CleanAtlantic

Tackling Marine Litter in the Atlantic Area

DELIVERABLE 4.1.- Regional characterisation of marine litter in the Atlantic Area

WP 4: Overview of the marine litter status in the Atlantic Area: beach, floating and seabed litter

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Introduction

CleanAtlantic is an INTERREG Atlantic Area Programme project that aimed at protecting biodiversity and ecosystem services in the Atlantic Area by improving capabilities to monitor, prevent and remove (macro) marine litter. Besides, the project also contributed to raise awareness and change attitudes among stakeholders and to improve marine litter managing systems.

To achieve these aims, the work was organised in 8 work packages. The present deliverable aims at synthesizing the main results obtained on the frame of the action 1 of work package 4, which focused on the *Regional characterisation of marine litter in the Atlantic Area*. With this purpose, an overview of marine litter status in beach, floating and seabed compartments in the Atlantic Area is presented. Additionally, the major key findings, gaps on monitoring and research as well as potential improvements and recommendations are identified. Links to the complete dedicated reports for each compartment are included in the references section. Also, an interactive map for spatial visualization of data on beach, floating and seabed litter composition and abundance in the Atlantic Area was created and is presented at the end of this report.

Marine litter status in the Atlantic Area

1. BEACH LITTER

A study on the characterization of beach litter composition and abundance in the Atlantic area was led by CEDRE. This study considers four regional scales: Atlantic area, OSPAR region, country, and beach. Note that only part of OSPAR regions, country coast and beaches located in the Atlantic Area are considered in the present study. The analysed data was collected during the period 2016 – 2019, in 922 surveys in total, covering 4 sites in Ireland, 18 in the United Kingdom (UK), 9 in France, 12 in Spain and 19 in Portugal.

1.1. Key findings

In the Atlantic Area, beach litter is abundant with a median value of 172 litter items/100 m, plastic being the main fraction of the total item count (89.7%) (Figure 1.1 and 1.2).

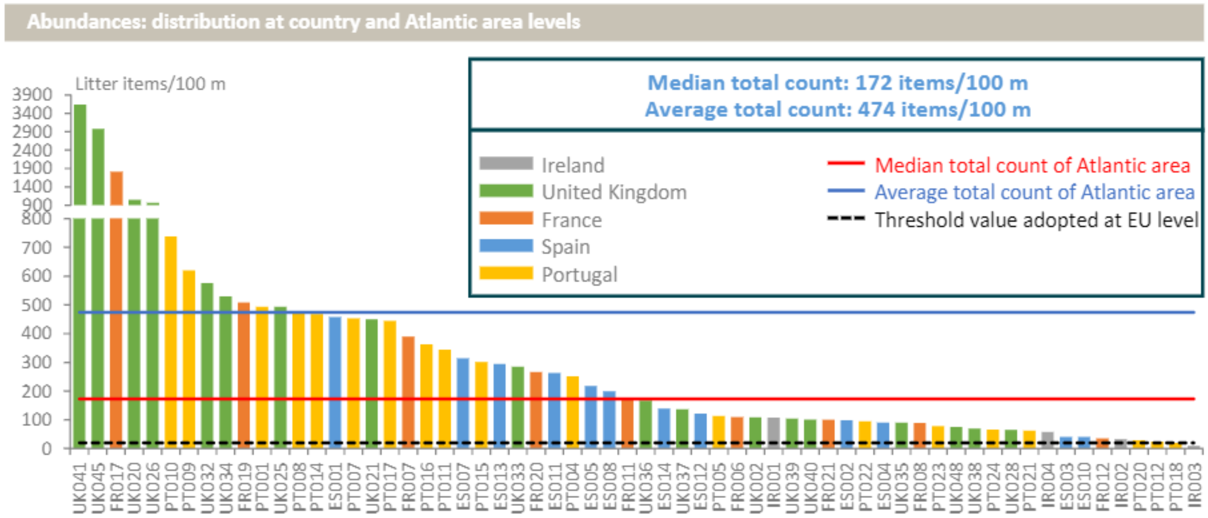


Figure 1.1. Beach litter distribution per country and at the Atlantic Area level (extracted from the original report). For the country analysis, only the Atlantic coast is considered.

At the OSPAR region level, the Atlantic coast of "Celtic Seas" presented median values of 137 items/100 m whilst the Atlantic coast of "Bay of Biscay and Iberian Coast" region showed values as high as 298 items/100 m.

The values for countries varied greatly ranging from 45 items/100 m in Atlantic coast of Ireland to 301 items/100 m in Portugal. Median values for Atlantic coast of the UK, France and Spain were 226, 178 and 170 items/100 m, respectively.

The same pattern was observed at the beach level where temporal trends are variable among sites, showing in some cases a significant increase (i.e. site "Sein", Atlantic coast of France) or a decrease ("Langland Bay", Atlantic coast of the UK) while significant changes were not detected for most sites.

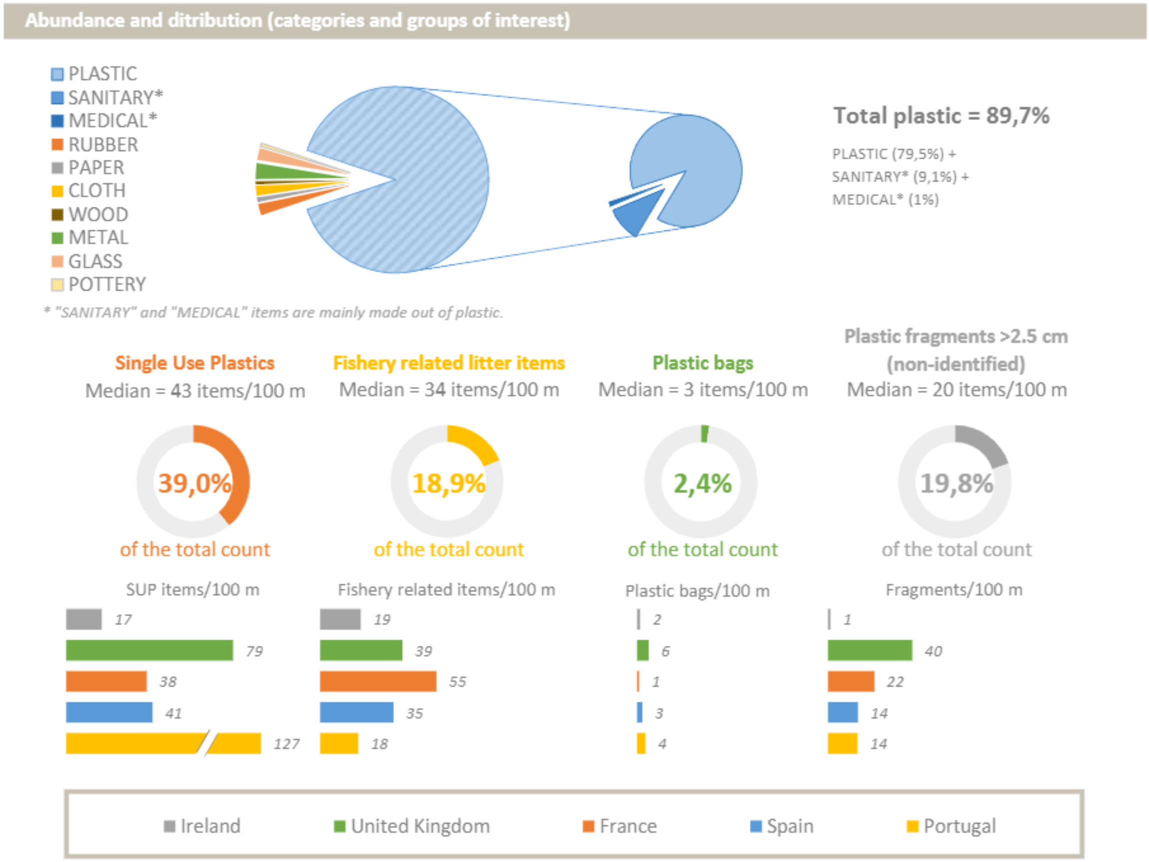


Figure 1.2. Beach litter abundance and distribution per litter class and country at the Atlantic Area level (extracted from the original report).

Considering the whole set of data, single use plastics (SUP) and fishery related product (FISH) represented an important part of the pollution (respectively 39 et 19%, respectively, in the Atlantic Area), although an important percentage were classified as non-identified fragments and ”other plastic/polystyrene items” (more than 20%). Portugal was the country where SUP contributed the most to its total item count (50.1%) while Atlantic coast of Ireland presented the highest percentage of FISH and plastic bags and bags ends (BAG) (52.4% and 5.1% respectively, see full dedicated report for detailed information). Cotton bud sticks, caps/lids and cigarette butts contributed greatly to the SUP total abundance, being in the top 5 of most frequent SUP items in the Atlantic Area (Fig. 1.3). The most frequent FISH items are strings, cords and aquaculture-related items.

Considering the recommended threshold of 20 items/100 m established by the European Union it is concluded that an 88% decrease is needed to attain this value in the Atlantic Area, although the need of reduction would be diverse for the monitored countries and regions (i.e. 10% for Atlantic coast of Irish Celtic Seas in contrast with 85% for Atlantic coast of British Celtic Seas).

