

Methodology for Monitoring Marine Litter on Beaches

Macro-Debris (>2.5cm)



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Prepared by: Thomais Vlachogianni (MIO-ECSDE, DeFishGear WPL)

With contributions from: Vicky Paraskevopoulou & Vaggelis Kalampokis (MIO-ECSDE), Andreja Palatinus & Stefan Trdan (IWRS), Stefano Di Muccio, Luigi Alcaro & Francesca Ronchi (ISPRA), Cristina Mazziotti (ARPA), Christina Zeri & Eleni Kamperi (HCMR)



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DeFishGear

www.defishgear.net

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-Ionian Coast & Sea.

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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)”, the OSPAR “Guideline for Monitoring Marine Litter on the Beaches in the OSPAR Maritime Area (2010)” 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 sites to be monitored should be selected randomly taking into consideration certain criteria. The selected beaches should be situated:

- ✓ 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;
- ✓ In relatively remote areas.

In addition, the selected beaches should:

- ✓ Have a minimum length of 100m;
- ✓ Be characterized by a low to moderate slope (~1.5-4.5 °), which precludes very shallow tidal mudflat areas that might be kilometers long;
- ✓ Have clear access to sea (not blocked by breakwaters or jetties) such that marine litter is not screened by anthropogenic structures;
- ✓ Be accessible to survey teams throughout the year;
- ✓ Ideally not be subject to cleaning activities. In case that they are subjected to litter collection activities the timing of non-survey related beach cleaning must be known such that litter flux rates (the amount of litter accumulation per unit time) can be determined.
- ✓ Posing no threat to endangered or protected species, such as sea turtles, sea birds or shore birds, marine mammals or sensitive beach vegetation; in many cases this would exclude protected areas but this may vary depending on local management arrangements.

In each case, these criteria should be followed as closely as possible. However, the surveyors can use their expert judgment and experience of the coastal area and marine litter situation in their respective country when making the final selection of the beaches to be monitored.

3. Sampling units

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 (either piled boulders or concrete structures). Two (2) sections of a 100-metre stretch on the same beach should be monitored, separated at least by a distance of 50m. The same sites should be monitored for all surveys. In order to identify the start and end points of each sampling unit permanent reference points can be used and coordinates obtained by GPS. In case of heavily littered beaches at least two 50-metre stretches are recommended.

4. Frequency and timing of surveys

At least four surveys in autumn, winter, summer, spring should be carried out.

The proposed surveys period are:

1. Autumn: mid September-mid October
2. Winter: mid December-mid January
3. Spring: April
4. Summer: mid June-mid July

It should be kept in mind that any circumstances that may lead to unsafe situations for the surveyors such as heavy winds, etc. should be avoided. The safety of the surveyors must always come first!

5. Pre-survey characterization of sites

Before any survey begins, shoreline characterization should be completed for each 100m site. The GPS coordinates of all four corners of the sampling unit should be recorded. A site ID name should be created and used for the duration of the study. The site's special features, including characterization of the type of substrate (sand, pebbles, etc.), beach topography, beach usage, distances from urban settlements, shipping lanes, river mouths, etc. should be recorded using the 'Beach Identity Sheet'. Digital photographs should be taken to document the physical characteristics of the monitoring site.

6. Size limits and classes to be surveyed

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

In case, the latter classes are found in extremely high numbers, a 1-meter transect will be used instead, to monitor these items, thus saving energy and time.

7. Collection and identification of litter

All items found on the sampling unit should be entered on the 'Beach Litter Monitoring Sheet'. On the sheet, each type of item is given a unique identification number. Data should be entered on the sheet while picking up the litter item. 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.

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).*

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.

8. Quantification of litter

The unit in which litter will be assessed on the coastline will be number of items and it will be expressed as counts of litter items per square meter (m²). In addition, the main category types of litter items should be weighed.

9. Equipment/Consumables

The following items are necessary to carry out beach surveys:

- ✓ Digital camera;
- ✓ Hand-held GPS unit;
- ✓ Extra batteries (ideally rechargeable batteries);
- ✓ Tape measure/pedometer;
- ✓ Flag markers/stakes;
- ✓ 100-foot measuring tape (fiberglass preferred);
- ✓ First aid kit (to include sunscreen, bug spray, drinking water);
- ✓ Protective gloves;
- ✓ Clipboard for each surveyor;
- ✓ Recording sheets (printed on waterproof paper);
- ✓ Pencils;
- ✓ Rubbish bags;
- ✓ Rigid container and sealable lid to collect sharp items such as needles, etc.;
- ✓ Appropriate clothing;
- ✓ Scales (if possible to weight your bags of collected debris);
- ✓ Pick-up sticks' for gathering litter.

