partners should be flexible enough to take this into account and to re-schedule the monitoring activity in order to meet appropriate conditions. Ideally the visual observation protocol should be applied after a minimum duration 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 sea. In addition, the wind speed should be less than 2 Beaufort.

## 5. Visual observation considerations

The observation from boats should ensure the detection of litter items in the size range of 2.5cm to 50cm, therefore along with the observation transect width of 10m, the speed of the boat should not be higher than 3 knots. 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 1h 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 to 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.

*The total time of floating litter monitoring (for the 2 surveys) should correspond to a total of 10-16hrs at least.*



## 6. Size limits and classes to be surveyed

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

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

## 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 'DeFishGear 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<sup>2</sup>). 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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Lippiatt S, Opfer S, Arthur C. Marine Debris Monitoring and Assessment. NOAA Technical Memorandum NOS-OR&R-46, 2013.

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# Monitoring Marine Litter (Macro) on the Water Surface

## Data Sheet

<b>Location name</b>	
<b>DFG location ID</b>	
<b>Country</b>	
<b>Surveyor Name</b>	
<b>e-mail address</b>	
<b>Date of survey</b>	

VESSEL CHARACTERISTICS		
<b>Vessel name</b>		<i>Name of the vessel</i>
<b>Type of vessel</b>		<i>Type e.g. research, fishing, hired, regular ferry etc.</i>
<b>Vessel length and weight</b>		<i>Length of the vessel (metres) Gross weight of the vessel (tonnes)</i>

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

ENVIRONMENTAL PARAMETERS - OBSERVATION DETAILS		
<b>Wind speed</b>		<i>Recorded in (Beaufort)</i>
<b>Wind direction</b>	<input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W	<i>Tick more than one boxes e.g. for SE wind</i>
<b>Sea surface salinity</b>		<i>Expressed in ‰ when reporting</i>
<b>Viewing quality</b>		<i>Good/Moderate/Poor ; in the latter two case state cause (e.g. fog)</i>
<b>Sea state</b>		<i>Expressed in accordance with the Douglas Sea Scale (0-9)</i>

<b>NOTES</b>
<p>.....</p> <p>.....</p> <p>.....</p>

<b>SITE CHARACTERISTICS</b>		
<b>Nearest river name</b>		Name of nearest river
Nearest river distance		Distance to the nearest natural input (river or stream) (kilometers)
Nearest river position	<input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W	Position of river mouth in relation to survey area
<b>Nearest major fishery</b>		Name of the nearest major fishery (named by type)
Nearest major fishery distance		Distance to the nearest major fishery (kilometers)
Nearest major fishery position	<input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W	Position of the nearest major fishery in relation to survey area
<b>Nearest town</b>		Name of nearest town
Nearest town distance		Distance to the nearest town (kilometers)
Nearest town position	<input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W	Position of the nearest town in relation to survey area
Population size of this town		No of inhabitants
Additional features of the town	<input type="checkbox"/> Residential <input type="checkbox"/> Tourist <input type="checkbox"/> Residential & tourist	<input type="checkbox"/> Winter <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Autumn <i>Indicate the main characteristic of the town, residential or touristic town; in case of the later indicate the high season peak</i>
<b>Name of the nearest beach</b>		Name of the nearest beach
Distance to nearest beach		Distance to the closest coastline (kilometers)
Position of the nearest coast	<input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W	Position of the closest coastline in relation to survey area
<b>Nearest shipping lane distance</b>		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	<input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W	Position of shipping lane in relation to survey area
<b>Name of the nearest harbor</b>		Name of nearest harbor
Distance to nearest harbor		Distance to the closest harbor (kilometers)
Harbor position	<input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> 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
<b>Nearest discharge of waste water distance</b>		Distance to the closest waste water discharge point(kilometers)
Position of nearest discharge point	<input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W	Position of nearest discharge points in relation to survey area
Type of waste water discharge	<input type="checkbox"/> Industrial <input type="checkbox"/> Municipal <input type="checkbox"/> Other	Indicate type of waste water discharged



		TYPE OF MATERIAL													SIZE												
ARTIFICIAL POLYMER MATERIALS		RUBBER						CLOTH/TEXTILE				PAPER/CARDBOARD			PROCESSED/WORKED WOOD				METAL			CLASSES					
		G125	G126	G127	G128	G134	G135	G141	G142	G143	G145	G148	G149	G154	G158	G160	G162	G168	G169	G173	G175		G182	G191	G192	G197	
G2		Other plastic/polystyrene items (identifiable)						Clothing (clothes, shoes)	Carpet & Furnishing	Rope, string and nets	Sails, canvas	Other textiles (incl. rags)	Cardboard (boxes & fragments)	Paper packaging	Newspapers & magazines	Other paper items	Pallets	Crates	Wood boards	Beams / Dunnage	Other (specify)	Cans (beverage)	Fishing related (weights, hooks, sinkers, lures)	Wire, wire mesh, barbed wire	Barrels	Other (metal)	
G6	Bottles																										
G18	Crates and containers / baskets																										
G38	Cover / packaging																										
G39	Gloves																										
G45	Mussel nets / Oyster 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)																										
G125	Balloons and balloon sticks																										
G126	Balls																										
G127	Rubber boots																										
G128	Tyres and belts																										
G134	Other rubber pieces																										
G135	Clothing (clothes, shoes)																										
G141	Carpet & Furnishing																										
G142	Rope, string and nets																										
G143	Sails, canvas																										
G145	Other textiles (incl. rags)																										
G148	Cardboard (boxes & fragments)																										
G149	Paper packaging																										
G154	Newspapers & magazines																										
G158	Other paper items																										
G160	Pallets																										
G162	Crates																										
G168	Wood boards																										
G169	Beams / Dunnage																										
G173	Other (specify)																										
G175	Cans (beverage)																										
G182	Fishing related (weights, hooks, sinkers, lures)																										
G191	Wire, wire mesh, barbed wire																										
G192	Barrels																										
G197	Other (metal)																										

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