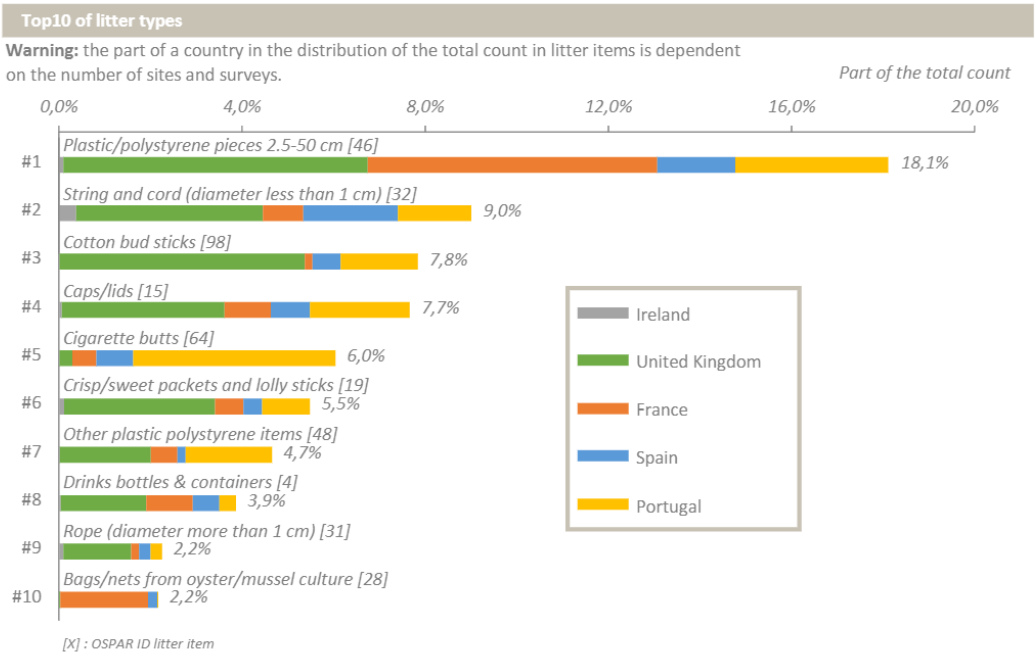


Figure 1.3. Top-ten litter item abundance and distribution in each country at the Atlantic Area level (extracted from the original report).

1.2. Gaps on monitoring and research

This study detected that:

- Nearly 1/5 of items are classified as non-identifiable plastic fragments by the OSPAR list for litter characterisation, without knowledge about their composition and sources.
- There exists high heterogeneity at the country and beach level in abundance, composition and temporal trends indicating the monitoring spatial coverage and the times series need to be sufficient to represent the beach litter status in a given area.
- Sources of beach litter could not be determined, due to the lack of specific methodologies aimed at the identification of these sources.

1.3. Potential improvements and recommendations

Considering the goal of beach litter reduction up to 88%, additional measures are needed. These measures should consider the specific item contribution for each region, since it may vary between countries and sites (i.e. cotton bud sticks and cigarette butts are the major SUP found in Portuguese sites except for Azores). It is recommended to adapt beach monitoring protocols to these measures to allow for the evaluation of these actions' effectiveness. Also, intermediate thresholds are suggested to be established to adapt measures to realistic objectives.

It is recommended to improve the knowledge on plastic fragment sources and composition.

Given the beach litter heterogeneity found at the beach and country scales, it is recommended to increase the monitoring temporal and spatial coverage in some areas. For trends analysis, at least a 6-year monitoring period is recommended.

Methods for source identification should be developed.

2. FLOATING LITTER

Floating macrolitter abundance and composition was assessed for the NW Iberian Shelf by IEO and for the South of the North Sea/English Channel and Bay of Biscay/Celtic Sea by IFREMER.

2.1. NW Iberian shelf

2.1.1. Study area

The pelagic campaign ''PELACUS'' is performed by IEO in a yearly basis during spring (April) covering the N and NW Iberian Shelf along coastline-perpendicular transects, 8 nautical mile away from each other. These surveys are aimed primarily at pelagic fisheries, although an array of multidisciplinary studies and data collection are carried out during the campaign. Experienced observers on board are responsible for the recording of top predator sights (marine mammals, sharks, turtles and seabirds), as well as floating litter. The data was collected during the period 2007-2017, for five main areas, encompassing Rias Baixas, Rias Altas, West Cantabrian Sea, Central Cantabrian Sea and West Cantabrian Sea (Fig. 2.1).

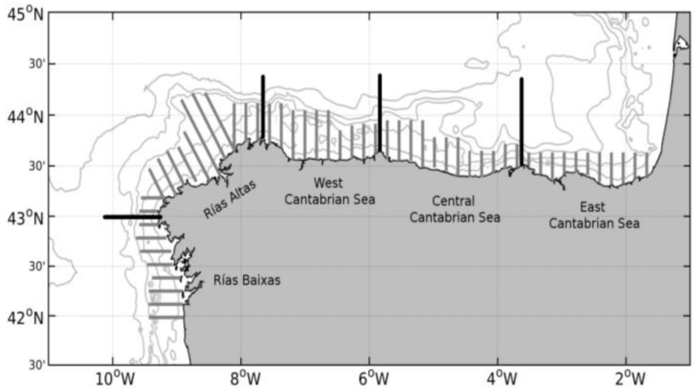


Figure 2.1. Sampling areas (black lines) and transects (grey lines) carried out in PELACUS surveys (extracted from the original report).

2.1.2. Results

The average of density of floating litter was 0.71 ± 0.04 items km^{-2} in the surveyed area, being the lowest registered values in Rías Altas and West Cantabrian Sea (< 0.8 items km^{-2}) and the highest in the East Cantabrian Sea (up to 2.0 items km^{-2}). Intermediate values were found in Rías Baixas and Central Cantabrian Sea, with densities of about 1.3 items km^{-2} (Fig.2.2).

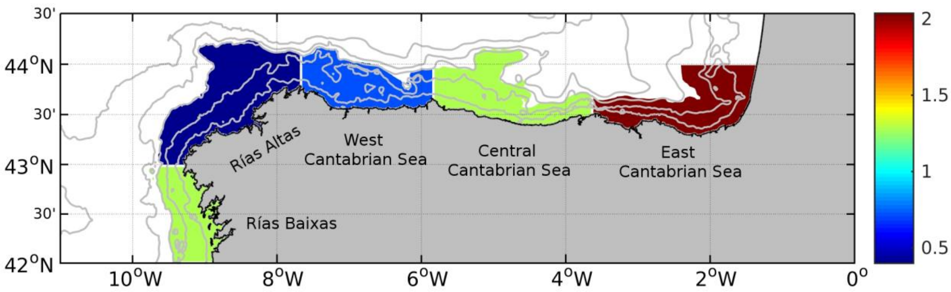


Figure 2.2. Floating litter density averages for the studied period at each sampling area (extracted from the original report).

Plastics contributed to 40.8% of the total observed litter, being wood the second most abundant detected item, yet in a much lower percentage (9%). Fishery-related litter comprised 1.2% of the whole. An important percentage was constituted by unidentified items, categorized as "small trash" (31.9%) and "trash" (15.9%) (Fig. 2.3).

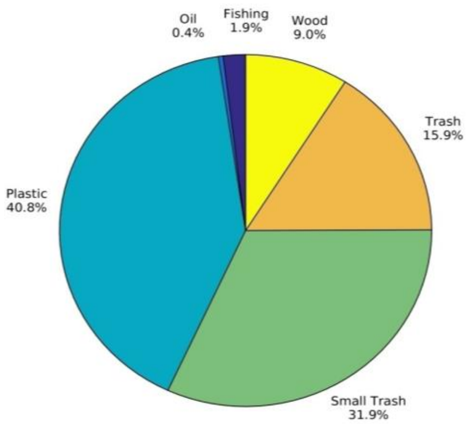


Figure 2.3. Contribution (%) of each floating litter type to the total amount of observed litter.

No inter-annual variability or temporal trends were identified for litter densities and composition although litter was more frequent near the coast. At least 50% of the total floating items were detected at distances closer than 12.6 km away from the shoreline, although plastics and trash items were observed at more distant locations (16.7 km and 16.3 km, respectively).

2.1.3. Gaps on monitoring and research

A relative high percentage of observed items could not be fully identified, neither their material nor their sources. It is likely that "trash" and "small trash" are made of plastic and in this case the plastic contribution to the total floating litter would reach 78%.

2.2. South of North Sea/English Channel and Bay of Biscay/Celtic Sea

2.2.1. Study areas

The implementation of the MSFD monitoring program was carried out in 2015 based on TGML recommendations (Guidelines 2013). In French Atlantic Areas (see figures 2.4 and 2.5), floating marine macrolitter was monitored on four yearly French fisheries stock assessment surveys on the R/V "Thalassa" vessel (Baudrier et al, 2018):

- IBTS (International Bottom Trawl Survey) during winter (January/February) in South North Sea/Eastern Channel,
- CGFS (Channel Ground Fish Survey) during early autumn (September/October) in zones 7d (Easter English Channel) and 7e (Western English Channel),
- PELGAS (*Petits Pélagiques Gascogne*) during spring time (April/May) in Bay of Biscay
- EVHOE (*Evaluation des resources halieutiques de l'ouest européen*) during autumn (end October, November, early December) in Bay of Biscay and Celtic Sea.

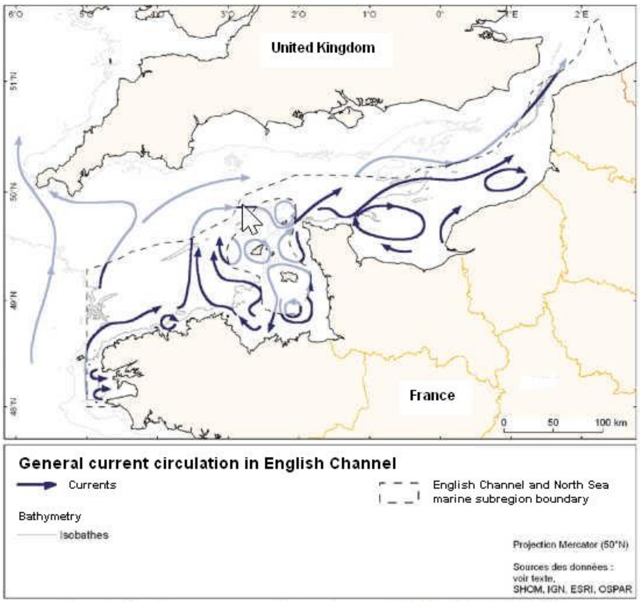


Figure 2.4: General circulation in the English Channel and South of North Sea (source Lazure and Desmare, 2012) from Gerigny et al, 2018.