10. Safety

Safety should be the number one priority during any survey activity. Since this work is carried out in the field, there are inherent hazards associated with these techniques. Caution should be used and the general safety guidelines presented below should be followed.

- Wear appropriate clothing. Be sure to wear close-toed shoes and gloves when handling any non-hazardous debris as there may be sharp edges.
- If you come across a potentially hazardous material (e.g., oil or chemical drums, gas cans, propane tanks), contact competent authorities to report the item with as much information as possible. Do not touch the material or attempt to move it.
- Large, heavy objects should be left in place. Do not attempt to lift heavy debris objects as they may have additional water weight and lifting them could result in injury.
- When in doubt, don't pick it up! If unsure of an item, do not touch it. If the item is potentially hazardous, report it to the appropriate authorities.
- Do not conduct field operations in severe weather conditions.
- Be aware of your surroundings and be mindful of trip and fall hazards.
- Carry a means of communication for emergencies, for example a cell phone or radio.
- Always carry a first aid kit. The kit should include an emergency water supply and sunscreen, as well as bug spray.
- Understand the symptoms of heat stress and actions to treat it.
- Make sure to carry enough water.
- Let someone know where you are and when you expect to return;
- The surveyor team should be composed of at least two people.

11. Additional 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.

12. References

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Monitoring Marine Litter on Beaches

Beach Identity Sheet

Name of beach:

Beach ID:

Country:

1. Beach width at mean low spring tide (m):

2. Beach width at mean high spring tide (m):

3. Total length of the beach (m):

4. Back of beach (e.g. cliffs, dunes, etc.):

5. GPS coordinates start 100m:

6. GPS coordinates end 100m:

7. GPS coordinates start strandline:

8. GPS coordinates end back of the beach:

9. Coordinate system used:

10. Date position measured://(d/m/y).....

11. Prevailing currents off the beach: ☐ N ☐ E ☐ S ☐ W

12. Prevailing winds: ☐ N ☐ E ☐ S ☐ W

When you look from the beach to the sea, what direction is the beach facing: ☐ N ☐ E ☐ S ☐ W

Type of beach material (% coverage):(e.g. sand 60%, pebbles 40%)

Beach topography: (e.g. slope 20%)

Are there any objects in the sea (e.g. a pier) that influence the currents:

Major beach usage (local people, swimming and sunbathing, fishing, surfing, sailing, etc.):		
1.	seasonal or whole year round:
2.	seasonal or whole year round:
3.	seasonal or whole year round:

Access to the beach: ☐ Vehicle ☐ Pedestrian ☐ Boat*

What is the distance to nearest town:

What is the position of town in relation to survey area:

What is the (seasonal) population size of this town:

☐ Residential:

☐ Residential and tourist winter
 spring
 summer
 autumn

☐ Tourist winter
 spring
 summer
 autumn

Is there any development behind the beach:

☐ No ☐ Yes, please describe

Are there food and/or drink outlets on the beach:

☐ No ☐ Yes

What is the distance from the survey area to the food and/or drink outlet (km):

Present all year round:

☐ Yes ☐ No
please specify:

Position of food and/or drink outlet in relation to the survey area e.g.*:

☐ N ☐ E ☐ S ☐ W

What is the distance from the beach to the nearest shipping lane (km):

What is the estimated traffic density (number of ships/year) :

Is it used mainly by merchant ships, fishing vessels or all kinds:

Position of shipping lane in relation to survey area:

☐ N ☐ E ☐ S ☐ W

What is the distance from the beach to the nearest harbor (km):

What is the name of the harbor:

Position of harbor in relation to survey area:

☐ N ☐ E ☐ S ☐ W

Type of harbor:

Size of harbor (number of ships):

What is the distance from the beach to the nearest river mouth (km):

What is the name of the river:

Position of river mouth in relation to survey area:

☐ N ☐ E ☐ S ☐ W

Is the beach located near a discharge or discharges of waste water:

What is the distance from the beach to the discharge points (km):

Position of discharge points in relation to survey area:

☐N ☐E ☐S ☐W

How often is the beach cleaned:

☐Daily ☐Weekly ☐Monthly ☐Other

All year round:

Seasonal, please specify in months:

☐Daily ☐Weekly ☐Monthly ☐Other

What method is used:

☐Manual ☐Mechanical

Who is responsible for the cleaning:

.....
.....
.....

