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MARLESS - MARine Litter cross-border awarenESS and innovation actions

Priority Axis: Environment and cultural heritage
Specific objective: Improve the environmental quality conditions of the sea and coastal area by use of sustainable and innovative technologies and approaches

PROTOCOL FOR VISUAL MONITORING OF FLOATING LITTER

PROJECT MARLESS

11.10.2021

Work Package:	**3. Monitoring optimization**
Activity:	**3.1 Harmonization of the monitoring plan and methodology**
Phase Leader:	**ARFVG – Autonomous Region of Friuli-Venezia Giulia**
Deliverable:	**3.1.3 Agreement on a method to use in the following activity**

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Responsible Partner:	**PP2 ARFVG – Autonomous Region of Friuli-Venezia Giulia**		
Involved Partners	**LP ARPAV, PP5 UNIDU, PP6 UNIBO, PP7 CIM-IRB, PP10 Puglia Region**		
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1. MONITORING SITE SELECTION

Methodology for visual monitoring of floating marine litter is intened to be applied for monitoring short transects in selected areas. In order to select those areas and to understand the variability of litter distribution it is advisable to start by surveying different areas, including:

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

Incoming sea currents from neighboring areas or outgoing currents should also be considered when selecting a monitoring site.

2. DEFINING SURVEY AREA

Transect width and length defines the survey area. Width of the monitoring transect should be 10 m. However, that width can vary depending on the observation level of the surveyor for the predefined ship speed of 2-3 knots (Table 1.)

Table 1. *Different widths of monitoring transect depending on different observation levels above the sea for a ship speed of 2 - 3 knots.*

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

The length of a transect will be determined from GPS coordinates of its starting and ending point. The same areas should be monitored during all surveys.

3. FREQUENCY AND TIMING OF SURVEYS

A total of two surveys should be carried out in a year: before and after the touristic season. Since observation of floating marine litter highly depends on observation conditions (e.g. sea state, wind speed), the schedule of marine litter monitoring should be flexible and susceptible for rescheduling the monitoring activity when observation conditions are favorable. Ideally, visual observation of marine litter should be carried out at calm sea state in order to exclude the bias caused by mixing the litter in a water column by storms or heavy sea. Additionally, wind speed should be lower than 2 on Beaufort scale.

4. WHAT TO CONSIDER DURING VISUAL OBSERVATION

Observation conducted on boats should secure detection of litter ranging between 2.5 and 50 cm in size. As a result of that and the 10 m width of the observation transect, the speed of the observation boat should not exceed 3 knots. Observation, quantification and identification of floating litter has to be done by a focused observer (or more) who does not have other duties at the same time.
Observed transect should be long enough to correspond to approximately 30 min of observation time during a survey. In most cases the most suitable location for litter observation is the front area of the boat. Direction of observation has to be perpendicular to the pathway of the boat (Figure 1.)

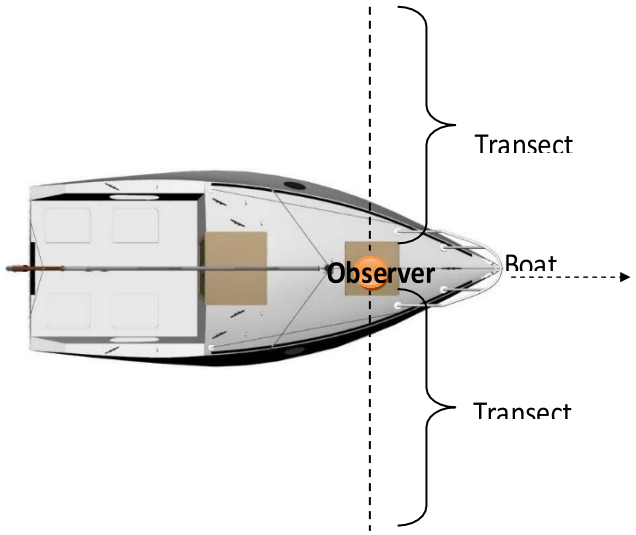

Figure 1. *Direction of litter observation as opposed to boat pathway.*

Monitoring survey should be conducted from the glare-free side of the vessel. In addition, monitoring during times of the day when the sun is low on the horizon (sunrise and sunset) should be avoided because of reduced visibility caused by glare and/or reflection.

5. LITTER SIZE LIMITS AND CLASSES

Litter ranging from 2.5 to 50 cm in size should be monitored and reported. Litter larger than 50 cm should also be recorded for statistical data evaluation. Since litter cannot be correctly measured by visual observation, the size ranges below should be determined for each recorded piece of litter:

- 2.5 cm - 5 cm
- 5 cm - 10 cm
- 10 cm - 20 cm
- 20 cm - 30 cm
- 30 cm - 50 cm
- > 50 cm

6. IDENTIFICATION OF OBSERVED LITTER

All litter items observed inside the survey area should be entered in the 'Floating Litter Monitoring Sheet' (at the end of this document). Each type of item in the sheet has been assigned a unique identification number. Data should be entered in the sheet during the litter monitoring.

Litter items that cannot be identified or are not listed in the survey sheet should be noted in the appropriate "other" item box. A short description of those items should be added to the survey sheet. When possible, unidentified items should be photographed so they can be identified later and added to the survey sheet.

If a group of floating litter is observed, its location together with the item list should also be recorded as that can provide information regarding litter accumulation areas. If possible, each item in the litter group should be identified and recorded.

7. QUANTIFICATION OF LITTER

The unit used for assessing the amount of litter on the sea surface is number of litter items per square kilometer (litter items/km^2). In order to calculate the exact size of the surveyed area, GPS coordinates have to be recorded regularly (i.e. every minute) while travelling through the monitoring transect. Handheld GPS can be used for recording these coordinates.

8. EQUIPMENT

Below are the items necessary for monitoring floating sea litter survey:

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

9. REFERENCES

[1] IPA-Adriatic DeFishGear, 2014. “Methodology for Monitoring Floating Litter”