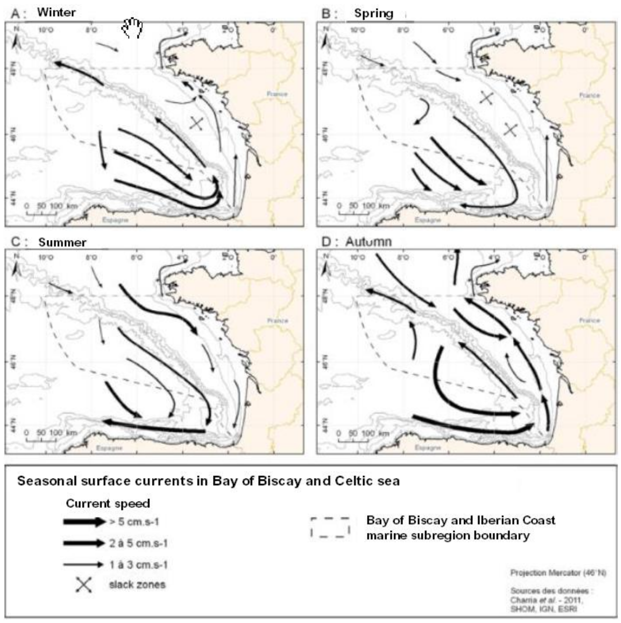


Figure 2.5: Seasonal surface currents on Bay of Biscay and Celtic Sea (source Lazure and Desmare, 2012) from Gerigny et al, 2018.

The MEGASCOPE protocol (Doremus and Van Canneyt, 2015) from UMS PELAGIS Institute is applied by observers on board. This protocol aims to observe marine mammals, seabirds, human activities, and floating marine macrolitter from the upper bridge or inside the bridge depending on weather conditions.

The table 2.1 below shows that PELGAS is the cruise with the most important number of legs with an average of more than 60% per year; followed by CGFS campaign with 25%, EVHOE campaigns with 19% and finally IBTS with 8% of the legs yearly.

	IBTS (Winter)	PELGAS (Spring)	CGFS (summer/automn)	EVHOE (automn)	Total
2015	23 *(4,8%)*	306 *(63,6%)*	78 *(16,2%)*	74 *(15,4%)*	**481** ***(100%)***
2016	23 *(4,9%)*	263 *(56,7%)*	97 *(20,9%)*	81 *(17,5%)*	**464** ***(100%)***
2017	75 *(15,2%)*	301 *(60,9%)*	118 *(23,9%)*	*0*	**494** ***(100%)***
2018	56 *(8,9%)*	388 *(61,4)*	114 *(18%)*	74 *(11,7%)*	**632** ***(100%)***
2019	42 *(8,8%)*	302 *(63,5%)*	74 *(15,5%)*	58 *(12,2%)*	**476** ***(100%)***
2020	9 *(7,1%)*	*0*	69 *(54,8%)*	48 *(38,1%)*	**126** ***(100%)***

Table 2.1: Number and percentage of legs per campaign and per year.

To have comparable results with the Spanish Institute of Oceanography (EIO), only observations realized under "good" weather conditions (i.e. Beaufort lower than 5), have been analysed. Thus, 2,673 legs out of 3,529 were kept in the dataset.

Considering the number of litter observations, figure 2.6 summarises the number of legs per campaign, with and without litter.

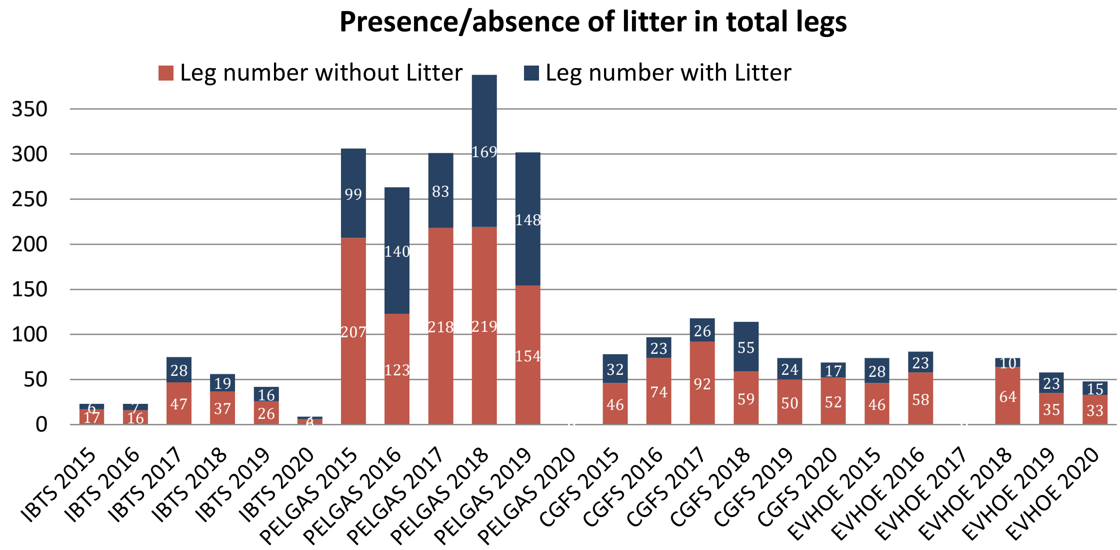


Figure 2.6: Number of legs with litter observations per cruise and per year.

In summary, litter was recorded in 37% of the 2673 legs analysed in this study.

2.2.2. Results

“**Plastic unspecified**” is the most common litter type with an average of 73.8% for all the cruises. The rank of the other types varied depending on the surveys (Figure 2.7 and 2.8).

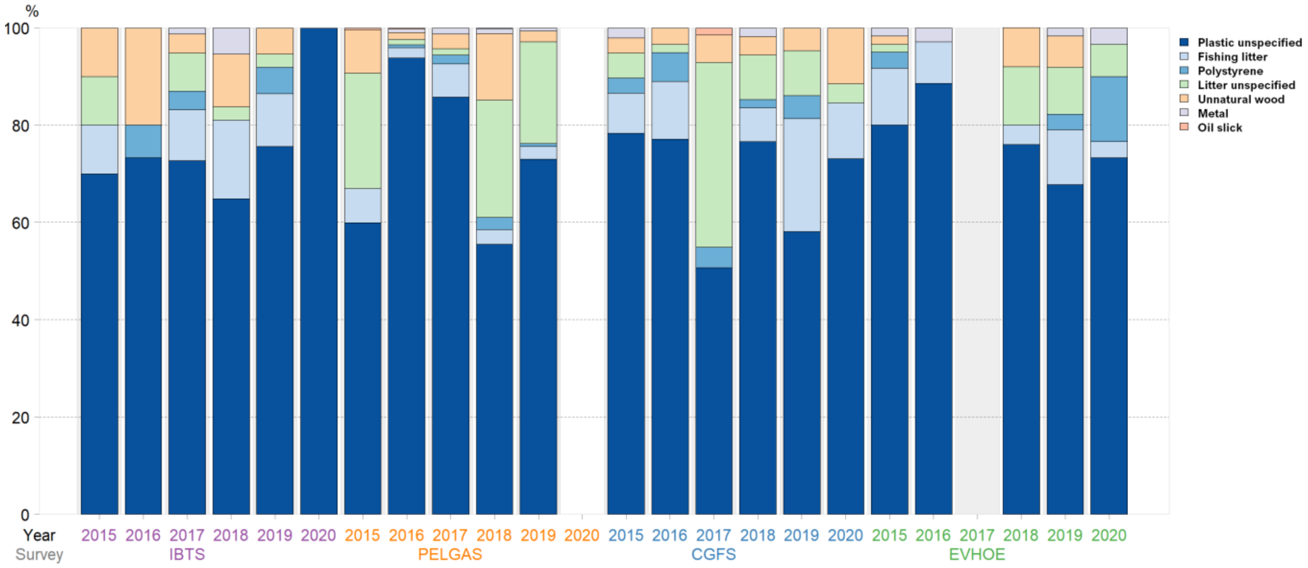
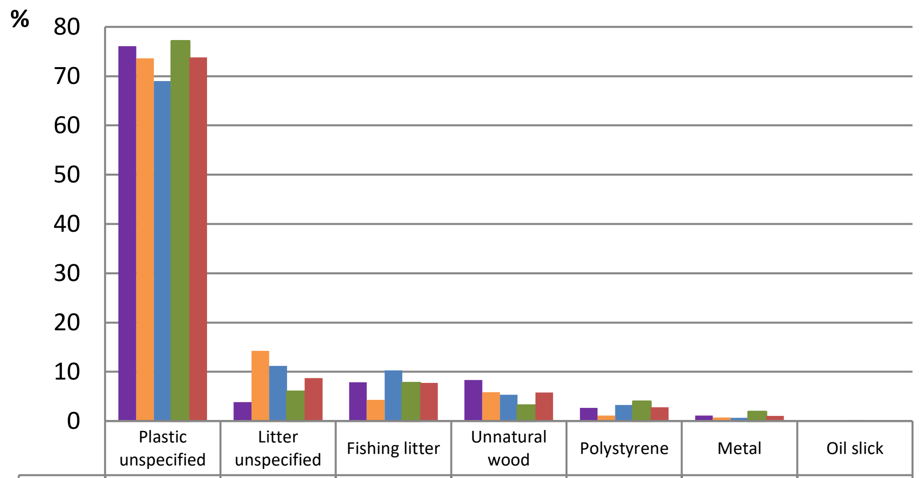


Figure 2.7: Percentage of the different types of floating litter collected during IBTS, PELGAS, CGFS and EVHOE surveys from 2015 to 2020.