Additional comments and observations about this beach:

.....
.....
.....
.....
.....
.....

Please include:

1. A map of the beach

2. A map of the beach and the local surroundings. When relevant please mark on this map the following:

☐ Nearest town

☐ Food/drink outlets

☐ Nearest shipping lane

☐ Nearest harbor

☐ Nearest river mouth

☐ Discharge or discharges of waste water

3. A regional map

Date sheet is filled in:/...../..... (d/m/y)

Name:

E-mail:

Monitoring Marine Litter on Beaches

Survey Sheet (100m)

Name of beach: Name of surveyor 1:
DeFishGear beach ID: e-mail address:
Country: Name of surveyor 2:
e-mail address:
Total number of surveyors:

Date of survey:/...../..... (d/m/y)
Start time of the survey:
End time of the survey:

Additional Information

When was the beach last cleaned:/...../..... (d/m/y)
Did you divert from the predetermined 100 meters: ☐ No ☐ Yes, please specify.....

Did any of the following weather conditions affect the data of the survey? If so please tick appropriate box:

☐ Wind ☐ Rain ☐ Snow ☐ Ice ☐ Fog
☐ Sand storm ☐ Exceptionally high tide

Did you find stranded or dead animals: ☐ Yes ☐ No If so how many:
Please describe the animal, or note the species name if known:
☐ Alive ☐ Dead

Sex of animal (if known):
Age of animal (if known):
Is the animal entangled in litter: ☐ Yes ☐ No
If so please describe nature of the entanglement and type of litter:

Were there any circumstances that influenced the survey? (For example tracks on the beach (cleaning or other), recent replenishment of the beach or other, difficulties in identifying items due to the presence of large amounts of wood washed ashore, etc.).

Please specify:

Were there any events that lead to unusual types and/or amounts of litter on the beach? (For example beach events or other)

Please specify:

ARTIFICIAL POLYMER MATERIALS			
Code	Items name	Item counts	Total
G1	4/6-pack yokes, six-pack rings		
G3	Shopping Bags, incl. pieces		
G4	Small plastic bags, e.g. freezer bags, including pieces		
G5	Plastic bag collective role; what remains from rip-off plastic bags		
G7	Drink bottles <=0.5l		
G8	Drink bottles >0.5l		
G9	Cleaner bottles & containers		
G10	Food containers incl. fast food containers		
G11	Beach use related cosmetic bottles and containers, eg. Sunblocks		
G12	Other cosmetics bottles & containers		
G13	Other bottles & containers (drums)		
G14	Engine oil bottles & containers <50 cm		
G15	Engine oil bottles & containers > 50 cm		
G16	Jerry cans (square plastic containers with handle)		
G17	Injection gun containers		
G18	Crates and containers / baskets		
G19	Car parts		
G21	Plastic caps/lids drinks		
G22	Plastic caps/lids chemicals, detergents (non-food)		
G23	Plastic caps/lids unidentified		
G24	Plastic rings from bottle caps/lids		
G25	Tobacco pouches / plastic cigarette box packaging		
G26	Cigarette lighters		
G27	Cigarette butts and filters		
G28	Pens and pen lids		
G29	Combs/hair brushes/sunglasses		
G30	Crisps packets/sweets wrappers		
G31	Lolly sticks		
G32	Toys and party poppers		
G33	Cups and cup lids		
G34	Cutlery and trays		
G35	Straws and stirrers		
G36	Fertiliser/animal feed bags		
G37	Mesh vegetable bags		
G40	Gloves (washing up)		
G41	Gloves (industrial/professional rubber gloves)		
G42	Crab/lobster pots and tops		
G43	Tags (fishing and industry)		
G44	Octopus pots		
G45	Mussels nets, Oyster nets		
G46	Oyster trays (round from oyster cultures)		
G47	Plastic sheeting from mussel culture (Tahitians)		
G49	Rope (diameter more than 1cm)		
G50	String and cord (diameter less than 1cm)		