Far behind “plastic unspecified”, the second most observed type of litter was “**Litter unspecified**” in PELGAS (14,2%) and CGFS (11,2%) surveys, whereas it was “**Unnatural Wood**” (8,4%) in IBTS surveys and “**Fishing litter**” (7.8%) in EVHOE surveys (Figure 2.8).



	Plastic unspecified	Litter unspecified	Fishing litter	Unnatural wood	Polystyrene	Metal	Oil slick
IBTS	76.1	3.9	7.9	8.4	2.7	1.1	0.0
PELGAS	73.6	14.2	4.3	5.9	1.1	0.7	0.2
CGFS	69.0	11.2	10.3	5.4	3.3	0.6	0.2
EVHOE	77.1	6.0	7.8	3.2	4.0	1.9	0.0
TOTAL	73.8	8.7	7.7	5.8	2.8	1.1	0.1

Figure 2.8: Percentages of the various types of floating litter collected during IBTS, PELGAS and CGFS and EVHOE surveys between 2015 and 2020.

The third one is “**Fishing litter**” in CGFS (10.3%) and IBTS (7.9%), whereas it is Litter unspecified (6.1%) in EVHOE and “**Unnatural Wood**” (5.8%) in PELGAS surveys. “**Metal**” and “**Oil slick**” were always the two less abundant types of litter with averages of 1% and less than 0.1% respectively for all the cruises.

Except for IBTS 2015, where sizes were not recorded due to the inexperience of the observers during the first survey, litter between 10 and 50 cm were the most commonly observed sizes (Figure 2.9).

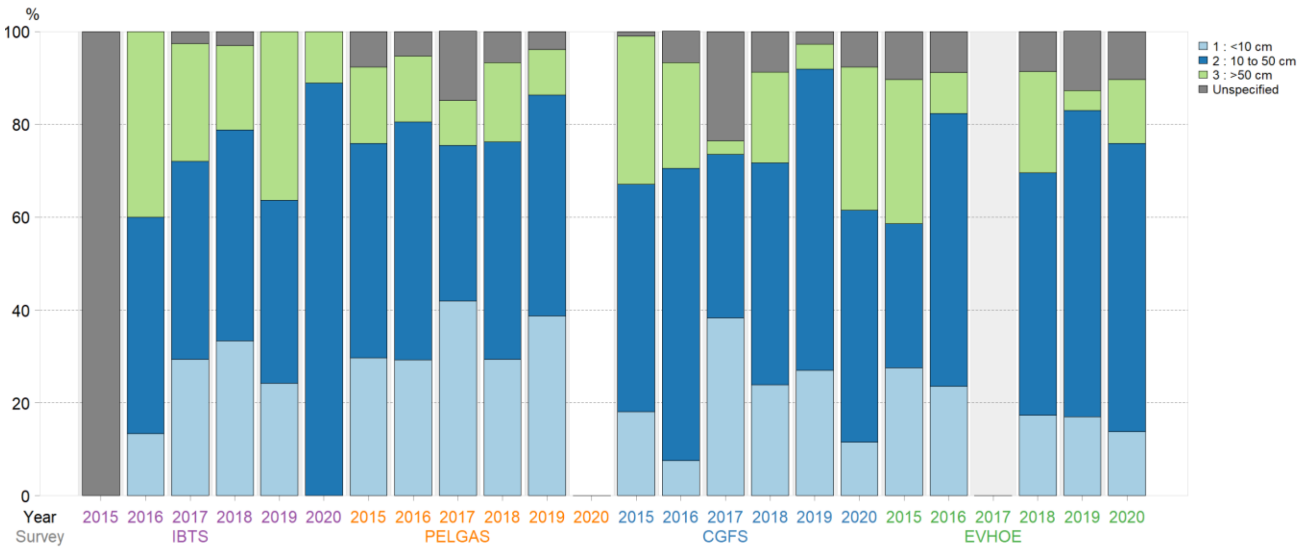
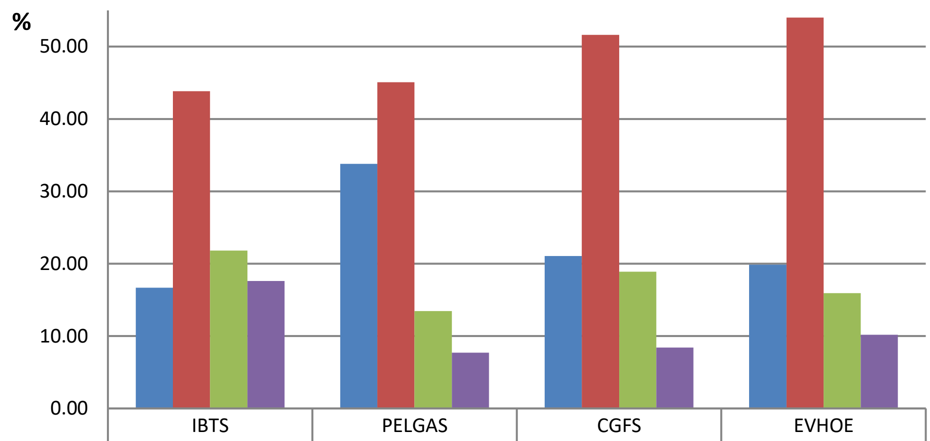


Figure 2.9: Percentages of the various litter size classes per survey (IBTS, PELGAS, CGFS, EVHOE) and per year (from 2015 to 2020).

Litter of less than 10 cm were also largely observed during PELGAS surveys, with approximately 33% of the total, whereas it made less than 21% of the observations in the other cruises (Figure 2.10). A high number of litter > 50 cm was also observed during the IBTS campaigns.



	IBTS	PELGAS	CGFS	EVHOE
<10 cm	16.71	33.79	21.07	19.86
10 to 50 cm	43.85	45.08	51.63	54.01
>50 cm	21.83	13.44	18.90	15.93
Unspecified	17.62	7.69	8.41	10.19

Figure 2.10: Percentage of various size classes of litter in relation to the cruise.

The size class from 10 to 50 cm represents 50.6% of the observations, followed by size class <10cm (23.5%) and litter >50cm (18.7%) (Figure 2.11). Years 2017 and 2020 did not have the same size distribution as the other years, probably due to the absence of 2 surveys: EVHOE in 2017 and PELGAS in 2020

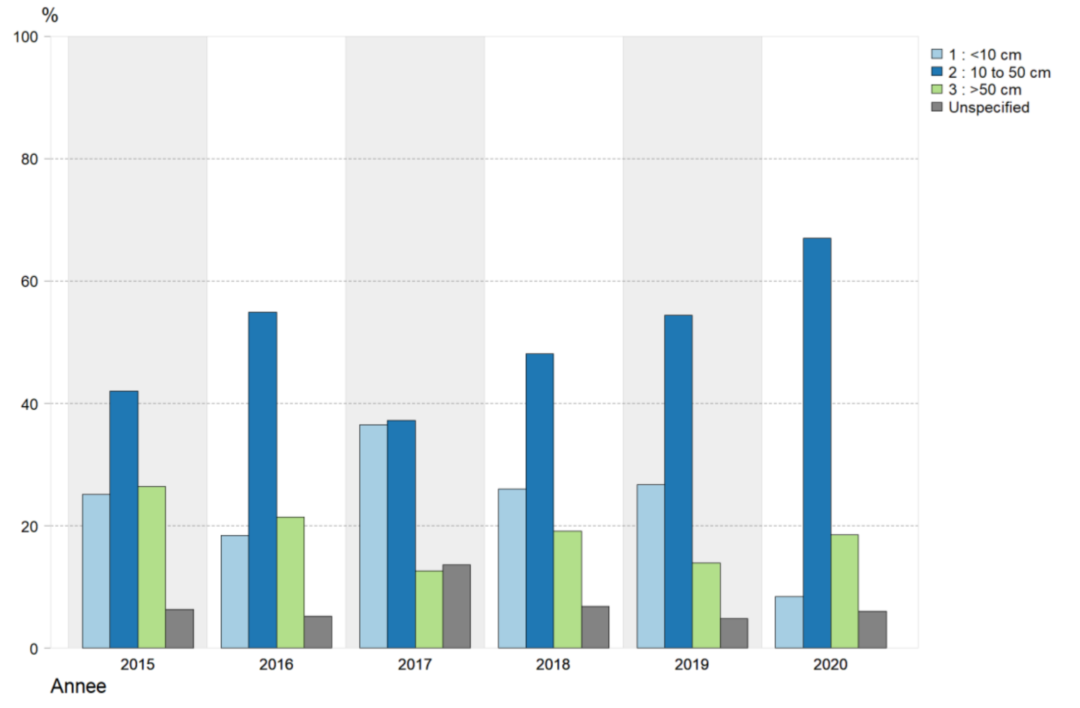


Figure 2.11: Annual variations of different size classes of floating litter.

Litter abundances were between 0 and 1.32 unit/km² in IBTS surveys (Figure 2.12), between 0 and 102.8 unit/km² in PELGAS surveys (Figure 2.14), between 0 and 5.94 unit/km² in CGFS surveys (Figure 2.13) and between 0 and 2.70 unit/km² in EVHOE surveys (Figure 2.15). Highest densities were found during the PELGAS surveys, especially in 2016 and 2019 (102.8 and 50.68 respectively). These surveys were characterized by a large number of legs (around 310 each year compared to 90 in CGFS, 70 in EVHOE and 40 in IBTS), with a higher variability.

In terms of annual mean densities, values ranged between 0,03 ±0,06 and 0,15 ±0,25 units/km² in IBTS surveys, between 0,16 ±0,37 and 1,48 ±7,19 units/km² in PELGAS surveys, between 0,08 ±0,16 and 0,43 ±0,88 unit/km² in CGFS surveys, and finally between 0,06 ±0,23 and 0,18 ±0,42 in EVHOE surveys.

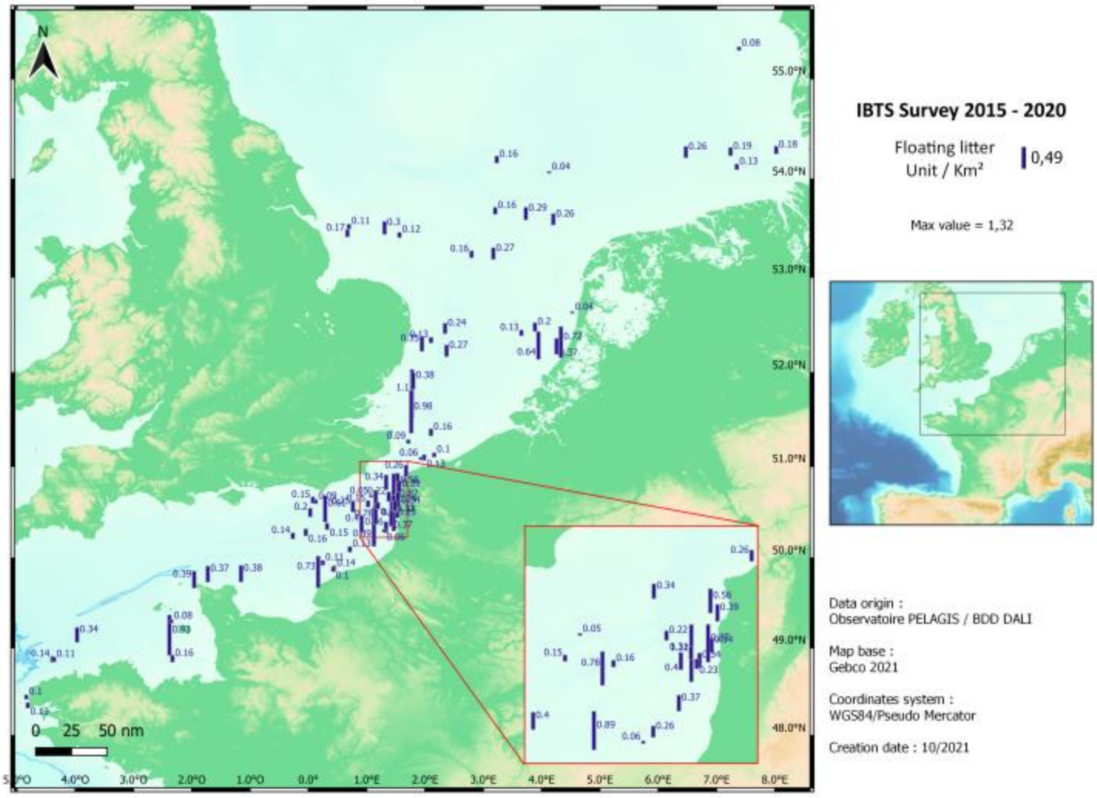


Figure 2.12: Litter abundance in IBTS campaigns 2015-2020

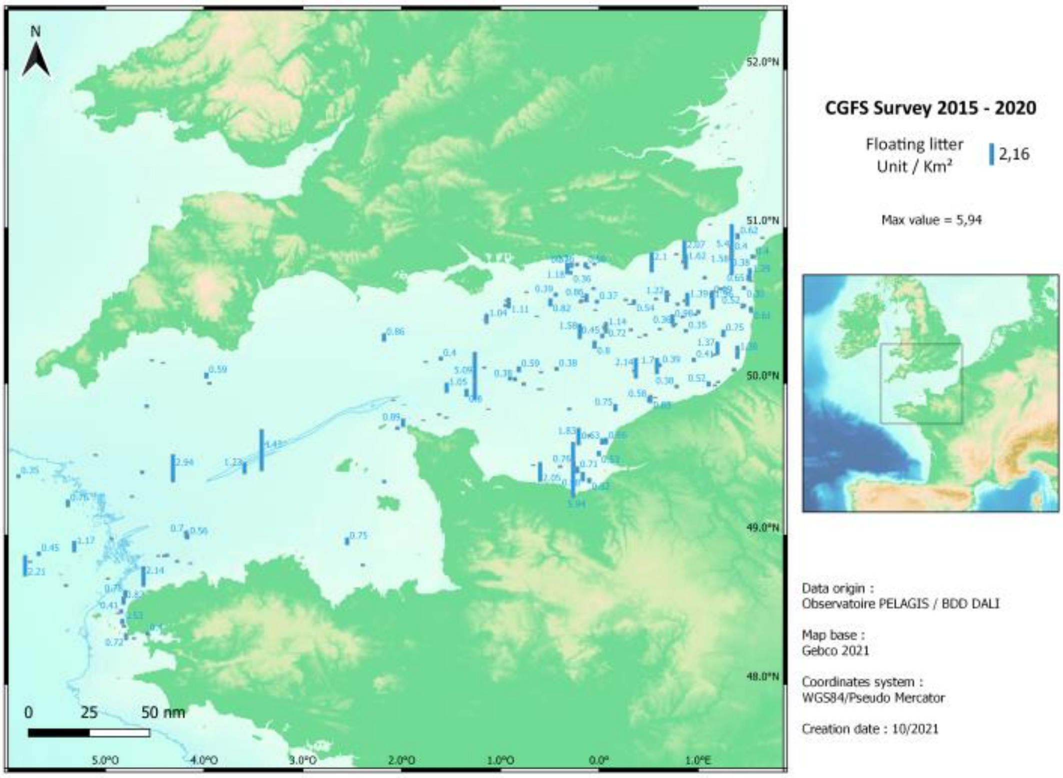


Figure 2.13: Litter abundance in CGFS campaigns 2015-2020

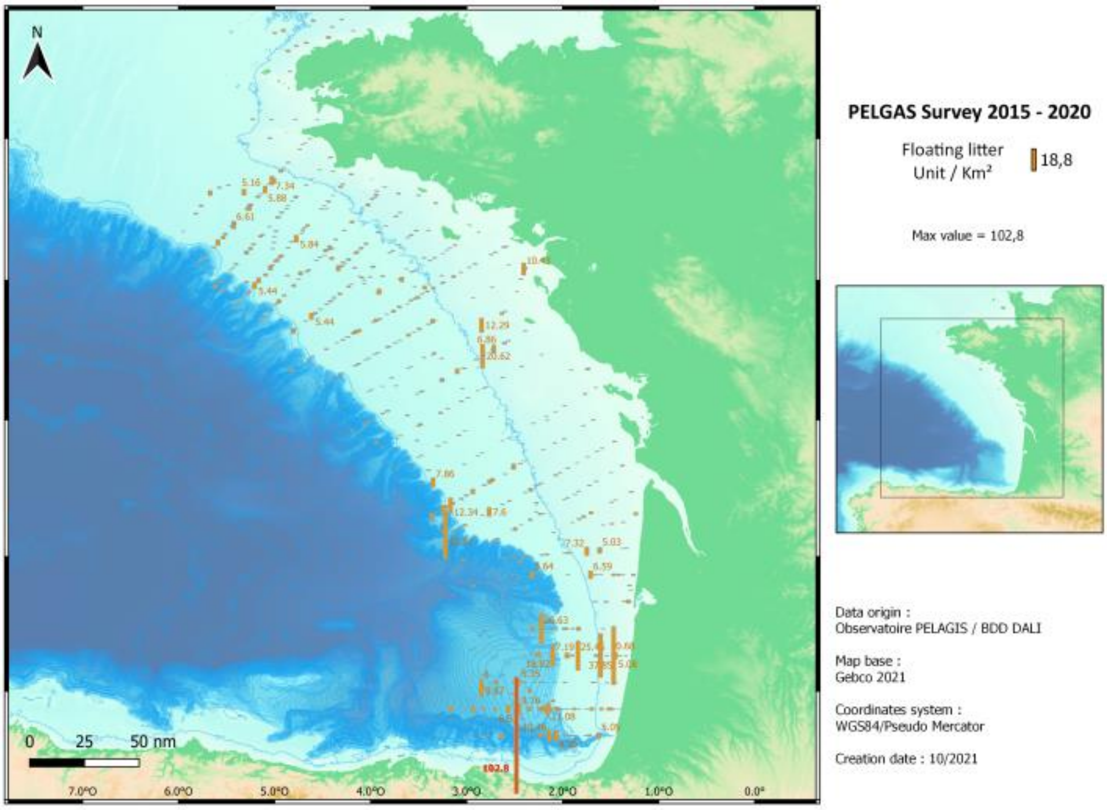


Figure 2.14: Litter abundance in PELGAS campaigns 2015-2020

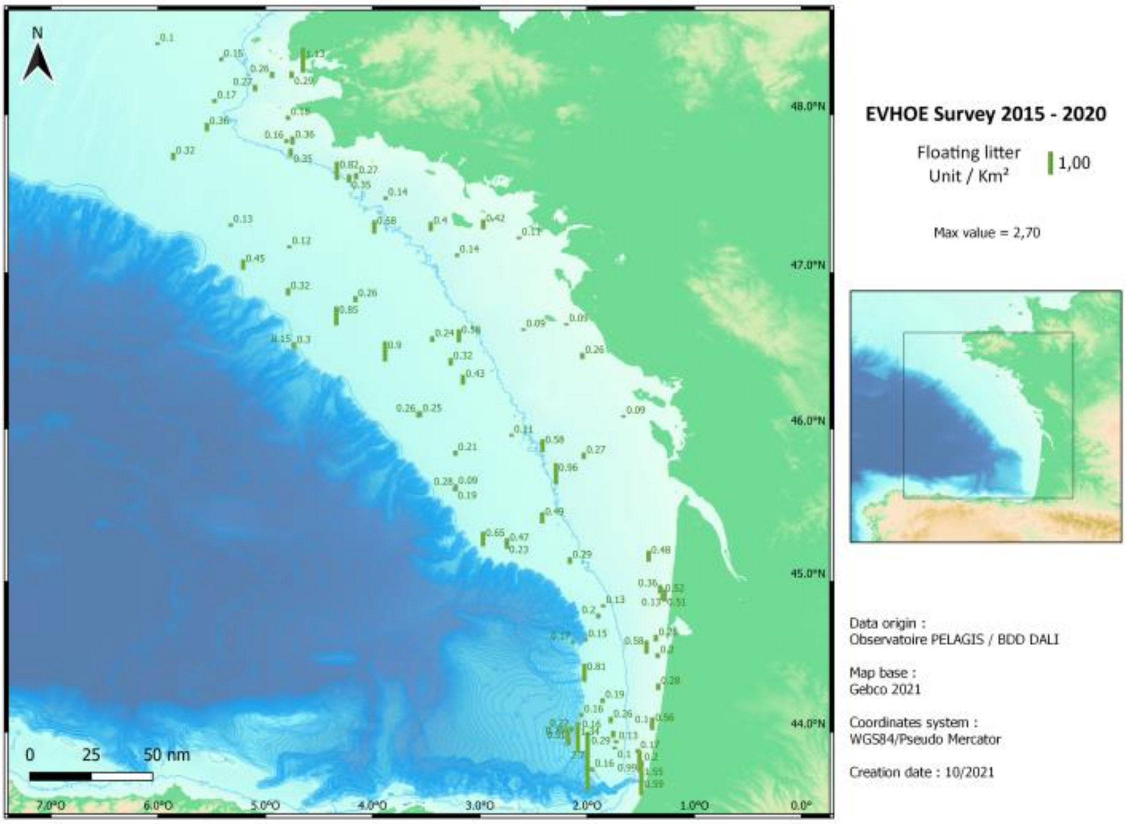


Figure 2.15: Litter abundance in EVHOE campaigns 2015-2020

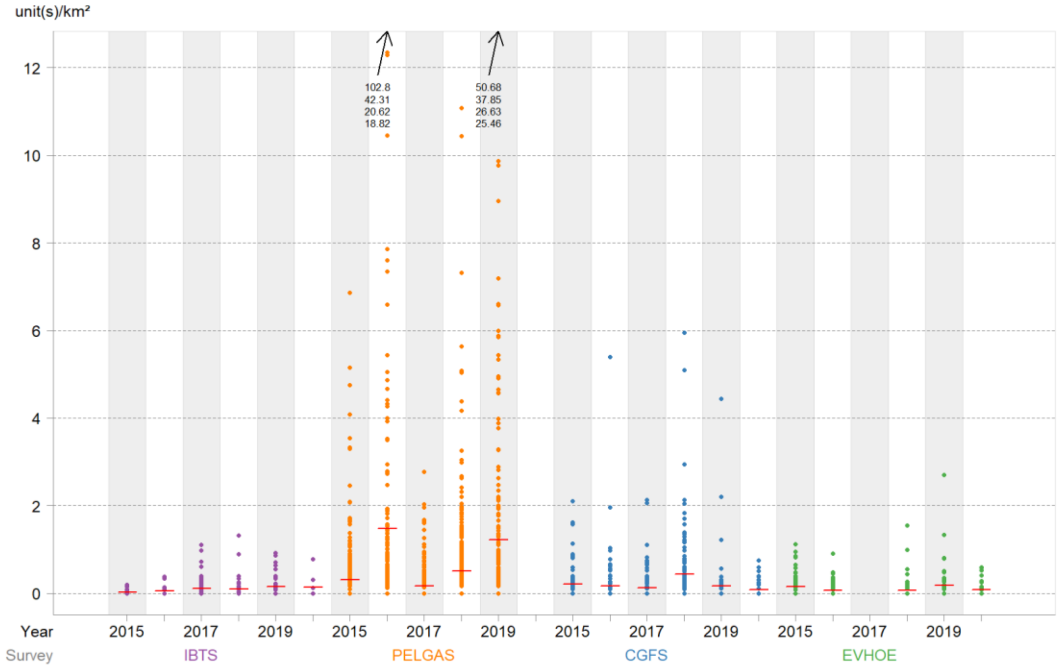


Figure 2.16: Year to year variation in litter densities per year and cruise (the red bars represent mean values).

Since the number of legs may largely vary from one survey to another (see figure 2.16), and possibly generate bias, calculation of annual means of total litter were calculated as the average of the means per survey.

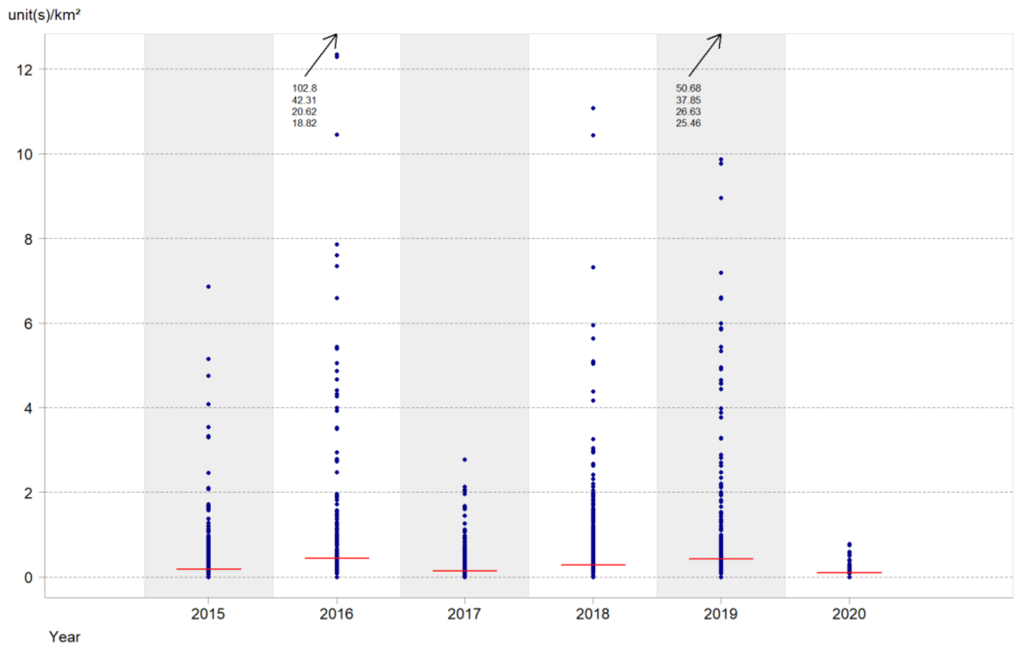


Figure 2.17: Year to year variation in weighted means (per 100 legs/campaign) of litter densities for all surveys.

The highest weighted means were observed in 2016 and 2019 with 0.44 and 0.43 units/km² respectively. These two years correspond to two very active years for PELGAS, in terms of litter abundance, indicating that the design of the survey influences the results. This was confirmed in 2020 when this campaign was cancelled, due to COVID-19, resulting in both a lower annual mean and variability of densities.

2.2.3. Gaps on monitoring and research

To improve the knowledge on floating litter and to rely on recommendations from the MSFD, a litter typology referring to Single Use Plastic could be added to the protocol. More information on "Unspecified Litter types" should be collected to better define the sources. Finally an alignment of the results with the modelling of current and lagrangian transport is expected to provide more information and enable the prediction of the transport of litter. Linking the outputs from WP6 to the results from field surveys will be very useful and a follow up of the present work.