G53	Nets and pieces of net < 50 cm		
G54	Nets and pieces of net > 50 cm		
G56	Tangled nets/cord		
G57	Fish boxes - plastic		
G58	Fish boxes - expanded polystyrene		
G59	Fishing line/monofilament (angling)		
G60	Light sticks (tubes with fluid) incl. packaging		
G62	Floats for fishing nets		
G63	Buoys		
G64	Fenders		
G65	Buckets		
G66	Strapping bands		
G67	Sheets, industrial packaging, plastic sheeting		
G68	Fibre glass/fragments		
G69	Hard hats/Helmets		
G70	Shotgun cartridges		
G71	Shoes/sandals		
G72	Traffic cones		
G73	Foam sponge		
G79	Plastic pieces 2.5 cm > < 50cm		
G80	Plastic pieces > 50 cm		
G82	Polystyrene pieces 2.5 cm > < 50cm		
G83	Polystyrene pieces > 50 cm		
G84	CD, CD-box		
G85	Salt packaging		
G86	Fin trees (from fins for scuba diving)		
G87	Masking tape		
G88	Telephone (incl. parts)		
G89	Plastic construction waste		
G90	Plastic flower pots		
G91	Biomass holder from sewage treatment plants		
G92	Bait containers/packaging		
G93	Cable ties		
G95	Cotton bud sticks		
G96	Sanitary towels/panty liners/backing strips		
G97	Toilet fresheners		
G98	Diapers/nappies		
G99	Syringes/needles		
G100	Medical/Pharmaceuticals containers/tubes		
G101	Dog faeces bag		
G102	Flip-flops		
G124	Other plastic/polystyrene items (identifiable)		
		Total weight (kg)	

RUBBER			
Code	Items name	Item counts	Total
G125	Balloons and balloon sticks		
G126	Balls		
G127	Rubber boots		
G128	Tyres and belts		
G129	Inner-tubes and rubber sheet		
G130	Wheels		
G131	Rubber bands (small, for kitchen/household/post use)		
G132	Bobbins (fishing)		
G133	Condoms (incl. packaging)		
G134	Other rubber pieces		
		Total weight (kg)	

CLOTH/TEXTILE			
Code	Items name	Item counts	Total
G137	Clothing / rags (clothing, hats, towels)		
G138	Shoes and sandals (e.g. Leather, cloth)		
G139	Backpacks & bags		
G140	Sacking (hessian)		
G141	Carpet & Furnishing		
G142	Rope, string and nets		
G143	Sails, canvas		
G144	Tampons and tampon applicators		
G145	Other textiles (incl. rags)		
		Total weight (kg)	

PAPER/CARDBOARD			
Code	Items name	Item counts	Total
G147	Paper bags		
G148	Cardboard (boxes & fragments)		
G150	Cartons/Tetrapack Milk		
G151	Cartons/Tetrapack (others)		
G152	Cigarette packets		
G153	Cups, food trays, food wrappers, drink containers		
G154	Newspapers & magazines		
G155	Tubes for fireworks		
G156	Paper fragments		
G158	Other paper items		
		Total weight (kg)	

PROCESSED/WORKED WOOD			
Code	Items name	Item counts	Total
G159	Corks		
G160	Pallets		
G161	Processed timber		
G162	Crates		
G163	Crab/lobster pots		
G164	Fish boxes		
G165	Ice-cream sticks, chip forks, chopsticks, toothpicks		
G166	Paint brushes		
G167	Matches & fireworks		
G171	Other wood < 50 cm		
G172	Other wood > 50 cm		
		Total weight (kg)	

METAL			
G174	Aerosol/Spray cans industry		
G175	Cans (beverage)		
G176	Cans (food)		
G177	Foil wrappers, aluminum foil		
G178	Bottle caps, lids & pull tabs		
G179	Disposable BBQ's		
G180	Appliances (refrigerators, washers, etc.)		
G181	Tableware (plates, cups & cutlery)		
G182	Fishing related (weights, sinkers, lures, hooks)		
G184	Lobster/crab pots		
G186	Industrial scrap		
G187	Drums, e.g. oil		
G188	Other cans (< 4 L)		
G189	Gas bottles, drums & buckets (> 4 L)		
G190	Paint tins		
G191	Wire, wire mesh, barbed wire		
G193	Car parts / batteries		
G194	Cables		
G195	Household Batteries		
G198	Other metal pieces < 50 cm		
G199	Other metal pieces > 50 cm		
		Total weight (kg)	

GLASS/CERAMICS			
Code	Items name	Item counts	Total
G200	Bottles, including pieces		
G201	Jars, including pieces		
G202	Light bulbs		
G203	Tableware (plates & cups)		
G204	Construction material (brick, cement, pipes)		
G205	Fluorescent light tubes		
G206	Glass buoys		
G207	Octopus pots		
G208	Glass or ceramic fragments >2.5cm		
G210	Other glass items		
		Total weight (kg)	

UNIDENTIFIED AND/OR CHEMICALS			
Code	Items name	Item counts	Total
G211	Other medical items (swabs, bandaging, adhesive plaster, etc.)		
G213	Paraffin/Wax		
		Total weight (kg)	