2.3. Potential improvements and recommendations

Considering the conclusions derived from the analysis of data available on the Iberian Peninsula NW shelf, special attention should be paid to the East Cantabrian Sea, where this and other recent studies found the highest concentration of litter and plastic litter, including microplastics (Mendoza et al, 2020). More accurate protocols for identification of sources and material of floating litter categorised as "trash" are needed in order to effectively addressed the causes and eventually reduce the abundance of floating litter.

The use of regular multidisciplinary campaigns for floating litter assessment is highly recommendable since it enables the recording of long-time data series thus the analyses of trends in litter abundance and composition, while saving resources and efforts.

The application of MEGASCOPE protocol since 2015 in South of the North Sea/English Channel and the Bay of Biscay/Celtic Sea during these four multidisciplinary cruises generated a consistent dataset on floating marine litter on a large spatial area. More "in deep "analyses will support better knowledge on the characterization of the differences between seasons, types, areas, and quantities. Actually, data is not sufficient to detect trends in litter abundance. Nevertheless, results show that the South of the Bay of Biscay presents the highest litter concentration. Linking the data with information on river inputs, shipping routes, urban sources and even sea floor litter amounts and composition will largely help to better understand the cycle of plastic at sea.

3. SEABED LITTER

As part of the OSPAR Coordinated Monitoring Programme (CEMP), seafloor litter is collected on benthic trawl surveys, which are primarily aimed at monitoring fish stock assessments. An assessment of these seafloor litter data has been led by Cefas. This work has benefited from feedback from the Seafloor Litter Expert Group and OSPAR Intersessional Correspondence Group on Marine Litter (ICGML) and will feed into the Intermediate Assessment and Quality Status Report. At the stage of submitting to CleanAtlantic the full report is still in draft format and undergoing final agreement and changes to be accepted as an OSPAR Intermediate Assessment.

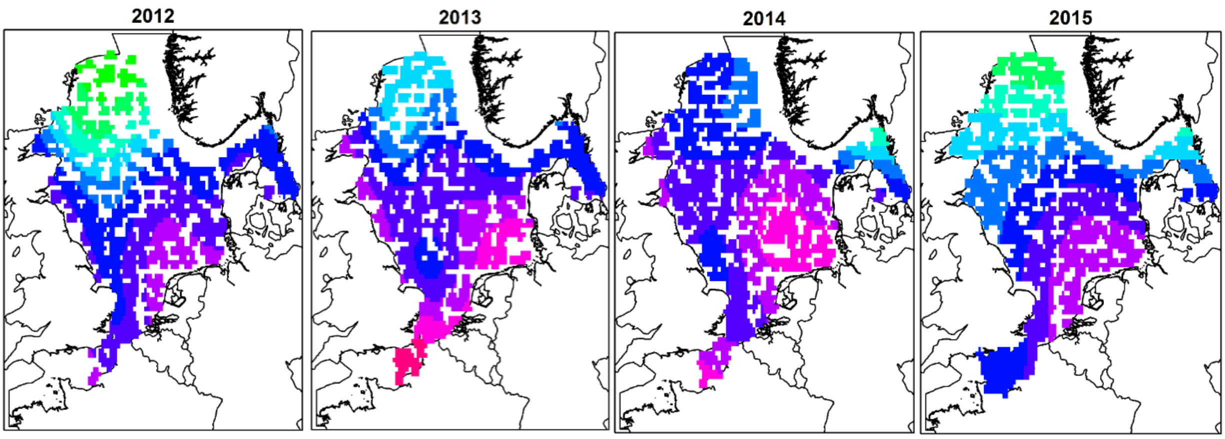
The main part of the assessment covers three OSPAR regions: the Greater North Sea, Celtic Sea and Bay of Biscay and Iberian Coast. It provides summaries and assessments including:

- Spatial maps for probabilities that hauls contain litter items for the years 2012 to 2019.
- Mean values and 95% confidence intervals of the probabilities for defined litter categories.
- An assessment of the trend of total litter, fishing gear, and plastic bag probabilities between 2012 and 2019.

The full draft assessment (see QSR Indicator Assessment document) also covers several case studies including one specifically on probabilities that hauls contain litter for Portugal, a demonstration of UK counts and some preliminary results for the catchability of litter types by gear. This summary will also identify the top ten items for the UK NS- IBTS case study (2015-2020).

3.1. Key findings

Litter is widespread on the seafloor in the Greater North Sea (GNS), Celtic Sea (CS) and Bay of Biscay and Iberian Coast (BB), with plastic the predominant material encountered (2012-2019). First, looking at spatial maps for the proportions of hauls containing litter items, separate assessments were made for each region. In the Greater North Sea, there was a North-West (low) to South East gradient in probability that hauls contain litter (Figure 3.1), in the CS there was a North (low) to South gradient (Figure 3.2). Overall, Bay of Biscay has the highest probability that a haul will contain a litter item (85%), with Greater North Sea next (69%) and Celtic Seas lowest (55%).



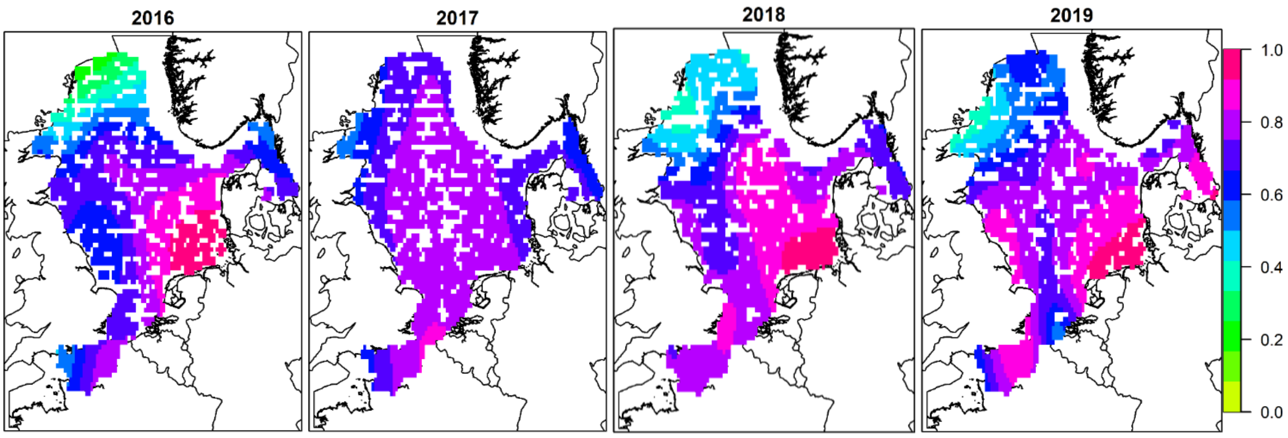


Figure 3.1. Smoothed maps for the GNS of the probability hauls contain a litter item, from 2012-2019. The spatial components of the models are statistically significant (p<0.05) for all years.

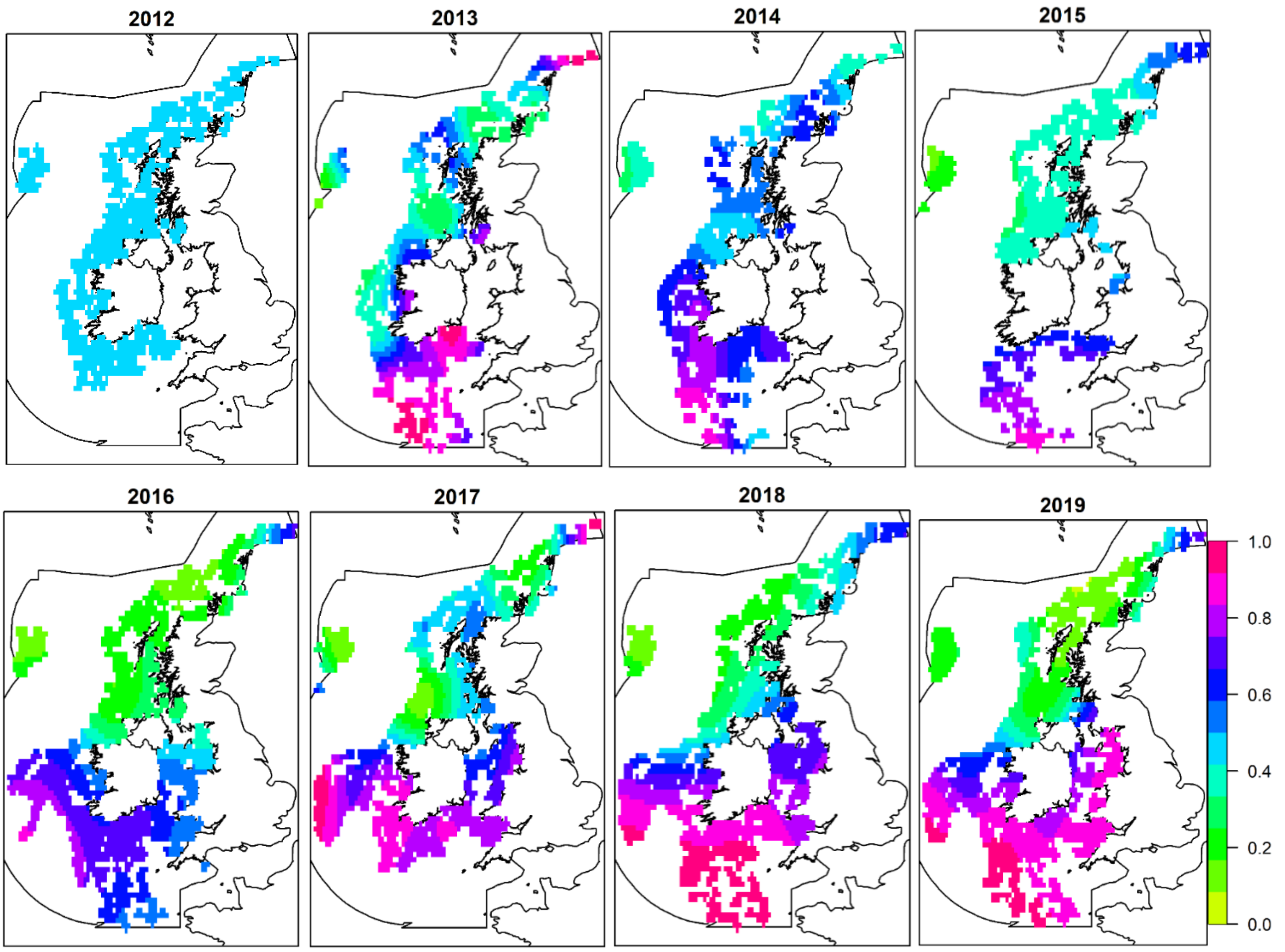


Figure 3.2. Smoothed maps for the CS of the probability hauls contain a litter item, from 2012-2019. The spatial components of the models are statistically significant (p<0.05) for all years except 2012.

The Greater North Sea was the only area to show a slight increasing trend in probability that hauls contain litter between 2012 (probability approximately 0.6) to 2019 (approximately 0.7) (Figure 3.3a). Although there appeared to be a potentially increasing trend for fishing litter, this trend was not statistically significant (Figure 3.3b).

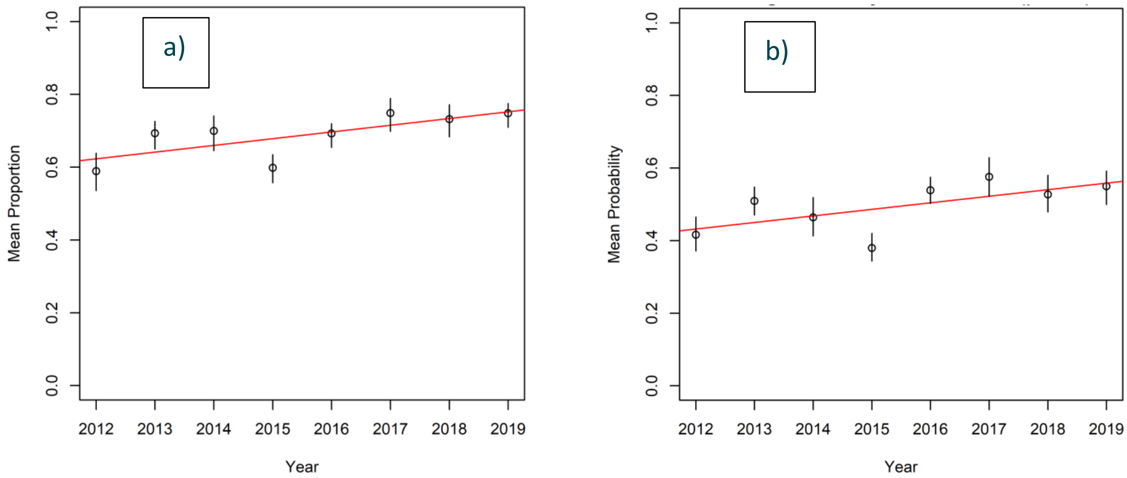


Figure 3.3. a): Trend of probability hauls contain litter in the Greater North Sea. Linear regression trend statistically significant (p=0.043). b) Trend of probability hauls contain fishing gear litter in the Greater North Sea. Linear regression trend not quite statistically significant (p=0.09). The vertical lines are 95% confidence intervals.

The top ten most frequently found litter items collected on the UK NS-IBTS survey between 2015 -2020 were mostly plastic. Materials related to fishing activities were common and included rope, fishing line and fishing net. Plastic sheets, bags, bottles, strapping bands and crates and containers were amongst the other plastic items in the top ten. Metal cans, rubber gloves, and natural rope and wood were amongst the other materials listed.

3.2. Gaps on monitoring and research

There are several limitations to the data collected from a monitoring programme which is designed primarily for fish stock assessments, rather than assessing the accumulations and trends of seafloor litter. The trawls cover only sandy areas (there are sampling restrictions in rocky areas), small litter items are not collected and, although there has been significant work to improve matters, there are still concerns over the quality of the data submitted due to limited technical guidelines and lack of quality control. Furthermore, how well the different gears sample litter is not well understood.

We need a better understanding of the lifecycle of litter on the seafloor, we need to know how hydrodynamics, geomorphology and human factors influence the geographical distribution of litter. Also, an understanding of the catchability of different gears and the conversion factors from one gear to another would strengthen quantitative statements. To estimate total litter abundance on the seabed, we need to know the percentage of litter on the seafloor the trawls are collecting.

3.3. Potential improvements and recommendations

Countries collecting seafloor litter data need to harmonise their methods for counting items so that count data can be used in future assessments. The OSPAR Seafloor Litter Expert Group is revising the CEMP guidelines for monitoring and the ICES Working Group on Marine Litter (WGML) is currently trying to publish improved technical guidelines to collect seafloor litter data. These documents, once published, need to be followed by OSPAR contracting parties to allow comparison of litter count data. As more years of data become available, we will aim to detect trends for these litter counts. To build on this we should also start to look at litter weights; however this will require improved data from surveys.

It would be useful to look at providing the assessment also at different spatial scales, such as by Atlantic Area, country or areas covered by specific fisheries survey. An assessment beyond the OSPAR region would enable wider comparisons, but further examination of the data and methodology and discussions between regional seas organisations are needed first. In future assessments, sources of seafloor litter should be considered, and methods developed to identify these. Commercial trawling intensities, major rivers, shipping routes and urban centres could be included. Finally, a better understanding of the fisheries assessments and how they account for variables such as gear type, area swept, haul and survey design is recommended.

4. CleanAtlantic Marine Litter Online Viewer

The main objective of the CleanAtlantic Marine Litter Online Viewer is to show the results of the assessment of the marine litter data available in the Atlantic Area and performed in the frame of the CleanAtlantic project. This interactive map was created to be a free, open-data and user-friendly interface, addressed to the general public as well as researchers or policy makers. It displays dedicated sections on "Beach", "Floating", and "Seabed" litter data that show the results obtained for each individual marine compartment. Additionally, a brief explanation about data sources, data processing and units is provided. By clicking on each location or area on the map (shown as circles or squares) a pop-up window shows a set of graphs (e.g. time series, histograms of litter density, pie charts of litter composition, etc.). See the example on Figure 4.1 below.

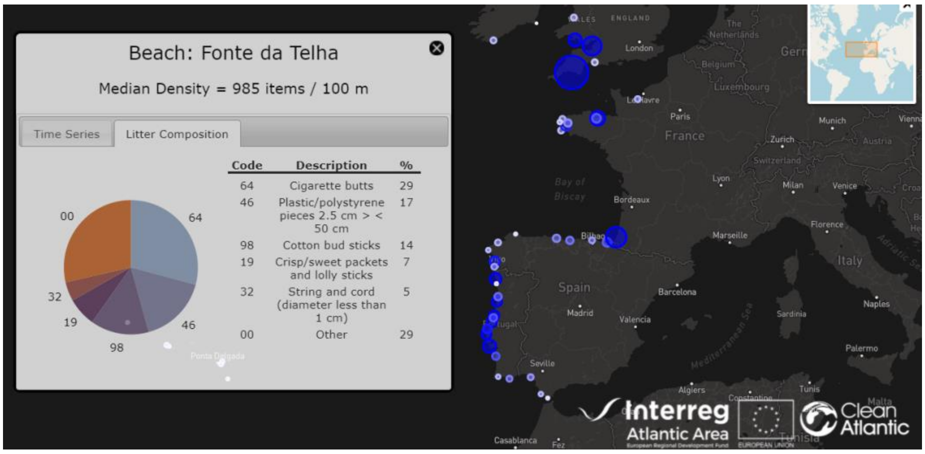


Figure 4.1. Screenshot of the CleanAtlantic Marine Litter Online Viewer showing the results of the assessment of beach litter data on the “Fonte da Telha” beach (Portugal).

The online viewer can be accessed through the CleanAtlantic website at: http://www.cleanatlantic.eu/

Go to -> MAPS/DATABASES -> Marine Litter Viewer.

Further development will require the implementation of a spatial database server for a regular collection of the exiting marine litter data and advance visualization and analysis options. The future development intention is to transform the current viewer into a web tool that will support analysis responding to common question from stakeholders needs. This tool could be developed in R language and code shared in Github to enable the collaboration between partners and scientist that use this programming language in a daily basis.

References

CleanAtlantic project full reports:

- Overview of marine litter status in the Atlantic Area: Beach litter: http://www.cleanatlantic.eu/wp-content/uploads/2021/04/CleanAtlantic-4-1-Overview-of-marine-litter-status-in-the-Atlantic-area-beach-litter.pdf
- Spatial and temporal variability in floating litter in the NW and N Iberian Shelf in spring (2007-2017). Gonzalez-Nuevo G., Gago J., Saavedra C., Valeiras J. and Santos M. B. Submitted to Marine Pollution Bulletin. Link to the publication to be available in due time at http://www.cleanatlantic.eu/marine-litter-in-the-atlantic-area/
- Spatial and temporal variability in floating litter in English Channel and Bay of Biscay- 2015-2020 http://www.cleanatlantic.eu/marine-litter-in-the-atlantic-area/
- Overview of marine litter status in the Atlantic Area: Seabed litter. http://www.cleanatlantic.eu/marine-litter-in-the-atlantic-area/

Other references:

Amaia Mendoza, Juan Luis Osa, Oihane C. Basurko, Anna Rubio, María Santos, Jesús Gago, François Galgani, Cristina Peña-Rodriguez. 2020. Microplastics in the Bay of Biscay: An overview. Marine Pollution Bulletin, Volume 153: 110996. https://doi.org/10.1016/j.marpolbul.2020.110996

Dorémus G., Van Canneyt O. 2021. Protocole d'observation de la mégafaune marine depuis les campagne Halieutiques. Suivi MEGASCOPE (Mise à jour). Cahier technique de l'observatoire PELAGIS sur le suivi de la mégafaune marine. La Rochelle Université et CNRS, 19 pages.

Galgani, G. Hanke, S. Werner, L. Oosterbaan, P. Nilsson, D. Fleet, S. Kinsey, et al.,Monitoring Guidance for Marine Litter in European Seas. MSFD GES Technical Subgroup on Marine Litter (TSG-ML). Final report, pp. 120, 2013

Baudrier, J.; Lefebvre, A.; Galgani, F.; Saraux, C.; Doray, M. Optimising French Fisheries Surveys for Marine Strategy Framework Directive Integrated Ecosystem Monitoring. *Mar. Policy* 2018, *94*, 10–19. https://doi.org/10.1016/j.marpol.2018.04.024.

Gerigny Olivia, Brun Melanie, Tomasino Corinne, Le Moigne Morgan, Lacroix Camille, Kerambrun Loïc, Galgani Francois (2018). Évaluation du descripteur 10 « Déchets marins » en France métropolitaine. Rapport scientifique pour l'évaluation 2018 au titre de la DCSMM

Lazure, P. and S. Desmare (2012). Caractéristiques et état écologique. Golfe de Gascogne. Etat physique et chimique. Caractéristiques physiques. Courantologie. EI2012.: 9.

Lazure, P. and S. Desmare (2012). Caractéristiques et état écologique. Manche-Mer du Nord. Etat physique et chimique. Caractéristiques physiques. Courantologie. EI2012.: 9.

Lazure, P. and S. Desmare (2012). Caractéristiques et état écologique. Mer Celtique. Etat physique et chimique. Caractéristiques physiques. Courantologie. EI2012.: 9.

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